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Note—Beginning with 1906 indexing of general articles and of mining news, which formerly had been given separate departments, was merged. New patents, when simply mentioned in our lists, are no longer indexed in detail. During the period covered by the present index, such lists appeared at pages 154, 202, 249, 298, 346, 394, 490, 631, 821, 1015, 1253.

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MINERAL AND METAL PRODUCTION IN 1906

Statistics of the Output and Commercial Movement—Market Conditions—Mining and Metallurgy

In the following table we summarize the production of minerals and metals in the United States in 1906 so far as it has been possible to collect the statistics at so early a date. The figures for copper, lead and spelter are based on reports received directly from the producers, who have communicated their actual output during the first 11 months of the year, together with their estimates of probable production in December; in many cases the estimates are for only the last few days of December. The other statistics are based on the reports of producers, State mine inspectors, and special correspondents.

Even under these conditions, it is impossible to insure accuracy. Among other difficulties, there are always likely to be duplications or omissions in the reports of the producers, which can be corrected only by careful investigation involving considerable time. However, we are confident that the statistics which we are able to present at this early date are close approximations to the truth, and we believe that statistics giving the production within 5 per cent. of the actual, presented five days after the close of the year, are more valuable to the industry than statistics that are precise, or within one per cent. of the actual, submitted six months or a year later.

It will be observed that there are differences between the statistics given by the various contributors to this number and our own statistics. This is because their contributions were necessarily written and put into type before our statistics were available, and consequently the statistics of our contributors are generally estimates. This explanation will account for discrepancies, though the reason will be so obvious to our readers that an explanation is hardly required.

MINERAL AND METAL PRODUCTION OF THE UNITED STATES.

Product.	Customary Measure.	1905. Quantity.	1905. Value. Total.	1905. Value. Per Unit.	1906. Quantity.	1906. Value. Total.	1906. Value. Per Unit.	Changes in Quantity.
Non-metallic:								
Coal, bituminous	Short ton.	310,285,015	$353,724,917	$ 1.14	335,738,059	$409,455,752	$1 22	I. 25,453,044
Coal, anthracite	Short ton.	78,731,523	178,788,244	2.27	71,018,433	169,580,506	2.39	D. 7,713,090
Garnet	Short ton.	3,694	114,625	31.03	5,442	187,095	34.40	I. 1,748
Graphite, crystalline	Pound.	4,260,656	170,426	0.04	4,079,333	131,866	0 032	D. 181,323
Iron ore	Long ton.	44,578,456	94,768,122	2.13	49,670,000	103,570,000	2.08	I. 5,091,544
Limestone flux	Long ton.	14,098,000	6,739,200	0.56	14,228,500	9,390,810	0.66	I. 130,500
Petroleum	Barrel.	139,728,839	118,769,513	0.85	131,061,505	96,593,274	0.74	D. 8,667,334
Phosphate rock	Long ton.	1,933,286	9,713,296	5.02	2,102,067	10,552,376	(k) 5.02	I. 168,781
Pyrites	Long ton.	200,280	651,796	3.25	204,896	77,600	3 31	I. 4,616
Manufactured:								
Alundum	Pound.	3,612,000	252,840	0.07	4,331,233	303,186	0.07	I. 719,233
Arsenic, white	Short ton.	773	50,225	64.97	831 5	83,150	100.00	I. 58.5
Bromine	Pound.	899,434	139,432	0.16	1,250,000	168,750	0.035	I. 350 566
Coke	Short ton.	28,404,112	72,284,336	2.54	32,568,926	99,960,968	3 06	I. 4,164,814
Copper sulphate	Pound.	52,278,996	2,352,555	0.045	48,534,129	3,009,106	0.062	D. 3,744,867
Copperas	Short ton.	21,103	147,721	7.00	18,546	129,822	7.00	D. 2,557
Crushed steel	Pound.	812,000	56,840	0.07	837,000	58,590	0.07	I. 25,000
Graphite, artificial	Pound.	4,595,500	313,979	0.068	4,868,000	312,764	0.064	I. 272,500
Lead, sublimed white	Short ton.	6,977	697,700	100.00	8,000	8,000,000	100.00	I. 1,023
Zinc, oxide	Short ton.	65,403	5,232,240	80.00	68,549	5,483,920	80.00	I. 3,146
Zinc-lead, white	Short ton.	7,200	540,000	75.00	5,749	488,665	85.00	D. 1,451
Metallic:								
Aluminum	Pound.	11,350,000	3,632,000	0.32	14,350,000	5,166,000	0 36	I. 3,000,000
Copper	Pound.	871,634,245	136,837,860	0.157	915,000,000	178,699,500	0.1953	I. 43,365,755
Gold	Oz. fine.	4,265,742	88,180,700	20.67	4,702,235	97,155,201	20.67	I. 436,493
Iron, pig	Long ton.	22,702,397	377,540,862	16.63	25,521,911	490,275,910	19.21	I. 2,819,514
Lead	Short ton.	319,744	30,133,490	94.18	364,336	38,962,092	106.94	I. 44,592
Quicksilver	Flasks.	30,650	1,189,220	38.80	27,276	1,063,764	39 00	D. 3,374
Silver	Oz. fine.	56,101,600	35,373,181	0.63052	57,358,267	38,301,160	0.66791	I. 1,256,667
Zinc	Short ton.	201,748	23,733,635	112.68	225,395	27,939,964	123 96	I. 23,647

(k) Taken same as for 1905 in absence of reliable statistics.

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Graphite

The [illegible] grades of graphite produced in the United States are crystalline, amorphous, and artificial. The production of graphite for the past three years is as follows, in tons of 2000 pounds:

	1904	1905	1906
Crystalline	1,879	2,330	3,000
Amorphous	19,117	21,365	(29,000
Artificial	1,024	1,298	2,181

Estimated.

The greatest part of the crystalline graphite comes from the Adirondack region of New York, but Pennsylvania is also a producer. Amorphous carbon occurs in Rhode Island, Michigan and Wisconsin, and to a smaller extent in Colorado, Ohio, North Carolina and Georgia. Of the last four States named, Colorado is the only one that has reported any production for 1906.

CRYSTALLINE.

In New York, the Dixon Crucible Company is much the largest producer, its output being a very pure, flake, crystalline graphite, particularly suited to lubrication. Other companies operating here, with recently completed mills, are the Adirondack Graphite Company, the Champlain Graphite Company, and the Silver Lead Graphite Company, all of Whitehall, N. Y. These last companies spent the whole, or most, of the year in development, so that their production was very small.

In Pennsylvania, the production of crystalline graphite in 1906 was merely nominal, due to the development of mines, the extension of plants, and changes of ownership. However, most of the companies now report that they are in condition to resume active productive operation.

AMORPHOUS.

Rhode Island, Michigan and Wisconsin have made their usual average production and there is very little new information to report from these localties. The Hathaway mine in the upper Michigan peninsula has not been worked for over a year. The Federal Graphite Company, of Colorado, has been producing steadily. It has the only graphite factory west of Chicago, and reports a steadily increasing demand for its products. The Chicago Graphite Manufacturing Company retired from business in July, 1906.

ARTIFICIAL.

The production of this form of carbon is increasing very rapidly. About 27 per cent. of the product is exported. The International Acheson Graphite Company is the only producer.

Gold Movements

[illegible] an [illegible] article, the great production of gold, which has marked the past decade, continued in 1906. This [illegible] one of the reasons of the activity of general trade, the rush of [illegible] of which we [illegible] In all the great commercial nations, business is conducted chiefly on credit of various kinds; but the basis of all credit, under our modern system, is found in the actual coin which is held, mainly as reserves in the banks and treasuries, and partly in general circulation. The greater this reserve is, the more credit is extended. The danger is that the enlargement of credit for legitimate, industrial and commercial enterprise is apt to be accompanied by a similar, or even greater, extension for purposes purely speculative, which may be carried far enough to endanger the solvency of the whole commercial system.

Twenty years ago Dr. Soetbeer estimated—and some other eminent authorities concurred with him—that not more than 25 per cent. of the world's gold production in any one year, was actually added to the available stock of money. The remainder was absorbed by use in the arts; by the amount actually destroyed in fire and wreck; by gold absorbed in private hoards, and in other minor ways; and finally by the amount needed to make up the actual destruction of values by war, fire and other public calamities. It is possible that even 20 years ago this estimate put the addition to the money stock too low. With the largely increased production of recent years, the improvements in transportation and communication and better methods in business, the proportion at the present day is certainly much higher, reaching very probably 60 per cent. The loss by public disasters is the most important in recent years. The financial derangements caused by the Boer war are hardly yet completely adjusted. The waste and loss of the Russo-Japanese war is still weighing on the world's money markets, and the destruction by earthquake and fire at San Francisco and Valparaiso were serious factors during 1906.

Reviews of the mining stock markets have been crowded out of this issue by the press of other matter. It is sufficient to remark that there was great activity in 1906 in all markets, which evinced an extraordinary public interest in mining investments. The transactions on the New York curb especially were very large. An important feature at the very end of the year was the decision of the New York Produce Exchange to list mining and industrial stocks. This is an old institution of the most respectable character, and its new departure will create a market for mining stocks where trustworthy quotations will be made and proper discretion will be exercized in the character of the stocks allowed to be traded in. This is a much needed consummation, and it is to be hoped that the new enterprise will have the coöperation of the New York Stock Exchange, the rules of which have really led to many of the evils of the curb, no organization of the curb brokers having been permitted heretofore.

THE PRECIOUS METALS

Production of Gold, Silver and Platinum—Commercial Conditions—Industrial Review

The approximate figures for the production of the precious metals show that the supply was fully maintained in 1906. If there were disappointments in some directions, there were unexpected increments in others, so that the final result is a gain over 1905; that is, the highest production ever recorded in a single year. In the following pages are given the figures of production, with comprehensive reviews of the conditions in most of the chief producing countries.

Gold and Silver in the United States

The gold production of the United States reached a total of $88,180,700 in 1905, the largest figure ever recorded up to that date. In 1906, according to the preliminary figures received through the courtesy of George E. Roberts, director of the mint, the total output was $97,155,201. The increase was largely due to developments in Alaska and the new mines of southern Nevada. The latter are remarkable from the fact that they are in a region which was prospected and passed over many years ago, and then neglected until two or three years ago, when the finds at Tonopah sent a multitude of prospectors into the country, to search out its heretofore undiscovered riches.

GOLD PRODUCTION OF THE UNITED STATES

In Dollars.

	1905.	1906.	Changes.
Colorado	$25,701,100	$23,506,069	D. $2,195,031
California	19,197,100	18,139,413	D. 1,057,687
Alaska	14,945,600	21,249,216	I. 6,323,616
South Dakota	6,913,900	6,821,100	D. 92,800
Montana	4,889,300	5,156,938	I. 267,638
Arizona	2,691,300	3,197,256	I. 505,956
Utah	6,140,900	5,849,052	I. 708,152
Nevada	5,370,100	9,921,600	I. 4,562,500
Idaho	1,075,600	1,041,210	D. 34,390
Oregon	1,244,900	1,368,540	I. 123,640
New Mexico	265,800	276,482	I. 10,682
Washington	370,000	374,168	I. 4,168
Southern States	367,600	247,783	D. 19,817
Other States	38,500	26,376	D. 12,125
Total	$88,180,700	$97,155,201	I. $8,974,501

SILVER PRODUCTION OF THE UNITED STATES

In fine ounces.

	1905.	1906.	Changes.
Alaska	236,578	191,706	D. 44,872
Arizona	3,400,000	3,093,000	D. 307,000
California	1,106,772	1,203,557	I. 96,785
Colorado	12,851,348	14,391,575	I. 540,227
Idaho	8,326,794	8,574,000	I. 447,206
Michigan	127,800	250,000	I. 122,200
Montana	13,500,000	11,532,000	D. 1,968,000
Nevada	6,000,000	6,600,000	I. 600,000
New Mexico	250,000	362,375	I. 112,375
Oregon	81,560	100,100	I. 18,540
S. Dakota	158,469	157,339	I. 19,130
Texas	469,600	280,000	D. 189,600
Utah	12,000,000	11,385,400	D. 616,600
Washington	115,412	31,119	D. 84,293
Other States	34,666	15,896	D. 18,770
Total	58,918,839	57,358,267	D. 1,560,572

Of course, their full value is still uncertain, and there may be a decrease in following years, or we should say, less production than is now anticipated; but so much is established that we may confidently expect to see some of the world's great gold mines on the Nevada desert.

The Gold and Silver Production of the World

The year 1906 records a further increase in the great production of gold which has marked the past decade. In the accompanying table we give the approximate figures for the year, compared with completed statement for 1905:

GOLD PRODUCTION OF THE WORLD

	1905	1906.	Changes.
Australasia	$85,470,779	$82,851,561	D. $2,619,218
British India	11,924,308	10,655,674	D. 1,268,634
Canada	14,486,893	12,000,000	D. 2,486,893
Mexico	14,526,855	15,460,000	I. 933,145
Russia	22,197,155	21,500,000	D. 697,155
Rhodesia	7,203,865	10,201,327	I. 2,997,462
Transvaal	101,225,558	119,605,922	I. 18,380,364
United States	88,180,700	97,156,201	I. 8,974,501
All others	34,151,823	35,250,000	I. 1,098,177
Total	$379,867,374	$404,649,685	I. $34,782,172

We are able to include in this table very close approximations for all the chief producers, except Russia. For the United States we have the preliminary figures compiled by Director George E. Roberts, of the United States mint; for the Transvaal, Rhodesia and Australia, there are the definite figures for eleven months, with the month of December estimated.

The total, as was predicted a year ago, exceeds $400,000,000, the largest amount on record. The Transvaal again leads, and moreover shows the largest gain. The United States holds the second place, with Australia third. These three producers together furnished about three-fourths of the total. For Russia, the fourth producer in rank, it has been impossible to obtain our usual estimates, owing to the troubles of the past year. From the best available information, however, we are obliged to allow a small decrease; it is small, because most of the Siberian gold mines are isolated from the centers of commercial and administrative disturbance. Canada dropped last year to the sixth place, falling below Mexico; the decrease resulted chiefly from a lower output in the Yukon territory, which is still in the transition state, but may be expected to recover within the coming year, to a large extent. British India showed a loss in the Kolar goldfield, the largest mine in that field—the Champion Reef—having entered a zone of lean ore, through which work is being pushed in the hope of recovering the main orebody at a lower depth.

The work done in all the chief producing countries is referred to at length in the special articles which follow.

The silver production of the world recorded little change in 1906. The output probably increased with that of gold, lead and copper, in connection with which most of the mining of silver is done. The United States and Mexico remained the chief producers during the year just closed.

The Commercial Movement of Gold and Silver

The tracing out of the disposition each year of the world's production of gold and silver is always a work requiring time and study. The great movements are clearly apparent, perhaps, but there are many obscure cross-currents which must be taken into account; all of these have their effect, and must be considered, if we wish to arrive at conclusions even approximately correct. At the present time it is only, possible to give such indications from official reports as will serve to point out the general direction of the movements.

The total gold production of the world in 1905, as given by THE MINERAL INDUSTRY, was $379,635,413; in 1906 it is estimated at $404,649,685, an increase of over 10 per cent. That is, after making all deductions, the commercial gold reserve standing back of trade and credit was increased by some $250,000,000, possibly a little more.

GOLD MOVEMENT IN THE UNITED STATES.

The United States, which has led in commercial, industrial and speculative activity, was in 1906 the chief absorber of gold. The imports and exports of gold for the 11 months ending Nov. 30—to which December will not add largely—are reported as follows:

	1905.	1906.	Changes.
Imports	$46,264,524	$147,961,827	I. $101,697,303
Exports	44,125,935	44,831,203	I. 705,268
Net imports, $	2,138,589	$103,130,624	I. $100,992,035

Adding our own production for the year there was, apparently, an increase of nearly $300,000,000 in the gold in the country; or of over $200,000,000, if we allow only 60 per cent. of the output to have passed into use. To a great extent, of course, this calculation is hypothetical; but it is evident that we absorbed the greater part of the new gold supplies of the world. The large imports were provided in various ways. In part they were the result of favorable trade balances; in part sales of securities; and in large part they represent actual borrowing of accumulated capital from Europe, which must be repaid at a future date. At the close of the year the situation is not altogether favorable for further imports, since the influence of the great foreign banks is against any extension of loans.

Great Britain has been for many years a taker of gold from abroad, because of its large foreign trade and its enormous investments in foreign enterprises. In 1906 its gold balance was lower than usual, chiefly because of large shipments to the United States. The official figures for the 11 months ended Nov. 30 are as [illegible]:

The exports to the United States were £1,817,000 in 1905, and increased to £14,148,304 in 1906.

For France, which also usually absorbs more gold than it gives out, we have the official figures for 10 months ended Oct. [illegible]:

Here we have a decrease of 325,307,000 fr. in the net imports; due to a large falling off in the receipts of gold, the exports remaining about the same.

The gold reserves of the great European banks in the closing weeks of 1905 and 1906 compare as follows:

	1905.	1906.
[illegible]	[illegible]	[illegible]
France	577,675,125	541,150,235
[illegible]	66,360,000	137,940,000
Austria	233,045,000	233,045,000
[illegible]	33,019,500	27,680,000
[illegible]	16,233,335	15,076,666
[illegible]	134,345,000	159,140,000
Spain	75,115,000	76,840,000
[illegible]	89,500,000	89,500,000
Sweden	18,900,000	19,780,000
Total	$1,186,773,960	$1,197,794,290

We find here a total decrease of $14,980,935, notwithstanding the large increase in the total of the Bank of Russia. That bank, it must be noted, holds practically the reserves of the Russian treasury as well as its own commercial balances. It has been charged also that the bank includes foreign gold bills in its balance; this, if true, would be to that extent a duplication of gold reported by other banks.

The specie holdings of the New York banks, including both gold and silver were $170,212,800 in the last week of 1905, and $179,323,000 in that of 1906. The working balance of the United States Treasury for the closing week included $136,831,505 gold in 1905, and $162,415,554 gold in 1906. In addition to this the Treasury holds $150,000,000 gold reserve against outstanding notes in circulation, and $572,972,119 against gold certificates; making its total gold holdings the largest in the world.

The price of silver rose gradually through the year, reaching its highest point in November. From that there was a recession, but comparatively small in amount. The average monthly prices of silver in the New York and London markets for two years past has been as follows:

AVERAGE PRICE OF SILVER

Month	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.930	30.113
February	61.024	66.108	28.047	30.464
March	58.046	64.597	26.794	29.854
April	56.600	64.765	26.108	29.984
May	57.832	66.976	26.664	30.968
June	58.128	65.394	26.910	30.185
July	58.915	65.105	27.168	30.113
August	60.259	65.949	27.822	30.529
September	61.695	67.927	28.528	31.483
October	62.034	69.523	28.637	32.148
November	63.849	70.813	29.493	32.671
December	64.850	69.050	29.977	32.103
Year	60.352	66.791	27.839	30.868

The New York prices are in cents per fine ounce; the London quotation is in pence per standard ounce, 0.925 fine.

The high price of silver was due chiefly to two causes, the first being the heavy demand from India, the result of three successive years of prosperity in that country; the second cause was the large demand for silver for use in the arts, incident to a period of general prosperity. Another reason for the maintenance of prices was the purchase of a considerable quantity of the metal by the United States mint.

MINT PURCHASES OF SILVER

Under authority of an act of Congress the United States Treasury Department began in August to buy silver in the market, to be used by the mint for the coinage of subsidiary coins. These purchases continued up to the early part of November, when they were temporarily discontinued, but resumed about a month later. Before inviting tenders in August, the Department, anticipating that the invitation to sell might have an effect upon the market, bought about 2,500,000 oz. in London for future delivery. These purchases were afterward exchanged for metal in this country, which was delivered at the several mints, as shown below. The total purchases made, with the deliveries, are shown below in ounces, the London silver above noted being given separately:

Mint	American.	London.	Total.
Philadelphia	875,000	1,630,307	2,505,307
New Orleans	850,000	400,119	1,250,119
Denver	1,950,000	403,299	2,353,299
N. Y. Assay Office	50,000	.....	50,000
Total	3,725,000	2,433,725	6,158,725

The London purchases were made at a price ranging from 65.474 to 65.772c. per ounce, and averaging about 65.60c., which was close to the current market price. The lowest price paid in the American market was 65.17c., Philadelphia delivery, on Aug. 2; the highest was 71.952, New Orleans delivery, on Nov. 9. The prices paid in America included delivery, and they ranged almost uniformly about 0.4c. per ounce for Philadelphia and Denver, and about 0.5c. for New Orleans delivery above the New York quotations of even dates.

The [illegible] silver bought by the mint was about 10 per cent. of the production of the United States for the year.

SILVER IMPORTS AND EXPORTS

The movement of silver in the United States for the 11 months ending Nov. 30 was as follows, in value:

	1905.	1906.	Changes.
Exports	$49,313,953	$53,400,246	I. $4,086,293
Imports	31,246,389	39,790,748	I. 8,544,359
Net exports	$18,067,564	$13,609,498	D. $4,458,066

The net exports showed a decrease, chiefly owing to the heavy receipts from Mexico. Detailed figures are available only for the 10 months ending Oct. 31; these show that the more important exports were as follows:

	1905.	1906.	Changes.
Great Britain	$35,335,408	$42,513,893	I. $7,178,485
Other Europe	1,492,466	2,942,218	I. 1,449,752
China	4,021,419	888,447	D. 3,132,972
Japan	1,538,070	1,564,802	I. 26,732

It is probable that most of the silver taken by Japan is for use in Manchuria and Korea. The leading imports for the 10 months were:

	1905.	1906.	Changes.
Mexico	$22,486,633	$30,439,540	I. $9,952,907
Canada	2,294,963	4,388,982	I. 2,094,019
Centr'l America	1,474,478	1,103,007	D. 371,471

The heavy exports from Mexico were due to the currency changes in that country and the disposal of its surplus silver.

EXPORTS AND IMPORTS OF GREAT BRITAIN

London continues to be the great silver market from which the East draws its supplies. As shown above, the exports from the United States directly to China and Japan were small, most of our silver going to London. The British returns for the 11 months ended Nov. 30—the latest available—show total imports and exports of silver as below:

	1905.	1906.	Changes.
Exports	£13,055,800	£17,829,585	I. £4,773,785
Imports	11,752,396	16,292,810	I. 4,540,414
Excess, exp.	£ 1,303,404	£ 1,536,775	I. £ 233,371

Of the 1906 imports the United States is credited with £14,032,451, or 78.7 per cent. of the total. The exports to the East, the most important of all, were as follows:

	1905.	1906.	Changes.
India	£6,379,112	£14,479,027	I. £8,099,915
Ceylon	5	65,700	I. 65,695
Straits	400	1,750	I. 1,350
China	986,691	433,957	D. 522,734
Japan	70,000	.....	D. 70,000
Total	£7,406,208	£14,980,434	I. £7,574,226

These exports in 1906 were more than double those of the preceding year. The great increase was due solely to India, whose people still follow the ancient custom of investing their savings in the white metal. These practically disappear from general commerce, as they either pass into the form of coined rupees in circulation or are added to the accumulation of centuries.

The Straits Settlements have ceased to import silver since the currency settlement of two years ago. The reason for the decrease in shipments to China is not altogether clear. It is understood that it was, in part, compensated for by shipments from Australia, but the returns for these have not been published.

COPPER PRODUCTION AND PROSPECTS

The Statistics, Conditions, and Commercial History of Copper in 1906

The production of copper in the United States is given in the following table. These statistics are based chiefly on reports received directly from the producers who have communicated their records for the first 11 months of the year, together with their own estimates of probable production in December. Only in two or three cases has it been necessary to include estimates; and these have been made on trustworthy data. In statistics collected within so short a time that investigation of all doubtful points is impossible, the final figures inevitably show some variations, but it is believed that the statistics now submitted, subject to revision, are a very close approximation to the actual production in 1906.

PRODUCTION OF COPPER IN THE UNITED STATES

(In pounds.)

State.	1904.	1905.	1906.
Alaska	2,043,586	4,703,600	6,250,000
Arizona	191,602,958	222,866,024	265,300,000
California	29,974,154	13,089,993	23,500,000
Colorado	9,401,913	9,854,176	9,100,000
Idaho	5,422,007	6,500,000	10,100,000
Michigan	208,429,248	218,929,753	225,800,000
Montana	298,414,804	319,179,885	293,000,000
New Mexico	5,868,668	5,634,842	6,800,000
South and East	15,211,086	14,307,982	19,500,000
Utah	47,082,889	51,950,789	56,800,000
Wyoming	3,555,629	2,303,201	250,000
Other States	1,418,065	1,550,000	1,600,000
Total	817,715,005	871,634,245	915,000,000

It appears, therefore, that the increase in the production of the United States in 1906 was about 5 per cent., making comparison with our revised statistics for 1905. The latter show a smaller total for that year than was reported by the U. S. Geological Survey, but we are confident of the accuracy of our figures. Other statisticians continue to report the Michigan production much too high, although the report of the Michigan Commissioner of Mineral Statistics, to whom the companies make sworn statements, gives the production substantially as we made it (217,762,382 lb. vs. 218,999,753 lb.).

ALASKA

The copper production of this Territory shows a small increase—much less than a year ago it was expected it would be. However, there is no question that the copper resources of Alaska, near the seacoast and easily workable, are large, and an important increase in production from this source is to be looked for in the near future.

ARIZONA

Of the chief copper-producing States, Arizona shows the largest increase in 1906. The increase would have been larger had it not been for the shortage in labor, which was a difficulty all through the year, and moreover a shortage in the fuel supply which became a difficulty toward the end of the year. The flood at Clifton, about the end of November, which seriously damaged the smelting works of that camp, also contributed to the restriction of the output. The smelting works at Douglas and at Globe produced considerable copper from ore received from Cananea and Nacozari, Mexico, the amount of which has been deducted from their reports.

CALIFORNIA

The increase in the production of this State is due especially to the operations of the Mammoth Copper Mining Company, which made a large output in 1906. The new smelter which is being erected by the Balaklala company to treat the ore of the Balaklala and Trinity mines will increase the copper production of California in 1907. A small increase in the production is shown by the mines outside of Shasta county, especially in Calaveras county. A new copper district, the Greenwater district, was discovered in Inyo county in 1906. It appears to contain important copper resources, but its development will be slow because of unfavorable natural conditions. A good deal of the ore and matte produced in California is shipped to Utah for smelting and at present we are unable to make an accurate separation of the California and Utah production in 1906. The suspension of smelting by the Bully Hill company, pending the completion of a railway connection, caused the increase in California production in 1906 to be less than was anticipated.

EASTERN AND SOUTHERN STATES

The increase in the production of these States was due almost entirely to the enlargement of operations by the Tennessee Copper Company. By far the largest part of the production credited to the East and South is derived from the Ducktown district, Tennessee. A small amount of copper was derived from North Carolina. Vermont re-entered the list of copper-producing States, the mine at Pike Hill having been a small producer. The attempt to treat the ore of the Elizabeth mine by magnetic separation did not prove a success. Massachusetts appears for the first time as a copper-producing State, some copper-bearing ore having been found in the Davis mine, at Rowe. A little copper ore was shipped from another mine in the same neighborhood.

IDAHO

The copper production of this State shows a large increase. The largest part of the production came from the Snowstorm mine, in the Coeur d'Alene. The producer next in importance was the White Knob mine, at Mackay, Custer county. A small amount of copper ore was shipped from the Seven Devils district. The ore and matte of Idaho are shipped to other States for smelting to pig copper, wherefore the production credited to this State is deducted from the reports of smelters in other States.

MICHIGAN

The production of the Lake Superior district shows only a small increase. In most cases the output of the older mines showed decreases, which in some cases were large. The Atlantic mine suffered a cave-in, which caused the mine to be abandoned; the Quincy also suffered from a cave; while the Tamarack had a fire. The Calumet & Hecla made a considerable increase in output, as did also some of the new producers. These gains a little more than offset the losses of the other mines.

MONTANA

The decrease in the copper production of this State was due primarily to shortage of labor. Even if the supply had been adequate, it is doubtful if the production could have shown any increase, because the smelting capacity appears to have been utilized at the maximum in 1905. Plans are now being carried out to increase the smelting capacity, which will be consummated during 1907.

UTAH

The important increase in the copper production of this State was due to the more extensive operations of several of the smelters. Construction of the new dressing works for the Utah Copper Company and Boston Consolidated was begun. These plants should add materially to the production in the latter half of 1907. A drawback to the situation in Utah, however, is the recent injunction against the smelters of the Salt Lake valley, which probably will cause the abandonment of certain plants and the removal of some departments of others. These conditions are likely to upset to some extent the smooth running of the industry in 1907. The new Garfield smelter did not get into regular operation until late in 1906 and consequently was only a small producer. The smelters of Utah receive a great deal of ore and matte from other States, and although the major portion of such copper has been deducted from the smelters' reports and credited to the States of origin, it is probable that the statistics representing the Utah production still include some duplication.

The copper production of the other States in 1906 was small. Colorado remained at about the same figure as in the [illegible] having made no shipments. Oregon and Washington made small outputs.

Copper in Foreign Countries

Outside of the United States, it is impossible at this early date to present statistics of the production of copper, except for Canada and Mexico. It appears that both these countries made diminished outputs. The Canadian statistics are based on reports from the producers, checked by an estimate based on the net imports into the United States. The statistics for Mexico are based on the net imports into the United States (assuming those in November and December to have been at the average of the ten months previous), to which is added the Boleo production. The total statistics for North America are given in the following table:

(In pounds)

				1906
[illegible]	[illegible]	[illegible]	[illegible]	915,000,000
[illegible]	[illegible]	[illegible]	[illegible]	16,580,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Outside of North America, it will doubtless appear that there was a material increase in the copper production of Japan, Australia, Peru, and possibly Chile. No figures for Spain and Portugal are available.

In Australia, the Mount Morgan mine opened its career as a producer of copper. This copper, as does also considerable other Australian copper, comes to the United States for refining. The copper production of Japan is increasing because of the high price for the metal and the more vigorous attention that it has been possible to devote to the industry now that the war with Russia is over. The output of this empire is helped materially by the great Osaka mine, which is now the largest producer.

In Peru, the Cerro de Pasco company began smelting in January, but like many other new enterprises, this has suffered from infantile troubles, wherefore the output is not so large as it was expected it would be at the beginning of the year. [illegible] to the United States for refining.

A noteworthy feature of 1906 has been the increased attention directed toward the copper resources of Chile. Several new British and American companies have become interested there. Doubtless this will soon result in a material increase of the Chilean production.

In Canada, the mines of the Boundary district, British Columbia, suffered from substantially the same difficulties as prevailed in the United States, namely, shortage of labor and fuel. In the autumn, a strike in the Crows' Nest coalfield temporarily cut off that supply of coke and compelled the smelters to obtain fuel, at greatly increased cost, from the United States. The furnaces of the Granby company, the largest producer, have now been remodeled, and if there be no further difficulties of the same kind as those which appeared in 1906, the output of the Boundary district will show a large increase in 1907.

The copper production of Mexico showed a material decrease in 1906, but it is manifest that this Republic is bound to increase more and more in importance as a producer of copper. However, even in Mexico, shortage of labor is the general complaint. For this reason, and also because of the riots at Cananea late in the summer, and other troubles of the Greene company, the production of Mexico in 1906 was not so large as it ought to have been.

The leading feature of the year was the development of a great new mine by the Cananea Central company, and at the very end of the year the amalgamation of that company with the Greene Consolidated, under the name of the Greene-Cananea Copper Company, in which Messrs. Cole and Ryan, who are affiliated with the Amalgamated Copper Company, are the controlling interest. Colonel Greene is still identified with the company, but the management of the mines which he developed has passed out of his hands. The ore of the Cananea Central properties has been smelted at the works of the Greene Consolidated, while a good deal of the ore of the Greene company has been shipped to the United States for smelting. The production of the Moctezuma Copper Company also was smelted in the United States.

Consumption of Copper in the United States

We can estimate the consumption only approximately, lacking statistics of imports and exports for the last two months. Estimating them each at the average of the first 10 months, we reckon the con- [illegible] as follows:

	1905.	1906
Stock, Jan. 1	208,376,672	128,980,000
Imports	210,724,685	225,000,000
Production	871,634,245	915,000,000
Total	1,290,735,602	1,268,980,000
Deduct exports	548,774,103	472,870,000
Deduct stock, Dec. 31	128,980,000	135,570,000
Consumption	612,983,199	660,540,000

The estimated stock at the end of 1906, except for the comparatively insignificant quantity which the refiners necessarily have on hand even when the market is technically bare of refined metal, represents crude copper in transit and in process of refining, the increase as compared with Dec. 31, 1905, being simply in proportion to the increased production of metal.

The New York Copper Market in 1906

The year 1905 witnessed developments which the most ardent admirers of copper would not care to have predicted at any time. The history of 1906 may be summarized in the single statement that consumption has actually overtaken production. It had been noticed for some time past that production and consumption were about even, in spite of the continued large increase in the former from year to year, mainly on the American continent, while the rest of the world followed only to a very slight degree. But consumption has pushed ahead with even more energy, and the uses of copper, especially in connection with the electrical industry, have stimulated an enormous demand, with the result as above stated. To the closer observer it was evident for some time past that the industry was in a dangerous position, inasmuch as no reserves, so to say, existed anywhere, or rather they were so small that they would hardly be sufficient in case of an emergency. We cannot call the comparatively large quantities which are in process of manufacture reserves, as it must naturally take some time for any article to be put into manufactured shape.

For some time no stocks of refined copper existed in this country, nor abroad, with the exception of the so called visible supplies, which are mostly warehoused in Liverpool, Swansea and London, and have of late been below 10,000 tons. These stocks form the basis of transactions in standard copper on the London Metal Exchange. They can thus be practically ignored. The moment therefore that production showed a temporary decline, or consumption increased, it was natural that a famine would have to be faced, with more or less serious consequences to the manufacturing industry. This is exactly what happened during the last few months of 1906, when all at once the demand became larger than the available supplies. That under such circumstances a very high level of prices was unavoidable can easily be understood, and while it must be conceded that the larger selling agencies did everything they could to prevent a material rise in prices from the already comparatively high level which existed earlier in the year, they soon found themselves unable to stem the tide.

Thus, at the close of the year, we find prices at 23¾@23⅞c. for electrolytic, and at 24@24¼c. for Lake, and with such a firm tendency that it is safe, at least, to predict that for some months to come the market is not likely to show a considerable easing off; while probably there will be a further advance. The last time when such prices as the present existed was from January to April, 1880, when copper sold between 23 and 24c. Since then

there have been fluctuations in the price for Lake copper as follows:

During		Average
1881	1890	14.60c.
1891	1900	12.30c.
1896	1905	13.88c.
1901	1905	14.11c.

The lowest prices in any year were those during 1894, when the average for the whole year was 9.50c., and for the month of June 8.04c.

During this period of 25 years two efforts were made to raise prices artificially, the first in 1887, when the French syndicate tried to corner the market, and the second during 1899-1901, when the Amalgamated Copper Company interests tried to hold the price arbitrarily between 17 and 18c. Both efforts failed, but in fairness it is only just to admit at this late date that the principle, viz., to put copper upon a higher basis, was right; only the efforts were somewhat ahead of time.

What has been a certain disappointment is the fact that, in spite of the high average value of copper in 1906, production has by far not increased as much as was anticipated 12 months ago. It is only natural that high prices should stimulate every effort for an increase, and great activity is noticeable in all directions in the development of new fields, which were hitherto either not known or were of too low grade for commercial success, or were too remote from the arteries of transportation. Unquestionably, the stimulus now given will help greatly to increase the production, but it will be some time yet before their effect is noticeable in the markets. In fact, it is not too much to say that years will elapse before that is the case. It was therefore the actually developed mines from which relief was to be expected, and that this has not been forthcoming was the result of various causes, one of which is the fact that some conservative producers thought it wise to mine lower-grade ores, the mining of which in the past did not afford sufficient remuneration, and in this way their yield was reduced. But far more important were two factors which developed more and more as the year progressed, viz: scarcity of labor and insufficient supply of fuel and transportation facilities. Although wages have been repeatedly increased during the year, there was continually a shortage of miners and smelting men. Both in the South and Northwest the smelters were very short of oil, coal and coke, and repeated shut-downs were the consequence. The railroads were utterly unable to provide the necessary cars for the transportation of fuel and partly also for the transportation of ore, and all these causes put together contributed very largely toward reducing the production from the estimated figures. It is very unlikely that there will be any immediate material change, and therefore we do not figure on any large increase during the next few months, but later in the year there ought to be a change for the better.

A feature deserving of notice happened last spring when the war between some of the largest producers in Montana, viz: the Amalgamated Copper Company on the one side, and the Heinzes on the other, was happily terminated, and the injunctions against working a great many properties were lifted. In the natural course of events this ought to result in a considerable increase in the output of Montana.

In Michigan great activity exists and prospecting is done on a larger scale than ever before in the district. Arizona is coming more and more to the front and would undoubtedly show a very much larger production had it not been hampered by events as above stated.

The main increase in the near future may be expected from Utah and afterward from Nevada, and while the former State will most probably be the more important during 1907, Nevada should follow during 1908. California will also share in the augmentation, and British Columbia and Mexico will not remain behind.

The year opened with Lake copper at 18½ to 19c.; electrolytic at 18½ to 18⅞c., and casting copper at about 18¼c. During January the market was rather sluggish. The Orient was re-selling copper in Europe and here. American consumers were covered and held off, and the European speculative market declined somewhat. By the middle of February Lake copper had declined to about 18c., and electrolytic to about 17¾c.

Meanwhile, the winter in this country had been exceptionally mild, permitting much work to be done which usually must be deferred until spring. This made business very active, so that our home manufacturers who found their supplies of copper exhausted entered the market again.

At the end of February the Europeans who had been skeptical as to the maintenance of the level of prices had also to replenish their stocks. As a result, prices gradually advanced, and during March, in spite of the fact that China was still selling copper, Lake again went to 18¾c., and electrolytic to 18½c. The London market for standard then began to show signs of the shortage of supplies. In fact, toward the end of March, it was practically cornered, having advanced £7 during the month.

In April it became evident that consumption was much in excess of production and consumers bought ahead with confidence, covering their wants until about the first of September, at about 18¾c. for Lake, and 18½c. for electrolytic. The producers recognized the situation, but sold freely at these prices, which were quite satisfactory to them; and besides, they were desirous of preventing a runaway market, with its inevitable reaction and bad effect upon the trade generally.

In May copper for early delivery became very scarce, and premiums were paid for it. Toward the end of the month [illegible] bought heavily for future delivery at about 18¾c. for Lake, and 18½c. for electrolytic, with casting selling at 18½c.

As expected, June and July were dull months because buyers had already covered their requirements. The political situation in Europe at this time looked very grave, and this induced the London speculators to press upon the standard market, selling it down to about £78, but by August the immense increase in the consumption again made itself felt. Manufacturers were receiving orders far ahead and they came into the market, buying heavily for delivery up to the very end of the year.

September opened with producers practically sold out for both September and October, and with large orders on their books for November and December, and prices advanced to 19c. for Lake and 18¾ for electrolytic. The orders which manufacturers were receiving extended far into 1907, and led them to buy for the first six months of 1907. Meanwhile, copper for early delivery commanded fancy prices, and the month closed with Lake at 20c. and electrolytic at 19¾c.

During October the shortage in supplies led to a squeeze in the London market, and standard copper went as high as £102 15s. Some of the largest producers who were sold out for 1906, and had refrained from booking any orders for 1907, now offered to sell for that delivery at 22½c., and were quickly cleaned out. In fact, at this time several of the important producers were already entirely sold out for the first quarter of 1907.

In November the market was somewhat more quiet, but in December the European buyers who had held off during November made heavy purchases for 1907, and prices advanced rapidly, closing at about 24½c. for Lake, about 23⅝c. for electrolytic, and 23¼c. for casting copper.

The year 1906 ended with no stocks of copper on hand, and several producers sold out for the first six months of 1907. It was certainly a prosperous year in the copper trade!

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.....	15.008	18.310	15.128	18.419	68.269	78.869
Feb....	15.011	17.869	15.136	18.116	67.963	78.147
March..	15.125	18.361	15.250	18.641	68.174	81.111
April...	14.920	18.375	15.045	18.688	67.017	84.733
May....	14.927	18.457	14.820	18.724	64.878	84.867
June...	14.673	18.442	14.813	18.719	65.881	83.994
July....	14.886	18.190	15.005	18.585	66.887	81.167
Aug....	15.664	18.480	15.725	18.706	69.830	83.864
Sept....	15.965	19.033	15.978	19.328	69.667	87.831
Oct.....	16.279	21.203	16.332	21.722	71.406	97.269
Nov....	16.599	21.834	16.758	22.398	74.727	100.270
Dec.....	18.328	22.885	18.398	22.850	78.993	105.226
Year..	15.590	19.278	15.699	19.543	69.465	87.282

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2240 lb., standard copper.

LEAD AND SPELTER PRODUCTION

Developments in the Lead and Zinc Industries in 1906—Statistics of Production

The production of lead in the United [illegible] increase, but even this was insufficient to supply the requirements for consumption, and a large amount of lead had to be imported. The statistics of production are given in the following table, which is based on reports from all the producers except one, whose output has been estimated on the basis of its known ore supply. These statistics represent the production of refined lead. The lead-smelting industry is so complex that it is impossible at this early date to make any distribution among the States, and even the separation between foreign and domestic production is only approximate.

PRODUCTION OF LEAD IN THE UNITED STATES

(In tons of 2000 lb.)

Class	1905.	1906.
Desilverized, domestic	205,665	237,816
Antimonial, domestic	8,450	8,532
Southeast Missouri	31,200	40,000
Southwest Missouri	21,324	16,800
Miscellaneous	6,000	1,500
Total, domestic	272,739	304,336
Desilverized, foreign	38,504	46,005
Antimonial, foreign	2,530	1,701
Total, foreign	86,234	47,706
Grand total	405,678	412,042
Less antimonial	11,186	10,433
Total, net	102,623	116,289
Total desilverized	289,169	321,891

NET IMPORTS OF LEAD*

(In tons of 2000 lb.)

	1905.	1906.
Imports of desilverized lead	3,503	11,256
Exports of refined lead	32,112	40,088
Imports of lead in ores and base bullion	9,650	11,900
Imports of lead in matte	11,481	8,148
Imports of lead in flue dust	8,440	6,396

*For the first 10 months of the year.

The prominent features of the lead industry in 1906 need be only briefly mentioned. Almost all of the important lead-producing districts show gains, and the increase in the production is attributable especially to them, viz., the Cœur d'Alene, Southeastern Missouri, the Joplin district, Leadville, Colo., and Park City, Utah. However, the operation of new smelters in Idaho, New Mexico, and Arizona added to the total.

The lead content of the ore produced in Idaho in 1906 is estimated by Robert N. Bell, State mine inspector, at 125,400 tons.

The conditions of lead mining in Missouri and Idaho are described in following articles. Outside of the leading lead-producing districts, the most important event of the year was possibly the reopening of the old mines at Eureka, Nev., which are now being unwatered. In the meanwhile low-grade ore and slag from the old dumps are being shipped to Salt Lake City. If these mines, operated under modern conditions, are able to approach their former record, they will add something to the much needed supply of lead.

Attention may be called to the increasing competition in the market for lead ores. The United States Smelting Company, of Salt Lake City, the Ohio & Colorado Smelting Company, of Salida, Colo., and the Pennsylvania Smelting Company, of Pittsburg, Penn., are now decidedly more than insignificant competitors of the American Smelting and Refining Company. The Bingham Consolidated Mining Company, of Utah, was planning to erect lead furnaces in connection with its copper smeltery, but although these plans may be deferred on account of the smoke injunction, it is likely that this company will eventually go into the business, inasmuch as interests identified with it have been investigating and optioning lead mines in the Cœur d'Alene. Moreover, there is an increase in the number of small lead producers in various States.

The Southeast Missouri Lead District

BY H. A. WHEELER*

The output of the southeastern Missouri lead district approximated 88,000 short tons of pig lead in 1906. Of this, St. Francois county, or the Bonne Terre and Flat river districts, contributed 90 per cent. and Madison county, or Fredericktown and Mine la Motte, produced about 9 per cent., while the small mines scattered throughout the adjoining Washington, Jefferson and Franklin counties produced much less than usual, or only about 1 per cent. This is about a 5 per cent. increase over 1905 and is the largest output in the history of the district. The prices received for the lead were also at high-water mark, as they ranged from $5.25 to $6 per 100 lb. in the St. Louis market. The year was prosperous in every respect and labor shared in the prosperity, as it never received such high wages as in 1906. There were no labor troubles, but labor was very scarce; however, the large companies managed to finish the year without serious curtailment. The outlying districts of Washington, Franklin and Jefferson counties were seriously affected, as the tributers, or small leasers, who produce the lead in those districts, were attracted and drawn off by the high wages paid at the big mines, so that the output was much below normal. The latter has become such a small factor, since the opening up of the deeper disseminated orebodies, that the deficiency was more than made up in the growth of the St. Francois county mines. The increased output is not due to the development of any new companies, but merely to the greater activity of the established mines that was stimulated by the high prices of lead.

*Consulting mining engineer, St. Louis, Mo.

The energetic prospecting for new orebodies by the large companies inaugurated in 1905 continued through 1906 and many thousands of acres were optioned and drilled, though in most cases the drilling was inadequate to demonstrate the value of the land. One of the older properties acquired by the Federal Lead Company under such an option was the land of the St. Louis Prospecting Company, for which $500 an acre was paid.

THE CENTRAL MINE

The most important event of 1906 was the successful unwatering of the main mine of the Central Lead Company (which was drowned out three years ago by the miners' strike) and the erection of a new mill. The old Central mill was started as a 200-ton mill and later enlarged to 400 tons at a time when capital was scarce; it has done excellent work in grinding out dividends, but it is to be superseded by a fine, modern, steel-frame mill that will be of 1000 tons daily capacity. A new shaft has been put down on the 40-acre tract in Flat River of the Central company that will prove a valuable acquisition in maintaining the success of this property.

ST. JOSEPH LEAD COMPANY

The St. Joseph Lead Company materially strengthened and improved its old plant at Bonne Terre, which is still the largest producer of the district. A new shaft was completed at North Bonne Terre, No. 13 or 2 B, that will assist the old mine in maintaining its big production, although the latter is holding up its output admirably in spite of having been continuously worked for over 40 years. The new plant at Leadwood, or Owl creek, was also enlarged, 10 roasting furnaces having been added, and it is now producing almost as much lead as the Bonne Terre plant, but with a very much finer electrically operated mill. A new shaft is being sunk that will come into production this year.

DESLOGE CONSOLIDATED LEAD COMPANY

The Desloge company suffered a temporary set-back in the loss of its No. 3 shaft house (its principal producer) by fire in the autumn. The output of this

company was therefore smaller than usual, although shafts Nos. 2 and 4 were carried vertically to make up for the loss of No. 3. No. 3 will be rehabilitated and will be producing again before [illegible]. A new shaft is being completed on the recently acquired land adjoining Washington county that should materially increase the output of 1907.

DOE RUN LEAD COMPANY

This company had a very prosperous year and is contemplating the erection of a new, modern mill. It is sinking a new shaft on its Mitchell tract and is considering the re-opening of its old mine at the town of Doe Run, where there is not only a large deposit of low-grade ore, but recent discoveries show plenty of high-grade ore that was overlooked in the earlier and supposed thorough drilling of the original property.

NATIONAL LEAD COMPANY

This company has begun to look around for new territory by optioning several tracts that are now being prospected with the diamond drill. It sunk a new (No. 5) shaft at Esther that will open up the eastern end of its property, and is arranging to make new improvements in the mill that will add to its efficiency.

FEDERAL LEAD COMPANY

This company had a very busy year in recovering the principal mine of its new acquisition, the Central Lead Company, and in erecting the mill for it. The latter should largely increase the output of 1907 if its completion is not delayed. The company is also sinking two new shafts on the southern portion of the property that it acquired from the old Missouri Leadfields Company. Additional property has been judiciously acquired and several other tracts have been optioned that are now being prospected. By the end of 1907 this company will be the largest producer in the district with the exception of the St. Joseph Company, and if its present rate of growth continues, it will even eclipse that famous property.

OTHER COMPANIES

The Columbia Lead Company has eliminated the internal legal troubles, that put it into the hands of a receiver, by the majority interests buying out the minority holders, but beyond doing some prospecting, it has not yet started up its mines.

The Union Lead Company's property is under option to the Doe Run Company, which is drilling it, while the Penicaut lands are under option to the St. Joseph Company.

In Madison county, the North American Lead Company is going into the nickel business by utilizing the large body of mixed nickel, cobalt, copper and iron sulphurets that have hitherto been neglected. It is now erecting a large smelting and refining plant that will cost $250,000 and is expected to be ready by July 1, 1907. It will not only work its own ores, but also will treat similar ores that are found on the adjoining Catherine and Mine La Motte properties.

The Madison Land and Mining Company has enlarged its plant by putting in a 20-drill air compressor and erecting a new 200-ton mill. Later on it expects to enlarge the latter to 400 tons and then to abandon its first mill, which is only 150 tons capacity. It installed a Hancock jig in the old mill, replacing the Harz jigs, and is so well pleased with it that it will use Hancock jigs in the new mill.

The old Mine La Motte property is being rejuvenated under the new Pittsburg management and is recovering from the blight inflicted on it by the Dougherty & Albers stock scheme. The old copper-mine lease to the Hudson Valley Mining Company was actively and successfully worked during 1906 and is producing from 18,000 to 20,000 lb. of concentrates daily.

The outlook for the district during the coming year is excellent, and if the scarcity of labor does not interfere, this year's output should exceed that of 1906, and thus maintain the healthy, steady growth that has characterized its recent history.

Lead Pigments

Any increase in the apparent consumption of lead pigments during 1906 was in the oxides, and it is doubtful whether white-lead did not show a slight falling off from the previous year.

This is attributable in a measure to the loss of the Canadian business through the imposition of a prohibitory tariff by the Dominion government, in its effort to assist in the development of a domestic white-lead industry. The effect thus far, however, has been to leave the Canadian consumers of lead pigments largely dependent upon foreign supplies, and to advance prices there very much above what white-lead from Europe or the United States would cost in bond at Dominion ports.

The prices on lead pigments in the United States established late in December, 1905, continued exactly twelve months, when the first change of the year was made, this being an advance of $5 per ton on white-lead and the oxides, on Dec. 20, 1906.

In the face of the stocks, or contracts for deliveries, during the year at the prices current late in 1905, held by grinders, the possibilities of competition from graded lead and mixed paints was such as to render corroders unwilling to advance the price on pure lead in oil, although the cost of pig lead had steadily risen. But the last advance made by smelters in December brought the cost of pig lead to $8 per ton above the figures ruling at the opening of the year, and this led to the advance of $5 per ton on the products above referred to.

A strenuous effort is being made by the manufacturers of zinc, in cooperation with the makers of mixed paints and graded leads, to popularize zinc and the so called "inert pigments" such as barytes, silica and whiting, at the expense of white-lead. This is being done through magazine and other forms of advertising which appeal to the public, and the effort forces upon corroders a problem in the solution of which is involved the margin they shall allow between dry lead, used as a base for all paints competing with pure lead in oil, and their price for the latter product. The margin in 1906 was narrower than usual, and although grinders and makers of mixed paints were pretty well supplied with dry lead at low prices, they have foreseen a changed condition in 1907, and have made strong protests to the corroders against so close a relation between the dry pigment and lead in oil. In view of the fact that the interests which control probably 85 per cent. of the production of pig lead now control nearly a like proportion of the production of lead pigments, the relation which they will choose to assume toward the industries that have been prominent factors in the distribution of those products, becomes an interesting question.

The United Lead Company, which was owned by American Smelting and Refining Company interests, was merged with the National Lead Company during the year, and the latter also obtained control of the Davis Lead Company, of Pittsburg, and the Carter White Lead Company, of Chicago. This leaves six corroding works outside, with a capacity of about 30,000 tons of white lead and oxides.

The New York Lead Market in 1906

Not for 30 years has the lead market ruled at as high an average as during 1906. The high level of 1906 was due not only to the fact that a very large proportion of the output is controlled by one interest, but also to the underlying conditions, which were such as fully to warrant the high market. Consumption overtook production, and not only was a large amount of foreign lead, refined in this country, retained for domestic consumption, but also during the summer several thousand tons were actually imported from Europe. More than the normal expansion has occurred in all lines of manufacture; an unprecedented tonnage was used up by cable makers.

The increase in the production of lead, particularly in the Far West, was not commensurate with what could have been reasonably expected on account of the

obstacles in the way of utilizing present facilities, owing to the scarcity of labor and other causes which are hampering industrial activity throughout the country. Supplies from Missouri became more plentiful, [illegible] prospecting going on there as well as in the Far West, which may be expected to show results during 1907.

The year 1906 opened with lead standing at 5.60c., New York, at which price it remained until Feb. 14, when, on account of a decline in the European market, the quotation was reduced to 5.35c. No change was made until the latter half of April, when the price was advanced to 5.50c., and then in quick succession there were further advances in the early part of May to 5.60c. and 5.75c. The latter price ruled until about the middle of December, when the demands upon the sellers became so heavy that the price was raised to 6c., at which the year closed.

AVERAGE PRICE OF LEAD, NEW YORK

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	4.582	5.609	July.	4.824	5.750
Feb.	4.450	5.464	Aug.	4.665	5.750
March.	4.470	5.350	Sept.	4.860	5.750
April.	4.500	5.404	Oct.	4.860	5.750
May	4.500	5.685	Nov.	5.200	5.750
June	4.500	5.750	Dec.	5.422	5.900
			Av., year.	4.707	5.347

Prices [illegible] per pound. The London [illegible] 1906 was £16.850 per [illegible] £16.021; March, £15.922; [illegible] £16.[illegible]; May, £16.756; June, £16.813; [illegible] £16.525; August, £17.100; September, £18.[illegible]; [illegible] £19.250; November, £19.281; [illegible] £[illegible]; year, £17.370.

Spelter

The production of spelter in the United States in 1906 showed another large increase, considerably more, indeed than 1905 showed over 1904. The details of the production are given in the following table, which is based on reports received directly from all the producers, who reported their actual production for the first eleven months of the year, together with their own estimates of probable production in December.

[illegible] (In tons of 2000 lb.)

[illegible]	1905.	1906.
[illegible]	[illegible]	[illegible] 211
[illegible]	[illegible]	18,048
[illegible]	114,918	121,857
[illegible]	11,800	11,056
[illegible]	20,044	[illegible] 180
[illegible]	201,748	287,[illegible]

ZINC-ORE PRODUCTION

The Joplin district continued to be the largest producer of zinc ore, and its statistics show a material gain over 1905. This is explained by the general stimulus to mining inspired by the high prices for the ore and metal; and also to further improvements in the milling practice, which have led to a higher extraction of mineral from the ore. [illegible] ago the average extraction in the district was probably not more than 70 per cent., at present it is believed to be in the neighborhood of 75 to 80 per cent. The effect of this improvement upon production is obvious.

Outside of the Joplin district, Colorado continued to be the largest producer of zinc ore. In regard to tonnage, Colorado probably leads all of the other States, but it is to be remarked that a large part of its zinc ore undergoes milling, which greatly reduces the tonnage actually received by the smelter, while moreover the finished product is of much lower grade on the average than is that of the Joplin district. Among the zinc-producing districts of Colorado, Leadville continues to be far in the lead. Other important districts in 1906 were Creede, Rico, Breckenridge and Red Cliff.

Among the other western States, New Mexico leads, its output in 1906 having shown a large increase over 1905. However, the major part of the output of this Territory is used for the manufacture of zinc oxide, rather than for spelter. Zinc ore was also produced in Utah, Nevada, Montana and Idaho.

Among the States east of the Mississippi, Wisconsin showed an important increase, far more indeed than the statistics alone indicate, because the average percentage of zinc in the finished ore produced there has increased materially.

The production of Kentucky in 1906 was small, but arrangements are being made which will doubtless lead to a considerable increase in the output in 1907, the problem of successfully separating the ore having been solved by the introduction of a flotation method. The Sanders Separating Company used this process at Marion in 1906. Two new ore-separating companies have been organized, which will probably be operating in 1907. The results of the year in Tennessee were rather disappointing, but one or two mills will probably be built in the Holston district in 1907. In Virginia, zinc mining was temporarily at a standstill. In New Jersey, operations were continued as usual at the Franklin mine, where, however, the management was changed, which possibly may indicate a change in the method of mining.

THE SMELTING INDUSTRY

Among the smelters, the works of the Mineral Point Zinc Company at DePue, Ill., were completed, and that company entered the market for ore. The works of Hegeler Brothers at Danville, Ill., are not yet completed. Another one of the old smelters at Pittsburg, Kan., was put in operation. Otherwise there were no new producers during the year. Several new plants are now under construction, however, including one at Bartlesville, Ind. Ter., and one at Dearing, Kan., and several more plants are in contemplation for 1907. Also, another one of the old coal smelters of Kansas will probably soon be put in operation.

A feature of the year was the entrance of two more of the mining companies of the Joplin district into the smelting business, these being the American Zinc, Lead and Smelting Company, and the United Zinc Companies.

The year was one of great prosperity in the smelting business, the margin between spelter and zinc in ore being so large as to yield a very handsome profit. The only troublesome factor was the further diminution in the supply of gas at Iola, but the shortage has not yet become sufficiently acute to cause any falling off in the production of that district. Doubtless the smelters there will continue to work with a low pressure of gas for some time to come; just as was the experience in Indiana.

The smelters of Kansas obtained a large supply of ore, chiefly carbonate, from Mexico during 1906, very much more than in the previous year. The protest of the smelters against the decision of the Treasury Department, making this ore dutiable at the rate of 20 per cent. *ad valorem*, instead of classifying it as "calamine," which according to the Dingley tariff is on the free list, was argued at New York before the Board of General Appraisers. The decision of that board has not yet been rendered. Several smelters were buyers of Western and Mexican ore in 1906, who had previously limited their purchases to the Joplin market.

EUROPEAN AND AUSTRALIAN SMELTERS

The production of spelter in Europe is also likely to show an increase in 1906. In Upper Silesia, the most important single district, the output in the first nine months of the year was 101,378 metric tons, against 96,097 metric tons in the corresponding period of 1905. The European smelters have received bountiful supplies of ore from Broken Hill, Australia, whence the offering of this raw material is destined to increase greatly. Largely on this account, the smelting capacity of Europe is being greatly increased, new and large works being now under construction in Great Britain, France and Germany. Australia itself will also become a larger producer of spelter, the idea being to make as much there as is required for home consumption. The Sulphide Corporation has already a works in operation at Cockle Creek, and its capacity is to be increased materially in 1907. The Central Zinc Company, a subsidiary of the Sulphide Corporation, is building a large works in Great Britain. The Broken Hill Proprietary Company now has the plans ready for a plant to be installed at Port Pirie, Australia, the construction of which will be proceeded with in 1907. In the meanwhile, the Zinc Corporation is considering the erection of a large plant. The outlook is, therefore, for a large increase in the supply of spelter outside of the United States in the near future.

Zinc Mining in Wisconsin in 1906

BY J. W. MOORE.*

It is now about five years since the first modern mill was put in active operation in the southwestern Wisconsin zinc field and those who at first were pessimistic as to the outcome have been forced to admit that they were wrong. The highly satisfactory prices, which have continued throughout 1906, have done much to spur on the local investors and also to induce outside capital to come into the field, but it is a self-evident fact that, no matter how high the prices of zinc may go, if the majority of the mines in the Wisconsin-Illinois district do not make good, nothing could induce anyone to take a chance. Another factor of great importance to which must be ascribed some of the remarkable growth of 1906 is the commercial perfection to which magnetic separation has been brought. Many producers state positively that were it not for the present type of roaster and magnetic separating plant, as generally used, the district would not amount to much. This fact metallurgically is considered one of the most important results of the year, for aside from demonstrating beyond a question of a doubt that magnetic separation pays commercially in the Wisconsin zinc fields, it has made it possible to work up a vast number of old dumps that were considered useless. Many new processes have been proposed and a few tried, but so far, for all kinds of ore, the slow-roast process of the Galena type of roaster has been the only one that has stood the test and given satisfaction.

USE OF CORLISS ENGINES

From the advent of the first mill in the district to the present day, the necessity for more economical and dependable methods of ore concentration has been continuously in evidence; but so far nothing startling has been developed. Some extravagant claims have been made along the lines of greater economy in operation of steam-driven machines, and, in many instances, machinery has been installed that has substantiated the manufacturer's claim of sustained economy. The majority of the engines that are now being installed are of the Corliss type. Along the lines of economical installation it has been found that the heavy-duty type of Corliss engine is particularly adapted to the strenuous work required in the concentrating and power plants. Early in the summer considerable interest was evinced at the installation of a gas-producer plant, but for some reason nothing much is said about it, although the plant is running. However, the general trend is toward Corliss engines and compound steam and air compressors. About 95 per cent. of the steam installations are now of plants designed for more economical operation, and the fact that the economy of two-stage compression is recognized is shown by the number of compound air compressors in operation; in one or two instances [illegible] pounded.

Paramount among the many improvements has been the gradual education of the miners and mine operators along the lines of mechanical devices used in cleaning their ores. There was a time when all of the uses of the different machines around a mill and methods of handling them were not thoroughly understood, and a great many expensive delays were thereby occasioned.

It has been found that the small mill (of about 50 tons capacity per 10 hours) is best suited to the underground conditions of this district. If for no other reason, it enables the operator to cull down his mine run and only run through the dirt that contains pay ore, whereas with the larger mill it is necessary to run through everything to keep things going and the ground boss is often tempted to side-shoot in the deads in order to "give 'em enough dirt on top."

PRODUCTION AND PROSPECTING

Unless one is thoroughly acquainted with the existing conditions in the Wisconsin-Illinois zinc district, it will be difficult to see much of an increase in tonnage production, as against last year. It will be necessary to go behind the reported figures showing the net tonnage shipped to the smelters. If this is done it will be found that 75 per cent. of all the ore now produced in the district is now finally treated in magnetic separating plants which materially reduces the gross weight; consequently the total gross tonnage exceeded that of last year by about 85 per cent., a marvelous growth when it is remembered that it has been necessary to locate the ore by the slow and laborious method of churn-drilling; then shafts have had to be put down and buildings erected, machinery installed and all within a short period. Last winter and spring 300 or 400 drills were busily prospecting for ore; today it is estimated that there are less than 75. This is due to several reasons, chief among them being that those who were drilling are now spending their money in development work. It is not to be wondered at if many mistakes have been made in the rush to endeavor to accomplish in a twelvemonth what it has taken other zinc fields several years to attain. The prospectors and operators have been forced to accept the conditions as they were found and make the best of them. The main question has been, "Is it profitable to do thus and so, commercially?" It is true that considerable waste has resulted in endeavoring to obtain the largest turn-ins obtainable, regardless of other results. At first it was not known whether or not the mines would last more than a year, but it now appears that in many of the present producers there is more ore in sight than has been taken out. Owing to this uncertainty a great many of the first installations, where expert help was not sought, were done hurriedly and with no thought of permanency and consequently were incorrectly designed, and some work has had to be done over again.

[illegible]

A thing that must strike the observer of the conditions in this district is the comparatively small proportion of absolute failures and the comparatively small area yet developed. Although the district has been a producer for over half a century, it is only within the last few years that any great amount of money has been invested in it. During the last year it is estimated that $1,500,000 has been invested in new enterprises. Nearly 70 per cent. of the new ventures, it is claimed, will be successful. A noticeable feature is that fully 90 per cent. of the new strikes have been made in the immediate vicinity of, or on the outskirts of, the lead diggings of the early days, and that nearly all of the strikes in new territories show the same conditions of the early days, excepting that the old water levels have been lowered.

Improved pumping methods have demonstrated the fact that the water problem is not nearly as bad as at first it was thought it would be. In the early days the inadequate pumps made it appear that the water in the mines was of unusual amount and that it took a fortune to keep the mine unwatered. It is now known that a great number of the mines do not yield anywhere near enough water to supply the concentrating plants.

NEED FOR MORE CAPITAL

The territory surrounding Platteville, Hazel Green, Benton, Cuba City, Mineral Point, and a few other camps, has seen more paying properties come to life than any of the others. Probably the main reasons for the prominence of these camps are their proximity to railways and good hotel facilities.

So far the principal activity has been confined to the camps where ore was known to be, although between Platteville and Big Patch camps there is now a string of mines widely separated, but nevertheless showing that the ore runs (as some are inclined to believe) in undulating waves from these two camps at least.

In spite of the great amount of outside money that has already come into the field, the progress of the district is being retarded for lack of capital; as in all other mining districts, new

*General manager, Galena Iron Works, Platteville, Wis.

the Wisconsin zinc district.

The Mineral Point Zinc Company (a subsidiary of the New Jersey Zinc Company) has pursued its policy of buying up a number of zinc properties. A commendable proceeding of some connected with this company was in several instances to advance the funds to carry on operations to the producing period, securing as a remuneration a half interest in the mine. Other large companies, heavily interested in zinc elsewhere, have been quietly acquiring control of good mines and mining lands.

The railroads have continued their broad policy and have aided developments materially by their readiness to meet the operator half way whenever it has been found necessary to run spurs or sidings. The C. M. & St. P. is at present contemplating a new route into Platteville, which will give several of the promising mines splendid side-track facilities.

The general prosperity of the mines has made itself felt in the different local camps. In order to take care of the increased number of inhabitants, mostly people connected with the mines, it has been necessary to build new homes and hotels. The local foundries have been pushed to their utmost, but by increasing their capacity have been able to keep pace with the rapid growth. There is not a village or hamlet in the entire district but has felt the impetus due to the success of the majority of the mines.

A local paper reports the proposed erection of an oxide plant in the near future, site not yet definitely decided, but it is said the choice lies between Benton and Galena.

The proposed electric railway and power plant is still in abeyance, but it is stated on reliable authority that the work of building will in all probability begin in the early spring. There is no doubt but that the mines will be greatly benefited by this as it will mean cheaper power and lower haulage costs.

The results in the zinc industry of southwest Wisconsin have more than exceeded the most sanguine expectations of a year ago. Today there are in operation about 60 concentrating plants and a conservative estimate shows that at least 50 more mines will be ready for mills before 1907 closes. At the beginning of 1906, there was a general rush on all sides to put up mills, regardless of development work, and in the excitement several mills were erected a little prematurely, and one or two were built on properties that will probably never make good, but fortunately the majority of the prospectors learned a lesson and are benefiting thereby, as also is the district generally.

The Joplin District in 1906

BY JESSE A. ZOOK

Last year, 1906, was foremost in the tonnage of zinc and lead concentrates shipped, and in the combined value of the two minerals. It was by long odds the greatest year the Missouri-Kansas district has ever known. As 1905 excelled all preceding years in the value of the zinc and lead concentrates marketed, so 1906 eclipsed even its immediate forerunner, there having been an increase of $1,800,000 in the value of the products shipped to the smelters. This refers to the value of the concentrates f.o.b. at the mines. The year put on record a price of $85.50 per ton for galena concentrate, $5.50 per ton higher than the closing price of 1905.

THE LABOR SITUATION

In writing at the close of 1905 it was noted that 1906 "should show a marked reduction in cost per ton of concentrate. * * * unless the demands of labor should absorb the saving." Additional cost for labor has prevented any marked reduction in cost, but it has been the exigencies arising from a scarcity of labor rather than the demands of labor. The prospect of trouble from organized labor, manifest at the close of 1905, was swept away by the general prosperity of the district and a higher wage scale resulted from the competition for labor.

LIGHT SUMMER DEMAND

The rainfall of the year was largely confined to the period between the latter part of April and the first of July, and was so distributed as to cause no serious obstacle to mining. Subsequent to July the year was comparatively dry and exceptionally good weather prevailed for mining, development and prospecting. The principal drawback of the year was the lightness of demand for ore throughout the spring and summer, believed locally to have occurred as a rebuke to producers for making their stand for an import duty on importations of Mexican carbonates.

CHANGES IN POINTS OF PRODUCTIONS

The mines of the Chitwood group, in Joplin, which held up the Joplin product for several years, were not such heavy producers in 1906, the points of production changing to the west and southwest, east and southeast of Joplin, the largest development of the year being on the southwest.

Oronogo, Webb City and Carterville have become merged by the development of new mines in the south part of the corporate limits of Oronogo, the output of which mines has been classed in Webb City-Carterville, taking Center creek as the natural dividing line, instead of the line of municipal incorporation, which extends nearly a mile on the Carterville side of the river.

The Porto Rico group has maintained the equilibrium of the worked-out mines of Duenweg. Alba and Neck City show the heaviest increase of shipments on the Missouri side of the line, while the Galena-Empire mines have held up the Kansas side with a material increase.

EAGER DEMAND FOR 1907

The completion of a new smelter at De-Pue, Illinois; one at Bartlesville, Indian Territory; one at Dearing, Kansas, and another projected by the European stockholders of the Pueblo works, would seem to insure a steadier and perhaps stronger demand for Missouri-Kansas zinc concentrate during 1907.

PROBLEMS OF 1907

The record of the last three years has fairly demonstrated that the price for zinc concentrate cannot be held below $45 per ton of 60 per cent. zinc to insure a permanently steady output.

The year should bring economies in labor-saving machinery in every manner practicable, to offset the scarcity of labor felt during 1906. The new year begins with several mills in operation that will change many fixed ideas regarding size, economy in operation and savings.

During 1906 many mills were equipped with various and sundry tables for handling slimes. The best is yet to be determined. The same is evident in the installation of gas engines. There are too many cheap, makeshift ones introduced.

While the idea is slowly changing to the installation of heavier and better machinery, the peculiar prospecting and development conditions of the district require only a cheap plant, and the same cheapness is too often followed in subsequent mill installation.

PRODUCERS ENGAGE IN SMELTING

At least two more companies holding the fee to a large acreage of Missouri mineral land, have become interested in smelting, that is, have a holding of stock in a smelter now in course of construction. The Granby Mining and Smelting company, the largest fee owner in the district, has been engaged in smelting several years. Report is current that still another company holding a fair-sized acreage, and producing the largest weekly tonnage, will either engage directly or be represented in a smelter in 1907.

A representative of the United States Zinc Company, owner of the smeltery at Pueblo, Colo., was in the Joplin district early in December, from whom it was learned that a smelter was being projected in the natural-gas field for smelting Missouri-Kansas zinc concentrate.

ZINC ORE PRICES

Zinc concentrate sold at $53 per ton the first week of 1906, advancing to $54 the following and succeeding four weeks, dropping successively to $53, $52, $51, and $50 for two weeks, then to $49 the third week in March. March closed at $52 and April opened at the same price, followed

by a decline to $40 to $47, and through May $44 was the highest. It showed a fluctuation from $45 at the first to $50 three weeks later, declining to $47, $48 and $47, up to $48 the last week, then $48.50 and $49, declining to $48 at the fortnight of September, dropping to $46 and closing the month at $47. For three weeks of October the price was $40, closing at $48. The first half of November it was $58, the third week $49.50, closing at $48.50.

The highest price paid for first-grade zinc concentrate was $54 in January and February, buyers inaugurating a decline immediately upon the decision of the treasury assessing an *ad valorem* duty on importations, from which the price continuously declined to the low point of $44 in May.

The average price for all grades of zinc concentrate, during the first eleven months of 1906 was $43.24, against $44.88 last year.

High zinc prices will be less a factor in the future, as all buying has been changed to an assay basis strictly, with deduction for actual moisture carried in the concentrate.

The highest assay basis price during 1906 was $50 in January and February; the lowest $40 the last week of April, all of May and the first week of June. An average basis of 60 per cent. zinc for the year ranged from $42 to $44 per ton.

LEAD PRICES

Lead concentrate began 1906 at $80.50 per ton, advancing to $81, declining to $80 and closing January at $76. The first half of February it was $78.50 and the last half down to $72. March recorded $73, $76.50, $79, $80, and closed at $78. April fluctuated from $76 to $78.50; May from $79 to $83; June from $83 to $787; July from $78 to $75; August from $78.50 to $82; September from $84 to $82.50; October from $82 to $84.50; November from $83 to 85.50.

The highest price for lead concentrate was $85.50, at the close of November; the lowest price for first grade was $72 in February; the average all grades, eleven months, was $77.40, as against $62.12 last year.

HIGH AND AVERAGE PRICES

The following table embraces the highest and the average price of zinc and lead concentrate for each of the last eight years:

ZINC

	Highest	Average
1906	$54.00	$43.24
1905	60.00	44.88
1904	53.00	35.92
1903	42.00	33.72
1902	42.00	30.33
1901	34.00	27.50
1900	38.50	26.50
1899	55.00	36.61

LEAD

	Highest	Average
1906	$85.50	$77.40
1905	80.00	62.12
1904	62.00	54.80
1903	60.50	54.12
1902	50.00	46.10
1901	47.50	45.99
1900	56.50	48.32
1899	55.00	51.34

PRODUCTION

The total shipment of zinc concentrate for 1906 was 279,053 tons, valued at $12,-035,752; the total shipment of lead concentrate was 39,156 tons, valued at $3,031,-118; the total shipment of both zinc and lead concentrate was 308,890 tons, valued at $15,126,870.

The following table embraces the shipments of zinc and lead concentrate and their combined values for 13 years:

	Zinc, tons	Lead, tons	Value
1906	279,053	39,156	$15,126,870
1905	272,153	34,679	13,302,800
1904	267,240	34,362	11,487,350
1903	234,873	28,656	9,471,395
1902	248,446	31,225	9,[illegible]
1901	258,306	35,177	7,971,651
1900	248,446	29,132	7,992,105
1899	255,088	25,888	10,715,307
1898	251,[illegible]	26,687	7,119,867
1897	177,976	30,105	[illegible]
1896	155,[illegible]	27,721	3,857,355
1895	144,487	31,294	3,775,929
1894	147,310	32,190	3,535,736
Total	2,918,147	401,672	$108,513,557

REDUCED TO METAL

The zinc ore produced in the Missouri-Kansas district in 1906 represents approximately 140,000 tons of metallic zinc. Whatever the total United States tonnage of metallic zinc may show, the difference between the product of this district and the total will show unmistakably the product from all other sources, including Wisconsin, the Western States and importations from Mexico. The tonnage of ore from all other sources will exceed that of this district and yet it is doubtful if the metallic zinc tonnage will reach 60 per cent. of the product of the Missouri and Kansas mines.

Zinc and Lead Mining in Virginia

BY J. A. VAN MATER*

Some prospecting was carried on in 1906, but no important results were realized. The Albermarle Zinc and Lead Company continued to explore its mine at Fabers, Nelson county, by sinking the shaft 60 to 70 ft. deeper and driving a cross-cut at the bottom, since which time the property has been idle. The company has a mill equipped with Krom crushers and rolls and Krom air jigs, but it has never been run, except experimentally.

The Cedar Spring Zinc Mine and Development Company, now called the Columbus Mining Corporation, at Cedar Springs, near Rural Retreat, in Wythe county, also has a mill which has never been run, because sufficient development work has not been done to supply it. The company is now giving its attention to prospecting and developing its property.

The only zinc and lead production during 1906 was made by the Bertha Mineral Company from the old Wythe mines at Austinville, in Wythe county, and this was entirely from surface workings, which are now practically exhausted. The total amount of zinc concentrate (carbonate and silicate) was about 500 tons and about 50 tons of lead concentrate (carbonate and galena). This output was considerably curtailed by the scarcity of men during the year, necessitating the closing down of all surface mining operations the early part of the summer. Development was prosecuted vigorously throughout the year on the sulphide ores, which were found about 200 ft. below the surface. The shaft was sunk 100 ft. below the tunnel level, or 335 ft. below the surface and the mineral developed on both the 235-ft. and 335-ft. levels by drifts and a winze between these two levels; in places considerable pyrite was encountered. Boilers and compressors have been erected for furnishing the mine with air, and air drills were in use throughout the year. The development, on the whole, has been encouraging, though no large area has yet been opened up. The deposit is not continuous, but the ore seems to occur wherever the rock conditions have been favorable for mineral deposition. It is a difficult property to develop, as there is apparently no connection between the deposit already located and others, if they exist. A mill of 10 tons capacity per hour was erected during the year for concentrating these sulphide ores and will be ready for operation about Feb. 1, 1907. If the separation is a success this property will be a small producer during the coming year; in the mean time the development work will be pushed as much as possible.

*General manager, Bertha Mineral Company, Pulaski, Va.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906
Jan.	6.190	6.487	6.032	6.337	25.062	28.225
Feb.	6.139	6.075	5.989	5.924	24.594	26.844
Mar.	6.067	6.209	5.917	6.056	23.826	24.563
April	5.817	6.078	5.667	5.931	23.813	25.781
May	5.434	5.997	5.284	5.846	23.594	27.000
June	5.190	6.096	5.040	5.948	23.875	27.728
July	5.396	6.006	5.247	5.856	23.938	26.800
Aug.	5.706	6.027	5.556	5.878	24.675	26.938
Sept.	5.887	6.216	5.737	6.066	26.375	27.563
Oct.	6.087	6.292	5.934	6.070	28.225	28.075
Nov.	6.145	6.375	5.984	6.225	28.500	27.781
Dec.	6.522	6.593	6.374	6.443	28.719	27.688
Year.	5.822	6.198	5.730	6.048	25.433	27.020

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2240 lb.) good ordinary brands.

It is reported that a large bed of bessemer hematite ore has been discovered near Port Arthur, Ont. The deposit lies about 20 miles east of Port Arthur, and covers an area averaging about three miles in width and six miles in length, reaching to within 1000 ft. of the shore of Thunder bay, Lake Superior. It is estimated to contain at least 200,000,000 tons of high-grade ore. The deposit ranges in thickness from 8 to 35 ft. All of it can be quarried without underground work being done.

PRODUCTION OF OTHER METALS AND MINERALS

Aluminum—Antimony—Quicksilver—Tin—Statistics and Commercial Conditions

reports about the same production as in ing no surplus for future demands. Quicksilver output does not increase, as some of the old mines are partly worked out, and new ones have not yet taken their place. Aluminum gained slightly, and the others show little change.

Aluminum

The production of aluminum in the United States in 1906 is estimated at 14,350,000 pounds, valued at $5,166,000 against 11,350,000 pounds, valued at $3,632,000 in 1905. A further great increase in the production is to be expected in 1907, for which year the total is likely to reach between 25,000,000 and 30,000,000 pounds. The average market price of aluminum in 1906 was 35 @ 36½c. per lb. for 99 per cent. metal and 34 @ 35c. per lb. for No. 2 grade of ingots, according to size of purchase.

The production of aluminum in Canada in 1906 is estimated at 6,000,000 lb. against 3,100,000 lb. in 1905.

Antimony

The high price for this metal in 1906 redirected attention to the deposits of antimony ore which exist in the West, especially Utah, Nevada and Idaho. There was a small production in those States, as to which complete statistics are not yet available, except for Idaho, where 40 tons (metallic content) was produced. A new antimony enterprise has been organized to operate a mine in Utah, which is said reliably to possess a large quantity of high-grade stibnite.

Last year has witnessed a remarkable rise in the market value of antimony. Supplies of antimony ore were again rather inadequate and the exhaustion of the more important antimony mines in China made itself keenly felt. The consumption of the metal increased considerably, and the different European governments were large buyers of antimony for ammunition purposes.

The production of antimonial lead, which is gained as a by-product in lead smelting, did not come up to the demands, and low-grade antimonial lead had to be manufactured out of lead and antimony. This low-grade antimonial lead is used to a large extent in storage batteries and as sheet lead in acid chambers.

At the beginning of 1906 antimony was selling at about 14@15c., depending upon the brands, and remained stationary for a few months. During March, however, the demand became so large and supplies so scarce that prices were driven up at a furious rate so that at the beginning of June Cookson's and Hallett's antimony commanded a price of 25@26c., while outside brands could be secured for about ½c. cheaper. After the heavy demand had been satisfied prices settled down. There was, however, at all times a scarcity of spot supplies for the reason that the production at the French and Italian works were frequently interrupted by strikes, and shipments which were contracted for a specified period were, in most cases, not made until a few months later.

The market remained neglected until the middle of October, when large contracts were again being entered into by dealers and speculators in this market. Prices then quoted ranged between 24½c. and 25c. for ordinary, 25½c., for Hallett's and 26c. for Cookson's brands. At the end of the year the market was again dull and neglected. This condition can invariably be observed in the antimony market after a spasm of great activity.

Tin

There was a small production of pig tin in the United States in 1906, made experimentally in the Black hills. There was also a small production of tin ore in the Carolinas and elsewhere. However, tin mining in the United States continues to be insignificant.

The statistics show a further decrease in the tin production of the Straits Settlements in 1906. On the other hand, there was a considerable revival of mining in Cornwall and Australia, stimulated by the high price for the metal, and tin production in Bolivia continues to forge ahead.

The production of Tasmania will probably show a decrease, inasmuch as the Mount Bischoff mine appears to be approaching exhaustion. The unfavorable reports from this company caused a great fall in the value of its shares.

According to Vice-consul-general G. E. Chamberlin, the exports of tin, in tons (2240 lb.), from the Straits Settlements, including the ports of Singapore and Penang, during the first nine months of 1905 and 1906 were as follows:

	1906.	1905.
United States	10,777	14,055
England	26,434	23,552
Continent of Europe	6,091	6,524
Total	43,302	44,131

The output of all the tin-producing States of the Malay peninsula for the first nine months of 1905 and 1906, in tons of 2240 lb., was as follows:

	1906.	1905.
Perak	19,271	19,740
Selangor	11,975	12,889
Negri Sembilan	3,452	3,738
Pahang	1,515	1,502
Total	36,213	37,869

According to the market reports of shipments from the Straits Settlements for the first nine months of 1906, there was shipped 43,262 tons, or 7049 tons more than the commissioner of mines reports the output of the mines. This shows conclusively that there was a large amount of tin on hand, held back to control the market and take advantage of the higher prices which prevailed during 1906.

The production of tin is largely from countries where the mineral statistics are not kept at all, or are collected very imperfectly. It is necessary, therefore, to compile them from the trade statistics of imports and delivery. From these sources we obtain the following figures for the 12 months ended Nov. 30; they are in long tons:

Shipments:	1905.	1906.	Changes.
Straits	58,547	58,307	D. 240
Australia	5,528	6,352	I. 824
Banka and Billiton	12,675	11,194	D. 1,481
Cornwall	3,857	4,100	I. 243
Bolivia	12,500	12,500	.....
Miscellaneous	800	950	I. 150
Total	93,907	93,403	D. 504
Deliveries:			
Europe and U. S.	89,499	91,369	I. 1,870
India and China	1,700	1,500	D. 200
Miscellaneous	950	1,050	I. 100
Total	92,149	93,919	I. 1,770

It is necessary to combine the deliveries to Europe and the United States, since a large part of the shipments to America go to England or Holland in transit, and are credited to those countries.

Imports of tin into the United States, estimating November and December, were 44,450 tons; showing a consumption in this country of 47.3 per cent. of the total production.

In these figures we have not included the production of China, which is altogether an uncertain quantity. Moreover, it is in large part consumed in that country, though Yunnan tin finds it way to the general market, in quantities estimated as high as 4000 tons or over in a year.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1905.	1906.	Month.	1905.	1906.
Jan	29.325	36.390	July	31.760	37.275
Feb	29.262	36.403	August	32.866	40.606
March	29.523	36.662	Sept	32.095	40.516
April	30.525	38.900	Oct	32.481	42.852
May	30.049	43.313	Nov	33.443	42.906
June	30.329	39.260	Dec	35.836	42.760
			Av. year.	31.358	39.819

Prices are in cents per pound.

Zinc Oxide

The production of zinc oxide in the United States in 1906 was 68,500 tons, against 65,403 tons in 1905. The average market value of the product, at the works, was approximately the same as in 1905, viz., 4c. per lb., the advance in price, which occurred during the latter part of the year, not affecting the average to any appreciable extent. During the year, the Ozark Smelting and Mining Company completed and put into operation its new plant at Coffeyville, Kan. There were no other new producers in 1906, but it is understood that the Tri-Bullion Smelting and Development Company, of Magdalena, N. M., contemplates the erection of a plant in 1907.

The production of zinc-lead pigment by the United States Smelting Company, at Cañon City, Colo., in 1906, was 5749 tons, valued at $85 per ton, against 7200 tons, valued at $75 per ton in 1905.

Quicksilver

The production of quicksilver in the United States in 1906 was 27,276 flasks valued at $1,031,667, against 30,705 flasks, worth $1,142,884 in 1905. California is still the mainstay of the industry. The Texas quicksilver district, about which such high hopes have been entertained, has not yet become an important contributor to the output, although from no lack of enterprise. Distance from railroads, and a variety of natural drawbacks are the retarding features. The old Sacramento mine of Mercur, Utah, is making a small output of the metal in search of which the camp was first founded; development of the Blackbutte, Ore., quicksilver mines continued through 1906, but no output of metal was recorded. An excellent reduction plant has been put up here, and a few experimental furnace runs have been made. A new cinnabar deposit in Yuma county, Arizona, is being developed by the Colonial Mining Company at a point 14 miles from Ehrenberg, but no furnace has yet been installed.

The production of quicksilver in the United States during the last three years has been as follows in flasks of 75 lb.:

	1904.	1905.	1906.
California	28,876	24,655	a22,500
Texas	5,336	5,000	a3,500
Utah	700	1,050	1,276
Total	34,912	30,705	27,276

a Partly estimated.

CALIFORNIA

SPECIAL CORRESPONDENCE

California for over half a century was the only section of the country which produced quicksilver, until recently when the Texas mercury mines were opened. The State still, however, yields the largest proportion of the liquid metal. The industry is not in these days as remunerative as it was formerly when there was no cyanide process and when hundreds of silver mines were worked where one is now.

California produced in 1905, a total of 24,655 flasks of mercury valued at $886,081. In 1906, as near as can be estimated without detailed returns from the producing mines, there were 2000 flasks less output than in 1905. The domestic sales decreased in direct proportion to the decreased yield. There were in 1906 virtually no exports to China, and only a limited amount to Japan. This has been a good thing for the California producers, because the quicksilver sold in the Orient brings less price than that sold in domestic market. It is sold abroad only as a matter of necessity, to dispose of the surplus product of this country, and these foreign sales reduce the general average prices received by the California quicksilver men. Therefore the California men really did better in 1906 than they did the previous year, though the product was materially less. Mexico, one of the California markets for quicksilver, has greatly decreased its annual demand because its own native product is preferred, and the Mexico quicksilver mines are now producing at a good rate. This leaves a stock to supply the increased requirements of the Eastern States.

The average prices for mercury throughout the United States in 1906 were $38.50 to $39.50 per flask of 75 lb., the lowest being naturally near the points of production in California and Texas. The latter State decreased its product about 25 per cent. The principal mine there shipped considerable less than in the previous year and while some smaller mines started up their output did not make up the decrease of the largest producers.

Sales of California quicksilver might have been made in China at an offered price of $30 per flask, but this offer was rejected. What very little was shipped to the Orient brought $31.50 per flask. California about held its own in prices by not shipping to the Orient, though the output was smaller for the year, as stated.

If the prices of silver are maintained, certain silver mines with lower-grade ores may resume operations using the amalgamation process, which will create a demand for quicksilver. The higher-grade silver ores are now shipped to smelters so no mercury is used in their reduction. Indeed it is to the prevalent use of the cyanide process that the decreased demand for mercury is due, coupled with the present custom of shipping ores to smelters.

The New Idria mine in San Benito county, which is yielding 600 flasks per month and is supposed to be in a condition to maintain this rate of production for many years to come, is now the only California quicksilver mine paying dividends. The famous old New Almaden mine in Santa Clara county is now increasing its output, as is also the Socrates at Pine Flat, Sonoma county. The Napa Consolidated is yielding less by one half than formerly. Some of the San Luis Obispo county mines have closed down but others are working. One new mine in Stanislaus county recently started up, but very few new quicksilver properties in California are being put into operation.

TEXAS

Only four of the quicksilver mines in the Terlingua district produced any quicksilver in 1906: the Marfa & Mariposa Mining Company; the Lone Star Mining Company; the Chisos Mining Company; and the Texas Almaden Mining Company, otherwise known as the Dallas Mining Company. The last is at Big Bend and all the others are at Terlingua. The Lone Star is now closed down. The Chisos did not smelt its ore in its own furnace, although extensive additions to the plant are now under erection. Two other former producers, the Terlingua Mining Company and the Big Bend Cinnabar Mining Company remained idle, while a third, the Colquitt-Tignor, it is rumored, will be reopened. The only mines active at this moment are thus the Marfa & Mariposa, and the Texas Almaden.

The Scott furnace is the favorite for reducing the ore. Wood is the only fuel employed, and this is becoming exceedingly scarce. The Upper Cretaceous shales of the district carry both oil and gas, and a fair grade of lubricating oil is not infrequently obtained with the mercury in the condensers. Coal of inferior quality is close at hand, and it has been suggested that this might be utilized for retort fuel through the medium of the gas producer.

The Texas Almaden Mining Company has recently completed a model reduction plant, containing a 20-ton Scott furnace, whose distinguishing feature is the use of extra hard and dense brick, set with special care to reduce the width and permeability of the mortar joints, for lining the condenser. By this means the soakage of quicksilver was greatly reduced, and permitted the recovery of 60 flasks of mercury in less than one month after the retorts were charged with ore; this is a noteworthy accomplishment in mercury smelting. The condensers are also housed under well ventilated roofs, whereby they are kept cool, even during the hot weather of that district. The company's mine is temporarily closed while a drainage hole is being drilled, but operations will shortly be resumed.

MARKET

The price of quicksilver in large lots at San Francisco for domestic delivery opened at $39 per flask, but at the end of January rose to $39.50, at which figure it remained throughout the rest of the year. As has been explained above, the price for foreign shipments ranged about $1.50 be-

low the domestic price throughout the

steady at $41 throughout practically the entire year, except at its beginning and its close, when it ranged $1 below. This lack of variation in the American market is accounted for by the pooling of the output in California. The London price opened at £7 5s., rose at once to £7 7s. 6d. and remained there until midsummer, when it fell to £7 per flask for the remainder of the year.

Sulphur

The growing importance of American sulphur was reflected in 1906 by two important events, namely, the practical taking over of the Sicilian sulphur industry by the Italian Government, under the *Consorzio Obbligatorio*, and the virtual disbandment of the Anglo-Sicilian Sulphur Company.

The *Consorzio Obbligatorio* came into being August 1, and in spite of strenuous protests, soon had full control of the Sicilian industry. The immense stocks of the Anglo-Sicilian company were disposed of to the *Consorzio* with the understanding that delivery was to be extended over a period of 12 years. The operations of the *Consorzio* led to great dissatisfaction among the producers, and to resentment among the rival shipping ports. Exports to the United States were not officially interdicted, but were largely restrained by the statute requiring the permission of the *Consorzio* to make any shipments whatever.

Total exports of sulphur from Sicily in the 10 months ending Oct. 30 were 361,120 tons of 1030 kg. in 1906, and 391,016 tons in 1905, a decrease of about 40,000 tons. On the other hand, stocks at the end of October had increased from 416,088 tons in 1905 to 500,123 tons in 1906.

The imports of crude sulphur into the United States in the first 10 months of the year, little of which came from elsewhere than Sicily, amounted to only 65,380 long tons, as compared with 71,027 tons, and 114,838 tons during the same periods of 1905 and 1904, respectively. There is usually an additional import of about 1000 tons of refined sulphur per year.

The *Consorzio* also controls the selling price of the Sicilian product, and has firmly insisted on high prices; some few stocks of independent operators were soon absorbed, and the process by which the Anglo-Sicilian stocks are to be gradually absorbed will permit prices to remain at a high level. No reduction is to be looked for.

The Anglo-Sicilian Sulphur Company sold its stock to the *Consorzio* at a price which involved a loss of £208,105. To meet this loss the depreciation reserve fund was entirely wiped out and more was taken from the general reserve fund. At its last annual meeting the company found itself unable to pay the 6 per cent. dividend on its preferred shares, and money was absorbed for this purpose from the capital guaranty fund. Steps are now under way to liquidate the liabilities, and dissolve the organization.

LOUISIANA

The sulphur industry of Louisiana has continued to grow, and had a prosperous year. We are unable to give statistics of the production. The Union Sulphur Company had great difficulty toward the latter part of the year in shipping its product. All deliveries along the Atlantic seaboard are made by boat from New Orleans, to which point the sulphur has to be transported by the Southern Pacific Railway; shipments in other directions are made by all-rail routes. The shortage of cars, which has been so prevalent, as well as of sea-going barges, has lately made it impossible for the company to insure prompt delivery.

FLUCTUATIONS IN PRICE

The price of first-grade Louisiana sulphur at New York, Boston and Portland fell from $22.15, during the first seven months of the year, to $20 for the remaining five months. The price at Philadelphia or Baltimore ranged about 50c. per long ton higher. This difference is due only to the fact that Sicilian sulphur costs more to deliver at Baltimore and Philadelphia than at the first mentioned cities, and the Louisiana company sees no object in quoting a different price. Roll sulphur or brimstone sold for $2 per 100 lb.; flour sulphur at $2.20; and flowers at $2.40 per 100 lb. during the year.

No noteworthy change has occurred in the consumption of sulphur. It is still practically confined to the wood-pulp business, and has not yet been adopted for the making of sulphuric acid. It has been estimated by Frederick J. Falding that the use of suitable pyrite for wood-pulp manufacture in New England would induce an economy of 75c. to $1 per ton of pulp, according to whether the plant is on the seaboard or inland. It is also generally stated that sulphur will not be generally utilized in the manufacture of sulphuric acid until it is reduced in price to $12 or $14 per ton, according to the location of the factory.

Magnesite

California is the only State in the Union thus far producing magnesite in commercial quantities, but the output does not exceed 4000 or 5000 tons per annum, that being about the limit of the local consumption. Thus far it has been found impossible to ship the mineral East to any extent on account of the high freight rates, the European material being furnished cheaper than the California product. While there are several dozen known magnesite deposits, thus far very few of them have become productive, and these few are near railroad lines. A team haul of any distance is against mining this substance when other deposits have the advantage of being near railroads.

For these reasons the deposits near Porterville, in Tulare county, continue to furnish most of the magnesite used. Both raw and calcined magnesite are furnished from this point. The deposits on Red mountain, in Stanislaus and Santa Clara counties, are being worked, and the product is shipped to factories in Oakland harbor, where some is made into building material and magnesite brick. Carbon dioxide gas is also manufactured at this plant. In Contra Costa, the Magnesia Product Company, at Nobel, is making magnesia alba, and this is sold to the powder companies as an absorbent for high-grade explosives. Some is also made into paint.

The Napa and Sonoma county deposits continue unproductive owing to lack of demand at remunerative prices. It would seem as if this mineral, which in a well calcined state is fire-proof, would be largely utilized in San Francisco, where there is a demand for a fire-proof structural material. No attempt to furnish it on a commercial scale has been made, or at least it has not come into general use. As to make it fire-proof all the carbon dioxide must be eliminated, the process is a somewhat expensive one and cheaper materials are more commonly used. More or less work has been done within the year in new or old claims, but for some reason no new producers have come to the front. Unless some new uses are found, or there is a material reduction in eastbound freights, it is hardly probable that the magnesite industry of California will expand to any great extent.

Phosphate Rock in 1906

The production of phosphate rock in 1906 is estimated at 2,100,000 long tons as compared with 1,947,190 tons in 1905. The figure for 1906 is estimated on the basis of the coastwise shipments and exports for the 10 months ending October, 1906, and the ratio of those shipments to production in 1905.

The general condition of the phosphate business in Florida was highly satisfactory in 1906. The supplies continue to fall short of the demand, and at the end of the year there was nothing offering for sale before the last half of 1907, while recent prices are fully maintained, and in some cases considerable advances are asked for by the miners.

The *British and South African Export Gazette* reports that remarkable discoveries of diamonds near Kimberley have recently taken place. They are said to surpass in area and richness the existing mines of the De Beers company.

METALLURGICAL PROGRESS IN 1906

A Summary of the New Practice and Improvements in Gold, Silver, Lead, Copper, and Zinc

The year which has just closed has witnessed steady improvements in the metallurgy of the precious and common metals. The most important of these have been made in the metallurgy of gold, which subject is treated by Mr. James in a highly satisfactory manner. Only a little inferior in importance have been the improvements in the art of separating mixed sulphide ores, which have added greatly to the world's supply of zinc ore. In the metallurgy of lead, the most important developments have been on the lines indicated originally by Huntington and Heberlein. In the United States their process of lime roasting has been modified into a new process called "pot roasting," in which the presence of lime and galena appears to be a subordinate factor. However, there is some question as to the success of this modification. In the metallurgy of copper, the improvements have been especially on the lines of increasing the sizes of both blast and reverberatory furnaces, and in sintering the fine material, such as flue dust, instead of briquetting it as heretofore.

Progress in Gold-ore Treatment During 1906

BY ALFRED JAMES *

Fine sliming and the treatment of slime may be taken as the main directions of improvement in this branch of metallurgy during 1906. The use of tube mills has progressed by leaps and bounds, and is now rapidly becoming well-nigh universal, but with the adoption of fine sliming the question of slime treatment has forced itself into still greater prominence, and, as stated in my article last year, some of our keenest metallurgists have been attacking this problem. Their endeavors have met with a considerable measure of success.

As will be indicated later, progress has also been made in the treatment of difficult ores—including silver-gold ores, antimony-gold concentrates and cupriferous tailings—and in crushing, roasting, and conveying we are ahead of last year's practice.

It is interesting to note how gold-ore treatment methods have progressed into the metallurgy of the other metals. Fine sliming and prolonged cyanide treatment is in many cases ousting chloridizing roasting and the old patio process for the treatment of silver ores. Copper ore is now being leached in Chile in a cyanide plant—without cyanide—and the Merton roaster (so successfully introduced in Australia for gold ores) has now taken quite a hold in the zinc industry for the roasting of blende, and mixed sulphides. Indeed, one cannot fail to be struck by the way in which some famed names in gold-ore treatment have temporarily been withdrawn from gold-ore treatment in favor of zinc-lead undertakings.

It is difficult to put one's finger on any one part of the world as having made the most striking progress of the year. Australia probably still has the pre-eminence. Quick-witted inventions, which may have originated in other countries, appear to be more quickly put into practice with useful results there than elsewhere; and just as Australia has taken the lead and been pre-eminent in fine sliming and in circulating cyanide solutions through the mill, so now it seems to lead in slime treatment. Probably the emulation arising from the keen up-to-date methods of the leading firm of mining engineers on the one hand, and independent managers on the other hand, has tended to place Australia in the front in the matter of up-to-date methods, high extractions and low costs. Certainly such men as Hamilton, Moss, Nicholson and Klug, and the gentlemen associated with Bewick, Moreing & Co., have cause for congratulation on the results they have achieved, and are achieving, and the adoption of their methods in other fields shows that the industry generally, and not merely locally, is under an obligation to them as well as to the alert and progressive West Australian Chamber of Mines, which has published an excellent series of articles by Mr. Allen on ore treatment as carried out at the various local installations.

American practice has chiefly busied itself with tube mills and slimes treatment. Argall, Bosqui, Butters and Merrill have all been contributing to our advancement by devising improved methods. In Africa the publication of Messrs. Denny's results at the Meyer & Charlton and New Goch has caused much interest, and generally extraction and output have been increased and cost lowered, mainly by the use of tube mills; indeed, once more record gold outputs are being produced from this territory, which has more than recovered the set-back occasioned by the war.

CRUSHING

The tendency to stage-crushing is in still greater evidence. Coarse crushers, fine crushers, heavy stamps, pans, tube mills, are not an uncommon sequence. With reference to crushing (or breaking), however, it has not yet been proved that crushing for stamps to finer than 2½-in. cube is advantageous. Experiments seem to indicate that finer crushing is more expensive than the gain arising from any increase in stamp duty resulting from such finer crushing.

As for crushers, the Gates type still mainly holds the field for big work, but the Bigelow crusher (of the Black type, but with the pitman working in compression and having its weight assisting the crushing stroke) appears to be replacing the other types at Kalgoorlie, and to show a lower running cost than the gyratory or older reciprocating patterns.

Stamps of 1500 lb. weight are now in use on the Rand, and it looks as if the weight limit has not yet been reached. One has heard but little this year of anvil blocks for mortars, but at the Waihi Grand Junction they seem to have made for a considerable increase in output beyond that originally expected. Judging by output per horse-power, ball mills would appear to be the most efficient machine, the best types giving an output of over two tons per horse-power per day, crushing all the ore through screening of 700 meshes per square inch, but the cost of dry crushing (milling) at the South Kalgurli (August) appears to be about 3s. per ton as against roughly 1s. 9d. per ton (wet crushing) at the Oroya Brownhill, Lake View and Ivanhoe. On the other hand, the latter crush through very much coarser screening (100-, 300- and 225-mesh respectively), reducing the over-size product by their pans and tube mills.

FINE GRINDING

The tendency has been to use stamps for coarser crushing only—i.e., to substitute coarser screens for those formerly in use—and from the pulp to separate the coarse product and to grind it in tube mills or pans. There have been no notable contributions to our knowledge this year as to which is the best appliance for this purpose. Tube mills seem to be generally employed, except at Kalgoorlie, where the roasted ore can be efficiently ground to the required fineness in pans. Not that pans are not effective on raw ore. On the contrary, the Ivanhoe results show very good work, indeed, and it is to be much regretted that the comparative tests of pans and tube mills made at that mine were carried out in such a way as to cause the results to be worse than useless. But it is a matter for serious thought that the Ivanhoe costs for regrinding sands should be only 8½d. per ton treated, when those of the Oroya-Brownhill, Lake View and other companies are double that figure. It cannot well be a matter of pans only, or one

*Consulting mining engineer, 2 Broad street place, London

would have heard of similar low results from the other companies exclusively employing [illegible] (Lake View pans are used in conjunction with tube mills). Is it that the Ivanhoe ore is softer, or that the final product is not slimed so fine? The management has recently been very keen on reducing its residues—and has succeeded very materially in doing so—and one would therefore expect that it would not overlook the gain from crushing as fine as its neighbors. One therefore assumes that the crushing is as fine; but anyhow the fact remains that the Ivanhoe sands-grinding cost is less than half that of neighboring wet-crushing companies of the same group. We still need that careful comparative test of pans and tube mills which has so often been asked and which we have hoped would be undertaken by Messrs. Klug or Denny (Johannesburg). Indeed, I have understood that the latter was making such tests, but nothing seems to have come of them.

Meanwhile, I am informed that such a test has been made at Broken Hill with a pan, a wet-grinding ball mill, a disk grinder, and a tube mill, and that the tube mill has proved itself the best of the lot, but in the absence of details I can only take this statement as the expression of individual opinion. Even if we assume tube mills to be the best slimers, there is still the question of stage-grinding, and it is by no means certain that the preliminary crushing of the coarser particles could not be effected more economically in pans.

The best pan figures have been given above. The following tube-mill figures will probably prove of interest. African costs have been reduced from 8½d. per ton ground down to 5½d., of which 1.89d. is for power, 0.7d. for pebbles and 0.93d. for liners. Mr. Leupold states that silex linings cost only half as much and last two and a half times as long as iron liners. The Consolidated Gold Fields made tests on manganese-steel liners as against silex, with the result that the former was shown to be more expensive and the grinding nothing like as good, owing to the slipping of the pebbles caused by the polished surface of the manganese steel. At El Oro a 20-ft. mill with 7½ tons of pebbles grinds 125 tons of sands per day, using 60 h.p., to such a fineness that 90 per cent. will pass a 100-mesh and 50 per cent. a 200-mesh screen. At Waihi an 18-ft. [illegible] day so that 93 per cent. will pass 150-mesh, using 37½ h.p. The Waihi is notorious for the hardness of its material, which ball mills fail to grind satisfactorily. Its tube mills do not appear to be run to their utmost capacity, but the figures are interesting as an example in practice of direct tube-mill work—i.e., without returns. The above figures of over two tons slimed per horse-power at first sight show a less duty than that mentioned in my article last year, viz., four tons per horse-power in Africa, but it must be remembered that the Waihi [illegible] much coarser, they having at that time adopted a standard of under 2 per cent. retained on 60-mesh.

But apart from the question of comparative cost of work done, tube mills have very fully shown their economical advantage as well as their capacity as regrinders. Reference was made last year to the huge additional net profit of £65,000 a year accruing to the El Oro company from this source. At Waihi three 18-ft. tube mills and 90 stamps have increased the output from 2.89 tons per stamp per day to four tons, and have reduced the assay of the residues by 50 per cent. They have improved the amalgamation returns by from 5 to 7 per cent., and have effected a 75 per cent. saving in screening. It is found also that since the adoption of tube mills the slimes are more permeable and the filter-press charges take less time for treatment, so that the same presses can now deal with 30 per cent. more slime than before. The new Barry tube-mill linings made on the spot seem to be most effective, and to result in a great saving of cost over the imported silex. One set of linings is stated to last six months; a new set is always kept ready at hand and can be replaced in two days. Mr. Barry makes a great point of having his linings as rough as possible, so as to give a grip to the pebbles, and has modified his doors also to effect this.

At Johannesburg, Mr. Dowling emphasizes the necessity for the complete separation of the sands to be re-ground from the slimes in the mill pulp, and for keeping the proportion of water to sand at as low a figure as possible. He shows at the Robinson Deep a 0.48 dwt. lower residue (formerly 1.26 dwt., now after tube-mill treatment 0.78 dwt.) and an increased tonnage of 2300 tons per month. The Eckstein mines show in addition to the increased output resulting from the tube mills an additional profit of from 1s. to 1s. 6d. per ton, 1s. at the Robinson, 1s. 4d. at the Ferreira) resulting from the increased extractions, which have reduced the assay of the residues by about 0.5 dwt. There are now 58 tube mills at work on the Rand—and more on order—at 24 different mines, and these 58 tube mills, working in the 24 mines only, have increased the amalgamation returns of the whole of the Rand by 3 per cent. At present the Knight's Deep appears to have the highest monthly output per stamp—for complete battery—this being 7.68 tons per stamp, since reduced by the substitution of different screening to 6.68 tons. In West Australia the Oroya Brownhill outputs 7¼ tons per stamp through 10-mesh screening, and the Great Fingall (1150-lb. stamps) has an average duty of seven tons per 24 hours through 12-mesh screening, and the Sons of Gwalia at Leonora (1000-lb. stamps) crushes 6.68 tons per head per day through 20-mesh screening.

It is estimated that in addition to the above gains resulting in Africa from the use of tube mills there is a saving of 30 per cent. in equipment, arising from the adoption of tube mills in place of obtaining the same output by the addition of the increased number of stamps necessary (see *South African Mines*, Oct. 27, 1906).

AMALGAMATION

The increased amalgamation returns resulting from the use of tube mills have been referred to above. At Waihi amalgamation is carried out on plates set in a large building right away from the mill, sands and slimes being treated separately. There is much to be said for this arrangement. Companies circulating cyanide solutions through the mill find a scouring of the copper plates by the cyanide solutions. Denney, at the Meyer & Charlton, proposed to minimize this action by adopting shorter plates, but probably the better method would be to exclude copper plates from the amalgamation arrangements. At Lake View (Kalgoorlie), for instance, plates are discarded and amalgamation takes place in pans. Fifty-one per cent. of the value of the concentrates is there recovered by amalgamation and 46 per cent. by subsequent cyanidation.

ROASTING.

Edwards has increased the capacity of his recent furnaces by a parallel system of rabbles, which is stated to promote interrabbling. Klug has adopted this for the Holthoff-Wethey furnaces at the Perseverance, and claims high results. Merton has also modified his furnace by making it a 5-hearth and also of greater hearth area; but except by the Great Boulder Proprietary Company, with its roasting cost of 2s. 3d. per ton (with its Merton furnaces) for roasting ore going 4 to 5 per cent. sulphur down to 0.07 per cent. sulphur as sulphide, the record of the South Kalgurli type of Merton furnaces does not yet appear to have been improved on, either for cost (2s. 6d. per ton roasted), output (32 tons per diem for small sized furnace, requiring 1½ h.p.,) or efficiency (3.1 per cent. of sulphur down to 0.01 per cent. of sulphur as sulphide; one ton of green wood roasting 11 tons of ore). With regard to the tip, referred to in my article of a year ago, of adding say 2 lb. of lead acetate per agitator charge (40 to 60 tons) of roasted ore, Mr. Hamilton of the Great Boulder finds that the use of lead salts appears to result in an increased consumption of zinc in the precipitation boxes, as against which he benefits by a saving of roasting fuel, an increased tonnage through the mill for the same labor, a reduction in the assay of the residues, and a general feeling of confidence in ability quickly to set foul roasts all right in spite of fluctuations in natural draft.

CONCENTRATION

There appears to have been no great advance made in 1906 in the concentration of gold ores. We are still faced with the difficulty that an attempt to concentrate out refractory particles from an ore usually leaves tailings practically as refractory as the original ore.

It was hoped that fine sliming and the Wilfley slimer might overcome this difficulty, but the latter machine is by no means perfect and maintenance is a most formidable item. So far the old canvas tables or frames appear to give the best results, but the cost of washing down is very heavy indeed—amounting in certain cases to 30 or 40s. per ton of concentrates produced. A continuous rough-rubber or canvas-belt table, somewhat on the Luhrig or Buss system, might solve the difficulty, though the capacity per unit would necessarily be small; or the old treatment table could have a traveling system of washing pipes worked by a water balance, and thus avoid the expense of so much boy-labor.

The flotation processes are being mainly applied to zinc-lead concentrates at Broken Hill, rather than to gold ores. De Bavay and Simpson appear to have made an interesting discovery as to the principles involved in the various flotation processes, which they claim depend on the surface tension of sulphides as contrasted with ore gangue, the greasy sulphides retaining an envelope of air when wetted which is expanded by heat, or by vacuum, or aided by the air entangled in oil, or gelatinous silica, or by flowing the mineral pulp in very thin layers—practically all surface—over inclined tables.

TREATMENT OF DIFFICULT ORES

Cupriferous tailings, with not exceeding 0.5 per cent. copper, are mainly successfully treated by leaching out the copper with dilute sulphuric acid and precipitating on scrap iron as described by W. S. Brown in his paper in the *Transactions* of the Institution of Mining and Metallurgy. With ores containing more copper—but not rich enough to smelt—a preliminary roasting of the ore has been found to improve matters. The addition of ammonia to the cyanide solution has been previously suggested and carried out in practice.

Auriferous antimonial concentrates, containing say 20 per cent. of antimony and arsenic, have been successfully treated by an ordinary careful roast of the ore previously mixed with from 2 to 5 per cent. of charcoal or coal, followed by a hot acid wash of dilute hydrochloric acid (obtainable by exposing old chlorine solutions to direct sunlight), and then lixiviating with cyanide solution or chlorine water.

A variation successfully employed is to roast as above, add salt at the end of the roast and chlorinate. Both methods have yielded 90 per cent. extractions, but have the drawback of requiring very careful roasting.

SLIMES TREATMENT

The Messrs. Denny have made a considerable sensation at Johannesburg by the running of their new plants at that center. In these they adopted the West Australian method of circulating dilute cyanide solutions through the mill, and filter-pressing the slimes in Dehne hydraulic-closed filter-presses. They claim a recovery of over 94 per cent. at a treatment cost, including cyanide, filter-pressing, and disposal of residues (5d.) of 1s. 10d. per ton. As this carrying into practice of their proposed treatment scheme was not effected without many prophecies of failure, and as the cost of the installation necessary appears to be less than half that of the method of treatment locally in vogue, it is natural that their work should have received much attention; and as their figures do not seem to be seriously contested the Messrs. Denny certainly look like scoring heavily again as the result of their enterprise and foresight—just as they did previously by the introduction of tube mills on the Rand.

But perhaps the two greatest successes in slimes treatment—as being a real advance on established filter-press practice—are the respective methods evolved by Ridgway at the Boulder and by Barry at Waihi. Anyone reading R. Gilman Brown's article in the *Mining and Scientific Press* of Sept. 8, 1906, on the Moore filter must have noticed the very sloppy, badly arranged frames shown in the illustration. One can understand, perhaps, from these illustrations one of the reasons for the small success attending the Moore filter in America. At Waihi, Barry has a frame (see the London *Mining Journal*, Sept. 30, 1905) which is much more effective than that shown in the illustration referred to above, and he has successfully treated many thousands of tons by his method of open-framed atmospheric filtration; but the drawback to this—as to the Moore basket filter—is the necessity of having men constantly in attendance to clean the frames.

Butters seems to have been alive to the defects of the Moore frame and has got out one which he appears to be working with considerable success at Virginia City, as does also Bosqui, at Tonopah. Butters has apparently, however, allied himself to the Cassel inclosed type of press, which looks similar to that referred to in a previous paper as being experimented with at Johannesburg, apparently unsuccessfully.

The Ridgway machine has now been in use for a year at the Great Boulder, and appears to have treated some thousands of tons of slime quite automatically and without any continuous supervision, and Mr. Hamilton, who has been testing it alongside his filter-press installation, is so satisfied with the results that he is laying down a [illegible] the largest slimes plant in the southern hemisphere. The principle of the machine is a number of horizontal plates revolving around a central vertical post, which is really a tube, and to which pipes communicating with each plate are attached. Each plate has an under filtering surface, and dips through a portion of its revolution into the slimes pulp. A cake is formed by the application of a vacuum, and the plate in the course of its journey around its axis finds itself next in a water bath, where it remains sufficiently long for thorough washing. The cake is then automatically dislodged into the residues deposit system. This machine is certainly cheaper than filter-presses, both in first cost and in operation, and a plant to do the duty of an African decantation plant should not only yield higher recoveries at a lower working cost, but also should be installed for less than half of the expense of the existing system.

Of the other methods referred to in last year's article but little has been heard. Merrill appears to be still at work on his hydraulic emptying filter-press, but details of successful work have not yet been communicated.

Argall has a fixed frame and movable tank, which probably he will install in his new plant at Colorado City for the treatment of Cripple Creek ore.

In West Australia one of the groups had a method of upward percolation of the solutions through the slime pulp during agitation, but this method does not appear to have been attended with any great success. Generally speaking it looks as if some direct method of automatic atmospheric filtration would displace both decantation and Dehne filter-pressing, although at the outset it will probably require a higher degree of intelligence for its effective and successful working.

TAILINGS RE-TREATMENT

We have heard but little of the Stark process during 1906. It seems to have been most profitably applied at the Crown Reef dump. Is it that there is any special characteristic feature of this dump which makes it exceptionally suitable for the Stark process?

MERCURIC CYANIDE

A reference to a test by Butters, on El Oro ore, of mercury salt added to cyanide solution recalls the investigation made by the Cassel company (the owner of the cyanide patents) in 1895 into the use of this salt. It obtained on some ores 3½ per cent. greater extraction of the gold and 3 per cent. greater extraction of the silver, with a lower consumption of cyanide, but the tests were not continued as the improved extractions seemed insufficiently encouraging in view of the additional expense of the added salt, but Butters' tests have renewed interest in the subject, and we hope for fuller data.

COSTS

Tube milling, fine grinding, milling and roasting costs have been given above. The following statement of West Australian costs will show the progress still being made on this field by comparison with those in preceding papers, as well as with those obtaining elsewhere.

Rock-Breaking—Lake View, 1.71d.; Ivanhoe, 1.87d.; South Kalgurli (dry), 3.30d.

Milling—Lake View, 1s. 9d.; Ivanhoe, 1s. 9d.; South Kalgurli (dry), 2s. 11d.

Concentrating—Lake View, 6s. 7d. per ton concentrated, 9d. per ton milled; Ivanhoe, 8s. per ton concentrated, 10d. per ton milled.

Roasting—Lake View, 3s. 10d. per ton roasted (concentrates only); Ivanhoe, 5s. 5d. per ton roasted (concentrates only); South Kalgurli, 2s. 6d. per ton roasted (all the ore); Great Boulder Proprietary, 2s. 4d. per ton roasted (all the ore).

Fine-Grinding Sands—Lake View, 1s. 10d. per ton ground; Ivanhoe, 8d. per ton ground; South Kalgurli, 1s. 3d. per ton ground.

Cyaniding by Agitation—Lake View, 3s. 1d. (includes 1s. 4d. for KCy and 1s. 2d. for BrCy); Ivanhoe, 4s. 1d. (includes 11d. KCy, 2s. 6d. BrCy, and royalty 2d.); South Kalgurli, 1s. 4d. (includes 7d. KCy.)

From the above it appears that the agitation treatment, less cyanide and bromocyanide, but including power, lime, labor and supplies, costs roughly 7d. per ton. (Ivanhoe 6d.).

Cyaniding by Percolation—Ivanhoe, 2s. 2d. (including 9d. for KCy and lime); Great Fingall, 11¼d. (including 6d. for KCy and lime).

Filter-Pressing—Lake View, 1s. 7d.; Ivanhoe, 1s. 6d.; South Kalgurli, 1s. 6d. per ton filter-pressed. (The cost of filter-cloths at the Lake View consols was under ½d. per ton pressed for every month in 1906, save one, when it was under ¾d.)

Total Treatment Costs—Ivanhoe, 9s. 0d.; South Kalgurli, 11s. 3d.; Great Boulder Proprietary, 11s. 6d.; Great Fingall, 6s. 11d.; Sons of Gwalia, 5s. 2d. per ton treated.

GENERAL

The battle of the processes in Kalgoorlie is now over. It is admitted that the all-roasting process gives the most profitable extractions, but the good fight made by the wet-crushing bromo-cyanide section, and especially by the Ivanhoe, has been of the greatest service to the industry, and the Ivanhoe's costs are such as to reflect very great credit on the management and the staff; but the fine showing made by the South Kalgurli, the Great Boulder, the Kalgurli, and other companies, appears now to have convinced even the former bromo-cyanide advocates.

In the first nine months of 1906, Prussia produced 95,053,110 tons of stone coal and 34,671,252 tons of brown coal.

The Metallurgy of Lead in 1906

BY A. R. INGALLS

The chief feature in the metallurgy of lead in the United States in 1906 was the further introduction of the lime roasting process, which has been modified, however, by the metallurgists connected with the American Smelting and Refining Company, so that as used by them it is rather a process of "pot" roasting than "lime" roasting, the distinction hanging upon the point as to whether lime does or does not play a chemical part in the process, i.e., any part other than merely serving as the diluent of the charge, which function may be fulfilled by ferric oxide or other material. A third alternative is that lime or other material may possibly act as catalyzers. The nature of the reactions which occur in these processes of desulphurizing galena is still a disputed point. Pot roasting, as practiced by the American Smelting and Refining Company is performed on charges low in lead, and free or nearly free from limestone. However, this modification does not appear to be an unqualified success, the time required for the working of a charge being rather long and the proportion of fines produced, which must be re-treated, being rather large. Certainly the results reported are much inferior to those obtained with the Huntington-Heberlein process on high-grade galenas in Australia, Europe, and elsewhere.

In the construction of dust chambers, there appears to be a general reversal of fashion, the flues of reinforced concrete construction, which were so much in vogue a few years ago, being now out of favor. It has been found impossible to prevent them from cracking, which of course is highly undesirable. In new constructions, the flues are built of brick in the form of an inverted catenary.

Another new feature has been the restoration to fashion of the bag-house which has been before the attention of silver-lead smelters since 1880 and found its leading exponent in Doctor Iles. However, it never came into general use. An installation was made at the East Helena works, but a few years ago was abandoned. In 1906, however, the bag-house at East Helena was put into commission again, and the United States Smelting Company at Salt Lake, began the installation of a similar fume-saving device.

A prominent feature of 1906 was the extension of interest in the Betts process of electrolytic lead refining. The installation of the Consolidated Mining and Smelting Company at Trail, B. C. was materially increased in size, and a new refinery was erected and put in operation by Locke, Blackitt & Co., at Newcastle-on-Tyne, England. Most important of all was the erection of a plant of 2500 tons per month capacity, near Chicago, by the United States Metals Refining Company. This plant went into operation early in December, and at the end of the month was in smooth running order. There seems to be no question as to the success of this process of lead refining in so far as the electrolytic work is concerned, but the problem of handling the anode slime does not seem yet to have been satisfactorily solved. Mr. Betts has patented a new process for this purpose, but both at Trail and at Chicago the slimes are being worked up by independent processes. Anyway, the treatment of this material is only an ordinary metallurgical problem from which an economical method will doubtless be developed by a little experimentation.

Progress in the Metallurgy of Zinc

BY W. R. INGALLS

The chief feature of last year was the further attention devoted to the mechanical separation of mixed sulphide ores and the improvement in processes already introduced for that purpose, which have put it beyond all question that an immense increase in the supply of zinc is now available from this class of ore, formerly of little or no value. It is now quite well established that there are few varieties of this sort of ore which cannot be raised to a grade of 40 per cent. zinc by magnetic separation, while in many cases much better can be done. Moreover, there are some ores which can be even more efficiently worked by electrostatic separation or flotation. Electrostatic separation does not appear to have made much further headway, but in the flotation processes great strides have been made. At Broken Hill the flotation processes have clearly beaten magnetic separation at all points, including extraction of minerals, degree of concentration, and economy both in operating expense and in first cost of plant.

It is another example of the backwardness of American metallurgists in adopting new inventions of foreign origin that these processes, which have become of so great importance in Australia, are still but little known in the United States. However, it is satisfactory to report that during 1906 an installation of this kind was made at Marion, Ky., for the separation of the blende-galena-fluorspar ore of that district (which previously had been a difficult problem) and the results have been all that was hoped for. The samples of the concentrates that I have seen have certainly been of excellent quality. It is interesting, moreover, to remark that the zinc of this ore occurs distinctly as resin blende, which character of mineral, it had been previously stated, was incapable of flotation. The fact is that at the present time no one knows what is the real theory of flotation, and the adaptability of the process to any particular ore can only be determined by experiment.

In zinc smelting there have not been any particularly noteworthy innovations. The new plants that have been erected in Illinois, all of which are planned with a view to the manufacture of sulphuric acid, have been equipped with the Hegeler roasting furnace. The advantages of the McDougall type of furnace for this purpose continue to be overlooked. In Kansas, where sulphuric-acid manufacture is not generally considered, all the new plants have adopted the Zellweger furnace, which does good work, but like other furnaces of its type is wasteful of fuel. The use of the Ropp, Cappeau and Brown furnaces is limited by patent rights, wherefore outside companies are obliged to adopt some other form of furnace. At the present time, of course, no one would think of using the old hand-raked kilns. At the Argentine works of the United Zinc and Chemical Company, furnaces of the McDougall type have been used for the roasting of Western ores, but Hegeler furnaces are being substituted because of the desire to have larger units. The ore is roasted at Argentine for the manufacture of sulphuric acid, and the cinder is shipped to Iola for reduction to spelter.

Various new types of distillation furnaces have been tried experimentally, but no remarkable improvement appears to have been effected. Smelters generally stick close to the lines of their previous experience and are timid about venturing far from them. The character of the new installations at DePue, Palmerton and elsewhere was referred to in my article in the last volume of THE MINERAL INDUSTRY.

Experiments have been made, with successful results, with the Queneau composite retort and the Queneau charging machine. A similar form of charging machine has been tried at Ougrée, Belgium, which was described in the JOURNAL of Oct. 6, 1906. The idea of charging the retorts mechanically has long been hopefully looked forward to, but after all it is questionable as to how much advantage will be gained and whether the machines that have now been invented, which certainly are workable, will come into general use.

Among the new processes, experiments have been made with the Imbert process in France, with the Ganelin process at Overpelt, Belgium, and with the Schmieder process in Silesia. Further experiments were to have been made with the Lungwitz process at Warren, N. H., but it has not yet been reported how much was accomplished. Electric furnaces have received considerable attention, but so far they are in use only in Scandinavia (de Laval furnace) and they do not yet present any promise of displacing the standard form of furnace.

It is reported that a large deposit of remarkably pure stibnite is located in southern Utah, and is shortly to be worked.

Gold Dredging in 1906

BY J. P. HUTCHIN*

The year 1906, one of remarkable general prosperity, was unusually favorable to most metallurgical operations, but those having for their object the recovery of gold were in some ways seriously handicapped. While the producer of gold received no more for his product, he was compelled to pay more for machinery, labor, and for all supplies needed in the installation and operation of machinery. He had to wait tedious periods for machinery or renewals, all manufacturers being swamped with orders; he paid higher prices for his necessities than ever before. That gold dredging should flourish in such circumstances vouches for its prosperous condition. That operating cost has been reduced when there were many features conducive to increased expenditure bears testimony to the improvements in design, construction and operation of gold-dredging machinery.

SEARCH FOR NEW AREAS

The great success of dredging, notably in California, stimulated the search for workable areas. Engineers have been scouring remote parts of the world and the dredging horizon was widened somewhat. The results, however, were hardly commensurate with the energy and capital expended, and there was considerable disappointment. Many countries credited with large total productions of placer gold, practically all of which has been won from dry deposits, have been thought to contain rich under-water alluvion and have been investigated, rather casually to be sure, with disappointing results by operators whose experience has been confined to California, where conditions are remarkably favorable; their unfamiliarity with tropic and Arctic environments has resulted in areas condemned hastily and probably unjustly. The characteristics of the Oroville field are said to be ideal. It must be remembered, however, that there has been some remarkably lucrative placer mining elsewhere in the world. The California dredgeman is prone to look for ideal conditions and to condemn areas not possessing similar features. It is extremely probable that, like the success achieved in the Klondike dredging fields, which were turned down by the California operators, similar success will follow in the tropics. Dredging cost is extremely sensitive; it is affected particularly by environment, and any hostile conditions raise cost in a surprising manner.

MISDIRECTED EXPLOITATION

As a result of the prosperity of dredging and of the recent strong general tendency of mining shares, a number of dredging corporations have been formed to exploit areas of dubious value. Some of these are entirely dishonest but have succeeded in disposing of their shares. Other companies have been promoted by ignorant but enthusiastic persons who have supposed that certain areas could be profitably worked. While they are honest in their belief, they are still reprehensible in not ascertaining accurately the gold content and the characteristics of their holdings.

Following the great success of one dredging operation in Klondike, there is a condition approximating a boom in that territory and its influence is likely to boom other northern districts. Large purchases of mining ground in the Klondike by powerful interests have made for this same result, opening great opportunities for illegitimate promotion.

During the past year there were several failures, all due to lack of sufficient preliminary investigation. Thus, attempts were made either to work undredgeable ground or to work dredgeable ground with unsuitable machinery. The choice of dredging machinery of design and construction proper for the area it is to work is a matter of prime importance. The press of business is so great that some of the dredge manufacturers are prone to urge the purchase of "standard" dredges. While these dredges have been successful in circumstances similar to those in which they were evolved, there have been failures where they have been worked under different conditions. It is easy for the manufacturer to build machinery like other that he has made, since there is no need of changing drawings, patterns, etc. This feature has been to a degree responsible for the installation of unsuitable machinery.

TESTING DREDGING GROUND

The past year served to emphasize the advantages of test pits of large diameter over holes of small diameter. When shafts are sunk, it permits not only a more accurate determination of the gold contents, but it allows, as well, a thorough inspection of the gravel section and an accurate investigation of all the characteristics which have such a potent influence upon the working of dredging machinery. Drilling machines, in areas whose characteristics are already known (by exploitation with dredging machinery), are entirely satisfactory. When an investigation is conducted in a new district, however, the characteristics of which are not known, it is much better to sink enough shafts to determine them, even though drilling machines are used in conjunction.

Prospecting cost did not vary materially during 1906. Shaft sinking cost, in general, from $1 to $8 per ft. Drilling cost about $1 to $2.50 per ft., though

*Consulting mining engineer, 52 Broadway, New York.

generally lower average cost. It is interesting to note that, under exceptionally favorable conditions, considerable drilling was done in California for less than $1 per ft., some of it for less than $0.50 per ft.

Although new dredges were constructed in 1906, the total number of dredges operating in the world remains about the same, namely, 500. This was due principally to the working out of holdings in New Zealand. Investigation proved the existence of new areas, and enlarged the boundaries of old districts. A considerable area was drilled in Klondike and considerable ground, said to contain from $0.40 to over $2 per cu.yd., was proved. Dredges in Klondike achieved the largest extraction per cu.yd.; more than $1 per cu.yd. was saved, out of considerable volumes. The lowering of cost widened the dredging horizon, and ground formerly thought unprofitable is now included.

South America is attracting much attention and this will have beneficial results. It is almost certain that such countries as Colombia, Brazil and Bolivia contain dredging ground. Russia and Siberia are known to contain large areas of auriferous gravel and some of it is now being dredged profitably, although in one instance it is costing about $0.16 per cu.yd. British Guiana has an inefficient dredge which is said to have produced 20,000 oz. of gold in about nine months.

Northern South America, already credited with about 14 dredging failures, added another during 1906. A dredge installed on an affluent of the Magdalena river seems to be a complete failure. It is not certain whether mechanical features were entirely responsible, but a continuous series of breakdowns, such as would have meant disaster even in California, occurred when operation began. Thus Colombia unjustly got more bad repute, even though there are probably areas of rich gravel suitable for dredging on the Magdalena, Atrato and other rivers.

A dredge is in course of construction for working auriferous and diamondiferous material in the bed of the Jequitinhonha river in Brazil. It is expected to be operating in 1907, when its unusual features will be watched with great interest. Its essential difference from the ordinary dredge is a large dredging pump to take the material of a diameter between 1-16 and 1 in., after its passage over gold-saving devices, through a pipeline, sustained as in hydraulic harbor dredging, to a diamond-saving plant on shore, where jigs and other devices will save the diamonds.

Investigation of ground in Ecuador progresses actively and a dredge having a producer-gas engine was installed. No data as to its working are available.

The island of San Domingo is known to contain auriferous gravel and it is being investigated with the idea of installing gold dredges. Some of the Central American countries are being examined similarly. Some Mexican placers near Chihuahua, which were unsuccessfully worked with a steam shovel some years ago, are now being considered as possibly suitable for exploitation with

There is a class of deposits in the United States which have been worked unsuccessfully with floating dredges of old and inefficient types. They have been investigated during 1906 and are now considered as well suited for profitable exploitation with modern dredges of large capacity. There are such areas near Breckenridge, Col., and Idaho City, Idaho.

VARIED DREDGING PROCEDURE

The variations in practice and design were almost as wide as before. This was noticeable, particularly, in the gold-saving phase of dredging, and the remarkable difference between the practice of New Zealand and of California remains as great as ever. It is difficult to account for this fact when it is remembered that the characteristics of the gold in the two countries are practically identical. Part of the variation in dredging practice arises from the circumstance, not generally understood, that it is a difficult matter *not* to save a large percentage of the gold in most placers—almost impossible to lose it, in other words—while, on the other hand, it is almost impossible to save the gold in some deposits, like those of Snake river, Idaho, when operation is conducted on a large scale. So some dredge operators strive for large capacity, working their machines at top speed, and save only that gold which is easily saved. Fortunately this is a very large percentage—often over 90 per cent. of the total—though this is not generally acknowledged.

The conflict of practice in gold saving is due largely to ignorance of the gold contents of dredge tailings. Any investigation in this connection is sure to have valuable results, as valuable as is the sampling of tailings in lode mining.

RECENT DREDGE DESIGN

There were no remarkable novelties in design and construction during 1906; there were some general improvements and dredging machinery is heavier and more powerful than ever. The 5-cu.ft. bucket of 1900, weighing about 600 lb., now weighs about 1500 lb. Comparisons of other parts indicate similar increase. Hull construction received more attention; the rotting and distortion of some of the older dredge hulls made it seem more likely that steel hulls will be used to prevent these difficulties. Steel hulls have not been used in the United States for gold dredges, and for no good reason, although more structural steel now enters into a gold dredge than ever. The tendency is to strengthen hulls in this way, for which there is a crying need, for some hulls have been greatly distorted. One of them, formerly with a 6-in. crown to the deck, now has a 6-in. cup, and the well is over 12 in. wider at the bow than originally built.

The large dredge was well tried in 1906. A 13-cu.ft., continuous-bucket dredge was at work near Folsom, Cal., in shallow free alluvion; this material is said to be excavated at the rate of 200,000 cu.yd. per month at a cost of 2.25c. per cu.yd. Other large dredges working in coarse, indurated gravel, demonstrated, better than before, that the concomitant weight of the large dredge is a great advantage in digging. There was a distinct retrogression at Oroville several years ago when a number of 3-cu.ft. dredges were installed; at present there is one 3-ft. dredge at work near a 5-ft. dredge in indurated material. Comparison of the operation of the two machines indicates most strongly the advantage of the larger and heavier dredge.

A dredge with 12½-cu.ft., open-connected buckets was installed in Montana in 1906. This dredge is electrically operated and is owned by a company which also works a 7-cu.ft. dredge and one with 10-cu.ft. buckets, both of which are steam driven. All three dredges work in gravel of great tenacity, and the results indicate that the larger dredge is the cheaper to run per cu.yd., and that electricity is more satisfactory than steam, particularly for driving dredge buckets.

The centrifugal tailing elevator has held its own in the Antipodes, but no dredges have used it in the United States. Considerable experimenting has been conducted by one of the large dredge factories with a similar device and it is possible that it will be used here in the future.

CLAY-BREAKING GRAVEL

The problem of handling alluvion containing clay, or lying on a clay bottom, received greater attention. It has been generally held that the proper way to treat such material is to macerate and disintegrate it as far as possible in revolving screens having spirals or projections to effect this result. Considerable effort has been expended in this direction with dubious success toward disintegrating really tenacious clay. Investigation will prove that really it is exceptional to find gold either in clay strata or on a clay bottom. It often occurs in contact with them but seldom in them, since the conditions that made

[illegible] deposition of clay and cement material are not those that [illegible] gravel deposits [illegible] gold. It is often found in sticky gravel, and it is fortunate that such gravel usually yields to treatment in a revolving screen with water jets. It is also fortunate that the really tough clays, almost without exception, contain no gold.

Much effort is being wasted in attempting to disintegrate tough clay, and, in fact, harm is often done in treating this material in such a way as to bring it in contact with gold, which may then be lost by adhesion to clay balls. Thus the revolving screen, where tough, barren clay occurs, is not so suitable as the shaking screen which does not roll the auriferous material around with the adhesive clay.

Some loss is occasioned through the picking up of gold by clay balls when clean-ups are so infrequent as to permit [illegible] the top of the riffles.

[illegible]

During the past winter, operations at Ruby, Mont., demonstrated that work can be carried on even when temperatures less than —25 deg. F. are noted for a time. This means that dredging can be carried on all the year in any part of the United States, by using modified design and manipulation as at Ruby or in Klondike, where housing the belt stackers and having a boiler for heating the dredge permitted work after all other out-door mining had been stopped.

STEAM-SHOVEL DREDGING

Within the last year a steam-shovel plant was installed at Atlin, British Columbia, for exploiting placer ground, and preparations were made for similar work in Klondike in the future. The Atlin plant has not been in operation long enough to form a positive conclusion. The outcome of such installations will be watched with considerable interest, for such plants can be successful only under exceptional conditions. Lack of mobility and the difficulties of tailing disposal are the more important of a number of obstacles to large capacity and consequent low cost.

DREDGING COST

The cost of dredging did not vary materially during 1906. The cheapest work was done in California (said to be 2.25c. per cu.yd.; the cost in Montana was more than 10c. per cu.yd. In Klondike, in unfrozen ground, the cost was about 15c. per cu.yd. with a large modern dredge, and about 75c. per cu.yd. with a small, obsolete dredge in partially frozen ground, which required considerable thawing. Cost was lowered in some instances by merging several operations under one management; dredging is naturally susceptible [illegible] such procedure.

Progress in the Metallurgy of Copper

The leading features in the present metallurgy of copper are the tendency toward increasing the size of both blast furnaces and reverberatory furnaces. This has indeed been the tendency for many years, but the recent great leaps in dimensions, which are far beyond what anyone dreamed of only a few years ago, are due to the boldness of Mr. Mathewson, of the Washoe works. The great economy obtained from these large furnaces has been thoroughly discussed and explained in recent papers by Prof. L. S. Austin in the *Transactions* of the American Institute of Mining Engineers and by Dr. E. D. Peters in *Metallurgie*.

Another striking feature of modern practice is the increasing use of the reverberatory furnace for the smelting of fine ores, the proportion of which is all the time increasing as we undertake the working of low-grade ores in greater quantity and consequently produce the mineral in larger proportion in the form of fine concentrates. For the smelting of such material the combination of roasting furnaces of the McDougall type with reverberatory furnaces of large dimension is hard to beat.

In this connection, attention may be called to the large reverberatory furnaces that were installed at the works of the Arizona Smelting Company at Humboldt, Ariz., in 1906, these being equipped with oil burners. The results have been extremely satisfactory and establish a reliable precedent for the use of that fuel wherever it be available at a lower relative cost than coal. Oil firing had previously been used in connection with reverberatory furnaces, especially at Kedabeg in Russia, but nowhere has it been applied on so large a scale as at Humboldt, Arizona.

The most recent feature in the metallurgy of copper is the increased attention that is being devoted to the proper treatment of flue dust and other excessively fine material. The desire appears to be to get away from the clumsy and costly process of briquetting. Curiously the attention of several metallurgists seems to have been directed toward this question at about the same time. The line of effort is toward the sintering of the material in a cheap and efficient manner. This has already been very ingeniously and satisfactorily accomplished by Messrs. Dwight and Lloyd at Cananea. It is probable that their process will find extensive application.

The Minister of Finance stated recently in the Chilean Senate that deposits of nitrate had been found at Antofagasta and Tocopilla, as rich as those of Tarapaca when first discovered.

Bismuth

The chief bismuth smelters and refiners of the world are Johnson, Matthey & Co., of London, the royal smelteries of Freiberg and Oberschlema, Saxony, and the Deutsche Gold- und Silberscheideanstalt, of Frankfurt am Main. These three concerns form the convention, or trust, which until recently held the monopoly in treating bismuth ores, by-products and crude metal, and which still determines the market price of the metal.

The sources of supply of ores have been Queensland, Bolivia, Mexico, the United States, the Erzgebirge (Saxony) and Spain. The bismuth ore obtained from the United States has come from Leadville, Colo., and has been of comparatively small amount. Formerly only high-grade and pure ores were bought, and even for such only low prices were given. With increasing competition, however, ores of a mixed character began to fetch fair prices, and for the purer kinds reasonable terms can now be expected. Frequent parcels of mixed bismuth and copper ores, generally in the form of oxides, with about 10 per cent. Bi and 10 to 20 per cent. Cu, have appeared on the market, and in these the bismuth has been paid for at the rate of about 10c. per lb.; when the metal was worth $2.50 per lb., the bismuth in these ores realized 25c. per lb. The higher grades of ore, containing 30 per cent. Bi and upward, were sold at $1 per lb. of bismuth when the metal was at $2.25 to $2.50 per lb., but now that the metal is worth only about half that amount, prices for ore are proportionately lower.

It is possible that if the market were not artificially contracted, and the metal were mined and smelted without restriction, new uses would be found for it, and manufacturing on a large scale might become a commercial success. Most of the metal now produced is made into pharmaceutical preparations, like the subnitrate, tannate, iodide and bromide. Some is used in the alloy business for making fusible *cliché* metal, and similar readily fusible alloys.

An important discovery of ore containing bismuth was reported in the Washington basin, Custer county, Ida., during 1906. At this place, the old Empire group of mines was taken over by the Idaho-Montgomery Mining Company, Ltd., the main office of which is at Hailey, Ida. The property is traversed by five large veins, which dip to the southeast about 40 deg. Bismuth, both in the form of maldonite and tetradymite, is said to occur in large quantities throughout all the veins, in connection with galena of high grade in silver and gold. The bismuth ore itself is said to be high in silver and gold and to assay 55 to 58 per cent. bismuth.

REVIEW OF MINING IN THE UNITED STATES

Virginia—New Mexico—Montana—Utah—Colorado—California—Nevada—S. Dakota and Other States

Mining in the United States in 1906 was generally prosperous, as is manifest from the following reviews. The production of the precious metals and the base metals in the States west of the Rocky mountains will be found, in almost all cases, to show increases when the final statistics are collected, except in the case of copper. Such decreases as there may be, and the failure to show increases as large as was expected at the beginning of the year, are due to the insufficient supply of labor, a difficulty which is remarked in many of the following reports.

New Mexico

In the main the advancement made in the mining industry of New Mexico during the year 1906 has been notable. Everywhere throughout the commonwealth there has been unusual activity in all branches of mining; and the coming year promises an even greater rate of expansion.

The remarkable immigration to the Southwest during the past year, the great increase in transportation facilities, the consummation of plans for the erection of additional smelters, the introduction of many new methods of hauling and treating ores, and a very material lowering of freight rates on certain grades of ores, have all been important factors contributing to advancement in the mining industry. Mines already operating are being worked on a much larger scale than before; many old mines are again producing; and new mines are being rapidly developed. In all of this the noteworthy consideration is that the progress is of a lasting character, as is evidenced by the greater care which is being taken in the erection of mills and plants. Moreover, when it is recalled that during the year just passed over one-fourth of the railway construction of the entire United States was in the Southwest, the effect of this development upon mining activity may be readily surmised.

The investigations of the past few years have clearly shown New Mexico to be far richer in minerals than had been generally supposed. There are none of the many mountain ranges which are not promising mineral districts. With the recent discovery that ample water is easily accessible, instead of being totally absent, as was long believed, mining will henceforward develop much more rapidly than in the past.

Nowhere in the world are the phenomena of ore deposition displayed in greater variety than in New Mexico, nearly every known type of deposit being known to exist here. The intimate relationships of ore deposits to geological formations have now been clearly made out; the geographic distribution of deposits with regard to the grander geotectonic features has been traced with a wonderful degree of accuracy; and the time when the great ore deposits were formed has been determined. All of these factors must have a most important bearing on the vast expansion of the entire mining industry in the near future.

Especially noteworthy is the fact that in New Mexico most of the great ore deposits now being worked, and the tracts where the most extensive mines are likely to be opened in the future, lie on the south and east slopes of the great dome of the high plateau region. Of great interest also is the further fact that, without a known exception, the ores being worked by all of the important operating mines were deposited very recently, chiefly in mid-Tertiary times. In prospecting, in development, and in the working of mines in the New Mexican region the economic value of these generalizations can be hardly overestimated.

ZINC

The mining of zinc ores is of special interest by reason of its being an entirely new industry, and also because of the extensive deposits which are continually being brought to light. At present the largest producing camp is in the Magdalena mountains, in Socorro county. Since the opening of these mines two years ago other camps have been found to contain large amounts of zinc ore. The principal shipping points are Magdalena, Hanover, Tres Hermanas, Pinos Altos, Las Cruces, Cooks Peak, Granite Gap and Hachita; and a number of other locations will soon have adequate transportation facilities.

The chief feature to be noted in regard to the New Mexican zinc ores is their large percentage in the carbonate form—the form most sought for in the manufacture of zinc pigments. In the case of the Magdalena mines, which during the last 30 years have been worked for lead only, the limestone walls of the lead slopes have been found to consist entirely of replacements of zinc carbonate.

Besides the carbonate ores there are large deposits of blende; also complex ores containing copper, lead, gold and silver. Zinc mining promises to be one of the most important of the mineral industries. The production for the year exceeds 30,000 tons.

LEAD

Much of the lead produced in New Mexico is derived from complex ores. In statistics the tonnages of lead ores alone do not appear so large as they should. Many of the zinc ores and copper ores contain large percentages of lead. The largest production of lead ores alone is from Las Cruces, in Doña Ana county, the chief mines being in the Organ mountains about 15 miles distant. The deposits are in contact zones of limestone and intrusive granite. New and important developments have taken place during the past year at Cooks Peak, Granite Gap, Magdalena, and a number of other places. In the Caballos mountains, west of Engle, some large deposits have been opened up during the year, the ore being a very pure galena in a fluorite gangue.

Taking into consideration the numerous new developments in complex deposits in which there is also a considerable lead content, it may be expected that during the next few years the lead production will greatly increase.

COPPER

The annual output of copper continues to increase slowly; but, with the full operation of new mines which have been opened, a rapid increase may be expected. The bulk of the copper ores comes from the mines of Grant and Socorro counties. In these districts extensive new operations have been going on during the past year. The Mogollon district will be especially worthy of attention as soon as better transportation facilities shall have been provided. Doña Ana county mines have become more active than for some years past. Provision has been made for handling the low-grade copper ores of San Miguel county. Some promising prospects have been opened up in the archæozoic schists of Santa Fé county. Considerable attention has been paid to the very low-grade copper deposits of the Red Beds, extending over large areas in the Southwest, and methods of leaching these ores have been proposed.

The Santa Rita mines are taking out native copper chiefly. This occurs in large plates in brecciated zones in porphyry.

The new copper developments in the Magdalena mountains continue to be of exceptional interest on account of the relationships which the ores bear to those

of zinc and lead. Important new developments have taken place in the Burro mountains, in Grant county, and some interesting deposits have also recently been opened up in the Caballos mountains in Sierra county.

It is difficult to estimate the exact total output of copper from New Mexico for the reason that many ores other than copper yield considerable copper percentages, and these do not show in the copper-ore returns, but for the past year it cannot be far from 6,000,000 lb.

IRON AND SILVER

The principal iron deposits now being worked on a large scale are those of Fierro, in Grant county. Other important ones occur in eastern Socorro county; some hematitic ores occur at Magdalena, and magnetic ores in Santa Fé county. The total output for the year exceeds 200,000 tons.

The output of silver shows an increase over the previous year; but, considering the former records of New Mexico, there is not nearly the activity that there should be. Western Socorro county continues to be far in the lead, with Grant county second. Doña Ana, Luna and Sierra counties are also among the principal producers.

Most of the mines which a dozen years ago produced high-grade ores still remain closed. Large augmentations of the silver output may, however, be expected from the complex ores of the baser metals now being so largely developed, as ores of this class almost invariably carry enough silver and gold to warrant recovery. The output of the year is about 300,000 oz.

GOLD

There have been notable developments in the mining of placer gold; but the output of the lodes has remained about the same as in former years. It may be expected that the great increase of production of the complex ores of the baser metals will add largely to the gold production also.

Rich placers have been demonstrated, and a number of large prospects for their exploitation have been begun. The most important new developments have been in the Rocky mountains, near Elizabethtown, in the Tuertos mountains, near Golden, in the Caballos mountains, at Apache cañon, and in the foothills of the Mimbres range, east of Hillsboro. Many other points of minor note might be mentioned. About one-half of the total gold product is now taken from placers.

West central New Mexico continues to be the chief lode-mining district. Mogollon and Rosedale are the principal gold-mining districts in Socorro county. At Hillsboro much new work has been done recently. In Grant county most of the gold comes from the vicinity of Silver City. Near Jarilla, in Otero county, some good quartz veins are yielding gold.

Operations have been lately instituted to explore more extensively than ever before the deep mines of Lincoln county, particularly the Old Abe, now down 1500 ft., and the deepest mine in New Mexico.

Recent investigations appear to show conclusively that in nearly all of the many mountain ranges of New Mexico gold occurs in workable grade. In many of the districts good placers are also to be found, and the problem of a sufficient water supply for exploiting these placers has now been solved. Another noteworthy circumstance, and one which should greatly stimulate mining, is that the geology of New Mexican gold has been carefully worked out, so that most of the uncertainties as to occurrence and probable extent of deposits have been removed.

The production for the year may be valued at $500,000.

COAL

Activity in coal developments has been very marked. The output has already increased, but progress in the construction of railroads to new fields will in the course of another year or two result in an immense advance in production.

In the northeast the Raton range coalfield has received much attention, and a number of large mines have been opened. Three lines of railroad are now under construction, which will afford access to markets not now reached by the Atchison, Topeka & Santa Fé Railroad, which has long controlled this territory. The coal rights on the Maxwell land grant, embracing over 300,000 acres, have been recently sold to a syndicate which is also building a railroad eastward into Kansas, and whose present expenditures involve upward of $15,000,000. The Phelps-Dodge are also surveying a new line, about 200 miles long, to tap their Dawson fields already reached by their road from Tucumcari.

In the northwest, in the San Juan valley, great activity has been manifested during the past year. At present the region is greatly hampered by inadequate transportation facilities, but these conditions will not long continue, as the Southern Pacific, Denver & Rio Grande, and other railroads, are pushing into this territory. The San Juan field is in many respects the most remarkable in the country.

At the present time the Gallup field continues to be one of the principal producers, and new developments here have been in progress.

A feature of special note has been the reopening, on a large scale, of the Carthage coalfield, near the Rio Grande in central Socorro county. The railroad from San Antonio has been entirely rebuilt, and the output is shipped directly over the Santa Fé.

Still further south, and near the site of the Elephant Butte dam, on the Rio Grande, some good coal has been opened up in the Mescal cañon. The seam is about 4 ft. thick, and the field is probably one of considerable extent. This is the most southerly of the known coal deposits of New Mexico. A large power-plant has been erected over the seam, and power transmitted over wires will supply a number of mines and mills within a radius of ten miles. In this locality are six other seams in the coal-bearing section. One bed of bituminous shale is 400 ft. in thickness.

The total tonnages mined during the year amount to over 2,000,000 tons.

Virginia

The mining industry in Virginia, during the year 1906, showed noticeable advancement. In general, those mines producing in 1905 continued to produce during 1906, with, in many cases, a substantial increase in output. At some of these, developments both above and below ground were made, increasing thereby the efficiency of the plants, and, in turn, the production. In many places new mines were opened and extensive areas underwent development.

Virginia is entering upon a new era of railroad building, which in the future, will greatly stimulate and increase mining operations over extensive areas of largely undeveloped mineral resources.

IRON

The year 1906 was one of considerable activity in iron-making in Virginia. Most of the old mines produced their full quota of ore, while new mines were opened and extensive areas were and are now being actively developed.

The most important type of ore is limonite. In the Cambrian sandstone of the Blue Ridge there is one important fault deposit being mined. In the upper Cambrian shales, along the western base of the Blue Ridge, there are three relatively large operations, and a number of minor ones. In the clays of the Valley limestone, in the New River-Cripple Creek region, there are some 25 operations producing a total of about 20,000 tons of ore annually. Of the so-called Oriskany ore, which is mined chiefly in the vicinity of Clifton Forge, there are seven operations each producing from 50 to 400 tons of ore per day.

Red hematite is second in importance to limonite. Of this ore there are two kinds, both bedded deposits, one of the Cambrian, the other of the Clinton age. The Cambrian hematite is mined in four operations in the Blue Ridge. The Clinton is mined in seven operations in the two extreme southwestern counties of the State, and in one operation near Clifton Forge.

the Norfolk & Western Railway, from Cripple Creek to Speedwell, has added

promising magnetic ore in Patrick county. In Pott's valley vigorous developments are now being prosecuted. Twenty miles of railway are being graded from Covington, and the survey of 35 miles more is completed. This is a new area which heretofore has been inaccessible. If its production proves proportionate to the funds which are now being expended in its development, this region will be the most important that has been opened in recent years, and should add very materially to the amount of the State's production of iron ore.

At Buena Vista the most substantial iron-ore dressing establishment in the State has recently been put into operation, which indicates the faith of the operators in one of the oldest mines in the State. At the Oriskany mine one of the most complete iron-ore dressing establishments in the South is now being erected. Two furnaces, each with tributary ore properties, have changed owners during the year and are now in blast.

MANGANESE

During 1906 special activity was manifested in the exploitation and development of manganese properties in both the Valley and Piedmont regions. The principal developments were confined to Augusta county, in the Valley, and to Campbell county, in the Piedmont region. The work was directed more particularly to the reopening and developing of old properties rather than to the opening of new mines.

In Augusta county, the Crimora Manganese Company suspended work in October, pending a change of management, and will probably not resume systematic work before February, 1907. A drainage tunnel 5800 ft. long, connecting with a central shaft, has recently been completed, and hereafter the ore will be broken down by hydraulic washing. In the vicinity of Vesuvius, near the Augusta county line, the Manganese Corporation of Virginia has been developing some old mines, which, in the past have produced small tonnages of ore. An extensive body of good ore has been blocked out ready for stoping, and arrangements are rapidly being completed to place the plant and the working in shape for extensive operation. The shipping of ore will shortly begin at the rate of 25 to 30 tons per day.

Vigorous prospecting at the Saunders manganese mines, located one mile east of Evington, in Campbell county, was in progress during the spring and summer of 1906, and good bodies of ore have since been found. In the extreme northeast corner of Campbell county, about two miles east of Mt. Athos, the old manganese mines, worked some years ago by the Lernel Mining and Manufacturing Company, have recently been acquired by the Piedmont Manganese Company, incorporated; and developments on an extensive scale for large shipments of ore are in progress. At each of the mines enumerated above, the ores are of excellent quality and they command good prices on the market, for uses to which the better grades of manganese ores are put.

GOLD

Gold mining in Virginia was less active in 1906 than during certain past years, although plans were being matured at several of the principal properties, in the main gold belt, preparatory to the be- [illegible] permanent basis in the early future. In Buckingham county, the Anaconda Gold Mining Company, located about three-quarters of a mile southwest of Johnson station, commenced development work in March on an old gold-mine property. In the Virgilina belt of Halifax county, the Red Bank gold mine of the Virgilina Mining Company, located about four miles northeast of Virgilina, has been [illegible] operating a 10-stamp mill, and is milling about 10 tons of ore per day. The underground work at this [illegible] built and [illegible] of the shaft.

COPPER

The Virginia portion of the Virgilina copper belt was inactive, as regards copper, during the past year. In the Blue Ridge copper district of northern Virginia, some development work was continued. About six miles south of Front Royal, in Harmony Hollow, Warren county, a 30-ft. shaft was sunk on the Beatty property. On the southwest end of the "Gossan Lead" at the Great Outburst, near Chestnut Yard, in Grayson county, the Pulaski Mining Company continued to mine the copper-lean pyrrhotite for trial tests in acid and ironmaking, with occasional shipments made of the black secondary copper ore concentrated beneath the gossan.

COAL

Owing to the rapid developments in the principal coal areas of southwest Virginia during the past year, and the length of the present account of mining in Virginia in 1906, a review of the developments during the past year in the principal coal areas will be reserved for separate treatment in an early number of the JOURNAL.

No shipments of coal were made from the mines of the Richmond coal basin during 1906. Actual developments in this basin were in progress at only one operation, namely, the mines of the James River Coal Corporation, at Midlothian, in Chesterfield county. The developments made by this company comprise the completion of an inclined slope at an angle of 33 deg. to a depth of 1022 ft., to coal 8 ft. thick. The coal in this shaft has been actually proved for considerable distances, so that the future of the company seems especially good. The building of 1¼ miles of trackage, and the erection of a a tipple, are under way, and on their completion, about the first of the new year, the shipping of coal will begin.

Rapid advances were made during 1906 in developing the Montgomery-Pulaski counties anthracite coal area. In the Montgomery portion of the field, the Merrimac mines of the Virginia Anthracite Coal Company, the largest operation in the district, produced steadily throughout the year with an output of 100 tons per day. Two smaller operations on the same ridge, Price mountain, and three on the nearby north ridge, known as Brush mountain, in the vicinity of Blacksburg, were producers, supplying strictly a local market.

In the Pulaski portion of the field, the developments were more extensive than in Montgomery county. The Parrot mine, formerly known as the Kimball, of the American Coal Company, produced on an average about 75 tons of coal per day. Extensive improvements were made during the year in the tipple of this mine. At the mines of the Belle Hampton Coal Company extensive development work, largely in the nature of deepening the mine slopes and extending the entries, was carried on. During the latter part of the year the shipments from this mine were estimated at an average of about 25 tons of coal per day, taken out principally to meet the cost of the development work. About three miles northeast of the Altoona coal mines of the Bertha Mineral Company a slope was put down during the year to a depth of about 600 feet, with an excellent showing of coal.

BARITE

In addition to the output of mines operating in the vicinity of Honaker, Gardner and Richlands, in Russell and Tazewell counties, which continue to be the principal barite producers in the state, and the Bennett mine near Toshes, in Pittsylvania county, small shipments of ore were made from mines reopened in Smyth, Bedford and Nelson counties. Barite mining on a small scale was recently resumed to the west of Marion in Smyth county. Work in connection with the opening of a barite property in Bedford county, about three miles west of Thaxton station, has been in progress for several months past. In Louisa county, barite mining was again begun about three miles east of Lindsay, a station on the Chesapeake & Ohio Railway.

PYRITE

The famous pyrite mines near Mineral, in Louisa county, and near Dumfries, in

Prince William county, continued operations on a very extensive scale during 1906, with a large total production of ore, which is consumed entirely in acid-making. The production of pyrite from these mines could have been considerably increased had the demand for labor been met. The mines operating in 1906 were the Arminious and the Sulphur mines, north of Mineral, in Louisa county, and the Cabin Branch mine, near Dumfries, in Prince William county.

SOAPSTONE

Within recent years the soapstone industry in Virginia has assumed large proportions. During 1906 the quarrying of steatite (soapstone) and talc was carried on in four counties in the State, the principal operations being confined to the Albemarle-Nelson counties belt. Beginning with the most southwesterly operation in Nelson county, the following companies were operating during 1906: The Piedmont Soapstone Company; the Phoenix Soapstone Company; the American Soapstone Company; the National Soapstone Company; the Plumbers Soapstone Company of America; the Virginia Soapstone Company; the Old Dominion Soapstone Corporation; and the Albemarle Soapstone Company.

In Amelia county, about four miles north of Jetersville, a station on the Southern Railway, extensive developments were in progress by a Philadelphia corporation during the summer, for the quarrying and dressing of soapstone. In the vicinity of Herndon station, on the Southern Railway, in Fairfax county, a good grade of talc was mined during the year.

GYPSUM

Considerable activity was shown during the past year in the gypsum industry, in Washington and Smyth counties, in southwest Virginia. The Buena Vista Mining and Plaster Company, with its well known established mines and mill located at Plasterco, has been engaged, in addition to its regular mining and production, in developing other deposits of gypsum on its property. From six to seven miles northeast of Plasterco extensive and thorough drilling by a Western company of a gypsum property, located immediately on the north fork of the Holston river, was in progress during the year.

ASBESTOS

The mining of asbestos in Virginia during the year was confined to the mines of the American Asbestos Company, located at Chestnutfork postoffice, in Bedford county, and about 12 miles from Bedford City on the Norfolk & Western Railway. The variety of asbestos mined at this locality is entirely of the amphibole type. Other very promising deposits of amphibole asbestos are found in a number of counties in the crystalline area of the State; but as yet they are largely undeveloped and little or no work has been done.

MICA

Although numerous deposits of excellent merchantable mica are known in a number of counties in Virginia, some of which have been rather extensively worked in the past, very little activity was manifested in mica mining during the year.

The Pinchback mines, located about two miles northeast of Amelia courthouse, in Amelia county, were the only ones operating in Virginia in 1906. New openings were made during the year on the Pinchback property with very encouraging results. All the products from these mines are marketed; they comprise mica, feldspar, and kaolin, the latter of which results from the alteration of the feldspar of the pegmatite dike down to some depth below the surface.

GRAPHITE

Developments near the base of the Blue Ridge foot-hills and along the Albemarle-Orange county line, on the Naylor-Bruce property, by the Naylor-Bruce Graphite Company, was continued during a part of the year just ended. A plant for refining the product is planned to be built in the near future, when the systematic mining and preparation of the mineral for shipment is expected to begin.

OTHER MATERIALS

Lack of space forbids, at this time, a review of the clay, lime, cement, and quarry industries of Virginia, all of which are extensive and are among the most important mining industries in the State.

Montana

BY R. L. ST. CHARLES

All of the large companies operating in Montana made good records last year, especially those mining copper and silver in Butte, and those mining gold ore in Fergus county. Butte was, of course, the center of activity; and, while its production was not much greater than in 1905, it promises an increase this year by reason of the opening of known bodies of rich ore that had been tied up for years by litigation between United Copper and Amalgamated interests. The year just ended brought forth a settlement of the controversies by the sale of all United Copper interests, save the property of the La France Copper Company, and an adjustment of interests between the purchaser and Amalgamated. Since then harmony has prevailed among all of the large operating companies, and the peace which characterized operations prior to the advent of F. A. Heinze as a mine-worker has been fully restored. Much development work was begun after the sale and adjustment of rights, and much more planned for future execution. The deep-

gun toward the close of the summer, and is still progressing. New shafts were started, and are going down rapidly. One of these is on the Badger State, through which this claim and the Auraria will be

company; another is on the Tramway, and will be used as an outlet for the ores of this mine, the Snohomish, and Minnie Healey. The expense of this work will be borne jointly by the Butte & Boston company, and Butte Coalition company, both of which are owners in the Tramway and Snohomish, while the Minnie Healey is exclusively a Coalition mine.

Many new companies were organized last year for work in the Butte district, and 90 per cent. of them began operations which are still under way. Their work has progressed so far that in all likelihood ore-bodies outside of the developed zone may be found by some of them. A few had ore to begin with, and maintained a steady output in a small way up to the close of the year. The advance in the price of silver toward the latter part of the year stimulated the mining of this class of ore, and numerous properties, in Butte and other sections of the State, that had been idle for years, were placed in commission. Up to the close of December, however, none had become phenomenal producers of the metal.

Mining in Montana is practically confined to a few counties—Silver Bow, Madison, Jefferson, Fergus, Missoula, Flathead, Beaverhead, Lewis and Clarke, Granite, Powell, Deer Lodge, Park, Broadwater and Carbon. In copper and silver production Silver Bow leads all in 1906; but Fergus produced the most gold. The output of zinc was small, due principally to the burning of the plant of the Montana Zinc Company, near Butte early in June. In the latter part of November the zinc company formulated plans for a new mill, and it will probably be in the productive class in 1907. The output of lead in the State was not great, for this class of mineral is found only as a by-product of other ores. The upper levels of the Lexington mines of Butte contain ore in which the percentage of lead is considerable.

GOLD DREDGING

Dredging became more prominent in the State last year than ever before. Five new boats were put in operation, one by the Conrey Placer Mining Company, operating at the mouth of Alder gulch, Madison county; one by the Supreme Gold Dredge No. 1, on Hughes creek, in the western part of the State; one by the Trustees Gold Company, on Basin creek, Jefferson county; one by a Kansas City syndicate on Cottonwood creek, Deer Lodge county, and the other by the Gold Creek Company, Ltd., on Gold creek,

Granite county. Another was built for work on the Jefferson river, 45 miles southeast of Butte, but faulty construc-

pany is operating three large boats within half a mile of each other and extracted a large amount of gold last year. Three companies suspended work as soon as the cold weather set in, but will resume in the spring. The boat on Cottonwood was designed for saving gold and sapphires, both of which the gravel contains.

Little copper is produced in Montana outside of Butte. During the first six months of 1906 the ores treated in the Washoe smelter yielded 94,360,915 lb. of copper; and it is estimated that the last six yielded a greater quantity on account of the fact that the ores of Red Metal and La France Copper were added to the shipments during that period. Prior to July 1 they had gone to the plant of United Copper. With Red Metal and La France ores the plant yielded about 112,360,915 lb. from July 1 to January 1, or a total of 206,721,830 lb. during the year. From this must be deducted 40,000,000 lb. for North Butte, 15,000,000 lb. for Red Metal for the last half of the year, and about 3,000,000 lb. for La France Copper for the same period; also the metal derived from the many smaller companies and individual operators that shipped ore to the plant during the entire year. The ores of Anaconda, Washoe, Butte & Boston, Parrot and Trenton therefore yielded about 150,000,000 lb. of copper, and the Boston & Montana about 90,000,000 lb., a total of 240,000,000 lb. for the Amalgamated companies. To this can be added North Butte, 40,000,000 lb.; Red Metal, 30,000,000 lb., La France Copper, 6,000,000 lb.; Clark mines, 15,000,000 lb.; miscellaneous, such as Pittsburg & Montana and individual operators, 10,000,000 lb.; making a total of 341,000,000 lb. for the entire district. This copper was produced from an ore tonnage averaging about 12,500 tons a day for the year, of which about 8000 tons a day was treated in the Washoe and 3500 tons in the Great Falls plant; the remainder passed through the Clark plant and the smelter of the American Smelting and Refining Company in Helena. The average daily shipments from Amal-

Boston & Montana, was a little more than 6000 tons. The production of North Butte and Red Metal mines in the early part of the year was much less than that of the latter part, but a good average was shown at the close of the year. Extensive development work was carried on in all of the

nearly all of the main shafts having been sunk from 100 to 400 ft. each. Great bodies of ore were opened in the Cora, North Butte, Anaconda and Red Metal mines; and many mines that had not been

tion were placed in commission and their development was begun. Among these properties are the Tramway, Snohomish, Nipper and Berkley. A deep shaft was started on the Badger State late in the fall; another on the Greenleaf at an earlier period, and another on the Poser, by which this claim and the Elm Orlu, Clark mines, will be opened.

ANACONDA

About the middle of the year the Anaconda company bought the Belmont from the Coalition company for the purpose of using it later as an outlet for the ore of the Anaconda mines and as an avenue for timbers. The company resumed operations in the veins of the Buffalo and Pacific mines, sunk the shaft on the High Ore from the 2200- to the 2550-ft. mark, and is sinking to the 2600; added 300 ft. to the Neversweat shaft, crosscut the vein of the Anaconda at the 2400-ft. and connected the 2000- and 2200-ft. with a raise in the vein. Late in the fall it began equipping the Diamond with electrical apparatus for operating all of the compressors of the Amalgamated system, deciding to retain its steam machinery for emergency.

BOSTON & MONTANA

Boston & Montana had a fairly good year. It retimbered the shafts of the Mountain View and West Colusa mines; finished the installation of a new hoisting engine and skips at the former; and placed the Leonard in shape for greater ore production. It ordered two large hoisting engines for the Pennsylvania and Badger State, and in November decided to install an electric-haulage system underground in its principal mines. It also began enlarging its smelter with a view of treating 1000 tons more per day.

NORTH BUTTE

North Butte began extensive development. In the early fall it started two crosscuts north from the 1200- and 1600-ft. of the Jessie for the purpose of cutting supposed veins in the Berlin group and sank its main shaft 200 ft. It opened the Edith May and Miners' Union vein, one of the largest and best in the district, and exposed 100,000 tons of ore in the old Speculator vein. It equipped its main shaft with an engine having capacity for 3500 or 4000 ft. erected a steel gallows frame, and added a large air compressor to its machinery. It also substituted skips for cages in the shaft and equipped the levels with skip pockets. Its possessions were greatly increased, several undeveloped claims having been bought by it. Toward the latter part of the year it resumed sinking in the old shaft on the Berlin.

LA FRANCE

La France Copper operated the Lexington property continuously, but did not make much of a showing on account of the fact that its work was confined to the upper levels. In November it finished unwatering the lower levels. Its daily average output was between 100 and 150 tons of ore carrying copper, silver, gold, zinc and lead. The destruction of the Montana Zinc Company's plant by fire in June prevented La France from realizing on its zinc, for it had no market for this class of ore after the fire. It made many improvements at the mine, one of which consisted in the building of a tramway from the shaft to the top of the hill east of the shaft, to facilitate the handling of ore by rail.

PITTSBURG & MONTANA

Pittsburg & Montana made a better record than it did in 1905. It closed its smelter in April and began shipping ore to the Washoe. It sunk two winzes, one 200 ft. and the other less, from the crosscut leading from the main crosscut between shafts 2 and 3, and developed a strong vein west of the 200-ft. winze. Its shipments during the latter part of the year averaged more than 150 tons of ore a day. Deeper work through the main openings was planned, and, if nothing happens, will be carried out this year.

CLARK'S MINES

Improvements begun at the Clark plant in 1905 were finished about the middle of last year. They included the erection of a 352-ft. steel and concrete stack, with dust-chamber and connecting flues, and the substitution of converters for blister-copper furnaces. The mines were productive up to Oct. 1, but from about that date up to the close of the year the output averaged 100 tons a day less and the concentrator was idle part of the time. Custom ores were bought to make up the deficiency, and with their assistance the furnaces were kept in operation continuously.

SILVER OUTPUT

Silver production in Montana in 1906 was large, considering that mining for this metal exclusively was conducted on a small scale up to the time the price began to ascend. Amalgamated was the greatest producer, its ores and those treated in its Washoe plant during the first six months yielding 3,811,735 oz. The amount for the year would thus be 7,623,470 oz., making a total of 29,710,285 oz. since the new smelter was blown in, 56 months ago. Red Metal mines, La France Copper, and smaller companies and individual operators in the Butte district alone turned out approximately 2,000,000 oz., Boston & Montana 2,000,000 oz., and the Clark interests 800,000 oz. North Butte and Pittsburg are figured in the Washoe yield. The total output of silver in Butte last year was about 12,423,470 oz. Granite, Powell, Jefferson, Beaverhead, Lewis and Clarke, and Madison counties added considerable to this, possibly 4,000,000 oz.

ZINC

The destruction of the plant of the Montana Zinc Company by fire last June

gave the zinc industry a [illegible] back; for after the fire no zinkiferous ores were treated in the State, except at Corbin, where an experimental plant was placed in commission in October. This plant was used principally for making chlorine gas to be used later in the treatment of zinkiferous ores, of which there is an abundance in that district, some of it running as high as 67 per cent. zinc. The original capacity of the plant will be doubled this year.

GOLD PRODUCTION

The output of gold in 1906 was not small, every county in which mining was done contributing to the aggregate. From Jan. 1 to July 1 the Washoe plant yielded 22,567 oz. or a total of 45,134 for the year. Boston & Montana, Red Metal, La France Copper, and other Butte mines added largely to this output, bringing the total to about 70,000 oz. Lewis and Clarke, Granite, Madison, and Deer Lodge counties contributed largely to the total production, the Cable Lease and Southern Cross companies being the banner producers. Both of the latter companies operated almost continuously; the former treating the output of its mines in its own mill, and the latter shipping to the Washoe part of the time, and using its own plant the remainder. The estimated output of the Pioneer district in Granite county was $200,000, and that of the Garnet district, in the same county, $100,000. Fergus county was the most productive, the Barnes-King, Gilt Edge, and other mines in that county in which there are immense bodies of average grade ore, yielding continuously. The Barnes-King property was sold in November at a figure said to have been $1,250,000, Butte and Eastern men taking it and organizing the Barnes-King Development Company, to operate it and double the capacity of the mill. To April 30, 1906, Barnes-King had yielded $1,527,126.37 gross, of which sum $547,800 was paid out in dividends at the rate of about $144,000 a year on 210 tons daily treatment. The average yield per ton is $5.95, and the cost of mining, etc., $2.80 per ton. Total extraction for 1906 was 49,384 tons. The quantity of ore in sight on April 30 was 400,281 tons. The company's surface equipment is valued at $121,495. It has 23 claims for mining purposes, and a ranch containing 1,000,000 ft. of lumber and a sawmill.

The Green Campbell Consolidated Gold Mining Company started its new mill about Oct. 1, and operated it almost continuously up to the last of the year. This mill and the company's mines are located in the Silver Star district, 55 miles southeast of Butte. During the three months' operation it crushed about 3600 tons of ore that averaged $10.50 a ton, but much of that crushed was second class. It began systematic development of its ore-bodies and expects to open immense reserves this year.

Colorado

[illegible]

The year 1906 was for Colorado, on the whole, uneventful and prosperous. No [illegible] opened up, and the long-expected new camp still remains undiscovered. The undoubtedly improved condition is due to two causes: viz., the absence of labor troubles, and the higher prices of metals, and especially of silver. At the time this is written, it does not appear probable that this will be found to have materially increased the output, but it makes a most welcome addition to the profit margin New enterprises have been relatively few in number. The only seriously disconcerting features in the outlook for the future are, first, the decadence of prospecting, due largely to the more alluring attractions of Nevada, and secondly, the scarcity of skilled labor.

CRIPPLE CREEK DISTRICT

The production of this district will probably be about the same as for 1905. The Portland is still by far the largest shipper, followed by the Elkton, Vindicator, Granite, El Paso, Stratton's Independence, and Golden Cycle. Several good orebodies have been opened up by lessees, of which the Little Clara lease, on the Work property, is the most important. The remaining properties of the Woods Investment Company, including the Gold-Coin, have been absorbed by the Granite Company. The Findley has been shut down, pending completion of the Golden Cycle mill; it is generally expected that this mine and the Golden Cycle will commence a large output as soon as the mill is ready, in the spring of 1907.

As to ore treatment, the proposed mill to handle the Independence dump by raw cyaniding is still in abeyance, and little progress has been made with the treatment of the large low-grade bodies of semi-oxidized ore, and the dumps, by this process. The old Telluride mill was purchased by the Golden Cycle interests, and is being remodeled as a roasting-cyanide mill. The Dorcas mill was destroyed by fire, and is not being rebuilt.

The projected co-operative drainage tunnel has not yet been commenced, owing to disagreement among many of the principal interests involved as to the basis on which the expense should be apportioned; nor has it yet been decided which of the schemes proposed will be finally adopted, although opinion is veering round again in favor of the deepest or Window Rock project. It is greatly to be hoped that this enterprise will be commenced as soon as possible; as unless the productive area is drained and deeper sinking rendered practicable the [illegible] maintained for many years longer.

LEADVILLE DISTRICT

There was a very great output from Leadville, as to tonnage; and it is probable that, owing to the improved prices for silver, lead, and zinc, the profits realized were greater than in previous years. The properties of the Western Mining Company produced the largest tonnage, followed by the Moyer mine of the Iron Silver Company, the various mines included under the administration of the Yak Tunnel Company, the Ibex (still operated mainly by lessees), and the Reindeer. Developments on the Owers property in Iowa Gulch are reported to have been unfavorable, the shaft sunk through the wash having struck granite without encountering the ore-bearing limestone series. Toward the end of the year shipments from the camp were greatly hindered by shortage of cars.

Perhaps the most salient single feature was the striking success of the Yak tunnel, which partly by supplying power and transportation of ores, but principally by leasing and working the properties opened up along its course, has become a very remunerative enterprise. Its success affords an excellent object lesson to the many other tunnel schemes throughout the State.

SAN JUAN DISTRICT

The list of misfortunes in this region of rugged mountains and heavy snowfall was again added to. In the spring the Camp Bird mill was destroyed by snowslide and fire; while about the same time a snowslide carried away the buildings of the Shenandoah mine, near Silverton, with a heavy loss of life. Several other mills, near Silverton, were damaged by the same agency. The Silver Lake mill, also near Silverton, was totally destroyed by fire. All of this damage, however, is being, or has already been, repaired; other properties are beginning to produce largely, and there is every reason to hope for a period of steady prosperity.

The Telluride district has been more prosperous than for many years past. The leases on the Smuggler-Union are producing largely and profitably; the advance in the price of silver is especially welcome to this property. The Tomboy Company's Argentine mine continues to make a large output, and the grade of the ore has considerably improved, so that the proportion of profit has been higher than at any time since 1902. The Liberty Bell has settled down to steady production, after the interruptions due to remodeling the mill. The vicinity of Ophir, on the other hand, has been less active.

At Silverton, owing to the loss of the Silver Lake mill, the Gold King and the

*Consulting mining engineer, Boston building, Denver, Colorado.

Gold Prince, which is erecting at Animas Forks, and has virtually completed, a huge mill of 500 tons daily capacity, in the construction of which no expense was spared. With the aid of cheaper shipping costs, by the extension of the Silverton Northern railroad to the same point, and a solidly built tramway from mine to mill, it is expected that the extensive low-grade orebodies opened up in the Sunnyside Extension ground last year can be profitably worked. It is certain that this district contains many other veins of almost or quite equal size, which will be successfully operated some day, whenever working costs have been reduced to a sufficiently low level; and it may be that the enterprise of the Gold Prince and Grand Mogul companies will prove this time to have arrived already. Prominent among the new producers near Silverton are the Old Hundred and Green Mountain in Cunningham Gulch.

At Ouray, the enforced suspension for seven or eight months of the Camp Bird, and the continued inactivity of the American-Nettie, have been severely felt. On the other hand, the reopening of the old Red mountain mines by the agency of the Joker tunnel, and the reworking of the Saratoga, have led to a feeling of hopefulness for the coming year. At the Revenue tunnel good discoveries in the lower workings have resulted in a profitable summer's work. The Bachelor is idle, excepting for the work of a few lessees.

[illegible]

The situation in Gilpin county remains unchanged; except in the Russell Gulch district a large proportion of the best mines are idle. The Old Town is still the largest and most profitably producing mine; but the Pewabic is also handling a large tonnage. Nothing has yet been done toward carrying out the extensive program of development projected for the Gregory-Bobtail consolidation, with a view to proving the famous old Gregory, Bobtail and Fisk veins at considerably greater depth. The Gunnell has changed hands, and the new proprietors have re-erected the shaft-house (which was destroyed by fire), and are retimbering the upper portion of the shaft, which was ruined at the same time, preparatory to re-opening the mine. On Quartz hill all the principal mines are idle; the future of this district is bound up with that of the Newhouse tunnel, which is now believed to be within less than 2000 ft. from many of the principal veins, and is advancing at the rate of over 250 ft. monthly.

The neighboring Idaho Springs district continues to pin its faith to its deep cross-cut tunnels, planned to unwater and develop the old producing veins to the north and southwest of the town. Among the most important of these are the Newhouse, Central and Lucania, the ulterior objectives of which are various parts of Quartz hill, and the McClelland tunnel, aiming to strike the old Freeland property in depth. The Gem and Lamartine are at present being worked only by lessees, and the Stanley is carrying out only development work.

At Georgetown there is to-day no bonanza mine, such as the Dives-Pelican, Colorado Central, or Terrible of former years. Several mills are at work on the dumps and stope fillings left by former workers, and others are being built. Pending the discovery of new bonanza orebodies, the milling of low-grade silver and zinc ores gives employment to a considerable number of men, so that the camp is by no means inactive. Considerably increased interest is shown in the veins of the Argentine district, which has been opened up during the year by a narrow-gage railroad (the Argentine Central).

In Boulder county there has been no increase of production, as compared with the last two years; but much is promised for the future. The new mill under construction for the Wano mine, at Jamestown, is nearly finished; and as the preliminary testing was thorough and satisfactory, it is safe to predict that a success will be scored, if the orebodies in the mine prove of the size and grade expected. A much larger mill is being erected to cyanide *en masse* a huge rhyolitic dike near the South Boulder, which is claimed to run on the average a couple of dollars or more. It has been known for years that some of the remarkable systems of dikes in this county contained gold, but the gold has hitherto been found too erratic in occurrence for economic work.

MINOR DISTRICTS

The vicinity of Breckinridge has been benefited by the advent of a market for zinc, and several mills are in operation on zinc-lead ores. It is currently reported that the Revett dredge on French Gulch has had a very successful season; and further developments in dredging are anticipated. Creede continues to ship a considerable tonnage, principally of low-grade silicious ores. Lake City and Kokomo are still awaiting a revival. The large zinc orebodies of Red Cliff and Rico are shipping a considerable tonnage, which is likely to be increased in the near future. At Aspen the principal production is made by the Percy La Salle and Smuggler mines; there has been little, if any, increase in activity as yet, following the better prices for silver.

PLACER MINING

Some work has been done by the dredges built a couple of years ago in the Clear creek valley near Golden; with what success is not known. The successful operation of the new dredge on French Gulch near Breckinridge is referred to above. Hydraulic mining is carried on at the Twin Lakes placer, near Leadville, and the Keystone placer, below Telluride; but in the latter case extensive caves of surface soil, resulting from the heavy snowfall in the spring, caused the suspension of operations.

MINING OF RARER METALS

As is well known, Colorado is relatively liberally endowed with ores of the rarer metals; but hitherto the small demand, and smaller knowledge of the subject, has confined production to the extraction of pockets of ore, so that it has been intermittent. Tungsten mining, however, has now become a staple industry in Boulder county, where the value of the production keeps pace with that of gold. Owing to the rather pockety occurrence of the ore in the veins, the actual mining is done principally by tributers. The price having been low during the early part of 1906, production was naturally checked; and the present high price is bound to increase it. The occurrences of huebnerite so far developed in the San Juan are more scattered and perhaps more pockety, and have not yet led to systematic operation.

There is a little mining of pitchblende in Gilpin county, this mineral occurring together with auriferous sulphide ores in the Kirk and Wood mines.

The numerous deposits containing finely disseminated molybdenite, in the central parts of the State, are as yet unworked. It seems probable that they are capable of a considerable production.

In San Miguel county the Vanadium Alloys Company has erected a mill for the treatment by roasting and leaching of the vanadiferous sandstone of the district, producing vanadate of iron for shipment. The process is said to be entirely satisfactory; but the mill is at present shut down, pending the addition of a mechanical roaster.

LABOR CONDITIONS

There was no strike or difference of opinion between employers and employees in 1906, a condition of affairs which can only be attributed to the comparative decadence of the Western Federation of Miners in every camp throughout the State, excepting Silverton and Ouray, where there is still a leaven of old-time independence and common-sense in the local unions. As a whole, it cannot be denied that wages and conditions of labor are satisfactory throughout Colorado. The demand for miners everywhere far exceeds the supply, and the opportunities for advancement open to steady and sensible men, in contracting, leasing or by promotion to positions of

responsibility in connection. There has as yet been no formal change in the wage scale, excepting at Ophir, where the operators, in accordance with a pledge made years ago, raised the minimum daily pay from $2.50 to $2.75, in consequence of the improved profit margin resulting from the advance in silver. This ($2.75) is now the lowest wage paid to miners anywhere in the State. Any general advance would perhaps be a grave mistake, as the majority of mines find it difficult to make both ends meet even now. But indirectly, in the case of obtaining employment, and in the increased wage paid to the more competent men, labor is getting its full share in the present condition of relative prosperity, as compared with two or three years ago. At Cripple Creek and elsewhere, business men (storekeepers and saloonkeepers) complain of slack business; but business men are apt to forget that the mines in a camp should be run for the benefit of the mine-owners, rather than that of the town.

At Leadville the card system has been abolished, and some are of opinion that its abolition at Cripple Creek and Telluride will follow. Undoubtedly the system has been abused in some cases, and its essential object of protecting and providing constant employment for the steady and competent men has been lost sight of, but in my opinion it would be a great mistake to do away with the system, because a few errors have been made in its administration.

Utah

BY L. H. BEASON

Mining was never in so prosperous a condition in Utah as at the close of 1906. The mills, smelters and other agencies produced in that year (December estimated) gold, silver, copper, lead, zinc and quicksilver to the value of $38,042,384, as computed from the average market prices of the several metals for the first 11 months; the output was as follows:[1]

Gold, fine oz.	476,976	89,735,084
Silver, fine oz.	15,981,315	10,629,547
Copper, lb.	67,303,367	12,744,988
Lead, lb.	115,018,811	4,480,310
Zinc, lb.	6,472,734	398,267
Quicksilver, flasks.	1,276	54,188

Utah is not entitled to all this production. Salt Lake being the smelting center of a vast mining territory, it is difficult to segregate the ores coming from outside States. Large amounts of gold-silver ores came from Nevada, while Idaho sent considerable lead from the Cœur d'Alenes. Southern Nevada also produced some zinc, which passed through Utah channels. However, the copper was nearly all of Utah production. If $5,000,000 were deducted from the foregoing total, the result would not be far from the actual production of Utah mines during 1906. This exceeded the value of the 1905 output by about $10,000,000.

The high prevailing metal prices, of course, stimulated mining, while the smelting and transportation companies also, in a number of cases, fostered the industry by granting concessions in treatment charges and freight rates with the result that a very large tonnage of low-grade ores were profitably marketed. In dividends, a total of $5,148,044 was paid by the mines in the following list:

Beck Tunnel Consol. (Tintic)	$307,000
Bingham New Haven (Bingham)	22,500
Bullion Beck & Champion (Tintic)	140,000
Carisa (Tintic)	30,000
Consolidated Mercur (Mercur)	100,000
Daly-West (Park City)	432,000
Gemini (Tintic)	200,000
Grand Central (Tintic)	172,000
Horn Silver (Frisco)	80,000
Mammoth (Tintic)	140,000
Mountain View (Tintic)	12,554
Petro (Bingham)	32,000
Sacramento (Mercur)	40,000
Silver King (Park City)	800,000
Swansea (Tintic)	18,000
Utah (Fish Springs)	54,000
Utah Consolidated (Bingham)	1,350,000
Uncle Sam Consolidated (Tintic)	50,000
United States (Bingham-Tintic)	1,099,907
Victoria (Tintic)	125,000
West Mountain Placer (Bingham)	2,483
Yankee Consolidated (Tintic)	42,500

Two new dividend payers will appear in January, 1907, when the Daly-Judge of Park City will make its initial quarterly distribution of 37½c. a share, or $112,500. Columbus Consolidated will be the other. Utah Consolidated will also pay a regular dividend of $2.50 and an extra of 50c. a share, or $900,000 within this month.

BINGHAM

Bingham made greater strides than any other camp in the State and, while the production from that source was not materially increased, a tremendous amount of development was done preparatory to ore extraction upon a much larger scale than heretofore. This is particularly the case with the Boston Consolidated, Utah Copper, Utah Apex and Ohio Copper Companies. The former has now under construction at Garfield, 13 miles west of Salt Lake City, a concentrating mill, which is planned to treat 3000 tons daily of the low-grade monzonite copper ores of the Boston Consolidated and Utah Copper mines. This plant will probably be ready for operation about June, 1907. The Utah Copper Company is building a concentrating plant in the same vicinity. This plant is being put up in two units, each of 3000 tons capacity per day. The first unit will go into commission about next March and the second in the autumn of 1907. Both the Boston Consolidated and the Utah Copper companies are using steam shovels to strip the overburden from the ore deposits, which carry average values of a little under 2 per cent. copper. The ores will be delivered to the respective milling plants by the Rio Grande Western Railway, which is building a second track into the camp to meet the demands of rapidly increasing traffic.

The Utah Apex Company conducted an energetic campaign of development, installed some heavy power equipment, and is driving what is known as the Parvenue Tunnel through which the main operations of the mine will be conducted. This adit will also tap the ore deposits about 1000 ft. under the surface. At present the company operates an aërial tramway, of new construction, between the mouth of the Andy Tunnel and Carr Fork Gulch and is producing a little over 1000 tons of ore per day. The most important mining deal in which Bingham figured was the purchase of a control of the Bingham Consolidated Mining and Smelting and of the Ohio Copper Company by F. A. Heinze, of Montana. Plans are now being made for the construction of a large concentrating mill for the Ohio mine, the initial capacity of which will be at least 2000 tons. The Utah Development Company, owner of the New Red Wing and Butler Liberal mines, has developed a large, low-grade deposit, which makes a concentrated product worth $10 to $12 per ton.

The principal mines now producing in Bingham are: The Utah Consolidated, Boston Consolidated, Utah Copper, Utah Apex, Phœnix, New England, Fortuna, Ohio, Utah Development and Montezuma; the Dalton & Lark and Commercial mines of the Bingham Consolidated; the Old Jordan, Galena and other properties of the United States Smelting, Refining and Mining Company; and the Bingham-New Haven. It is estimated that the present daily output of the camp is between 3000 and 4000 tons; but a year from now it will probably be anywhere from 15,000 to 20,000 tons.

While the mining of copper ore represents the principal resource of Bingham, the production of lead ore is by no means unimportant. The United States Company finds it profitable to extract lead ore from its Galena mine, and the Bingham Consolidated from its Lark and Lead-mine veins. Lead ore is a factor in the shipments from the Phœnix, Utah Apex, Utah Development, New England and the Bingham-New Haven mines. The lead ores shipped range from 15 to 35 per cent. lead and from 5 to 15 oz. silver.

The copper ores are of two general types: Sulphide ores occurring in the limestone as replacement deposits, and the silicious ores. The replacement ores are characterized by a heavy excess of iron and carry from 2 to 18 per cent copper, averaging in most cases from 1.5 to 3.5 per cent. copper as mined. The copper ores also carry from $1 to $4 in gold and some silver.

[1] These figures are as communicated by the contributor and will be found, in some instances, to differ from those reported elsewhere in this issue.

district sent the largest tonnage to the smelters. Tintic has the deepest mines in the State and several of the older companies, the Mammoth, Centennial Eureka, Eagle and Blue Bell, and Gemini, have sought lower levels with most gratifying results in increased values. The leasing system, inaugurated in the Bullion Beck & Champion mine a little over a year ago, has been conducted successfully in other mines and has contributed largely to the increased activity in that camp. The only milling was conducted by the Uncle Sam Consolidated and the Godiva Mining Companies; the other mines shipped direct to the Salt Lake smelters.

Announcement was made recently of the formation of the Tintic Smelting Company, backed by some of the strongest financial interests in Utah. It is the intention of this concern to begin the construction of a lead smelter at a convenient point within the Tintic district. The initial capacity will be about 400 tons of ore per day and will, no doubt, afford a market for the low-grade silicious ores which are abundant. This new smelting concern is closely allied to the Utah Smelting Company, operating a small copper smelter near Ogden.

The principal gold mining in the State in 1906 was conducted by the Consolidated Mercur Gold Mines Company at Mercur and by the Annie Laurie and Sevier Consolidated Mining Companies, in the Gold Mountain district of Sevier county. The former is still the leading gold producer and the management has succeeded in working out some interesting metallurgical problems in the treatment of low-grade gold ores. The Consolidated Mercur handled, up to Dec. 1, 1906, an average of a little better than 800 tons of ore daily through its mill, and has come very near capturing the world's record in economy of operation.

There are mines with open cuts and "glory holes" and nothing but oxidized ore, which can show a lower cost per ton. The Consolidated Mercur, however, gets practically all its ore underground; all of the ore has to be trammed a long distance and all of it has to be hoisted to the mill. About half of it comes in the form of sulphides and has to be roasted before it can be treated by the cyanide process, thereby entailing an extra cost of $1 per ton.

The company is also put to considerable expense for power and water; but in spite of these drawbacks, the management kept the expenses during the past fiscal year down to $2.48 per ton, including not only the ordinary expenses of mining, but taxes, insurance and all other costs. In November the directors authorized the management to proceed with the installation of a new slimes plant at an expense of about $25,000 and this decision was reached only after a series of experiments by Manager G. H. Dern and the company's metallurgists. The residue values in the ore after treatment have in the past averaged close to $1 a ton, sometimes slightly higher and sometimes lower; the average during 1906 was 95c. By the new process, the management expects to bring the tailings down to as low as 50c. per ton. The condition of the mine is excellent; much better than it was a year ago. The December production was light on account of the scarcity of fuel.

The only other mines operated in the Mercur district during the year were the Sacramento, which produced about 6000 oz. of gold and over 1200 flasks of quicksilver. This is the only quicksilver producer in the State. It is reported, that the high-grade cinnabar ores are pretty well worked out and, while the mine still contains large bodies of low-grade ores, there will be a falling off in the revenues from this source in 1907 unless other bodies are developed. The Overland mine, which is equipped with a good mill, has been closed, some say permanently, owing to the refractory character of the ore.

PARK CITY

This noted silver-lead camp of Summit county has not yet recovered from the Ontario Tunnel disaster of almost two years ago, when the avenue through which practically the whole camp is drained was obstructed by caving. The Ontario Company, however, has been heroically endeavoring to clear the way and its efforts are about to be crowned with success. The tunnel stoppage prevented the resumption of development and of ore extraction on the lower levels of some of the older mines, but a number of newer exploitations have responded so as more than to offset the bad results of the tunnel difficulty. The more important developments were made in the Daly-Judge mine, which is now a dividend payer. In February, 1906, this company had an indebtedness of $232,000, which has since been cleared up, and it begins the new year with $300,000 in its treasury. Other important developments occurred in the Thayne's cañon section of the camp. There were no important sales of mining property within the year. Three mills are being operated in the camp at present—by the Daly-Judge, Daly West and Keith-Kearns companies. The Daly-Judge has realized considerable revenue from the shipment of zinc ore. This mine, the Scranton in the Tintic district and the Horn Silver mines in Beaver county, are the only mines in the State producing zinc ore of commercial value.

ALTA

Alta, in the Big Cottonwood district, 25 miles from Salt Lake City, forged ahead and promises to be a large contributor of gold, silver, copper and lead ores from now on. The Columbus Consolidated is the best developed property in the camp, but large bodies of mill ore have been proved in the Albion and City Rocks mines. The Albion will, no doubt, provide facilities for treatment during the coming year. Both the City Rocks and Albion, however, contain considerable high-grade ore and shipments are being made. Several important deals were consummated within the year. The old Flagstaff and Emma mines were sold to Salt Lake and Eastern syndicates, resulting in the formation of the Consolidated Flagstaff and the Emma Copper companies. A consolidation of the South Columbus and Alta Quincy mines, under the title of the South Columbus Consolidated, was effected and the new company has mapped out a broad campaign of development.

OTHER MINING DISTRICTS

In Beaver county, the most sensational developments were made in the Cactus copper mine of the Newhouse Mines and Smelters Company, which is now looked upon as being one of the great copper mines in Utah. The Newhouse company is doubling the capacity of its mill, which has been treating from 600 to 800 tons of ore daily for some time. The Cactus ores concentrate on the basis of from 8 to 10 tons into one, and of late, the mill has been turning out a concentrate product of the value of about $60 per ton. Mining activity in other parts of the county was also pronounced and a number of new shippers came to the front, among them the Cedar and Talisman, near Milford, and the Lulu, at Frisco. The Frisco Contact, also at Frisco, developed a body of low-grade copper ore and a drift is being run to cut the extension of the Horn Silver vein. The Horn Silver Company added materially to its ore reserves. The Newhouse Company is using steam shovels for mining, and was the first to introduce them in this portion of the West; the two Bingham companies followed closely.

Although little has been heard of the Ophir district in Tooele County, some extensive shipments of lead-silver ore were made. The Ophir Hill mine, owned by Senator W. A. Clark, is the largest producer. The Ophir Hill Company operates a mill of 100 tons daily capacity. The Cliff Mining Company, controlled by Michigan people, is about to complete the installation of an aërial tramway and will possibly build a mill next year. At Stockton, the Honerine Mining Company resumed mill operations in the autumn, and has since been marketing from 20 to 40 tons of concentrates daily. The

New Stockton Company developed some extensive bodies of low-grade lead-silver-copper ore at a depth of 1000 ft. and has run a small mill intermittently. The Black Diamond Company owns that paid expenses from ore shipments, and has kept up energetic development. The Southport, a new company, but solidly financed, encountered some good ore-bodies and promises to become a shipper in the near future.

In the Sierra Madre mining district, in Boxelder county, recent development indicates some good copper mines. The Eldorado, Napoleon and Santa Maria are the principal mines; the latter expended $50,000 in development and improvements during the past year. Little has been done in the Park Valley mining district except by the Century Gold Mining and the Ione Mining companies. The Century company is operating a mill and making good profit. A new gold camp, known as Gold Springs, has been established in the western part of Iron county. It is less than a half-year old and contains about 100 population.

In the Gold Mountain district, Sevier county, the Annie Laurie Company has carried on a vigorous campaign of development and has kept its cyanide mill in operation about all the year. The Sevier Consolidated placed its new 125-ton mill in operation several months ago and is said to be working very successfully. The Sevier Consolidated ores average $10 per ton.

THE SMELTING INDUSTRY

The smelting situation in Salt Lake valley is rather unsettled, owing to the outcome of the "smelter smoke" litigation instituted by residents in the surrounding agricultural districts. The farmers won the case in a decision by Judge Marshall, followed by an injunction, which, if it becomes operative, will end sulphide smelting at Murray and Bingham Junction in the southern part of Salt Lake county. The case has been appealed to the United States Circuit Court of Appeals at Minneapolis, and, pending a settlement by that tribunal, the companies will continue smelting as usual, under bonds of $100,000 each. It is evident that the smelters do not expect any relief from the higher tribunal, for already the Utah Consolidated Mining Company is preparing to build a new $1,000,000 plant elsewhere and to go into custom smelting. It is practically certain that the Bingham Consolidated and United States companies will move also. In his decision, Judge Marshall prohibits the defendants, the American Smelting and Refining, the United States, the Bingham Consolidated and the Utah Consolidated companies from treating any ore or combination of ores carrying any more than 10 per cent. sulphur, and from casting off any arsenic in fumes. The Yampa smelter in lower Bingham, and the new Garfield plant of the American Smelting and Refining Company are not affected by the injunction.

Placer mining has been carried on in a limited way in Grand and San Juan counties.

South Dakota

BY JOHN V. N. DORR

The expectations of a year ago of an increased production of gold in South Dakota in 1906 were not fulfilled, as, according to the State Mine Inspector's report, the production fell off slightly. This is due, among other things, to the fact that the "Limestone district" has dropped out as a producer; the one mill operating there in the fall of the year, that of the Spearfish Gold Mining Company, shut down in the spring and the two 200-ton mills of the Eleventh Hour and Victoria companies, which were just being completed a year ago, shut down after a short campaign.

The chief event of the year just closed was the change of the Homestake Mining Company to an eight-hour basis. The whole force of more than 2000 men, including miners, mill men, teamsters and wood choppers, have been given an eight-hour day with the same wages previously paid them for 10 and 12 hours. It is understood that the management does not expect that the change will increase the cost of operating materially, as most of the miners actually worked little more than eight hours and with the shorter hours for mill men the number of men per shift can be decreased.

The output of the Homestake company for 1906 shows an increase for the year, although the slime plant which was expected to start in the fall has been delayed on account of the impossibility of getting material. It is thought now that it will not be in full operation until spring.

The Maitland, Imperial, Dakota, Wasp No. 2, and the Lundberg, Dorr & Wilson mills treating silicious ore, were operated during the year and the Golden Reward until fall, when they shut down to change from dry to wet crushing and they will probably start again early in the spring. The Gilt-Edge Maid mill was changed from fine wet crushing to coarse dry crushing and is reported to be making some profit on the low-grade ore. The Kildonan mill of the Mogul Mining Company, which has been changed to a wet crushing mill, has just started up, using four 6-ft. Monadnock Chilean mills to do the grinding, with one 5x18-ft. Abbé tube-mill to re-grind the sands from the highest-grade ore treated. The Reliance company, holding property in the Portland district, has just completed a 150-ton mill in which Huntington mills are used. As the Golden Reward is putting in both Chilean and Huntington mills, the comparative value of these two grinders on the hard silicious ores will probably soon be determined.

No new discoveries of great importance were made during the year, although several companies did considerable development and were able to block out large quantities of low-grade ore. There was considerable prospecting in the southern hills during the year, but no heavy production was made from there.

The smelter at Rapid City has been operating since spring and affords a nearer market for the blue ores produced in the district, but cannot compete with the cyanide mills on oxidized ore unless it runs over $20 in value.

It is impossible to foretell the effect of the anticipated change to eight hours on the mines outside the Homestake, and what its influence will be on the production in the hills for the ensuing year. If no trouble ensues, the additional mills now in commission and the operation of the Homestake slimes plant should cause a material increase in the production in 1907.

It is true in this district, as in many others, that the increase in production for the past few years has been due almost entirely to the advance in metallurgical knowledge and the consequent reduction in the cost of operation, for, leaving out the Homestake, four-fifths of the ore now being treated could not have been handled at a profit with the milling costs of five years ago.

California

BY CHARLES G. YALE

The immediate effect of the disaster of last April was to stop the work of development at many hundred of mines in California, also in Nevada, Arizona, Mexico and other places where San Francisco capital was employed in opening properties. Those properties, however, which were on a producing basis were not in the least affected by the disaster. No caves resulted from the earthquake nor were any plants or buildings injured in any way. It was only those mines in process of development which were closed down, and there are hundreds more of these than there are of productive ones. Most of these closed because no further funds were forthcoming for the time, and others because it was impossible for some months to obtain machinery or have extensive repairs made. The latter feature inconvenienced even the productive mines to a certain extent. Some mines are still idle, but many more have resumed work in the usual way, the effect on the mining industry having been, therefore, mainly temporary.

Numbers of California mines are now being opened and developed, and others

*Metallurgical engineer, Lead, S. D.

are being equipped with the necessary plants. This work, however, is not so active as it was before the fire, and normal conditions are not to be expected for some months to come. This is due not only to the delay, but also to the fact that miners are turning their attention to the newer districts of Nevada. There are so many opportunities for investment in these young camps, and such mines as have been opened have shown such good results that they would have overshadowed California mining investments in any case. The success of these mines of southwestern Nevada is virtually of as much importance to San Francisco as if the mines were in California itself, most of them being just over the border. Their stocks have largely displaced those of the old Comstock in stock speculation, but the money still changes hands in San Francisco.

GOLD DREDGING

There are few matters to note regarding mining in California during 1906, aside from the usual progress. The bulk of the gold continues to come from quartz mines, although the greatest increase of output occurred in dredging, which is the most progressive of all the forms of gold mining. There are upward of 50 dredges now at work in the State, the largest number being in Butte county, in the Oroville field. The increase from this source is some $750,000 per annum and this will be enlarged next year as the new machines lately put in operation have so much greater capacity than the old ones. Some have been started in the Yuba river field, in that county, which are digging to a depth of 100 ft., the ground in that vicinity being very favorable. The only other important field is near Folsom in Sacramento county, where several of the largest machines are now at work. Dredges are also operating in Calaveras, Siskiyou and Trinity counties, but the fields at these places are not so extensive as in Butte, Yuba and Sacramento counties, where they work the bottom lands near the mouths of the Feather, Yuba and American rivers.

The hydraulic, drift and surface placer mines do not evince any increase of output, and in fact are turning out less gold each year, though the deficiency is more than made up by the dredgers. The dredges now turn out more gold each year than the hydraulic, drift and surface placers of the State put together. The greatest gravel-mining counties for the old-style work are Siskiyou and Trinity, which yield half the output of the State from the hydraulic and placer mines. They have no restrictions in that section to hamper hydraulic mining, the tailings going into the Klamath river and tributary non-navigable streams. There are many [illegible] in Siskiyou than in any other county of California, but most of them are small ones. The most productive county in gold is Nevada, where quartz mines predominate, followed second by Butte, where auriferous gravels and sands are worked by the dredges.

COPPER

While the copper mines of Shasta county were not so productive as in past years, owing to the closing down of the largest plant because its flumes caused damage, yet new smelters were put up by other companies and some of the old ones were enlarged. The Fresno copper mines made some product and will make more. Nevada county is attracting attention to its copper mines, and some deposits long known, but never worked, are being opened. Calaveras is also doing more in copper than formerly. The new Greenwater field in Inyo county has not yet begun to produce, though it is very promising. Large investments have been made there by leading copper men. It is all prospective as yet. The railroads have not yet reached the camp and adjacent copper territory.

PETROLEUM

In petroleum, California still leads in output the other States of the Union, and this output is on the increase as new markets are found. Santa Barbara is the coming county in this mineral product, being near the sea, and some of its fields very productive. In the valleys, the Kern and Fresno fields are productive, but prices are unsatisfactory owing to transportation difficulties.

CALIFORNIA'S MINERAL WEALTH

The steady growth in values of mineral output in California for the last 10 years is shown in the following table:

1896....	$24,291,398	1901....	$34,355,981
1897....	25,142,441	1902....	35,069,105
1898....	27,289,079	1903....	37,759,040
1899....	29,313,460	1904....	43,778,348
1900....	32,622,945	1905....	43,069,227

To show the wide distribution of mineral substances in California, an analysis of the statistical table for 1905, recently published by the State Mining Bureau (Bulletin No. 42), proves that all of the 57 counties of the State, except three, made some mineral product in that year. Gold was mined in 35 counties, and is known to exist in several others; silver in 27 counties. Some 40 mineral substances are now being mined or quarried in California, with an annual value of from $43,000,000 to $45,000,000. The gold alone is worth $19,000,000 or $20,000,000 and is increasing about half a million a year. The silver will increase as the copper does, but the latter will increase materially in the next few years. In the structural materials, limestone, lime, macadam and rubble, marble, granite, sandstone, slate, soapstone, brick and pottery clays and cements, there is a marked advance in output, many of these things being in great demand in the rebuilding of San Francisco.

The excitement in the development of new camps in Nevada has brought much capital to San Francisco, and there is now more interest in mining than there has been for many years. All this is of advantage to California mines as well as those of the neighboring State. There are some thousands of known mines in California needing capital for development, and attention is gradually being turned toward them.

Idaho

BY ROBERT N. BELL*

In common with other Western States, Idaho, during 1906 enjoyed another prosperous year of mining, development and production, and was largely free from exaggerated fictitious operations, and when complete returns are available the year will prove to have been another record-breaker in metal production and in dividends.[1]

LEAD

The lead-silver mines of the State continue to progress, and Idaho's production is destined to increase at a rapid pace, if the market can absorb it and the prospects seem bright in that respect. The most noteworthy development during 1906 was the performance of the Bunker Hill & Sullivan lead-silver mine, at Wardner; in spite of a nasty fire in one of its principal stopes during the early months of the year, which greatly retarded production, the dividends paid by this property during the year probably stamp it as the most profitable metal mine in the United States. The other great mines of the district all continue to show remarkable strength or improvement in their lower levels.

Several new lead-silver producers entered the shipping list during the year, and when more fully equipped, are likely to make paying mines. Notable among these are the Tamarack & Chesapeake, Callahan, the Success, Rex, Bear Top, and the Pittsburg.

The Hunter mine at Mullan also made an important production; it is being developed at depth by a long drain tunnel which will greatly facilitate its output, and is likely to open higher-grade ore. There are fully 4000 men at work in the district. Many new companies have been incorported, and new orebodies of both lead and copper will unquestionably be disclosed in the near future. Some extensive preliminary work has already been done in the Park copper belt, south of Mullan, which had been lying dormant until the recent disclosures of the Snowstorm revived interest in that section of the district.

*State inspector of mines, Boise, Idaho.

[1]The statistics in this article are as given by the author and may differ from those reported elsewhere in this issue.

Among the other lead-producing dis-tricts of Idaho the output for 1906 was not much improved. The principal pro-ducer of the Wood River district, in Blaine county, the Minnie Moore, sus-pended its output early in the year. This mine has yielded high-grade ore both in lead and silver, and has a record of over 2,000,000 produced. Development was cut off by a fault last year, and the ore body has not been found beyond it, although a large amount of work has been done for that purpose. The total shipments from the Wood River district, during 1906, amounted to 200 cars, and ranged in value from 10 to 60 per cent. lead, and from 20 to 130 oz. silver per ton. There are sev-eral hundred men at work on develop-ment in the district. None of the old mines has been completely bottomed, and it is likely that deep work on its more important fissures will disclose new ore-bodies.

In Lemhi county, the Gilmore mine shipped over 1500 tons of high-grade lead-carbonate ore and concentrates during 1906, containing an average of 60 per cent. lead and 30 oz. of silver per ton, and had 250 tons of similar grade on hand at the close of November, which it was unable to get hauled to the railroad. This prop-erty has been worked conservatively with little capital investment. The mine car-ries a pronounced fissure in blue lime-stone, which has been developed to a depth of 300 ft. by a vertical shaft. It has yielded in the neighborhood of $300,000 gross, and its ore now exposed principally between the 200- and 300-ft. levels is es-timated at a like value.

On the opposite side of the valley from the Gilmore the Viola mine produced ore to the value of $5,000,000 in the early eighties when lead was selling around $3 per hundred.

One of the most extensive and promis-ing silver-lead prospects in Idaho has re-cently been taken over by Wayne Dar-rington, former state engineer, on a work-ing option for an Eastern syndicate. These are the South Mountain mines, situated near the extreme southwest corner of Idaho, in Owyhee county, 25 miles south-west of Silver City. The property con-sists of 15 patented claims owned by George A. Sonnemann, of Spokane, Wash., and is being developed by a force of 20 men. The Sonnemann property covers the choicest mineralized section of the limestone lode for two miles of its course, and comprises the best old claims that formed the basis of an excitement in 1873, when South Mountain had a popula-tion, for a short period, of 1000. A small 10-ton smelter was built and $250,000 worth of bullion run out; a like amount of crude ore was shipped to the railroad at Winnemucca, Nev., which was the near-est shipping point at that day.

COPPER

The most important progress in Idaho's copper development during 1906 was at the Snowstorm mine, three miles above Mullan, in the Cœur d'Alene district. This property developed bonanza proportions during the year, and with a light pros-pecting equipment produced shipping ore and concentrates to a total gross value of $1,200,000 in copper and silver, and paid nearly half of that amount in net profit. There are a number of good copper pros-pects, both east and west of the Snow-storm, actively developed at present, and on the opposite side of the Cœur d'Alene river, in the Parke or Stevens Peak cop-per belt. It is eminently probable that rich copper sulphide ore will be disclosed by the numerous operations now in pro-gress on that side.

Unlike most other portions of the Cœur d'Alenes, the Parke copper belt has some remarkable surface showings of rich, brown, spongy gossan sprinkled with peb-bles and kidneys of chalcopyrite. One of the main veins of this belt is traceable by such croppings for 15 miles, and is accom-panied throughout its entire length by pronounced dikes of hornblende diorite, another rare accompaniment of ore in the Cœur d'Alenes. The Monitor mine on this belt has already made several ship-ments of high-grade sulphide ore con-taining about 16 per cent. copper and $5 or $6 in gold, and other mines may be ex-pected among the shipping list at an early date.

The next most important yield of cop-per in Idaho during 1906 came from the White Knob mine, at Mackay, in Custer county. It was successfully handled dur ing the past year by a company of west-ern leasers who mined and smelted 50,000 tons of ore which ranged something over 4 per cent. copper.

The Lost Packer mine, at Loon Creek, Custer county, with rich copper-gold ore, was equipped with a 100-ton matting fur nace, which was started in the summer, but owing to an accident to the plant the first day of its operation, the run did not realize success. This property contains a shoot of 30 per cent. copper-sulphide ore carrying 3 or 4 oz. per ton of gold, to-gether with 12 or 14 oz. silver. Develop-ment has increased its resources during recent months, and it is the intention of the company to readjust the smelter and get it into commission early next spring, when an important yield of high-grade gold and silver matte may be anticipated.

From the Seven Devils district,, in Washington county, 2792 tons of copper ore, mined by leasers, was shipped to the Sumpter Valley smelter; it contained 636,-000 lb. of copper, 7942 oz. silver, and 162 oz. of gold. The Copper Queen, in Lemhi county, made several shipments of high-grade bornite from a fissure in a schist and slate formation on Agency creek in the Lemhi pass. This ore runs better than $10 per ton in gold, and over 30 per cent. copper. The deposit is being actively developed.

The total gross contents of copper ore and matte shipped from Idaho during 1906 was 11,720,000 lb., and the future pros-pects for copper mining in this State are bright indeed.

SILVER

The total output of silver in Idaho for 1906 was 9,675,000 oz. derived chiefly as by-product by treatment of the Cœur d'Alene lead ores and concentrates, but comprising 500,000 oz. from the Snow-storm copper ores, and 750,000 oz. from the silver-gold milling ores of the Trade Dollar mine at Silver City.

The old Ramshorn mine, at Bayhorse, in Custer county, carries a rich deposit of dry silver ore with resources equiva-lent to 2,000,000 oz. blocked out. The ore of this mine is a siderite gangue carry-ing gray copper, and yields on an aver-age 100 oz. silver per ton. This property, with a number of important lead-ore de-posits in the same neighborhood, was carefully studied during the autumn, with a view to forming a combination and building a smelter, for which the district presents a fine opportunity. It was for-merly a big producer of silver and lead, but has remained practically idle except-ing for small leasing operations since the slump in silver in 1893.

GOLD

The gold output of Idaho during the past year did not show a material increase and probably did not exceed $1,108,000. One of the main producers of the State, the old Delamar mine, was practically out of commission, owing to the installation of a new method of treatment which was not completed early enough to make much of a show in production this year. The mine has been developed right along, how-ever, and shows bigger resources of de-veloped ore (but probably not of as high grade as formerly) than any time during its career. The most important part of Idaho's gold production will still have to be credited to extended placer operations and a continued increase may be antici-pated from this source, involving exten-sive mechanical equipment.

A remarkable revival of interest oc-curred in the old Atlantic gold camp in Elmore county, which produced ore to the value of $5,000,000 from its secondary en-riched surface horizons, 40 years ago. The ore, on development, showed a slight mix-ture of antimony, and proved difficult to treat, and the camp has been quiet for a number of years. The Monarch mine, at this camp, is installing a hydro-electric power plant, an extensive aërial tram and a new mill of 200 tons daily capacity adapted for amalgamation, concentration and cyaniding; the ore is said to be suited to this treatment, and will make a good yield, even though one-fourth of its value is in silver. Most of this machinery is on the ground, and the management in-tends to have it in full operation early next summer; the mine has 1,000,000 tons of developed ore worth $5 a ton and up-

ward. The Minerva mine, in the same district, has developed and operated a 10-stamp mill throughout the year, producing from $7000 to $10,000 per month, by plate amalgamation, while the tailings, which are being saved for further treatment, are said to run from $5 to $7 per ton. The Pettit mine, in the same district, has $1,000,000 worth of developed ore in sight with average gold values of $10 per ton, and the owners are installing a 50-ton mill.

The Golden Sunbeam mine, near Bonanza, Custer county, developed an ore-body 10 ft. wide and something over 150 ft. long, that yields free-milling values of $30 to $50 per ton. It will shortly be equipped with a new mill, and should become an important producer of gold.

COAL

The deposits of steam coal discovered in Fremont county have been developed to a limited extent during the year by the original claimants. One of the veins, 5 ft. wide and 93 per cent. fixed and volatile carbon, is operated and produces 20 tons of coal a day for local consumption. The property carries 10 distinct seams, varying from 2 to 10 ft. wide, and exposed in shallow shafts, cuts and tunnels. The series is somewhat faulted, but indicates an extensive resource of high-grade steam coal. Private capital has been attracted to the discovery and evinced an inclination to develop it extensively, but, unfortunately, it is located on unsurveyed land, and the President's withdrawal of Western coal land from entry, involving the uncertainty of obtaining title, has deterred progress.

PHOSPHATES

Some important discoveries of phosphate rock have recently been made in Bear Lake county, in the extreme southeastern corner of Idaho. The deposits occur in thin-bedded limestone, and flag stones, like flat-dipping seams of coal, and are being opened in a similar manner. The beds are from 1 to 5 ft. thick and carry a fine grade of phosphate rock of a dark color. Five large groups of claims have been located in Idaho, and others extending into Utah and Wyoming. 3,020,000 lb. of the mineral have been shipped and it is believed the deposits will develop into an important industry. The formation in which they occur are believed to be Tertiary immediately overlying the Cretaceous coal-bearing formations of western Wyoming.

SAPPHIRES

An important discovery of corundum crystals was made in 1906 on the bedrock of an old placer mine, near Meadows post office, in Washington county. The general formation of the district is gneiss and the crystals, which include some of excellent gem quality, seem to be derived from a wide dike of decomposed basalt. The dike is 100 ft. wide, with a spheroidal structure, and the gem stones were found associated with a great array of pyrope garnets and opaque corundum in the clean-up boxes of the placers below this dike, which was uncovered in washing the gravel for gold. Some beautiful gems have been found, in a variety of colors, the oriental amethyst shades predominating. Most of them have a silky opalescent luster, and would cut into cats-eyes. Some small stones have been cut into sets weighing ½ carat that have a beautiful clear cornflower blue color, others of a larger size make brilliant light-pink stones. The crystals also include large segments of bronze color, with distinct structure and cleavage that would make star sapphires and tiger-eye sets. Some pieces of a poor red color have also been found, but nothing approaching a true ruby as yet. However, the colors are so varied and the crystals so plentiful that valuable gems are likely to be found with the further development of the deposits. This development is now in progress. The corundum of these placer fields is invariably associated with other heavy concentrates, often in appreciable amounts; these include monazite, zircon, chromite, illmenite, magnetite and traces of platinum.

Nevada

SPECIAL CORRESPONDENCE

There has been more stock gambling during the past year than at any other time in the history of the State. Much of the money has been furnished by Easterners who have found that Nevada mining shares offer as good a chance of profit as horse races or other sports. The great fortunes made by some of the speculators this year will attract capital for a long time to come. There is but little conservative mining in the State; the principal business of nearly all the mine managers is in hunting up new mines for their special group of capitalists, and in floating new companies. Everybody is in the game; clergymen are found on the directorates, and the governor of the State has lent his name to some very shady companies; one, the Bullfrog Rush, is now in the receiver's hands.

HIGH PRICES FOR CLAIMS

Prices for prospects are still out of all reason and one must be provided with a great vein of romance to do any business at all. I have heard of but one mine, out of all the hundreds that have been launched, that has paid dividends within a year of its discovery; this is the Nevada Hills, of Fairview.

This asking of high prices is nothing new; I was told by George Grayson that he paid $85,000 for the Grand Prize mine of Tuscarora when there was only a 10-ft. hole on it. This must have been in the late 70's; in the Raymond reports of that period are complaints of the unreasonable prices given for undeveloped claims; however, the prices obtained now are probably records as regards mere prospects; probably Greenwater holds the palm for that bad eminence.

MOHAWK MINE

The great feature of the year has been the rich strike in the Mohawk mine in Goldfield. Ore was discovered here by Hayes and Monette on their lease at a depth of about 250 ft. in April; this strike caused a rush for other leases and now the whole hillside is covered with hoists and looks like an active oil field with its forest of gallows-frames. These leases will nearly all end on Jan. 1. Work is now being pushed as fast as possible, in some cases with six-hour shifts paying miners $5 per diem; nearly all the shafts have a separate engine for each compartment. Exact production figures are not attainable, but it is thought the output since April will be some $10,000,000. Hayes and Monette, in addition to the ore already shipped to the amount of $2,600,000 to Nov. 20, will make a special shipment of 100 tons of ore carrying about $1,500,000.

The claims adjoining the Mohawk have been merged into the Goldfield Consolidated by Senator Nixon and George Wingfield. This company has 156 acres and a capital of $50,000,000 in 5,000,000 $10 shares. Messrs. Wingfield charged the modest commission of 250,000 shares for making the combination. The shares are selling now for about $7, or $35,000,000 for the property.

GOLDFIELD

Goldfield is one of the most active places on earth, but much of the activity is misdirected to saloons and gambling. These evils are supposed to be necessary by the average Nevadan; however, I read that Cobalt, where there is a fairly active boom, does without these plagues. Goldfield has increased greatly in population; the present estimate is 15,000. There has been much suffering because of lack of fuel; wood has sold for $90 per cord. Owing to lack of rooms many of the poorer men slept in the saloons or in unfinished buildings. The death rate was high, as many as 20 deaths were reported in a day, but there is much difficulty in learning the true state of affairs. Conditions are a little better at the close of the year. A curious phenomenon is the employment of prize fights as a booming factor. Goldfield has had one fight, and a large arena is building for a fight in Tonopah, on the first of January, and arrangements are being made for a fight at Rhyolite soon.

Goldfield is the scene of the operations of the L. M. Sullivan Company, whose personnel and methods would make a startling history. They are reported to have received $80,000 a day from the sale of their widely advertised stocks and their advertising bills have been enormous. They seem to have obtained several good properties which will perhaps make a profit

for some of their investors. This sort of mining is the twin brother of the Louisiana Lottery and most of the purchasers of the stocks realize that they are buying a lottery ticket. Stealing of rich ore, or "high grading" has become a leading business of Goldfield, and 50 assay offices have sprung up to handle this business.

No important discoveries seem to have been made in Goldfield except in the immediate vicinity of the Mohawk. There have been some small strikes in the Great Bend, Daisy and other Diamondfield mines.

BULLFROG AND OTHER CAMPS

The Bullfrog district has been rather quiet during the year and nothing phenomenal is reported. The Gold Bar mine is said to have a very wide ledge of rather low-grade ore. The banner mine is still the Montgomery-Shoshone where work has been pushed. Men are now grading for a 100-stamp mill, which is expected to be running in March. Several other companies are talking of putting in mills, and the Bonny Claire mill will soon be running. Up to date the Tramp Consolidated seems not to have decided about its mill.

A few miles north of Beatty was the camp of Transvaal, where there was a lively excitement for a few weeks in April and May. Town lots were sold for $100 to $400 and for a time there was a population of several hundred. The camp is now almost deserted.

A little work is being done in many camps south of Tonopah. A rush was made for the Saline valley copper deposits in September, but I have heard nothing since. The silver camp of Klondyke seems to be coming to the front; a number of claims are being opened here. This camp antedates Tonopah; rich bunches of silver ore are found here in strong quartz ledges.

TONOPAH

Tonopah has gone on steadily; a threatened strike of the miners was avoided by wise management in the summer, and wages are now settled for three years on an eight-hour, $4 basis.

The 100-stamp mill of the Tonopah Mining Company, at Millers, is now running, and the 40-stamp mill of the Montana Tonopah will soon be in operation. The camp has been free from litigation for a long time, but an apex suit has just been started by the West End Consolidated against the MacNamara.

MANHATTAN

Manhattan was started in December, 1905, and by April was a town of 3000. The mines here were largely financed from San Francisco, and the earthquake caused great depression; lately things have picked up a little on the report of the coming of a strong company bringing in water and building a large custom mill. There are some very promising properties in Manhattan, but they are cursed by litigation; the richest part of the camp is called Litigation hill, and is well named, as all of the mines are tied up with from one to seven suits.

INADEQUATE LAWS

Nevada laws and custom particularly favor litigation; 90 days is allowed for doing location work, and the claims are usually marked only by the center monument. This gives a chance of swinging the claim should any neighbor make a good strike; then the prospectors have a pleasing way of destroying monuments and location notices. Great hardships are caused by the loose system of taking up ground. It would seem best to have all the claims officially surveyed within thirty days of location; this would be hard on the poorer prospectors in some cases, but it would give certainty to titles, which is greatly needed. Some system of this sort and the abolishing of the apex law are greatly wanted reforms, although William M. Stewart, who knows as much mining law as anyone, says that the laws are good enough as they are and only need enforcement. But little ore has been shipped from Manhattan; the average ore is too low grade to stand the long haul to the railway.

OTHER NEW CAMPS

Twenty miles or so north of Manhattan is Round Mountain, where there have been some rich gold discoveries; the Antelope claim showed a sheet of gold 10 by 14 inches, on a face of rock at the mouth of a badger's hole. Great things are promised for this camp.

On Oct. 29, there was a lively scene at Walker Lake. The Indian reservation was thrown open on that day and some 4000 people took part in the rush; most of them found men already in possession of the best claims. Much litigation will result should any good discoveries be made; so far, copper prospects are giving best promise. It is said that 2000 claims located on Oct. 29 will be abandoned.

The Blair mines at Silver Peak, have been sold during the year. A 20-mile railway connecting with the Tonopah & Goldfield Railroad, at Blair Junction, has been built, and the town of Blair started. This should be a genuine good camp for the Blair mines have been long and favorably known, the ore exists in large amount, the average is said to be a little below $10 gold, and with the wide ledges the costs should not be over $4 per ton, leaving a good margin of profit. The Valcalda mines, near the Blair mines, are said to have $2,000,000 in sight, whether prospectively, or problematically in sight, is not known, since there is very little to be learned in the shape of accurate figures. I predict a great development for this section.

Northeast of Walker Lake there is much activity in copper mines and prospects; the Ludwig mine is shipping steadily, and said to be making a profit of $30,000 per month; some of their ore is used for ornamentation, selling to New York jewelers for 50c. per pound.

Thirty-five miles northeast of Luning are the camps of Goldyke and Atwood; a ten-stamp mill is being erected at Goldyke on a wide low-grade ledge about which all sorts of optimistic predictions are made.

Fairview has some good mines, the Nevada Hills being a specially good property. The town of Wonder, near Fairview, is young, but has some very rich silver mines and all speak well of this camp.

Seven Troughs and Rosebud are among the newest camps; both are near Humboldt. Rosebud shows white porphyry with specks of ruby and stephanite; assays of croppings give up to $4000. Rosebud is said to be more promising than was Tonopah at the same age. Phonolite is also very new, the mines having been found in August; this is 12 miles north of Ione, an old camp. The Silent Friend mine averages $35 for a 4-ft. ledge, with streaks giving higher assays.

Many old camps are being reopened and prospectors are everywhere. Antimony is found in many places in Nevada; the Japanese are working mines in Lander county.

Tungsten and molybdenum ores are found in Nye county, and a little prospecting has been done during the year, but nothing of much value has been opened thus far. Lack of all sorts of material has greatly hampered mine operators during the last months of the year, and the coal shortage has been a curse.

Many railways are projected for Nevada; the San Pedro, Salt Lake & Los Angeles Railroad is already at Rhyolite and the Tonopah & Tidewater Railroad will soon reach the same place. This is Borax Smith's road, and will be continued to join the Nevada Central at Austin, probably touching Manhattan and Tonopah en route.

The year 1907 should be a banner year for Nevada. The army of prospectors in the mountains are sure to make good discoveries; most of the prominently rich deposits have probably been found, but ores are now looked for that were not thought of a few years ago, and in formations that were passed by as barren.

The biennial report of the Colorado State School of Mines has just been made public. In consequence of the number of students from outside the State having increased, the tuition charge for these will next year be increased to $150. It is to be hoped that at the coming session of the legislature ample provision will be made for the institution, which is becoming more important from year to year. The attendance is 294 at present, 43 per cent. coming from outside of Colorado, which shows the reputation the school is getting abroad.

REVIEW OF MINING IN FOREIGN COUNTRIES IN 1906

The Transvaal—Rhodesia—Mexico—Ontario—Eastern States of Australia

The mining industries of foreign countries generally showed the same prosperity that prevailed in the United States. The production of gold in South Africa was the largest on record, but nevertheless the year concludes with an unhappy feeling on the Witwatersrand, especially because of the unsatisfactory conditions arising from the labor question. In the mining industries of Canada and Mexico there have been great advances. In Australia there has been a boom, resulting from the successful utilization of the great resources of zinc ore at Broken Hill. An especially remarkable feature of 1906 is the great attention which is being directed toward the mineral resources of South America, which will doubtless result in an important development of that continent in the near future.

The Transvaal

BY W. FISCHER WILKINSON*

The value of the gold won in the Transvaal in 1906 was, in round figures, twenty-five million pounds sterling, which represents about 30 per cent. of the total production of the world. There has been a considerable increase over last and previous years, and the Transvaal will no doubt easily maintain its place at the top of the list of gold-producing countries.

The Transvaal production is mainly derived from the Witwatersrand area, the outside districts contributing only about 4 per cent. of the grand total. It is also interesting to note that 68 per cent. of the Witwatersrand output comes from the section between the Langlaagte estate on the west and the Witwatersrand mine, on the east, containing a continuous line of mines covering a distance of 12 miles. The following table compiled from the September returns shows the relative importance of different sections of the Witwatersrand goldfield.

Randfontein to [illegible]			
[illegible]	11	840	10
[illegible]	9	720	7
[illegible]			
[illegible]	15	2110	31
[illegible]	22	3080	37
East Rand Mines..	7	1145	15
	64	7895	100

The large increase in the production over 1905 is due more to the increased scale of operations on the mines working in 1906 than to the accession of new mines.

*Consulting mining engineer, London, England.

STATISTICS OF PRODUCTION

In January, 1906, there were 63 producing companies in the Witwatersrand district, and in September, 65, the two new companies being the Cason of the East Rand, and the Luipaardsvlei of the West Rand. The number of stamps dropping in January was 6920, while in September the number was 7915. The use of tube mills now largely increases the milling capacity of the stamps, which are no longer the best standard of measurement. The tonnage treated forms a more trustworthy basis for comparison.

During the month of January, 1906, 1,039,500 tons were milled, and in September 1,235,055 tons, these figures including the outside mines. The value of the gold produced for the 10 months, January to October, was Witwatersrand, £19,177,737; outside mines, £799,664; or a total of £19,977,401. The total production for the year may therefore approach £25,000,000.

The September figures included the gold reserves to the value of £63,580 of the Goerz and Albu groups, the managements of which decided to stop the practice of keeping gold reserves for the purpose of equalizing the monthly returns. Several of the other groups now publish what their gold reserves are, but the amounts have not yet appeared in the output returns. From the figures published it appears that on Oct. 31 the value of gold held in reserve by the Eckstein, Rand Mines, Goldfields and Barnato groups, was about £354,598, which gold might now well be included in the returns.

The following table gives the figures of production and tonnage of the Transvaal from the commencement of gold mining:

TRANSVAAL GOLD PRODUCTION

Chamber of Mines Returns.

Year.	Witwatersrand District. Tons milled.	Value	Value per ton milled	Outside Mines Value.	Transvaal Total.
		£	s	£	£
1884-9	1,000,000	2,440,000	48 8	238,231	2,678,231
1890	730,350	1,735,491	47 4	134,154	1,869,645
1891	1,154,144	2,556,328	44 2	367,977	2,924,305
1892	1,979,354	4,297,610	43 4	243,461	4,541,071
1893	2,203,504	5,187,206	47 0	293,292	5,480,498
1894	2,850,985	6,953,140	49 2	704,052	7,657,192
1895	3,456,575	7,840,770	45 2	728,776	8,569,555
1896	4,011,697	7,864,341	39 2	739,480	8,603,821
1897	5,325,355	10,583,616	39 74	1,050,109	11,653,725
1898	7,381,446	15,141,376	41 3	1,099,254	16,240,630
1899	6,000,455	14,046,938	44 14	661,220	15,728,693
1899-0	233,395	1,020,787			
1900	450,018	1,510,131	65 82	.....	1,510,131
1901	412,006	1,014,687	49 25	81,364	1,096,051
1902	3,416,813	7,179,074	42 00	74,591	7,253,665
1903	6,105,016	12,146,307	39 79	442,941	12,589,248
1904	8,058,295	15,539,219	38 46	515,590	16,054,809
1905	11,140,422	19,991,658	35 82	810,416	20,802,074
1906 c	13,510,000	23,677,000	35 00	962,000	24,639,000

a Jan. to Oct. b Nov. to Dec. supplementary incomplete. c Estimated.

GRADE OF THE ORE

The average yield of the Witwatersrand mines, in 1906, amounting to about 35s. per ton milled, again shows a decrease. The average reduction in grade is due, as was pointed out in a previous review, to the increased scale of operations, which (by reducing the cost of working) allows of the profitable working of lower-grade ores than formerly.

Classified according to the value of recovery the September returns show the following figures:

No. of companies.	Yield per ton milled.
3	20 to 25s.
21	25 to 30s.
20	30 to 35s.
8	30 to 40s.
9	40 to 45s.
4	45s. and over

PRACTICE IN CHARGING UP DEVELOPMENT WORK

The cost of development, which figures in the costs as development redemption, becomes proportionally reduced as the tonnage is increased. It may be well to explain that it is customary on the Rand to charge all development work, except main shafts, to capital account, and to write off to working costs a round figure per ton milled calculated on the available ore reserves. These figures have in the past been estimated on a conservative basis, and it will be evident that by including ore, which was formerly considered unpayable, the average cost of the ore reserves may be considerably reduced.

As to how development expenditure should be treated in the accounts has been the subject of discussion—some arguing that when a mine reaches the milling stage the development account up to that date should be closed, and that only the current development, which should of course be kept up to the scale of milling, should be charged to working expenses; others maintain that the development account should be gradually liquidated by charging an amount to working costs equivalent to what the ore reserves stand at in the books. As the development costs of a mine are usually highest in its early years, this system makes the working costs higher than they really are when milling commences, and is, on this account, misleading.

In examining the working costs of a mine it is important to note whether the tonnage developed is equal to the tonnage milled, and that the amount charged to working costs is not less than that actually expended.

In charging to working costs a higher figure for development than what it actu-

dly costs when the producing stage is reached, a sinking fund for the redemption of capital expenditure being formed. If this policy is considered right, the redemption of all capital expenditure should logically be provided for and not only of the money spent on development. But sinking funds for the redemption of capital, except on development account, are not provided for and investors must take this into consideration.

AMALGAMATION OF MINES

During 1906 several amalgamation schemes were carried through with the object of increasing the working area, and of obtaining the advantages of large plants, and of reducing management expenses. Some of the smaller outcrop mines are now approaching exhaustion, and the ground remaining can, in certain cases, be worked with advantage by the neighboring deep level. Among such amalgamations may be mentioned those of the Wemmer and the Village Main Reef; the Henry Nourse and the Nourse Deep; the Geduld Group; the Klip Deep and South Wolhuter, and the South Geldenhuis Deep, South Rose Deep, Rand Victoria and Rand Victoria East, which four companies will in future become the Simmer Deep.

These amalgamations have on technical grounds much to recommend them. In the early days of the Rand the parceling out of the ground was done on too small a scale, and the boundaries were in many cases irregular and unsuited for economical working. But exception has been taken to some of the amalgamations on the ground that the shareholders in the different mines have little say as regards the terms, which are practically arranged for them by one or other of the big financial houses. Take, for instance, the case of the Henry Nourse and Nourse Deep amalgamation. The former mine was one of the old-established outcrop mines, which had for years paid regular dividends and had an assured future before it of about 17 years. Judging by its past results and by the favorable statements of the directors as regards the future, the mine appeared a particularly sound mining investment. The controlling house, however, suddenly proposed and carried out a scheme for amalgamating the company with another neighboring mine also under its control. Although in theory the property of the Henry Nourse shareholders has been improved by the fusion with another mine, due to possible advantages of longer life and cheaper working costs, the practical result to them has been that, instead of their customary dividend of over £100,000 a year, their share in the profits of the combined concern in 1906 was only £56,250. In the face of these figures it seems that the objections raised to this amalgamation were not without weight.

In some cases economy of working has been sought by erecting a joint plant for two mines, each having its own stamps, tubes, and cyanide plant, but sharing in the power station. The Knights Deep and Simmer East have a joint plant of 400 stamps and three tube mills, this being the largest reduction plant on the field. The Crown Deep and Robinson Central also have a joint mill, and the East Rand companies are also laid out on the cooperative principle.

IMPROVEMENTS IN MINING AND METALLURGY

The use of tube mills is being rapidly extended. In August, 1906, there were, according to *South African Mines*, 58 tube mills on the Rand. Their use has enabled higher extractions to be obtained, and an increased tonnage to be put through the battery as coarser screening can be used. The Knights Deep, for instance, put through, in September, 7.24 tons per stamp per 24 hours, while the Luipaardsvlei mill deals with about 8 tons, using 400-mesh screening. Both mines have stamps weighing 1550 lb., and maintain an extraction of over 90 per cent.

As regards fineness of ore reduction, W. A. Caldecott, the consulting metallurgist to the Goldfields group, informs me that now 97 per cent. of the total ore passes a 60-mesh screen (0.010 in. aperture), and that the stamp battery's economic limit appears to be 92 per cent., the rest being done by tube mills.

There is not much variety in the methods of milling and cyaniding. Denny Brothers, however, have introduced at the George Goch and Meyer & Charlton mills a new method in which the use of cyanide solution in the battery and filter presses in the extractor house are the chief features. A detailed account of these plants was given in a lengthy paper read before the South African Association of Engineers.

It is too early yet to say whether the new process is more economical than that in common use. The inventors may, however, be congratulated in having struck out a new line, and in having erected a plant which as regards first cost is said to compare favorably with the standard plant of the field.

Among metallurgical improvements may be recorded the use of zinc fume for precipitating gold dissolved in acid washes from the clean-up of zinc gold slimes, a process which is to be tried on working solutions.

A new departure as regards management which is being tried at one of the Goldfields mines is in placing the whole of the reduction plant under one manager instead of having separate managers for the mill and cyanide works. This change has been successful, and it is probable that the system will be extended.

Belt conveyors for ore and sand have come largely into use.

As an example of the present-day costs of [illegible] give the costs of the Simmer & Jack Mine for the year ending June 30, 1906:

Data: Tons milled, 624,507; sorting, 16.83 per cent.; No. of stamps, 320; no tube mills. Yield of fine gold per ton, 7.572 dwt. Value, 31s. 10.453d.

Items		
Mine expenses	10	1 513
Handling expenses	1	5 838
Pumping expenses		5 596
Transport of quartz		2.717
Crushing and sorting		7 322
Mill expenses	1	3 528
Cyanide expenses	1	5 573
Slimes expenses		6 591
Development redemption	2	6 000
Maintenance of buildings		9 937
Roads and surface improvements	0.	1.156
General charges	0	9 891
Total	20.	4 762

Of the ore mined 47 per cent. was broken by hand and 53 per cent. by machines.

The report of the Rand mines group of nine mines for 1905 gave the following figures based on 2,023,239 tons milled:

	Highest		Lowest		Average	
	£	d	£	d	£	d
Revenue per ton	53	10 534	28	2 051	35	3 782
Expenditure per ton	29	1 680	19	3 407	22	9 824
Working profit	32	2 822	1	0 395	12	5 908

The report of the Consolidated Goldfields gives some interesting figures as regards the amount paid in wages on the Transvaal gold mines during the year ending June 30, 1906. They are: White men, £6,341,706; Chinese, £2,742,239; Kafirs, £1,079,908.

Gold to the value of £22,100,707 was recovered during the same period, and was distributed as follows:

		Per cent.
To Working costs	£14,637,943	66 24
Dividends	5,344,550	24 69
Profits tax	475,000	2 15
Reserve fund debenture redemption and interest, machinery, renewals, etc	1,753,914	7 93
Total	£22,100,707	100 00

The working expenses of the producing mines of the Goldfields companies were approximately in the following proportion: White wages, 34.5; colored wages, 19; stores, 39.5; sundries, 7; total, 100 per cent.

PROFITS IN MINING

The profits earned by the mines show a general increase over 1905. For the first half-year 29 companies on the Witwatersrand paid out £2,535,706 and three outside companies, £110,623, or a total of £2,425,083. As increased dividends for the second half-year may be expected, the total for the year will probably be between five and six million pounds sterling.

DIVIDENDS PAID BY GOLD MINES OF THE TRANSVAAL

Year	£	Year	£
1887	[illegible]	1897	1,707,750
1888	[illegible]	1898	2,511,000
1889	437,541	1899	2,[illegible]
1890	[illegible]	1900	[illegible]
1891	[illegible]	1901	44[illegible]
1892	[illegible]	1902	[illegible]
1893	[illegible]	1903	[illegible]
1894	[illegible]	1904	[illegible]
1895	[illegible]	1905	[illegible]
1896	[illegible]		

dividends during the first half-year of 1906.

The mines of the Central Rand are the largest profit earners, seven mines distributing 46 per cent. of the total dividends of the Witwatersrand. The Robinson mine heads the list with a half-yearly dividend of £247,500.

The finance companies have not done so well as the mines, owing to the heavy fall in the value of South African mining shares, necessitating the writing off of large sums for depreciation of securities. According to the *Investors' Chronicle*, the market value of 44 leading companies, which was £154,509,000 on Dec. 12, 1904, had fallen on Nov. 26, 1906, to £70,308,489. Goerz & Co. for the year ending Dec. 31, 1905, wrote off £331,851. The General Mining and Finance Company for the same period £230,104, and the Consolidated Goldfields of South Africa, for the financial year ending June 30, 1906, wrote off £700,000. All these companies passed their dividend, as did also the East Rand Mines. The latter company appears to have been unfortunately financed, the dividends of the profit-earning subsidiaries being [illegible] new plant.

THE LABOR SITUATION

The mining industry continues to suffer from an insufficient supply of unskilled labor. The following table gives statistics of the labor supply during 1906 and previous years:

[illegible]		
[illegible]		
[illegible]		
[illegible]		
[illegible]		
....	15,021	84,689
[illegible]	[illegible]	99,891
[illegible]	[illegible]	[illegible]

In June, 1906, the labor employed on all mines, including gold, coal and diamonds, was: Whites, 19,329; colored, 108,980, and Chinese, 52,352.

The present labor force is concentrated on the best producing properties, while the less promising properties, and those which are some distance from the productive stage, have to remain comparatively idle. Owing to the uncertainty as regards labor and in some cases to the difficulty of raising fresh capital, work on the unproductive mines has been reduced since the beginning of 1906. In January there were 57 developing companies, using 173 machine drills; while in September there were 48 companies, using 146 drills.

The Chinese supply has ceased, and by the end of next year about 20,000 will be free to return home on the expiration of their three years' engagement. Re-enlistment may take place, but in any case it seems that this labor will be a decreasing quantity. The Chinese now represent about a third of the unskilled labor supply, and their repatriation must necessarily mean a considerable contraction of mining work and of gold production, and the dismissal of a large number of whites.

From an economic point of view, as remarked in my last year's review, the experiment has proved a success. If, on other grounds, the policy is now to be reversed, it is to be hoped that it will be done gradually, so as to prevent, as far as possible, any sudden dislocation of business, which would bring ruin or distress to thousands in South Africa.

FUTURE PROSPECTS

There is some hope that an important economy of labor may be brought about by the introduction of small machine drills, which can be put into the hands of Kafirs. But the solution of this problem has not yet been obtained, although the experiments made in this direction appear to be meeting with success. The mining correspondent of the *African World* (Nov. 17, 1906) says that experiments at the Robinson mine with the Gordon stope drill have shown that a Kafir can put in eight 3-ft. holes with this machine against one by hand. I have not yet seen any official figures, and no doubt an extended trial will be given before responsible engineers will make a statement, but it seems probable that a reliable stope drill will before long become an accomplished fact. Its adoption must bring about a great economy of labor, and will go a long way toward solving the labor problem.

Further, a reduction in the cost of living, which time will no doubt bring, will also tend to alleviate the position by making it economically possible to employ more Europeans. But a reorganization of the methods of working on these new lines cannot be done in a moment, and it does not seem that there is much hope for any rapid expansion in the industry, while if the Chinese are repatriated, a serious set back will certainly take place.

Spanish Mineral Trade

Exports of metals from Spain for the 10 months ending Oct. 31 are reported by the *Revista Minera* as follows, in metric tons:

	1905.	1906.	Changes.	
[illegible]	[illegible]	[illegible]	D.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]
[illegible]	[illegible]	[illegible]	D.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]

Exports of minerals for the 10 months were as follows:

	1905.	1906.	Changes.	
[illegible]	[illegible]	[illegible]	I.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]
[illegible]	[illegible]	[illegible]	D.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]
[illegible]	[illegible]	[illegible]	I.	[illegible]

Imports of chemicals for the 10 months were 11,627 tons alkaline borates and silicates; 11,837 tons caustic soda and potash; 2266 tons sulphate of soda; 151,726 tons mineral fertilizers; 76,049 tons phosphates and basic slags.

Rhodesia

BY W. FISCHER WILKINSON*

The gold production for 1906 may be expected to reach 555,000 oz. of a value of £2,053,000. Rhodesian returns are not made in fine ounces except in the case of the Panhalonga and Rezende mines, which are up to date in this respect. The official figures for the 10 months ending Oct. 30 were 457,153 oz. of an approximate value of £1,681,215. Besides gold there is a production, not indeed of much importance, of silver, lead, coal, wolfram, chrome-iron ore, and diamonds. The following table shows the gold production from the commencement, in ounces:

GOLD PRODUCTION OF RHODESIA

Prior to Sept. 1, 1898.....	6,470
Sept. 1 to Dec. 31, 1898....	18,085
1899	65,303
1900	91,940
1901	172,061
1902	194,169
1903	231,872
1904	267,737
1905	409,836
1906 estimated.....	555,000
Total	2,012,473

According to the statistics of the Chamber of Mines the gold production from 1898 to March 31, 1906, was as follows:

	Tons of 2,000 lb.	Oz.	Value.
Matabeleland ...	2,557,780	1,221,586	£4,427,598
Mashonaland ...	441,265	211,109	1,585,191
Fatt Companies ...	69,161	20,626	74,886
Total ...	3,341,255	1,581,121	£6,750,675

The most noticeable feature in the returns for 1906 is the large number of small producers having batteries of five stamps or under. Whether this source of gold will be permanent seems doubtful. As pointed out in the president's address to the Chamber of Mines in reviewing the work of the financial year ending March 31, 1906, many of the small workers and tributors are working on properties partially developed by companies that have exhausted their working capital. Quartz mining is not generally profitable for the man of small means, and a time must come when development is necessary in order to obtain grist for the mill. The president does not anticipate that the production of gold by the small producer will be maintained at its present figure.

The official figures for the first 10 months are as follows:

RHODESIA CHAMBER OF MINES

Month 1906.	Tons milled	Stamps	Oz.	Value £
January ...	106,032	892	43,353	159,597
February ..	95,033	882	38,375	141,707
March ...	112,531	899	44,916	165,343
April	107,129	920	43,024	161,433
May	116,568	999	47,135	175,658
June	112,631	991	47,664	174,022
July	120,420	1,024	48,485	175,708
August	123,773	1,065	50,127	182,577
September ..	118,088	1,012	48,410	176,170
October	.....	.....	45,664	*169,000
Total	.....	.....	457,153	1,681,215

*Estimated.

DIVIDEND PAYING MINES

An unfavorable feature of the gold-mining industry of Rhodesia is the lack of

*Consulting engineer, London, England.

dividends. During 1906 only two companies, viz., the Globe & Phoenix and the Giant, declared dividends. The latter is a new company, which commenced crushing in December, 1905, added materially to the output. It has a mill of 40 stamps and two tube mills. The value of the output is about £9000 per month, of which about £5000 is profit. This company paid its first dividend of 7.5 per cent. in July. The capital is £250,000. A wide reef is worked and the filling in of stopes is practised. The Globe & Phoenix mine, which has a 40-stamp mill, continues to make good returns and to pay dividends.

[illegible]

The Killarney Hibernia mine has a 20-stamp mill and a tube mill. The monthly value of its output is about £5000, but the company [illegible] the development of the mine in depth has been disappointing. The Selukwe mine with 40 stamps is one of the principal producing mines, but it has not paid a dividend since 1903. The Wanderer, which is more of a quarry than a mine, crushes the largest number of tons per month of any Rhodesian mine. It has a dry-crushing mill equivalent to 100 ordinary stamps. The value of its monthly output is in the neighborhood of £9000. For the year ending March 31, 1906, it crushed and treated 174,975 tons at a cost of (exclusive of development redemption) 6s. 9.38d. per ton. Nine other Rhodesian mines operating 195 stamps crushed 369,018 tons during the same period at a cost, exclusive of development redemption, of 21s. 5d. per ton. Other mines treating over 4000 tons of ore a month are the East Gwanda with 60 stamps, the Sabiwa with 40 stamps, the Ayrshire with 60 stamps, and the Penhalonga with 50 stamps. Attention is now being paid to the mining of low-grade iron stone and schistose ores as distinct from ordinary quartz reefs.

[illegible]

A discovery of diamonds which may turn out to be of some importance has been made at Somabula in the Gwelo district, a place situated on the Buluwayo-Salisbury railway. The diamonds, with which are associated other gem stones, of no great commercial value, however, are found in a gravel deposit resting on a decomposed surface of granite. The occurrence is, therefore, an alluvial digging and not a pipe, and is probably similar to the diamond fields of India and Brazil. Stones of good quality have been found. Up to March, 1906, the production was 1161 carats valued at £4028. A plant capable of treating 500 loads a day is in course of erection.

It is estimated that the copper output at Mount Molloy, Queensland, during 1907 will be 2000 tons of blister copper. This is assuming that necessary additions are made to the reduction plant.

Mexico

[illegible]

In a review of the year's mining and metallurgy in Mexico, naturally the first thought is of silver. Mexico is still the leading nation in the production of this metal. Yet it is not alone to silver that her greatness is now due, for as the government has adopted the gold standard, the output of the gold mines of the country has increased until production more than meets the demand of the country, and Mexico easily stands fourth among the world's gold producers, being preceded only by the United States, Africa and Australia. Likewise in copper, the production continues at such a pace as to keep it second only to that of the United States. In the output of lead, Mexico is surpassed only by the United States, Germany and Spain. Among other mineral products are iron, coal, oil and asphalt, zinc, sulphur, tin and mercury; the salt beds and salt lakes; the building stones, the onyx of Puebla, and precious stones, of which the most important are opals and turquoise.

The greater attention, however, is paid to the production of silver and gold, and in the production and extraction of these two metals has the greatest progress been made. As will be seen, much of this progress has been due to the application of cyanide process to the copper-free silicious ores, very few of which are not amenable to this treatment. In the introduction of this process great credit is due the Mexican Gold and Silver Recovery Company, which for 12 years has held the rights in Mexico to the McArthur-Forrest cyanide patents. This company's experts have demonstrated the process in Sonora, Sinaloa, Chihuahua, Durango, Zacatecas, Guanajuato, Michoacan, and all over the Republic. What promised to be a long and expensive litigation over the right to hold a patent on this process was instituted early in February by the manager of the Recovery company, against the Guanajuato Reduction and Mines Company, for use of the cyanide process without paying royalties, but the controversy was amicably adjusted by the payment of a nominal sum for the perpetual right to use the process.

[illegible]

Guanajuato—Of the silver-producing districts, Guanajuato is in the lead. Only a few properties were working in a small way at the time the Guanajuato Consolidated Mining and Milling Company entered the district and took hold of the Sirena mine seven years ago. After heavy expenditures in development and equipment, Jan. 1, 1905, saw this company with 90 stamps dropping and practically satisfied with the success of cyanide, after concentrating, for the treatment of its ores. Including that done in the patios, 300 tons were being treated daily in Guanajuato, which would have given a total valuation of $2,000,000 for the year's product. The [illegible] the pay rolls had increased from $80,000 to $200,000 per month, 200 stamps were [illegible] 000 Mexican per year. The advantages of electric power have been proved; the cyaniding of low-grade ores and the old dumps is no longer an experiment; the profits on $30 ore have been raised to about $22, where formerly they were less than $3, and it has needed only capital to make Guanajuato one of the leading silver-producing camps of the world. This has been done principally with American capital.

The history of one company is the history of all, and I can do no better than to record here the year's work of the Guanajuato Reduction and Mines Company, operating all the old producing mines of the mother vein of Guanajuato, except the Sirena. Work was started upon an 80 stamp mill and cyanide plant in March, 1905, and was completed in March, 1906, since which time the mill has run in its entirety something over 98 per cent. of its possible stamp hours, and upon ores about one-half of which have been old waste and one-half mine ore. An extensive compressor plant was at the same time installed on the Cata mine, which is the central one of the group, and most energetic development work was prosecuted throughout the entire year with very favorable results. For the unwatering of the huge Rayas and Mellado workings, occupying the southern, one of the two miles owned by the Guanajuato company, two 300-gal. pumps were installed in the Cata, upon the 1000-ft. level, and were connected by piping to an aperture in a dam separating the Rayas and Mellado mines from the Cata, on a deep level, the pumps thereby receiving their water under pressure of approximately 400 lb. per sq.in. and performing the labor only of lifting this pressure to 425 lb. Unwatering is proceeding at the rate of 600 gal. per minute, day and night. The Tepeyac mine, lying to the north, has, in this same manner, been unwatered to the bottom and the unwatering of the Valenciana will shortly follow.

The ores, while containing a fraction of their values in gold, are silver ores and many doubts were expressed as to the ability to treat them by the cyanide process. This has been so successfully accomplished, however, that extraction of better than 86 per cent. has been steadily obtained. The company owns dumps aggregating 2,000,000 tons, all easily accessible to the mill site, and the original design of the mill involved the installation of a 1000-ton plant, of which the present 80 stamps constitute one unit. The working of these dumps has been so much more profitable than the original estimates

[illegible] engineer, City of Mexico, Mexico.

chinery and excavations, while foundations [illegible] additional 80 stamps; it is probable that before these are installed the third unit [illegible] that the second 80 stamps will be in operation by August, 1907, making this the largest mill under a single roof in the Republic. The stamp mill and concentrating units are located immediately at the mines, the tailings of the concentrators being conveyed a distance of more than a mile through an 8-in., cast-iron pipe, laid on a 2¼ per cent. grade, to the Flores hacienda, an old patio hacienda in the city of Guanajuato, where they are cyanided, and the waste discharged into the main stream of the district.

In addition to the mine development satisfactory progress has been made in opening up the immense masses of stope fillings in the old mines, which exist in widths up to 50 ft., the average grade of which is about $10 (U. S. gold) per ton. On the least calculation the company's mines on the mother vein have 1,500,000 tons of this grade.

The company also owns a mile along the main La Luz vein, north of Guanajuato, the mines held there embracing the Purisima, San Pedro, Rosario and Pili, all very important producers in the past, but now flooded. One of the shafts of this group has been put in excellent condition, with electric hoists, and unwatering is proceeding. At the same time a fair amount of development has been done upon virgin ground between these old producers with such results that it is contemplated, before long, to install a 250-ton unit upon this group in addition to the installations upon the mother vein.

With the companies: Guanajuato Consolidated, Peregrinas, Guanajuato Amalgamated, Central, Nayal, El Cubo, Carmen, Pinguico and others, practically all is new work, but the metallurgical problem is the same, and all are cyaniding, so that combined there are 650 stamps now dropping in Guanajuato, treating 2000 tons a day, or at the rate of $14,000,000 (Mexican) a year, an increase of more than 50 per cent. over that of the most flourishing bonanza days of the past centuries. Nor is the end yet in view: for example, in the workings of the Pinguico mine of the Guanajuato Development Company, where marvelous bodies of ore have been encountered, it is said that once as much as $1,000,000 worth of ore was opened up in a week's development work. [illegible] Central Railroad from Marfil into Guanajuato, and the building of a line from Guanajuato, via Marfil and San Gregorio (this much of which has been in operation for some years), to Salamanca to connect with the Mexican National Railroad, both of which lines Guanajuato should have had years ago.

Pachuca—Next to Guanajuato, of the old camps, comes Pachuca, but unlike Guanajuato it had not particularly declined, one of its old plants alone, the Hacienda de Guadalupe, of the Santa Gertrudis & Guadalupe Mining Company, treating 150 tons a day by the old process of Bartolomé de Medina. In February, 1906, the United States Smelting, Refining and Mining Company, of New York, purchased through the MacDonald Brothers, of Guanajuato, the famous old Real del Monte mines, and since that time the property has been practically closed down while a full electrical equipment is being installed, and a 250-ton cyanide plant is being erected. It is understood also that the Blanca y Anexas, another of Pachuca's largest properties, has just been sold for $10,000,000 (Mexican).

Zacatecas—This famous old silver camp where the patio prevailed, which had fallen off much more in its production than the two just mentioned, seems to stand a fair chance of being revived. The old San Rafael group was taken up by El Grande Mining Company, of A. E. Stillwell and associates, and active mining operations were resumed about the middle of the year. The property is being slowly unwatered, and results so far, especially from the work in virgin ground, have been most encouraging. El Bote, also famous during the last century, has been under examination for some months by an American company. The old Tajos de Panuco, which gave the silver for the coins minted in Zacatecas as early as 1560, is being unwatered by New York capital, as is also the San Roberto, adjoining the Mala Noche, while it is probable the Veta Grande will also be unwatered to admit of examination. As yet little has been done here with the cyanide process, but unquestionably the coming year will see its introduction in this old camp.

San Luis Potosi—The success of the cyanide process has been proved for some years in the treatment of the old dumps in the San Pedro district near San Luis Potosi, though the greater part of the ores still go to the smelter of the Mexican Metallurgical Company, at the latter point. This company has opened up this year large bodies of silver-bearing lead and iron ores in the properties it holds under lease from the Victoria company in the San Pedro district.

Chihuahua—In Ocampo, or Jesus Maria, the seat of the Rayon district in western Chihuahua, beyond Miñaca, where stamps and amalgamation, with and without concentration, have been in use for years, the success of the Concheño Mining and Milling Company, with its 60 stamps and cyanide plant, has convinced the skeptical, and the past year saw the extension of cyanide practice to the other companies, led perhaps by the Greene interests. At the famous Dolores mine, May, 1906, saw the successful institution of cyanide after amalgamation. In Parral, too, the initiative has been taken by the Veta Colorada in the starting of a 250-ton cyanide plant, which will be the first in the district, and if a success will be followed by others and possibly by a 1000-ton custom plant.

Jalisco—In the Etzatlan district of this State the greatest activity was shown during 1906, and the Amparo Mining Company, of Philadelphia, owning the old Santo Domingo mine among others south of Etzatlan, has gradually brought up its production to 100 tons a day, and with a 20-stamp experimental mill has proved the practicability of the cyanide process for its ores, so that orders have been given for a 200-ton plant for the treatment of the low-grade ores that will not stand shipment, and possibly eventually for the treatment of all its ores. In the old properties of Mololoa and Tamara in Hostotipaquilla, a district north of Etzatlan, remarkably rich bodies of ore have been disclosed, and the last months of the year saw a large combination effected between these properties and those of Amajac, which will mean much for that section. As yet the patio is in use in this district for the ores that are not shipped. At El Favor mines, owned by a company of the same name, and controlled by Makeever Bros., of Boston, what is believed to be the Mololoa vein was encountered in October, and a large body of ore is being blocked out, only that produced in development work being shipped, while the rest is left in the mine for treatment in the immense mill for which experiments on the ore are now being carried on.

El Oro—The mining camp of El Oro extends from the town of El Oro, in the State of Mexico, over into the State of Michoacan, and includes Tlalpujahua. Into this district electric power was introduced by the Mexico Light and Power Company, from its power plant at Necaxa over a distance of 200 miles, and with El Oro Mining and Railway Company the replacement of steam by electricity was begun in February and applied throughout the property. The operation of the electric plants has been most satisfactory since the installation, and has resulted in a reduction in the cost of power from $150 or $200 per horse-power-year down to about $50, and a consequent lowering of the milling cost from about $7 to $5. This company reported in June, 1906, for the preceding 12 months' work, a total production of 234,079 tons, from which were realized $2,225,000 gold at a total cost of $1,257,000, and of the resultant profits $675,000 gold was distributed in dividends, or something over $100,000, Mexican, per month, while the Dos Estrellas Company has kept up its regular monthly dividend of $40, Mexican, per share, or a total of $120,000 per month; this should be materially increased after the completion of the new mill, with 120 stamps and three 24-ft. tube-mills, capable of treating 60

tons daily. The Esperanzas Mining Company, said by many to be the most productive gold-mining company in the world, has continued paying its dividends of $400,000, gold, per month. This company has resorted to the novel expedient of further leaching with water the old dumps that have been acted on by weather, and this water passed over zinc.

The combined production of these three El Oro properties, amounting to a little over $12,000,000, Mexican, per year, of which 80 per cent. is gold, makes it the second most productive gold-mining center on the American continent; the reduced cost of extraction, owing to the introduction of electricity, and the development of the smaller properties will greatly increase this enormous output in the present year. At the properties of the Mexican Mines of El Oro, Ltd., several thousand tons have been opened up, and a plant of 20 stamps, with tube-mills and cyanide tanks for 100 tons daily capacity, is under erection. The Chihuahua, Aldebaran, Victoria and a number of smaller properties are actively engaged in development.

Miscellaneous—In Sonora the great copper camps so overshadow all else that little is heard of other work, but rich silver-lead ore has been opened by the Cubana Consolidated Copper Company, at Arizpe, 40 miles south of Cananea; at the Pichaco mines, southeast of Cananea, bought from Phelps-Dodge Company by Clancy Bros., of Detroit, bodies of silver and gold ores are being developed and are treated at the 200-ton mill just completed on the Oro Maximo Mining Company property, under the same ownership. Chas. Butters has started the cyaniding of his low-grade ores at the Grand Central, while the Boss process, followed by cyanide, is used at the Creston Colorado, both of which are at La Colorado, Sonora. At the Llanos de Oro placers, Epes Randolph is putting in a 100-stamp mill, while the Greene Gold Company is installing dredges of 2000 tons daily capacity for operation on La Brisca placers. In Chihuahua the Lluvia de Oro is putting in a 100-ton plant with cyanide after amalgamation, while the Palmarejo and Mexican Gold Fields, Ltd., has been put on a profitable basis by increasing to 100 tons a day and cyaniding after concentration.

Metal Refinery—In connection with the country's gold and silver production the most important new work of the year was the putting in operation of the electrolytic refinery of the National Metal Company, in Mexico City, from which the first shipments of fine silver and fine gold were made in January, 1906. The melting department of this plant consists of three Doré furnaces, one reverberatory furnace and three tipping-retort furnaces; the parting and refining departments are made up of 10 sections of four cells each for the electrolytic refining of silver by the Moebins process, and one section of six cells for the electrolytic refining of gold.

The refinery is receiving base bullion and cyanide and sulphide precipitates from almost every State in the Republic, and among these receipts is practically the entire output of the Guanajuato, El Oro and Pachuca districts, with many others. The business has grown from a necessarily small beginning up to where now the monthly production amounts to 500,000 oz. of fine silver and 25,000 oz. of fine gold, which is about two-thirds of the actual capacity of the plant, and as the output is continually increasing there is no doubt that additions will have to be made to the plant during 1907. Of the product, which, in both silver and gold, is 999 fine, all the gold is sold to the Monetary and Exchange Commission of the Federal Government, while the silver, with the exception of a small proportion disposed of locally, goes to London.

COPPER

Cananea—The great increase in the production of copper, which has put Mexico among the chief producers of this metal, is due to the properties in the State of Sonora, and particularly in the district of Cananea. The greatest at this camp is the Greene Consolidated Copper Company. In eight years this company has grown from nothing to be one of the greatest works of its kind in existence, and it is now adding to the world's wealth of copper at the rate of $10,000,000 (gold) per annum. This is notwithstanding the fact that three-fourths of its ore is of second grade and has to be concentrated. Development has been carried on beyond the ability of the surface equipment to handle the tonnage, but this is being rapidly brought up to meet the requirements; the caving system is being introduced in the mines; an elaborate system of underground and surface roads and ways, with electric traction, between the mines and mills has been installed; the concentrators have been increased by 1000 tons, and brought up to a daily capacity of 3500 tons; an extensive system of Robins belt conveyors, for bedding the ores and feeding the furnaces from the beds, is about ready to be put into operation; the fines and flue dust are being sintered by a patent process to relieve the work of the blast furnaces, and the eight blast furnaces now in commission are being replaced by larger furnaces, 56x180 in., at the tuyeres, and with automatic feed; so that 1907 should see the present production of 6,000,000 lb. per month greatly increased. It is said that the company will be able profitably to handle ore running as low as 1 per cent. copper by the new and enlarged plant, with the practically automatic equipment which cuts down labor and cost of handling.

What promised to be another immense company was organized in July by T. F. Cole and associates, among them W. C. Greene, it was known as the Consolidated Central Mining Company, with a capital of $10,000,000 gold, and owned, among others, the American mine (which previously had been under bond to the Lewisohn Bros., of New York, and a year before could have been purchased for $100,000), for which $2,500,000 gold was paid, and the Cananea-Duluth, which was obtained for $500,000 gold and certain interest in the new company. Development was at once started, the old shafts were deepened, new shafts were projected, so that by the middle of September the company was shipping 100 tons of ore per day. More recently, through Messrs. Ryan, Cole and Greene, the Amalgamated Copper Company obtained an interest in the Cananea companies, and a merger was effected between the Cananea Central and the Greene Consolidated, and for the combination a new holding company, the Greene-Cananea, was formed, with a capital of $15,000,000 gold. There can be no doubt that Cananea will soon be the largest copper camp on earth, for in addition to the companies interested in the merger, there are the Sierra de Cobre Mines, of the Queen Consolidated Copper Company, now producing 200 tons a day of 5 per cent. ore and continually increasing: the Southwestern Copper Company, the Cananea Eastern, the Rouquillo Copper Company, and the South Cananea, all producing, together with a number of other properties which have not yet got onto the shipping list.

Miscellaneous—Among other more important copper properties are La Dicha mines, of the Mitchell Mining Company, in Guerrero, producing 15 tons of copper per day; the Jimulco Mining Company, with its railway and mines at Jimulco and Panuco, whose work on the building of its own smelter at the latter point was checked by an exceptionally favorable contract with the American Smelting and Refining Company, the Mazapil Copper Company, with its mines, smelters and railroads in the States of Zacatecas and Coahuila, whose new smelting plant in Saltillo has just been completed; the Rio Tinto, with its 250-ton smelter at Terrazas; Chihuahua, which has just been blown in; the Tezuitlan Copper Company, with its large smelting plant in the State of Puebla, which company has added largely to its holdings during the year and greatly increased its ore reserves: and a number of smaller properties in the southern part of the State of Jalisco, and in the States of Michoacan and Guerrero.

COAL AND IRON

With iron little has been done, notwithstanding the immense deposits at Durango, at Las Truchas, in Michoacan, and at Alvarez, in Colima. But in the coal fields several large companies have been formed, the principal of which are the Mexican Coal and Coke Company, at Esperanzas, Coahuila, producing 50,000 tons of bituminous coal and 8000 tons of

of Esperanzas, organized the early part of the year, which is developing and opening up its 30,000 acres of coal lands. It is awaiting the completion of the railroad from Barrteran before placing its bituminous coal on the market. For the opening of the semi-anthracite beds in Puebla, between Tulancingo and Guachinango, the National Railroad has ordered a survey to be made, but another year will have passed before much can be done there. On the other deposits known to exist in the States of Sonora, Vera Cruz, Oaxaca, Michoacan and Guerrero, little or nothing has been done because of the lack of transportation.

ZINC

In zinc little new was done because of the check given it by the imposing of a 20 per cent. *ad valorem* duty by the United States on zinc ores shipped into that country. The chief new work of interest is the magnetic separator at the American Smelters Securities Company's mines in Velardeña, Durango, and its Tecolotes mines in Santa Barbara, Chihuahua; and the Sutton-Steele dry table and the dielectric separator at the Tiro General mine in Charcos, San Luis Potosi. All of these are still in the experimental stage, and results are not yet assured.

SMELTING

The prediction that lead must soon give way to copper as a base for collecting the gold and silver values in the ores in smelting, though looked upon as a fact for the future, does not seem as yet to be proved in the work of the past year. The existing smelting plants that have been using lead continue to do so; and of the new and independent plants, in the building of which there seems to have been somewhat of a contagion during the year just past, the tonnage is perhaps equally divided between copper and lead. Among these the more important custom plants are the Magdalena lead smelter in Oaxaca, of 100 tons, blown in in July; the Oaxaca Smelting and Refining, of Oaxaca, with a lead plant of 250 tons capacity, which was blown in by the end of December; the Mexican Smelting and Refining, Taxco, Guerro, with a 40-ton lead furnace blown in in September; the [illegible] Metallurgical Company, at [illegible] copper plant blown in last July; the Guaymas, Sonora, 500-ton lead and copper plant; and the 500-ton lead plant of the American Smelting and Refining Company in course of construction in Chihuahua. The largest new plant to go into commission in 1906 was that of the American Smelters Security Company, at Velardeña, Durango, intended for 600 tons of lead ores and 900 tons of copper ores, though as yet only two copper stacks, of 600 tons daily capacity, have been installed and blown in. At this plant all is automatic from the time the ore leaves the railroad cars, belt conveyors taking the ore to the mill, thence to the beds, and from the beds to the 5-ton, electrically driven charge cars, which dump directly into the furnaces, and by electric traction the slag pots are taken from the furnaces and dumped. As yet no converters have been erected, the matte being shipped to the American Smelting and Refining Company plant at Aguascalientes.

RAILROADS

Railroad building has been carried on at a pace as never before since the original completion of the Mexican Central and National systems from the United States border to the City of Mexico. The Cananea, Yaqui River & Pacific is running its extension to the port of Guaymas, Sonora; the Kansas City, Mexico & Orient is driving across Chihuahua and Sinaloa to Topolobampo, the first desirable port south of Guaymas on the west coast; the Mexican Central is completing its branch from Guadalajara to the Pacific coast port of Mazanillo; and the Southern Pacific is stretching out its gigantic arms almost across the continent, from Guaymas, Sonora, through that State, and Sinaloa, Tepic and Jalisco, to Guadalajara, the second city of the Mexican Republic, as fast as surveys and construction work will permit of its being done. But most important to all business interests in Mexico, of whatever nature, is the control just obtained by the Federal government over the Mexican Central, which, taken with the Mexican National, of which the Government secured control in 1903, will form a gigantic combination with a mileage, including branches under construction, of 10,000 miles, and for the operation of which a new $225,000,000 (gold) company will be formed, the Government holding $113,000,000 of said company. What this means in the building of much needed lines and connections can only be surmised. Mexico may possibly be considered now as in a transition stage, but the change is so healthful and the development so certain that its success is assured.

Ontario

BY THOMAS W. GIBSON*

In the Province of Ontario the chief interest centered in the silver ores of the Cobalt camp, the discovery of which in the autumn of 1903 ranks as one of the most notable finds of mineral within the last decade. The early promise of these narrow, but wonderfully rich, veins has so far been more than realized.

Nothing was shipped from Cobalt in 1903; in 1904 the output was 206,875 oz. of silver; in 1905 it rose to 2,451,356; in 1906 the product up to the end of September was 2,542,827 oz., and as the shipments during the last quarter of the year were in excess of those for the first nine months the yield will hardly be less than 5,500,000 oz. of silver for the year. The prospects for 1907 are that the production will be still greater. The development of Cobalt has given Ontario easily the first place among the Provinces of the Dominion in the production of silver. British Columbia led for many years, but in 1905 its yield was only 3,439,417 oz., so that unless it has greatly increased during 1906, the leading position must be conceded to Ontario.

GRADE OF ORE

A glance at the tonnage of ore shipped from the mines shows its quality. The first shipments in 1904 were native silver nuggets and plates found in the upper zones of the deposits; the 158 tons sent out averaged 1309 oz. per ton; in 1905 the consignments were 2144 tons and the average contents 1143 oz., while in 1906, although the exact figures cannot yet be given, the shipments will amount to about 5000 tons, containing an average of say 1100 oz. of silver to the ton. Some of the consignments have been of phenomenal richness; one carload from the O'Brien mine in 1905 brought about $65,000, while one from the La Rose, or, as it is sometimes called, the Timmins mine, in 1906, yielded a return of $110,000. Ores, carrying up to 200 or 300 oz. of silver per ton, which in other camps would be reckoned of high quality, are in Cobalt spoken of as "low grade." The mine owners feel that in comparison with the more valuable ores they do not pay to handle and ship; hence they are piled on the dump until the time arrives when concentration methods will be employed.

PRODUCING MINES

The producing mines are as follows: Nipissing, La Rose, Coniagas, Jacobs, Trethewey, Drummond, Foster, University, McKinley-Darragh-Savage, Buffalo, Cobalt Silver Queen, O'Brien, Violet, Right-of-Way, Lawson, Hargrave, Watts and Allen, and Green-Meehan. In addition to these, several other properties are just about to enter the productive stage. The rich territory is fairly well distributed. Most of the mining companies hold one, two or not more than three 40-acre claims, so that there is no great likelihood of any one concern's owning absolute control. One or two of the companies which were early on the ground are, however, an exception to this rule, the principal one being the Nipissing Mining Company, whose holdings aggregate 846 acres. This company is the successor of E. P. Earle, who, in 1904 before the field became famous, bought out a number of the original locators, and secured a large area in the center of the camp. O'Brien

*Deputy Minister of Mines, Toronto, On-

& O'Brian have also a considerable tract, procured in the same way, consisting of 257 acres. The Hudson Bay and Timiskaming Mining Company has several 40-acre claims, but its producing property, now known as the Cobalt Silver Queen, has been sold to the company of that name.

Cobalt has been the scene of much litigation. The titles of the Nipissing Mining Company and of M. J. O'Brien & J. B. O'Brian were called in question by the government of the Providence on the ground of misrepresentation as to discovery, but both suits have been settled, that against the Nipissing Company having been abandoned, and the one involving the O'Brien mine having been settled by the agreement of the proprietors to pay the government a royalty of 2½ per cent. on the output. A similar suit against Messrs. Hargrave and White concerning three 40-acre claims was decided in favor of the government by Chancellor Boyd, but proceedings have not yet been concluded.

DISTRIBUTION OF ORE

The labors of the prospectors seem to have pretty well defined the boundaries of the productive area of Cobalt, and have shown it to be limited to certain portions of the eastern half of Coleman township and portions of the adjoining townships of Bucke and Lorrain. Outside of this territory, comprising perhaps 10 or 12 square miles, cobalt bloom and smaltite are found at many widely separated points, but silver values are low or absent altogether. What special influences were at work to deposit silver so profusely in the veins which characterize the conglomerate and diabase of eastern Coleman, while denying it to veins occurring in the same or similar rocks occurring elsewhere in the region, has not yet been elucidated by geologists. During the closing days of the prospecting season of 1906, two prospectors, the White brothers, returned from near Lady Evelyn lake, in the Temagami forest reserve, with fine samples of native silver in diabase, as well as smaltite and cobalt bloom, and it is not impossible that another argentiferous area may be opened up in that region.

DISPOSITION OF ORE

The Cobalt orebodies carry considerable cobalt, nickel and arsenic. The last two constituents are at present valueless to the mine owner, and he gets nothing for cobalt unless it is in excess of 6 per cent. Ore buyers settle on the basis of 93 per cent. of the value of the silver, if in excess of 2000 ounces per ton. A sliding scale governs payments for ore of lower grade. Up to the present, most of the ore has been shipped to Newark and Perth Amboy for treatment, but several reduction plants are in course of construction in Ontario, some of which will shortly be ready to begin operations. The Copper Cliff refinery has already treated considerable ore.

An interesting development in the Cobalt district has been the direct participation of the Ontario government in the mining field. A portion of the mineralized area known as the Gillies limit was withheld from the market because of its value for pine timber. This timber having been removed, the government, authorized by the legislature, embarked upon the business of mining. Operations were placed in charge of Prof. W. G. Miller, the Provincial geologist, whose prospectors during the past summer located several promising veins. One of these, carrying cobalt and native silver, is 7 in. wide on the surface and a shaft, which has been sunk to a depth of 70 ft., showed the vein to be strong and rich at that point. The mines are to be worked for the benefit of the Provincial treasury. On Dec. 20, the government disposed of the bed of Cobalt lake, containing some 43 acres, to the highest bidders, an Ottawa-Toronto syndicate, for the sum of $1,085,000, a reasonably good price for an undeveloped claim.

SUDBURY DISTRICT

The nickel mines of the Sudbury district were more active in 1906 than during any previous year. High-water mark in the yield of nickel was reached in 1905, when the production was 9503 tons; for 1906 the output was 8037 tons for the first nine months, and for the full year it was about 10,750 tons. The chief producers are the Canadian Copper Company and the Mond Nickel Company. The production of copper, which comes mainly from the nickel-copper ores of Sudbury, was about 5200 tons in 1906, as against 4525 tons in 1905.

IRON ORE

The iron ore raised in Ontario comes almost wholly from the Helen mine in Michipicoten, and the shipments totaled somewhat less than in 1905 when they amounted to 211,597 tons. New sources of production are likely soon to come into play, as an extension of the Canadian Northern Railway is now under construction into the Hulton iron range north of Sudbury. The Farnum mines in Mayo township, Hastings county, are now also equipped with railway facilities. The pig-iron produced during 1906 was in the neighborhood of 280,000 tons as compared with 208,094 tons in 1905. The output of steel was about 160,000 tons in 1906, a considerable advance over that of 1905.

The other metallic products of Ontario are not important, a small quantity of gold being obtained from the quartz veins of Lake of the Woods and Sturgeon lake mines, and a little zinc and lead in Hastings county.

The yield of the petroleum fields in the southwestern part of Ontario showed a decided increase in 1905, when the production was 22,131,658 gal., and the returns are likely to prove that this increase has been maintained, or even improved upon, in 1906. Several new pools were opened up during the year. In natural gas, the outlook is very promising. The Dunnville field is now producing largely, and late in the year a large well was struck in Raleigh township, which had a flow of about 7,000,000 cu.ft. per day. Salt is obtained from the brine wells west of lakes Huron and St. Clair in quantities sufficient for domestic consumption. The principal point of production is now Windsor. Corundum, mica, iron pyrites, feldspar, gypsum, graphite and other useful substances are mined in considerable quantities and form the basis of important local industries. The manufacture of portland cement is rapidly advancing, and the output of 1,254,360 bbl. in 1905 was surpassed during 1906. Building materials of all kinds, such as brick, lime, stone, etc., are being turned out year by year in increasing quantities, the distribution of clay, limestone and the other necessary raw materials being widespread throughout the Province.

In short, the record of the mining industry of Ontario for 1906 was very satisfactory, showing marked advance in almost every department.

The Eastern States of Australia

BY F. S. MANCE

The year 1906 has proved one of the most prosperous in the annals of mining in the eastern states of Australia. From the returns for the first nine months it is clear that the year will close with an increase of over £1,000,000 in value on that of the total mineral output for 1905, which was as follows:

State.	1905.
New South Wales	£ 7,[illegible]
Queensland	4,[illegible]
Victoria	3,[illegible]
Tasmania	1,[illegible]
South Australia & Northern Territory	[illegible]
Total	£[illegible]

The gold yield falls below that of previous years, but as against this the production of silver, lead, copper, tin, antimony, etc., has been on a greatly extended scale, and the results achieved furnish evidence, not only of the activity displayed and the success which has attended mining operations, but also of the variety, extent, and richness of the mineral resources of these states. It is expected that the returns for the states of New South Wales and Queensland, where the mining for minerals other than gold is more actively followed, will far outstrip all previous records.

GOLD

As mentioned already the gold yield for

[illegible] that for the previous year, the estimated decrease [illegible] Particulars are given in the following table of the gold production of Australasia in ounces fine [illegible] the figures for the latter year are estimated on the basis of the returns for the first ten months thereof:

State.	1905.	1906.
Western Australia	1,005,416	1,802,000
Eastern States—		
Victoria	747,116	790,000
Queensland	522,620	535,000
New South Wales	274,267	285,000
Tasmania	73,541	61,500
South Australia	20,530	18,000
Total Commonwealth	3,643,240	3,491,500
New Zealand	492,954	515,000
Total Australasia	4,136,194	4,006,500

Referring now only to the eastern states it will be seen that Victoria ranks as the chief contributor. The Bendigo field is the staple support of the industry, and has maintained an output averaging some 10,800 oz. per month. The principal dividend-paying mines were the New Argus, South New Moon, and New Moon. The disclosure of a massive gold-bearing formation in the Victoria quartz mine, at a depth of 4154 ft., has given unmistakable proof of the permanence of the reefs on this field, and has come as a fitting reward to those who have so consistently prosecuted operations to such deep levels. The output from the Ballarat field continues to show a falling off, but the quartz mines at the other centers have yielded well. In connection with alluvial mining, the dredges at Castlemaine, Fryer's creek, Buckland and Bright have contributed largely toward the total yield, as have also the mines working the deep levels at Chiltern and Rutherglen. The work of draining the Moolort deep lead has been unremittently carried on, and it is anticipated that it will shortly be possible to rise into the gutter at the Loddon valley mine, at which mine the pumping operations have been concentrated for some time past.

The lessened output of the state of Queensland may be accounted for in a great measure by the closer attention which has been given to the mining for the baser metals. The Charters Towers field is the chief center of gold-mining operations in this state, but the results compare unfavorably with those secured in previous years, and a further drop in the average grade of the quartz won is noticeable. Calls have been readily paid by in- [illegible] f development work has been carried out during the year. Altogether the outlook seems to warrant the assumption that the output for 1907 is not likely to recede below the present level. The Mount Morgan mine, which has paid dividends aggregat- [illegible] new era during the last half-year as es- [illegible] Wales is again fortunate in record an increased production. The Mount Boppy stands out preeminently as the gold mine of the state, and the developments underground during the year have been of such a satisfactory nature as to indicate that the output during the year 1907 will be still further augmented. On the Wyalong field rich sulphide ore is being obtained at a depth of 1000 ft., and the prospects are favorable to the maintenance of a large output. The yield from the Hillgrove field has come well up to the average, although the operations of the New Hillgrove Company have been considerably hampered owing to explosions of rock carrying away the shaft in the lower levels. The various dredges throughout the state have again won a considerable quantity of gold, and remunerative returns have been secured by most of the plants, but the yields as a whole are not as satisfactory as in preceding years.

Tasmania has unhappily to record an output below that of 1905. This is due to the fact that just as the principal gold mine, the Tasmania, was on the eve of reaping the benefit of the expensive plant which had been installed, the underground workings were flooded by an inrush of storm waters, which caused the suspension of mining operations for some months. To the end of June, 1906, the quartz crushed from this mine totaled 613,924 tons and yielded 655,408 oz. gold.

The gold yield of South Australia is now an inconsiderable item, the only producing mine of any importance being the Tarcoola Blocks, which won 4922 oz. during the year ended June last.

The export of gold from Australia during the year has been very heavy, and the shipments for the first eleven months of 1906 are £6,400,000 in excess of those for the same period in 1905. The following statement shows the value of the gold shipments from the respective ports:

	1905. £	1906. £
Melbourne	770,258	3,122,935
Sydney	1,784,112	5,329,302
Brisbane	1,800	.....
Adelaide	16,250	180,960
Fremantle	5,820,031	5,060,988
Total	7,892,451	14,294,245

SILVER

The dominant feature of the mining industry has been the exceptional interest evinced in the Broken Hill field, and toward the closing months of the year the market value of the shares of this group of mines had reached over £11,000,000. The confidence shown by investors appears to be fully justified, as it has been estimated that, with the complete plants now installed at the principal mines, operations could be remuneratively carried on with lead at £11 10s. a ton, and it is at once apparent that, with the sustained price of this metal, the way has been laid for the reaping of enormous profits. In the first half of the year production was curtailed by several causes, notably the fires in the Proprietary and Junction mines, and creeps at the Central and Block 10 mines. The total output is on this account below that of the previous year, but the value is considerably greater. In the last quarter of the year all the disabilities mentioned had been overcome, and the field was the scene of the greatest activity. Work underground has further added to the ore reserves, and, as bearing on this point, it may be mentioned that the lode in the Broken Hill South mine was opened up at the 975-ft. level during the year, and was proved to be over 316 ft. wide, with an average assay value over the whole width of 18 per cent. lead, 32 per cent. zinc, and 17 oz. silver per ton.

In the matter of the production of spelter from the enormous heaps of tailing, progress has not been as rapid as expected. The Zinc Corporation, which was formed to treat these heaps of tailing, has given very close attention to the subject during the year. Preliminary experiments were disappointing, but it is now announced that, with a remodeled plant using the Potter process, a concentrate has been produced which is in every way satisfactory, an extraction of 85 per cent. zinc and 60 per cent. lead being guaranteed. The first unit of the plant on the improved lines, which is to be capable of treating 500 tons of tailing per diem, is being erected on the British mine, and is expected to be in operation early in 1907. The Proprietary Company, in accordance with contracts extending over several years, has exported a large quantity of zinc concentrate produced by the Delprat process, and has also entered on the work of zinc distillation at Port Pirie, a furnace holding 120 retorts having been brought into commission during the closing months of the year. The Sulphide Corporation, finding it impracticable to deal with the quantity of zinc concentrate produced, has formed a subsidiary company to treat the output, the site of operations being near Middlesborough, England. The tailing at the North mine is being treated by the De Bavay process, but work can hardly be said to be yet established on commercial lines.

At Howell, N. S. W., the company which took over the Conrad and King Conrad mines, in the year 1905, has obtained most gratifying returns. The Yerranderie field, N. S. W., has contributed large supplies of silver-lead ores, as has also the C. S. A. mine, Cobar.

As already indicated, it is known that the actual production of metal from the silver-lead mines of New South Wales during the year 1906 is somewhat less than in 1905, but that the value is much greater. The figures for the year 1906 are not available at this date, but the following statement, showing the metal produced during the years 1903-1905, gives a good index of the extent of operations:

	1903.	1904.	1905.
Silver, oz. fine	6,489,680	7,551,667	6,804,304
Lead, tons	93,293	100,098	93,182
Zinc, tons	586	299	544
Value of metals	£1,700,929	£2,088,784	£2,141,417

In addition concentrates were exported Europe as follows

	1903.	1904.	1905.
Quantity, tons....	76,854	140,464	270,474
Contents by average assay			
Silver, oz. fine	1,706,512	2,945,056	5,480,561
Lead, tons	21,701	39,507	69,044
Zinc, tons	14,625	22,518	30,637
Value	£ 808,714	£ 642,125	£1,181,720
Total value of output	£2,089,643	£2,730,909	£3,313,037

The zinc contents have only been calculated where that metal is paid for, and the increase in the exports of zinc concentrate is thus very apparent.

The value of the production of silver-lead in Tasmania for the first nine months of 1906 is £342,557. The mines in the Zeehan and Dundas districts, on the West Coast, are in a thriving condition, and the indications are favorable to a sustained output.

In Queensland the bulk of the output has been contributed by the mines at Mungana. The permanence and extent of the sulphide lodes are regarded as so assuring that a complete Huntington-Heberlein plant, crushing appliances, roasters, etc., were installed during the year, and have given gratifying results.

COPPER

As was only to be expected, the mining for copper has received a marked degree of attention. The copper produced in the eastern states during 1905 was valued at £2,258,000, and the fact that these figures were exceeded by the output for the first nine months of the year 1906 may be accepted as proof of the flourishing condition of affairs

In the state of Tasmania the Mount Lyell Company has taken full advantage of the favorable market, and for the twelve months ended Sept. 30, 1906, produced blister copper containing 9000 tons of copper, 703,045 oz. silver, and 23,088 oz. gold, the profits earned during this term amounting to £495,000. The manager has furnished an estimate of the ore reserves which assures a continuance of successful operations under present conditions for a lengthy period.

In New South Wales the results achieved have been altogether of a satisfactory nature. The production for the first nine months of 1906 is valued at £534,000, which is £7000 in excess of the total value of the output for 1905, which previously stood as a record. The Great Cobar mine was taken over by a new company, and arrangements are now in progress which, in the near future, will permit of the present output of 600 tons of ore per diem being increased to 1500 tons, a quantity which the orebodies seem well capable of contributing. The other established mines in the Cobar district have furnished substantial outputs, while several new and promising lodes were opened up during the year. Nothing has yet been done in the way of providing for the treatment of the large bodies of auriferous copper ore on this field, and the combining of interests to this end is much to be desired. The Lloyd Copper Company, Burraga, was fortunate in re-locating the lode which had been faulted, and has thus received a fresh and vigorous lease of life.

The Wallaroo & Moonta Mining and Smelting Company, in South Australia, was able to resume the payment of regular dividends, despite the heavy outlay incurred during the past two years in repairing the damage occasioned by the fire in the underground workings of the Wallaroo mine, and also in the installation of new plant. On the basis of the production for the first nine months the output for the year 1906, including that from purchased ores, should reach 7250 tons of fine copper. It is expected that the beginning of the year 1907 will see the work of restoration completed, and that the company will then be in a position to considerably augment the production. At the Moonta mines, the new workings at Truers, and the old North Yelta property, are being vigorously developed, and there is every prospect of large supplies of ore being made available.

Of all the states, Queensland has shown the greatest advance as a producer of copper, a yield valued at £600,844 being contributed during the first nine months of 1906, which is £97,207 more than the value of the output for the whole of the year 1905. The Chillagoe Company has benefited greatly by the rise in price, and has been enabled to earn substantial profits. Some promising developments are reported, the best being that of the Queenslander lode at Morrison's. The O. K. and Mount Molloy mines have come prominently into notice as large copper producers. Some doubt was expressed as to the quantity and value of the ore reserves in the O. K. mine, but a recent report by Dr. R. L. Jack shows that no anxiety on this score need be felt, as the ore in sight is sufficient to maintain the present output for some 17½ months. Work on the Clonecurry field has been active, operations being stimulated by the proposal to connect the field with the existing railway system. The Mount Morgan Company, as previously mentioned under the heading of gold, is now engaged extensively in the treatment of the cupriferous orebodies, and for the September quarter the output totaled 1027 tons blister copper.

TIN

Operations on all the tinfields have been characterized by incessant activity, and a largely augmented production has to be recorded. The mines of Tasmania furnished an output of 3189 tons of ore, valued at £384,069, during the first nine months of the year, which exceeds that for the same period in 1905 by 468 tons, and £130,023 in value, and is greater by some £21,000 than the value of the output for the whole of 1905. The Brisbane and New Brothers Home No. 1 mines have been favored with a plentiful supply of water, and have been thus enabled to deal with large quantities of [illegible] tin ore, averaging 1½ to 2 per cent. The high price ruling for tin permitted the Mt. Bischoff company to conduct operations profitably on ore of very low grade, but during the month of September the value of the ore decreased to such an extent that the output of concentrates fell from 100 to 70 tons per month. Attention has accordingly been directed toward effecting further economies in working, and in securing improved recoveries by the tin-dressing plant. It is thus hoped that a monthly output of 60 tons of concentrate can be still maintained. Consideration is also to be given to the question of treatment of the available pyritic ores. During the past 30 years this mine has distributed £2,070,000 to shareholders, or at the rate of £173 5s. per share.

New South Wales also shows decidedly improved returns. The feature of the industry is the success which has attended the operations of the dredges in the Inverell-Tingha district, which were installed to treat the stanniferous gravels mostly worked over by ordinary methods in past years. During the September quarter of 1906 fifteen plants won 269 tons of ore, valued at £30,000. The yield obtained in the month of September by the three principal dredges averaged 2.5 lb. of tin ore per cu.yd. of material treated, valued at 32.2d., which, after deducting all expenses, gave a profit of 22.6d. per cu.yd. Other plants are being erected on similar areas in the state, and there are indications that many years of profitable work are ahead.

The mines within the confines of what is known as the Walsh & Pinaroo field in the state of Queensland have yielded most satisfactorily, and the developments at the lower levels have been especially encouraging. The principal contributing mines are the Vulcan, Stannary Hills, and Arbouin. At the 900 ft. level in the Vulcan mine, a lode body was exposed which gave a value of 10 per cent. The dredges operating at Stanthorpe, on the New South Wales border, have also secured very good returns.

OTHER MINERALS

The favorable price ruling for antimony has stimulated the mining for this mineral. The chief centre is Hillgrove, N. S. W., the value of the output for the September quarter being estimated at £16,000. From Woodville and Northcote within the Hodgkinson field, Queensland, fair supplies of ore have also been drawn. The production of wolfram shows a considerable falling off, as compared with the previous year. The bulk of the yield is still contributed by the mines of Queensland, principally in the Herberton and Hodgkinson districts. The estimated output for the state of Queensland for the year 1906 is 715 tons, valued at £56,300, as compared with 1449 tons, valued at £99,873, for the previous year.

PRODUCTION OF PETROLEUM

California—Texas—Louisiana—Ohio—Indiana—Mid-Continent—Appalachian Field

articles. The total production in 1906 is tabulated below and shows a decrease from the previous year. It will be noted that while there was a large increase in [illegible] falling off in Texas.

PRODUCTION OF CRUDE PETROLEUM IN THE UNITED STATES.
(In barrels of 42 gal.)

Fields	1906	1905
[illegible]	[illegible]	4,000,000
[illegible]	[illegible]	1,600,000
Texas	[illegible]	15,000,000
Louisiana...	[illegible]	7,000,000
[illegible]	[illegible]	2,000,000
[illegible]	[illegible]	2,500,000
[illegible]	[illegible]	1,200,000
[illegible]	[illegible]	2,000,000
[illegible]	[illegible]	8,000
[illegible]	[illegible]	600
Total	[illegible]	141,004,565

[illegible] by the California Producers Association.
[illegible] U. S. Geological Survey.
Kansas, Indian Territory and Oklahoma.
Pennsylvania, New York, West Virginia and Eastern Kentucky.

Petroleum Developments in Louisiana and Texas

The predominant feature of the petroleum situation in Texas and Louisiana during 1906 was the large decrease in production as compared with that of 1905. This decrease was practically confined to what is known as the Gulf coastal field. The Powell and Corsicana fields in north Texas (which produced about 450,000 bbl. in 1905) will probably not show any great variation in output, although drilling was active in the Powell field. The output of petroleum in 1905 in Texas was 28,136,000 bbl., and in Louisiana 8,910,000, a total of 37,046,000 bbl. of which all but about half a million barrels was derived from the coastal fields. The 1906 production (assuming that the December output will be equal to or slightly less than that for November—and there is little doubt but this will be a fact) will be about 13,000,000 bbl. in Texas and 7,000,000 bbl. in Louisiana, a total of 20,000,000 bbl. These figures indicate a decline in Texas and 1,900,000 bbl. in Louisiana, a total decline of nearly 15,000,000 bbl.

lead the van in petroleum production as it did in 1905, but will almost certainly be exceeded in output by the California, Appalachian, Lima (Indiana), and Mid-continent fields. To appreciate the situation and causes for such a marked decrease in 12 months, it is well to state the fact that the great porosity of the reservoir rocks in the coastal region makes the inital flow of the wells very large and the life of the wells proportionately short. The oil pools are also usually small in area, the gas pressure being very strong, and the fields overdrilled, so that each pool, when discovered, has been developed to its maximum output in a very short period.

No new productive gusher fields were [illegible] up in 1906 and for the reasons above stated the fields that were so productive in 1905 did not yield as they did in 1905.

The Humble field in Harris county shows the largest decline, as from a production of 60,000 to over 100,000 bbl. per day it has fallen off to 7000 bbl. per day in December, 1906.

COMMERCIAL CONDITIONS

The average price of crude petroleum in 1905 was slightly less than 27c per bbl., while the price steadily advanced during 1906 until it is now between 65 and 75c. in the various fields. The average price for 1906 will likely be in excess of 50c., so that while the decline in production is large, the money value of the output will probably exceed that of 1905 and perhaps that of California for 1906, although the output of the latter State for 1905 will be double that of the Texas-Louisiana fields. During 1906 the consumption of crude has greatly exceeded the production and in face of rising prices, that tend to restrict the consumption for fuel, the surplus petroleum in tanks has been reduced from 20,000,000 bbl. to about 11,000,000 bbl., of which two-thirds is held by refining interests.

From the standpoint of the well owners, 1906 was probably more profitable than any previous year. For while the production was vastly less, facilities for handling the product and prices were much better. In spite of the phenomenal production of the fields in gusher times very few operators made any money, the refineries and the fuel users reaping most of the benefit of the drillers' enterprise, but in 1906 even the owners of small wells producing 40 to 100 bbl. daily made

LOUISIANA FIELDS

While many wild-cat wells were dril[illegible] in Louisiana in 1906 the only co[illegible]mercially successful operations were c[illegible]fined to the old fields of Jennings, We[illegible] and Anse Le Butte; the last two ha[illegible] been small producers, probably less th[illegible] 75,000 bbl. for the entire year. The m[illegible] promising new field is at Caddo, n[illegible] Shreveport, where, after much delay a[illegible] loss occasioned by the heavy gas pr[illegible]sure, some wells have been develop[illegible] sufficiently to give promise of being su[illegible]stantial producers in 1907. The Je[illegible]nings field is by all odds the best in t[illegible] coastal region, although the crude [illegible] practically available only for fuel. Ma[illegible] new wells were drilled and old on[illegible] deepened, and production held up bett[illegible] than in any other southern field, as demonstrated by the November outp[illegible] of 535,000 bbl., compared with 661,0[illegible] bbl. in November, 1905. This showin[illegible] is attributed to the fact that it has bee[illegible] developed by strong companies and n[illegible] overdrilled like nearly all the oth[illegible] coastal fields.

TEXAS FIELDS

In many Texas counties prospectin[illegible] was active and many wild-cat wells wer[illegible] drilled. This prospecting covered [illegible] large area of territory, though naturall[illegible] more wells were drilled in the Gul[illegible] coast counties, where the topography an[illegible] geological formation are similar to thos[illegible] of the present producing fields. Mos[illegible] of these wells were abandoned as dr[illegible] holes or salt-water producers, and none developed sufficient petroleum to indicate a new gusher field or to create any boom.

The fields located in 1905 and previous years were actively worked by drilling new wells and cleaning out, deepening or pulling the pipe up to the upper sands in old wells. Operators in gusher times did not care for small wells pumping 25 to 100 bbl. daily, but improved prices and economical arrangements for pumping made them profitable in 1906.

The largest producing field of Texas in 1906 was Humble, followed by Batson, Sour Lake, Saratoga, Spindletop and Dayton. All show a decline as compared in 1905 except Saratoga, which was producing more oil than any other Texas field at the end of 1906, and will likely show an increased output. This field produced 235,000 bbl. in November, 1906, as against 159,000 bbl. in the same month in 1905 and is the most promising of the old fields for the same reasons referred to in discussing the Jennings field in

Louisiana. The sensational yield of Spindletop, near Beaumont, which started the boom in Texas petroleum, produced only about 50,000 bbl. in December of 1906 as against 143,000 in December, 1905, and all the wells are pumpers. In fact none of the coastal-field wells can now be termed gushers, although when first brought in some of them had an initial flow of a few thousand barrels. Many, however, especially at Jennings, are caused to flow by air pressure and have still a daily output of from 500 to 1,500 bbls.

PRESENT CONDITIONS

The former conditions and supposed course of development of the coastal field and its actual standing at the end of 1906 are aptly and briefly set forth in a circular issued recently to stockholders of the J. M. Guffey Petroleum Company. A portion of the circular is as follows:

"The J. M. Guffey Petroleum Company was organized in May, 1901, shortly after the discovery of oil at Spindletop, which was the first oil field discovered in Texas. At that time it was supposed that the supply was practically inexhaustible and the company at its organization acquired a very large territory, upward of 1,000,000 acres, of what was supposed to be undoubtedly and practically invaluable oil territory; and for this it issued $15,000,000 of capital stock. It was very soon discovered, however, that the Spindletop field was of exceedingly limited area, the fact being that 90 per cent. of the entire production of that field has come from about 100 acres. It was also found that the life of the field, contrary to all expectations, was exceedingly short, the wells very soon ceasing to flow, and within a few years it practically disappeared as a producing field. A little more than five years have elapsed since the discovery of the Spindletop field, and in that time five additional fields have been found. The total productive area of all these fields probably does not exceed 1000 acres, and at the same time they have been found widely scattered, the fields or pools so developed being as much as 190 miles apart, which has entailed not only a large expenditure in the discovery of the fields, but also very great outlays of capital for pipe lines and storage facilities. These fields also have all of them had but a short life. At the present time the total production of oil in the State of Texas is about 30,000 bbl. per day, and of this only about 12,000 bbl. is of such quality as to be available for refining. The Louisiana fields are producing about 15,000 or 20,000 bbl per day, but there are no pipe lines connecting this field with the properties of the Guffey and Gulf companies, and the oil is not generally of such quality as to be refinable."

While the above quotation is not optimistic, it must be borne in mind that Texas refineries and tankage represent a large investment of capital and that they have exceptional shipping facilities by land and water and they will use Indian Territory oil. The center of the Southern petroleum industry will remain in Beaumont and Port Arthur and active prospecting will continue during 1907, because the lack of suitable coal within a reasonable distance will keep fuel oil at a price that will make even small producing wells remunerative and any large gusher output would still be handled by the refineries at prices commensurate with quality. Moreover, while actual conditions during 1906 have been unfavorable, it cannot be assumed that the coastal field is destined to a steadily declining production, for it requires only a few months to develop the maximum production of its gusher fields, one of which may be located any day. Past experience shows, however, that to maintain its production one or two new pools must be discovered each year

Petroleum Production in the Appalachian and Lima Fields

BY HAROLD C. GEORGE*

Neither the increased demand for high-grade petroleum nor the advance in price over 1905 seems to have been a sufficient stimulus to maintain production in the Appalachian fields during 1906 at the level of the previous year. A similar decline is noticed in the Lima field also, although the latter does not produce high-grade petroleum.

The Appalachian oil-fields, which produce the high-grade petroleum of the United States, include the oil-field of western New York, all the fields of Pennsylvania in the various sands, the field in southeastern Ohio in the Berea grit, and the fields of West Virginia, Tennessee and Kentucky. The Lima field includes the oil-pools in northwestern Ohio and northeastern Indiana in the Trenton formation.

The gradual decrease in the production of the fields producing high-grade petroleum is attributed not so much to the natural decline in the production of the old wells as to the failure of West Virginia and southeastern Ohio to produce wells of the gusher type. Very few large wells have been struck. The oil territory of western New York and northern Pennsylvania seems to produce each year fewer wells and fewer attractions in the petroleum industry.

WESTERN NEW YORK AND PENNSYLVANIA FIELDS

The old wells in the Allegheny field in New York, and the Bradford and Warren counties fields in Pennsylvania, average about ¼ bbl. per day, while the new wells in the same fields average only about 3 bbl. daily. This indicates that practically these fields are things of the past. Very little new, undrilled territory is left, and operations are confined mostly to improvement in methods of operation. Many of the old wells are being abandoned and the material secured from them is being used to equip new wells drilled between the locations of the old ones. By this method of procedure many prospects which were about to be abandoned have been put on a paying basis.

In the Venango-Clarion county pools of Pennsylvania, which include the new developments in Jefferson and Mercer counties, there is still much territory to be tested.

Mercer county has afforded some good wells regularly; and the activity in Jefferson county, which has not been very thoroughly developed, may produce some new pools in the near future.

In Venango county, Pennsylvania, in the old Bullion district, made famous by the "Big Injun" strike of thirty years ago, one of the largest gushers the State has seen in years was struck in October. This well started off at 1500 bbl. per day.

The pool in Butler county, which created so much excitement in the fall of 1905, has experienced a decline as rapid as its growth. No more large wells have been struck, and the gushers of last year have almost ceased to be producers. The new wells in the Butler-Armstrong county field average about 5 bbl. per day.

The Burgettstown field in Washington county, Pennsylvania, produced some excellent wells in 1906. Six were completed in March which averaged 45 bbl. apiece, and twenty were completed in April which averaged 30 bbl.

The Beaver-Allegheny county field of Pennsylvania has produced nothing but small wells and dusters during the year. It has been thoroughly tested and its limits defined, and the territory offers nothing to encourage renewed activity.

The one field which, in its producing status, is the exception in Pennsylvania oil territory is the new one in East Finley township, Washington county. All the other fields of the state show a steady decline without any promise of renewed activities. Nearly one-quarter of the wells completed in Pennsylvania in 1906 were dusters, and the average production of the remainder was very low.

SOUTHEASTERN OHIO AND WEST VIRGINIA

The oil-field of southeastern Ohio embraces Washington, Harrison, Monroe, Morgan, Mercer, Belmont, Jefferson, and Noble counties. Some very good wells have been drilled in Washington county. Several of the largest wells have been found in the Maxon sand. In this region the "Big Injun" sand has previously been regarded as the principal producing formation; and the tendency is to regard the recent large wells in the

*Instructor, Western University of Pennsylvania, Allegheny, Penn.

turrence only. Operations have been active in ... during the past year. The Berea grit. The Woodfield district in Monroe county has been the most active in southeastern Ohio. In addition to operations under way and being begun inside of defined limits, there is much work in advance of the old developments. In southeastern Ohio the old districts have been fully developed, and, except in a few localities, there is no longer room for additional wells.

The wells in West Virginia produce 45 per cent. of the total production of the fields producing high-grade petroleum. This gusher territory has been gradually declining. With the single exception of a new pool in the Green district in Wetzel county, no territory in West Virginia has furnished inducements for renewed activities during the winter of 1906-

When operations are resumed in the spring of 1907, they will probably be a repetition of the work of 1906. Drilling in old territory and an occasional test, looking for extensions in some of the old fields, will then, as now, be the rule. The wells completed during the latter part of 1906 have, as a rule, been light producers, located within definite limits. During the past year several good strikes were made in the Point Pleasant district in Tyler county. There has been considerable interest aroused in the new developments on State Road Run in Wetzel county. There is room for a pool of some dimensions in this locality; and the territory has not been condemned by any previous tests.

In Roane county the extension of the Rowell's Run district in Calhoun county has attracted some notice, as most of the wells drilled are test wells of more or less importance. In Ritchie county the salt-sand district received much attention. The developments extend over a large area; and a large percentage of the work is of the experimental kind. In the extreme lower southeast, in Cabell, Lincoln, Putnam, and Kanawa counties, West Virginia, some new work was started during the fall of 1906; but in all, save Cabell county, it was purely experimental. In general it can be said of operations in West Virginia that there has been a general decline, especially in the deep-sand district. Except for the new work projected by the various gas companies and the test wells drilled, things have been very quiet. The territory that awaits development is not good for anything better than light pumpers; and the expense of drilling and equipping small wells is too great to induce investment. The work under way consists of drilling odd wells in the old fields, which, if they prove remunerative, can be operated in connection

KENTUCKY

... to have had practically no petroleum developments in Tennessee during 1906. Kentucky operators continue to manifest interest in the theory of a connecting link between their developments and the new field in southern Illinois, but nothing has yet been furnished to support it. Operations in Kentucky are confined mostly to Wayne and Wolfe counties; and the new wells completed from month to month help to sustain a total production of about 3000 bbl. per day.

LIMA FIELD

The Lima oil-field shows a general decline in the number of wells completed, in new production, and in field operations during the year. This is due not so much to market conditions as to lack of territory. The Illinois oil-field has also had a great effect in checking operations, by attracting many operators from the Indiana and the Buckeye districts. The decline in the Lima fields has been very marked. Large numbers of wells have been pulled out, and the junk secured from these has found a ready market in the southern Illinois field.

In brief, the report on the Appalachian and Lima oil-fields for 1906 may be expressed in one word—"decline."

The total production of the Appalachian field in 1906 was 27,345,600 bbl., as compared with 28,324,324 bbl. in 1905. The output of the Lima field in 1906 was 25,680,000 bbl., as compared with 22,102,108 bbl. in 1905.

The following table gives the average value of petroleum in the Appalachian field per barrel at the wells by months throughout 1906:

January	$1.58	July	$1.63½
February	1.58	August	1.58½
March	1.58	September	1.58
April	1.60 1/10	October	1.58
May	1.63	November	1.58
June	1.63	December	1.58

In the Lima fields the average value at the wells ranged round 90c. per barrel.

The above figures are the prices paid by the Standard Oil Company. Nearly all other oil companies pay from 5 to 10c. per barrel more for crude petroleum. Some districts, too, received more than the average market price—as, for example, Warren county, Penn., whose oil is worth 10c. per barrel more than that in any other Appalachian district.

California

The output of petroleum in California in 1906 has been estimated by the secretary of the Petroleum Miners' Association at 34,500,000 bbl., with a value of something over $7,000,000, as compared with 35,671,000 bbl. in 1905. California has thus been the largest single producer of oil in the United States for four years, although in point of value of the product the State ranks below Ohio, West Virginia, Pennsylvania and Indiana.

Oil and Gas in the Mid-continental Field

BY ERASMUS HAWORTH*

The production of oil and gas in the mid-continental field was much greater in 1906 than in any previous year. The oil was bought principally by the Prairie Oil and Gas Company, the Standard Oil Company in Kansas. At present there are nine independent refineries in Kansas and one in Indian Territory, but their consumption was small, due in part to their small size and in part to the fact that a number of them did not begin operation until late in the year. A considerable amount of oil was used for fuel and was shipped to many places here and there over the State. One producer, Hon. C. A. Stannard, operated a system of tank cars and supplied customers in western and central Kansas with a comparatively large amount of crude oil.

The following table gives a monthly statement of the oil purchased by the Prairie Oil and Gas Company, to which is added an estimated amount for all other consumption:

PRODUCTION OF CRUDE OIL IN THE MID-CONTINENTAL FIELD, 1906.

Month.	Total Run.	Daily Average.	Deliveries	Stored.
	Bbl.	Bbl.	Bbl.	Bbl.
January	1,472,214	47,491	539,009	933,205
February	1,352,531	48,305	527,996	824,536
March	1,693,182	54,619	719,320	973,862
April	1,779,251	59,308	752,625	1,026,626
May	1,741,941	56,192	802,838	939,103
June	1,688,403	56,281	642,128	1,046,304
July	2,022,215	65,233	668,439	1,353,776
August	1,779,262	57,396	900,755	878,508
September	1,546,719	51,557	846,128	700,591
October	2,009,650	64,827	1,559,520	450,130
November	1,945,195	64,839	1,680,928	264,267
December	1,920,562	64,019	1,528,524	392,038
Total	20,951,155	690,067	11,168,209	9,782,946
Other sales	973,750			
Grand tot'l	21,924,905	690,067	11,168,209	9,782,946

No available method is at hand at present to determine definitely what portion of the above grand total given came from Kansas and what portion from Oklahoma. It is probable, however, that about one-fourth of the entire amount came from Kansas and three-fourths from Oklahoma.

DEVELOPMENTS

During 1906 the only new development of any considerable note was in the Glenn pool area, a few miles southeast of Red Fork. Here a wonderful pool of oil was discovered, which already furnishes many wells producing more than 1000 bbl. a day. Apparently the boundary of the pool has not yet been located, as new wells occasionally are found almost on all sides of it.

The next most remarkable discovery

*State geologist, Lawrence, Kansas.

was in Section 27, east and a little south of Dewey and makes northeast of Bartlesville. Here is an area nearly one mile across which was wonderfully productive in which also a few 1000-bbl. wells were brought in. Drilling was so active, however, that they soon had the boundaries of the pool located and the wells have now run down to 200 to 300 bbl. daily capacity.

A large amount of development was carried on during the entire year with an aggregate of close to 2000 wells drilled. During the first half of the year development was very active in the shallow pool around Alluwe and a very large production was obtained, some wells reaching 400 to 500 bbl. capacity. The next greatest production was in the Osage near the eastern boundary, south of Bartlesville. Next to the Glenn pool this area remains the most remarkable in the mid-continental field. It seems that we have here a long, slender, north and south pool lying parallel with the ninety-sixth meridian, which is the boundary between the Cherokee and the Osage lands, lying principally in the Osage, with a few good wells east of the boundary line and a few from five to ten miles to the west. In a north and south direction the pool extends nearly to Tulsa, with only occasional dry wells interspersed. A number of these wells started at 1000 bbl. per day and they held up their capacity as well, or better, than any other wells in the area. Farther west in the Osage, drilling has been done irregularly with quite indifferent success. Some wells are good oil wells, others good gas wells, and quite a number of them are dry.

But little drilling has been done in Kansas during the year. Early in the year there was some development in the vicinity of Paola, Osawatomie and Rantoul, also a small amount in the Huffman field, Chautauqua county, five miles west of Peru, and an occasional well elsewhere here and there over the entire Kansas territory. But in general all the drilling done in Kansas was in searching for gas, as will be explained later.

MARKETS

The Prairie Oil and Gas Company is the principal purchaser of oil, and, therefore, fixes the price. The lesser concerns consume but little, and, although occasionally they bid a little above the market price, they have little, if any, influence on the market. In fact, some of them can hardly obtain as large a quantity as they desire. There is a sentiment abroad that if a producer once sells to an independent concern the Prairie Oil and Gas Company will not take his supply or any fraction of it. It is probable this has not been put to a test, but the wide-spread belief that such would be the case has kept a number of people selling to the Prairie and declining bids from others.

At the beginning of the year the price paid was 52c. per bbl. for oil with a specific gravity of 32 deg. B. or higher. During the summer this price gradually dropped until the low mark of 39c. was reached in August, at which point it has remained. For oils heavier than 32 deg. B., in most cases a reduction of 5c. was made for each half degree.

GAS

The mid-continental field has witnessed the most activity in developing and marketing gas. The Kansas Natural Gas Company got its pipe line laid to Kansas City, Kan., Topeka, Lawrence and Leavenworth before the close of 1905, and by February the pipes were in Atchison and St. Joseph, Mo. Certain difficulties regarding a franchise kept them out of Kansas City, Mo., until the autumn of 1906. By the close of 1905 also a pipe line had extended eastward from the gas fields to Joplin and Carthage in Missouri with laterals ramifying the entire Joplin mining region. During the summer of 1906 a pipe line was carried westward from the gasfields toward Wichita and Hutchison and has just now reached the former city. All of these mains have laterals from which they supply the various towns and villages along their lines.

To supply such large quantities of natural gas for domestic consumption it is necessary to have a large amount developed in the gas fields. On this account drilling has been fairly active in many different parts of the gas fields of Kansas. The pipe line reaching northward to Kansas City, etc., is supplied principally from the vicinities of Iola, Humboldt, Chanute and Neodesha and intervening locations; that eastward to the Joplin area is supplied from the Montgomery county fields in the vicinity of Independence and Coffeyville, and the supply for the western pipe line will come principally from western Montgomery, Chautauqua and other counties in Kansas, and probably from the Cherokee and Osage country, although that matter is not definitely settled. It is reported that a prominent gas producer applied to the Secretary of the Interior for permission to pipe gas out of Indian Territory and was denied the privilege. There seems to be no law, however, to prevent such an undertaking.

During the year the most extensive developments of gas were in Montgomery county, Kan., south of Independence and in the Cherokee Nation throughout a strip from five to ten miles wide, reaching from the south side of Kansas southward almost to the Arkansas river. In fact gas has been developed in Indian Territory to such an enormous extent in connection with oil development that the Cherokee and Osage territories probably could supply two or three times as much gas as is developed in Kansas. A great deal of this Territory gas is shut in awaiting a market, while other portions are piped to various towns and villages and retailed for domestic consumption. Practically no large manufacturing concerns are established south of the State line. This is due to land titles in Indian Territory. Different laws of Congress and different rulings of the Interior Department have matters in such a shape that to the ordinary mind they are very confusing, and, as a result, capitalists prefer to remain away rather than jeopardize their holdings by insecure titles.

In Kansas, however, factories are on the increase so rapidly that the best judges are becoming alarmed lest the gas should become entirely exhausted. A number of zinc smelters in the State have enlarged their capacity and portland cement plants have increased in number and in size. Five such plants are now in operation, consuming from 40,000,000, to 50,000,000 cu.ft. of gas per day, and two or three others are in contemplation.

Gas wells near the southern end of Kansas and those in the Cherokee Nation generally are very large. A well from 10,000,000 to 15,000,000 cu.ft. per day is nothing unusual, and some of them run up to 30,000,000 or 40,000,000. The somewhat famous well in the Cherokee Nation, which caught fire in the spring of 1906 and burned for several weeks, was estimated at 30,000,000 cu.ft. before the gas was ignited, and before it was completely closed it was estimated at 60,000,000 cu.ft. capacity, although no accurate measurements were made. In the outlying borders, however, wells average much less and some of them are even less than 1,000,000 cu.ft.

GAS MARKETS

The price of gas for domestic consumption along all of the long pipe lines is 25c. per 1000 cu.ft., meter rates. The Kansas Natural Gas Company is offering gas to large factories at 10c. a thousand, but this is generally considered higher than coal and as a result but little coal has been driven out of the factories. In the gas fields a number of the towns and cities still pay the same flat rates they did years ago, that is, from 10 to 15c. each for lights per month and from $1 to $2 each for stoves. Also, a number of the factories, such as the glass factory at Coffeyville, the brick kilns at Coffeyville, Independence, Sycamore, etc., get gas at the old rates of 3c. per thousand. But no new contracts on this basis are sought for by the gas companies. Occasionally parties owning gas will make such contracts for factories or for large consumers. It must be said, however, that all indications are that the day of cheap gas for large factories in this territory is almost past.

Rakes are much used by incompetent firemen to remove clinkers. The result of using this tool is to mix up the ashes and the coal, and makes the combustion take place under uneconomical conditions. The only occasion upon which the rake should be used is in drawing the fires, to replace the coal from one portion of the

COAL MINING IN THE UNITED STATES

The Technology, Markets and History of the Industry in 1906

in many of the bituminous districts during [illegible] alties, did not materially affect the coal output for the year. The differences that occurred were anticipated, so that a heavier tonnage preceded and followed the tie-up.

The great business prosperity of the year was visibly reflected in all our coal districts, and although many new mines have been opened and numerous virgin fields developed, the production is no further ahead of consumption than it was 10 years ago. In fact, the destructive competition that took place three years ago is now generally suppressed. This is not only due to the many large consolidations and better understanding between independent operators, but the revised contracts with labor, especially in Indiana and Illinois, has resulted in establishing a fair and fixed tonnage price for the product.

Indications point to a continuation of the present great activity in steel manufacture, which, as a criterion, is a favorable indication that the coming year will, if anything, surpass in activity the 12 months just gone.

Pennsylvania and West Virginia will continue to furnish a large part of the total output. However, it is expected that southern Illinois and eastern Kentucky will show, perhaps, the greatest new development, with Colorado as a close second.

For many years the fear of over-production has worried many coal managers and deterred capitalists, but the same feeling prevailed 20 years ago, and is as far from realization now as then.

Progress in Coal Mining in 1906

It can be truthfully stated that methods and ideas concerning the mining of coal materially advanced during 1906. The companies which manufacture mining machinery have actively kept pace with the more modern requirements, and as a consequence, the mining machines, motors, drills, ventilating fans and coal washeries have been considerably modified and many improvements effected. The greatest advance, however, is in the greater enlightenment that has been thrown upon some of the more difficult problems whose nature and solution have heretofore been obscure. Along with this increase of intelligence has come a sense of greater precaution, and more humane action on the part of mine managers, which condition has resulted in a widespread agitation for safer methods of operation, and a simultaneous desire by miners and officials for a stricter observance of the rules and laws necessary to afford greater security and comfort.

Of all the tasks to which men are assigned, there is, perhaps, none more disagreeable than that of the miner who spends his time underground; and of these workers, none endures greater hardship than the producer of coal.

The problem of greatest importance that has presented itself to managers and engineers during the past few years is the prevention of coal-mine explosions. The last 12 months has been a period of great effort toward the solution of this problem. Whether the increased loss of lives during 1906 has caused this sudden awakening and made us seriously face the conditions as they actually exist, I do not know. The fact remains that the general mining public, if not also our State and Federal governments, are evincing unusual interest in this vital problem.

A few years ago the engineers who believed that an explosion could occur with coal dust as the sole factor were in the minority, while at the present time such an opinion is general. We are now considering whether an explosion of dust can take place without the presence of any flame, and many competent authorities agree that such is the case. We are all ready to acknowledge that where a quantity of gas is present in a mine, the temperature of the gas-containing atmosphere may be so increased by sudden compression, due to a fall of roof or other like cause, that the temperature of ignition may be realized, and the gas exploded. We will also agree that such a pressure may react to a distant part of the workings, and there ignite an entirely separate body of gas. Without any gas present in a mine, there is no doubt that various dust explosions have been started by a blown-out shot, but whether a dust explosion can originate from such compression of the mine air as may be caused by a fall of roof without the presence of some gas, is a theory that we believe has yet to be proved. Dynamite or powder might be so exploded, but coal dust would not answer so quickly to such action.

PREVENTION OF EXPLOSIONS

In providing a remedy for dust explosions, several unique plans are being considered, and some of these arrangements have already been successfully installed. At some mines a reservoir has been placed at an elevation above the workings so as to give a considerable head to water that flows through pipes, which are extended along the main entries and into all partings where dust is likely to accumulate. This plan of sprinkling the mines and wetting the intake air has met with only partial success. It is well known that when a layer of coal-dust is sprinkled with water, the latter collects on top, while the dust underneath remains perfectly dry.

A second method is to haul a large part of the dust to the surface, where it is dumped, and to have parts of the mine absolutely free from dust. This is accomplished by arching certain sections with brick, or by frequently wetting a stretch of entry. By this method, a dust explosion will generally be confined to some one locality, and will not extend through the workings. Other plans are to have each car of coal pass under an automatic shower before it starts on the main haulway, while still another scheme is to have the fine coal loaded into separate cars which are covered before being moved.

Those managers who have overcome the dust problem by sprinkling salt or the chloride of calcium along the different haulways have been subjected to considerable initial expense, but the result desired has been attained. One ton of calcium chloride, costing $12, will treat 1500 ft. of entry. Salt, however, costing $3.50 per ton, will cover almost as great an area.

VENTILATION

In ventilating our mines, no radical improvements have been introduced; the tendency, however, is to increase the number of intake and return airways. Not long ago the general system was to have one main intake and a parallel return airway; but present practice favors at least two intake and two return airways, and in some instances five or six have been driven and are being successfully used.

Modern practice now requires that stone or heavy brick brattices be built to close the crosscuts and separate main airways. Overcasts cost about $48, and are much preferred to doors. Furthermore, when the cost of a trapper-boy is considered, the overcast is certainly cheaper and much safer. Modern managers also prefer to split the current into all cross-entries, and are specifying that their ventilating fans shall be readily reversible. In slope or drift mines the fan is generally run as an exhaust; while in shaft mines the blower system is preferred on account of hoisting during the winter, when, if the hoisting shaft is used for an intake, the collection of ice on the guide-rods and sides of the shaft during the

old mouths after years seem to do.

One other point in our ventilating system has attracted some attention. This consists in the use of booster fans in remote parts of large workings, where from leaky brattices and friction, the air current has lost some of its efficiency.

METHODS OF WORKING.

Great progress was shown during 1906 in the methods of mining that are used by some of the larger companies. It is no longer the practice to try to reduce the first cost of mining by sacrificing all regularity. Instead of driving entries water level to prevent any expense from cutting or filling, the scheme is to now drive all headings and rooms on carefully placed centers, with certain limits as to the distance of driving and the width of the room or entry.

Some bituminous mines are now procuring from 85 to 95 per cent. of all the coal contained in each acre of land. This is being accomplished by working the seam on what is known as the panel system with 15 to 25 rooms to each panel, and by then systematically robbing all the pillars that have been left.

In the anthracite coalfield the problems of mining are more numerous, and since the various companies are now turning their attention to mining thin seams of inferior coal, a greater number of difficulties are encountered. Anthracite mining will not admit of such a regular system of working as can be inaugurated in most bituminous districts; however, the development is made to conform as nearly as possible to the general plans laid out. Last year, in the anthracite field, for every ton of coal produced, 8.5c. was spent for timber and mine props. This immense drain on the available timber supply has caused the operators in this field to turn their attention to methods of preserving the timber that is used. The coming year will probably witness many successful experiments that will lead to modifications, and consequently better results in present methods of preserving mine timbers.

Since much success has attended the practice of washing and selling the culm that was formerly considered nothing more than waste coal, the operators are now turning their attention to the fine dust that results from this culm washing. The practice of flushing this fine dust into the mine is likely to be entirely discontinued, especially if it is found that this fine coal can be utilized profitably in making briquets. One other practice that is meeting with general disapproval is that of connecting the underground workings of adjacent mines. Not only is this action dangerous, but on closer study it is said to be unattended by the increased economy which was thought to result from the sinking of fewer shafts. It is to be hoped that legislative action will prevent this evil practice from being further extended.

In fighting the mine fire at the Warrior Run colliery, the anthracite managers have for the first time made an effort to analyze carefully all the gases besides taking daily temperatures and other data that may throw light on the action of such fires, and furnish information that will be useful in future efforts along this line.

The last year has witnessed a continuation of the struggle for supremacy between electricity and compressed air for driving coal-mining machines. The advocates of both of these systems are ready to prove the advantages of their favorite apparatus.

For hauling coal, electric motors seem to be meeting with the greater favor. Many of the new installations have been of the third-rail type, while the greatest advancement along this line has taken place in what are known as gathering motors, which carry their cable on a self-coiling reel, and since they are compact, often standing no higher than 30 in. above the rail, they are particularly useful in collecting cars from the face of rooms. Where the haulways in a mine are on a grade of from 8 to 14 per cent., rack-rail haulage has proved wonderfully successful, and the future will probably witness the installation of many such haulage systems.

One of the newer innovations is the steel mine car. The manufacturers of these cars are very optimistic, and stand ready to prove to operators that the day of the wooden mine car is past. One point in this connection is worthy of mention, and that is the bad practice of spragging mine cars; progressive managers now prefer to have all such vehicles supplied with a steel brake.

In European coal mines, a number of operators have installed electric hoists which seem to be meeting with much success; in this country, however, the hoisting power still continues to be furnished by steam. Successful winding drums are now built so as to combine the advantages of both the spiral and the cylindrical forms. By having the first four or five revolutions on a gradually increasing diameter, the engine is enabled to get under speed quickly, and the retardation at the end of the hoist is considerably lessened. The objection to drums that are entirely of the conical shape is that the increased width requires more inertia for driving. In connection with mine cars and other machinery, it is indeed well that superintendents are giving more attention to proper lubrication. Only recently when visiting a large and supposedly modern mine, I watched the men drop the loaded cars, that had just been hauled out of the mine, upon the tipple. The approach to the tipple was 200 ft. long and was built on a 1.75 per cent. grade which had in previous years been sufficiently steep to cause the loaded cars to run by gravity upon the tipple. The fact that a man now had to push each car almost all the way to the dumping point attracted my attention, and subsequent investigation proved that the whole trouble was caused by the cars not being properly lubricated. It would be interesting to know what amount of power is being needlessly expended in hauling these rickety, poorly oiled cars through that mine every day.

SURFACE EQUIPMENT.

The improvements that have taken place in our colliery surface plants are too numerous to be dealt with at length. The tendency has been to do away with all outside labor, by substituting mechanical devices, and to concentrate the outside plants as much as possible, thus preventing the loss that results from having to carry steam or other power long distances. Much attention has been directed toward having the intake at a sufficient distance from the tipple or dumping point, so that whatever dust is raised in handling and loading the output will not be distributed and drawn back into the mine. At one operation, an expenditure of less than $5000 enabled the company to do away with four men who had been employed on the tipple and received from $1.75 to $2.50 per day. This result was accomplished by the installation of self-dumping cages, and by having a heavy pan-conveyor carry the coal that was hoisted, from the top of the shaft to the head of the gravity screen. In coal washeries and other places where water is to be lifted to a hight less than 100 ft., practice is now favoring the installation of turbine pumps instead of the old-fashioned steam pump.

FORMATION OF COAL.

A great many theories have been evolved dealing with the methods and forces that have operated in forming our coal deposits. Of the many ideas recently presented, the one most favorably commented upon ignores the conclusion that our coal beds are the remains of great primeval forests. More careful thought and examination leads us to believe that all of our coal seams have been formed from minute vegetable matter that has probably lived and flourished at the bottom of inland lakes, being deposited year after year for a long period, and then covered with layers of sand and other materials, while later ages have furnished the pressure and heat necessary to complete the transformation. The principal argument in favor of this theory of fine vegetable matter forming our coal is that the parting between our known coal seams and the underlying and overlying strata is perfectly uniform and even. The strata forming the floor for our beds of coal do not show any traces of the roots or stumps of large trees, nor indeed any evidences of large vegetable growth.

COKE MANUFACTURE.

We are on the eve of a great awakening to the immense losses that have resulted from making coke in bee-hive ovens and allowing all gases and by-products to be wasted. If the power that has already been lost in the [illegible]

facture of coke, could be made available at the present time, it is fair to say that the factories of our country would not have to purchase coal to produce power for many years to come. This great and inexcusable waste has been one of the [illegible] industrial history.

By-product ovens are coming into greater use, and where operators persist in retaining the principles of bee-hive ovens, they are in many cases modifying the style by building their ovens 25 to 30 ft. long and 6 ft. wide. The by-product oven does not produce a coke with a silvery luster like the products that come from the bee-hive ovens; however, the structure and quality of the by-product coke is not far inferior to that of the old-fashioned product. In a number of instances where ovens have recently been constructed, the arrangements have included a long main flue running behind the ovens and connected to each one by smaller flues, thus catching the gases that have heretofore been lost. These gases are carried to the power house and there burned in gas engines, and used to manufacture steam. A considerable saving with little extra expense is thus effected.

CO-OPERATIVE MINING

A brief review of the work accomplished during the past year would be incomplete without a reference to co-operative mining. Two conditions are absolutely necessary in creating efficient workmen: the first is encouragement; the second is enthusiasm. The latter will not be present if the first is not exercised, and encouragement is the cheapest gift in the bestowal of a mine manager. One other fact may be mentioned as a basis for enthusiasm, and that is a thorough and intelligent understanding of the work in hand. A man who can read nothing but English will not be likely to grow enthusiastic over an article in a German paper; neither will a miner who is unfamiliar with the principles of ventilation or the effect of mine gases be sufficiently interested in building his brattices or hanging a curtain. The foregoing statements may be advanced as the fundamental principles on which successful co-operative mining is based. This leads us to a consideration of the plan which is successfully carried on at several different localities in America. One operation of such a character is at Saginaw, Mich. This mine is owned entirely by the workmen who operate it. They establish prices, make contracts, and go underground to dig out the product. There are no strikes here, for every man is personally interested in the welfare of the operation.

The company was first organized with 100 men, and a capital stock of $50,000. After a year of success, however, it has been decided to increase the capital to $250,000, and the company to 500 miners. Some of the men had no money, and arranged to pay their part in labor.

When trouble was expected in Ohio this year the Caledonia Company, as this co-operative mine is called, was flooded with orders, due to the fact that consumers knew there would be no shut-down at this property.

The men at the Caledonia mine choose their own superintendent, who is responsible to a board of managers elected by the miners. Other men, noting the success of this new venture, have formed companies along these lines, and as every employee is interested in seeing that the product turned out is of the best, the mines have succeeded in establishing a reputation for themselves, as well as surviving the fiercest kind of competition. There have been many instances where co-operative work of this sort has utterly failed, while, on the other hand, the advocates of the system can point to a number of examples where success has attended the efforts of the men thus engaged.

LEGISLATIVE ACTION

The mine inspectors of the larger coal States are urging their respective legislatures to revise the present laws, so that coal-mine development will hereafter be governed by more stringent rules, which will insure greater safety to the men, and as a final result, less worry and expense to the operator. At no place is military discipline so necessary as in the operation of a mine. It would not be bad policy to have our mines policed, and see that all workmen are arrested for such infractions of rules as smoking, or having matches in a gassy mine; or for carrying powder, entering a place marked "danger," neglecting to report the strength of brattices, etc.

The organization of rescue teams is no longer an idle dream, as is proved by the recent meeting held in Scranton, Penn. All the mines of one large company were represented in this event, and the work done by the different teams showed the result of conscientious training, and promises well for the future of this important work.

Recent investigation has gone to prove that barometric pressure has a probable effect upon gases in a mine, and consequently exerts considerable influence on mine explosions. The humidity of the air, which is also closely allied to barometric pressure, has an undoubted effect upon the conditions that govern and make mine explosions possible. In this connection it is likely that the Government, both Federal and State, will investigate this hypothesis during the coming year, and be of much service to the mining industry. There is no doubt, that if through our weather bureau, mine managers could know of the movements of areas of high and low barometric pressure, certain precautions might be taken that would result in a reduction of accidents and a material saving of life.

I remember during the summer of 1902, when the whole country was agitated because of the terrible coal strike that was taking place, causing the price of coal to be raised until its purchase by the common people was almost impossible, a coal operator (whose mines were working because he employed unorganized labor) rubbed his hands and smilingly told me that there was no doubt but that coal was king. So long as things run smoothly the general public does not realize this fact, but let the wheels that govern the production of coal, whether the time be winter or summer, stop for a short period, and see what alarm prevails and suffering ensues.

As to the efficiency of our men and methods, we have only to remember that every miner now employed in our coal mines produces on an average nearly twice as much coal per year as the miner of any other country. We as a people are also consuming more than twice as much coal for making steam than the United Kingdom, our nearest competitor. Coal mining during 1906 has not followed the great wave of prosperity that has swept over our country, but instead has led the whole procession, and present prospects seem to indicate that it will continue in this exalted position.

The Chicago Coal Market

BY E. MORRISON

In general, the year 1906 was similar to previous years in the history of the Chicago coal trade. There was the same over-supply of coal from Illinois and Indiana mines, prices continued low and the last four months of the year saw the same difficulty in getting supplies because of car shortage on the railroads. The year, however, contained one notable variation from the normal in its record for the months of April and May, when mining in the western fields was almost wholly suspended because of labor troubles. It was shown in these two months that stores of bituminous coal could be provided for at least two months, without serious losses from slacking or inconvenience to the users of coal.

During the two months in question, prices of western bituminous coal rose 20 to 80 per cent, but nearly all the large consumers had laid in stores sufficient for two or three months' needs, and the amount of coal sold at the speculative prices was small. In the other months of the year prices were about the same as in 1905 for the leading grades of bituminous. Anthracite, after the end of labor troubles at the mines, sold at the same prices as the year before.

Beyond question too many bituminous mines have been worked in Illinois and Indiana, for fair profits, in the last two or

these years. The natural car shortage troubles of the autumn are in one respect helpful to the coal trade of Chicago, since they keep back from the city shipments that under normal conditions flood the market with coal that must be quickly disposed of to avoid demurrage charges. Chicago is the natural market-place for coal not sold when it leaves the mines of the two States in question, and some arrangement that would regulate shipments would greatly benefit both operators and wholesale dealers.

Approximately 11,000,000 tons of bituminous and anthracite coal are received by the Chicago market yearly, of which amount about 3,000,000 tons are reshipped to points outside the city. A large amount of coal that never reaches the city is, of course, handled by local dealers. About 15 per cent. of the total received in the city is anthracite coal and 60 to 65 per cent. is bituminous from the Illinois and Indiana fields, the rest being from West Virginia, Pennsylvania and Ohio. Receipts of anthracite by lake were 208,420 tons less than in the previous year, and should the winter prove severe, the deficiency must be made up by the all-rail traffic in the next three months.

The range of average car prices of Illinois and Indiana bituminous, for the year, is shown in the following table:

Month	Lump and Egg	Run of Mine
January	$2.00@2.75	$1.30@1.75
February	2.10@2.85	1.30@1.75
March	2.20@3.00	2.00@2.50
April	2.75@3.00	2.50@3.00
May	2.50@3.00	2.25@3.00
June	2.00@2.50	1.70@2.25
July	1.75@2.50	1.50@2.15
August	1.90@2.40	1.30@1.85
September	2.00@2.50	1.50@1.90
October	2.00@2.85	1.50@2.25
November	2.20@3.00	1.75@2.25
December	2.20@3.25	1.75@2.25

Smokeless coal has ranged $3.25@3.50 for run-of-mine, with the standard quotations for the last half of the year $3.40 for run-of-mine and $4.30 for lump and egg, these prices applying to Pocahontas and New River. Hocking valley coal has ranged $3.15@3.40 for run-of-mine, with lump running as high as $3.75 toward the close of the year. Coals from east of Indiana have in general been scarce in the last half of the year, because of the car shortage.

Anthracite has sold at the standard prices of $6.25 for grate and $6.50 for egg, stove and chestnut, subject to discounts of 30c. for June, 20c. for July and 10c. for August. The customary discounts of 40c. for May and 50c. for April were not announced, owing to the labor troubles at the mines.

The Cleveland Coal Trade

BY G. W. CUSHING

The coal trade in the Lake region for 1906 presents a study of the development of forces which have lain dormant, but apparent, for several years. For one thing the year has been conspicuous for the development of the coal trade almost out of proportion with the demand and surely beyond the capacity of the railroads to take care of it. For another thing it has brought into stronger relief the possibility of new fields entering the market to compete with Ohio, West Virginia and Pennsylvania, in the markets these States have dominated for a good many years. The crux of the situation naturally rested upon the strike of the bituminous coal miners in April.

When the year opened there were already strong premonitions that a coal strike was ahead. This brought about buying on the part of consumers to collect a stock which would last for several weeks, or the normal period for the duration of a strike of some violence. This made a good market for coal, which was fully up to the expectations of the operators and to the ability of the railroads to furnish cars. At first there was talk that the anthracite and bituminous miners would join forces in a general strike in Pennsylvania, Ohio, Indiana and Illinois. West Virginia and Kentucky were considered out of this combination, being largely non-union. The Mine Workers' officials evidently arrived at the conclusion that public sentiment would not support a strike of such general nature as would completely tie up commerce, and in consequence the struggle was confined to the bituminous mines. The men wanted 10c. a ton advance. West Virginia and Kentucky hoped this would be granted, since the differential on coal rates is only that amount in favor of the Ohio and Pennsylvania field and this addition to the cost of production would put these two States on an equal footing with Ohio and Pennsylvania in the market theretofore controlled by those States. But the Pittsburg Coal Company had contracts for the delivery of a specified amount of coal per week to the Steel Corporation and had to yield to the demands of the miners, forcing the smaller mines in Pennsylvania to the same position. Part of the Ohio mines held out until June and some until the middle of July. When an agreement was reached to resume operations it was found that half of the season of navigation was gone and yet there were contracts, in the closed districts, to ship an aggregate of nearly 4,000,000 tons to the head of the Lakes, to say nothing of supplying the strictly local demand. The shippers by Lake immediately went into the market to tie up vessel capacity in quantity for the last half of the season and succeeded in getting about all the boats they needed. Within six weeks, however, there set in a shortage of railroad cars which increased as the regular fall trade opened, and the business in iron and steel kept enlarging. By October the car shortage was serious and by the middle of November it was admitted that shippers by Lake would not be able to fill their contracts. This was made finally impossible when winter set in son of navigation to a close, practically, before hull insurance had expired on the big steel steamers. The car shortage crippled West Virginia and Kentucky as well as Ohio and Pennsylvania, and held in abeyance the forces of competition.

As for influence on prices, the early demand of the consumers to provide a supply against a strike kept values steady until the strike was declared. Then there was a very rapid rise which lasted only long enough to determine that most consumers had a supply which would last for at least six weeks and in most cases three months or more. Then values dropped rapidly and the market was quiet.

When the car shortage set in in September prices began to move up again and by the middle of October mine-run steam coal was selling at $1.50 at the mines and slack at $1. This was due to the fact the supply of cars at no time permitted mines to run more than one-third their capacity while in some instances production was between 20 and 25 per cent. of normal. Prices were also influenced at one time—principally in midsummer—by the fact that many consumers showed no discrimination between the various grades of coal, having improved their furnaces to use either fine, or lump coal, whatever came to hand. This change promises to have even a greater influence on values in the future.

The Hepburn law had its effects also. In Ohio it brought about a ruling by the State Railroad Commission that the old practice of reserving certain points, local to certain railroads, as markets for mines located along those railroads, was illegal, thereby broadening the market for the product of all mines. In Kentucky it had the effect of bringing the railroads to terms. In that State the railroads have had a peculiar grasp of the coal situation, refusing to put switches in operation when those led to mines that competed with the railroad-controlled mines. The new law gave the operator redress for such grievances, and brought about the opening of some new mines. The Kentucky fields are extensive, and the absence of unionism there, gives the Kentucky operator a chance in the markets north of the Ohio which he is almost sure to develop, if the car situation will ever permit.

In the Lake region many shippers have filled their contracts, while others have failed. The shipments have been equal to those of former years, but not up to the demand this year, largely because the market has broadened, owing to developments in northwestern Canada.

Alabama Coal

A serious railroad-car shortage during the last four months of the year interrupted the production of coal in Alabama. While it will be several weeks into 1907

eral hundred thousand tons over the out-

the larger mines, especially where the coal was not used in iron making, caused often more than two-thirds time to be lost.

Much development took place during the year. The Louisville & Nashville Railroad built several miles of track on its North Alabama railroad, to coal properties in the western part of Jefferson county and in Walker county. The Central of Georgia railroad built an extension in Jefferson and St. Clair counties. The Southern Railway built a branch line for the Sloss-Sheffield Steel and Iron Company, while the Frisco put down a branch line in Walker county to reach coal properties. There was a demand for every ton of coal that could be mined. The strike of the union coal miners, which began two years ago, was called off in June of this year, and many of the idle men had no trouble in getting employment at old and new mines. The effect was that, with the new men brought into the district, and the strikers returning to work, more men today are employed in coal mines in Alabama than ever before.

State Mine Inspector J. M. Gray admits that had the transportation facilities been what was expected by the coal producers the production would have been several hundred thousand tons better than it will total when all figures have been received. In 1905 Alabama produced 11,900,153 tons of coal, a year previous 11,273,151 tons, and in 1903, there were 11,700,753 tons of coal produced by this State. Basing the output for 1906 at 13,000,000 tons, it can readily be seen that there has been active work at the mines.

But one serious accident happened during the year, that at Piper, where an explosion killed 12 men. Nearly 100 men lost their lives in coal mines in Alabama during 1906, as compared with 185 the year previous. The loss of life in 1905 was brought about mostly by the explosion in the Virginia City mines, in which 112 men were killed.

During the year State Mine Inspector J. M. Gray gave notice that the mining laws of the State would be enforced to the letter, and a number of reforms were introduced by him. He forbade the use of dynamite, and excessively heavy explosives in the mining of coal, and demanded that superintendents and mine bosses caution the miners.

The Sloss-Sheffield Steel and Iron Company during the year began the opening of their Bessie mines in the western part of Jefferson county and it is expected the daily production will run something like 1,500 tons.

The coke production was steady. The demand was met sparingly. Several new and large washers were erected by the Tennessee Coal, Iron and Railroad company and others, looking to an increase in the production and a better grade of coke.

Coal in New Mexico

BY J. J. SHERIDAN.*

The production of coal in New Mexico for the calendar year 1906, estimating the December output, reached a gross production of 1,973,650 short tons. The amount used in operating the mines was 77,250 tons; the net product shipped from the mines being 1,896,400 short tons, an increase of 295,400 tons over the preceding fiscal year, or 18.46 per cent. increase of net product shipped. The production of coke was 118,000 short tons. The average value of the coal at the mines was $1.50 per ton, and of coke $3.30 per short ton.

The number of men employed in mining, taking the average for the year, was 1753 men and 40 boys underground; 765 men and 31 boys outside, a total of 2518 persons. The number of persons killed in the mines was 17, an average of 6.70 per 1000 persons employed. This exceedingly high percentage of fatalities was due to a disastrous explosion which occurred in the Dutchman mine, near Raton, N. M., on Oct. 5, 1906, by which 10 men lost their lives. In addition to the foregoing number of persons directly employed in and about the mines fully 2500 men were employed in building railroads to transport coal from the mines, and construction of increased equipment at the mines.

The prediction of a year ago, that "the production of coal and coke from New Mexico coal mines would probably be increased by 100 per cent. during the calendar year 1906, has not been fulfilled. The failure of fulfillment of anticipated production was not in any manner due to either lack of producing capacity of the mines, nor to shortage of orders for the product. While consumers have begged for delivery of coal and coke, the production has been restricted, first by lack of transportation facilities; second, by a dearth of miners, it being impossible to secure full shifts of men, and lastly by delay in manufacture and delivery of machinery and other equipment to facilitate the increased production at the mines.

The Colfax county coalfields take precedence for production and extensive equipment. At Dawson, N. M., where the most extensive development of the mines and increase of equipment is being carried into effect, the promised increase of tonnage of coal was delayed by the difficulties above mentioned, and the production of coke was farther delayed by an unforseen obstacle arising in the building of the 440 new underflue coke ovens; the intense heat, generated by the combustion of the confined volatiles, fused the mortar, or cement, in which the bricks were laid, the fused material running down into the underflues and clogging them, thus necessitating the rebuilding of the entire string of 440 ovens. A more refractory and infusible sand has been found which will be used in rebuilding the ovens.

The extensive developments of the St. Louis, Rocky Mountain & Pacific Company, while having achieved comparatively good progress, have been retarded by the influences mentioned in the earlier paragraphs of this article. The Yankee coal fields, on Johnson and Barela mesas, is attracting merited attention. This field has for years been neglected except for development by a few country coal banks operated for local demand in home towns, where the coal obtains exceptional favor for domestic purposes. Development and tests have proven these coals to have exceptional coking properties, as shown by the following analysis:

ANALYSIS OF COAL AND COKE FROM YANKEE, NEW MEXICO

	Coal Per cent.	Coke Per cent.
Moisture	.39	.60
Volatile matter	41.30	.40
Fixed carbon	50.55	86.65
Sulphur	.00	.00
Phosphorus	.00	.00
Ash	7.85	12.35
Total	100.00	100.00

Coke made in keg in beehive oven.

STRENGTH OF YANKEE COKE

Weight in grams per cu.in.	Compressive strength
13.9	2000 lb.
12.9	2150 lb.

The foregoing makes a favorable comparison with Connellsville, Penn., coke, and the quality assures a good demand for this coke.

The Santa Fé, Raton & Eastern Railroad now gives these coalfields connection with the main line of the Atchison, Topeka & Santa Fé Railroad, and another new line, the Santa Fé, Liberal & Englewood Railroad, is now under construction and will give the Yankee field direct connection with new markets in Kansas, Texas and Oklahoma, adding another prominent factor to the coal and coke production of New Mexico.

The American Fuel Company, in the Gallup district, has ample development and equipment on its mines for a production of 5000 tons per day, but operation of the mines is handicapped by lack of sufficient transportation facilities. There is a constant demand for the coal from these mines for both domestic and steaming uses.

In Socorro county, the New Mexico Midland Railroad has been completed from the Carthage mines to the Atchison, Topeka & Santa Fé Railroad, at San Antonio, New Mexico, and the production from these mines will be largely increased during the ensuing year.

The several new mines being opened at

*Territorial coal inspector of mines, Silver City, New Mexico.

Dawson, Kochler and Yankee, in Colfax county, together with new railroads furnishing a great increase in transportation facilities, warrant the anticipation of a very large increase in the production of coal from the mines in that district. The production of coke will be increased from 200 per cent upon the completion of the new coke ovens at Dawson, New Mexico. To this increase there will be added the production from 200 new coke ovens under construction by the St. Louis, Rocky Mountain & Pacific Company, at Koehler, New Mexico, and from 200 new coke ovens to be built at Yankee, New Mexico., in the very near future.

The prospects of the coal-mining industry in New Mexico are exceedingly bright; it is simply a question of sufficient supply of labor, increased equipment, which is being installed as fast as manufacturers can supply it, and ample transportation facilities, which will be provided by the completion of railroads now under construction.

Coal in West Virginia

BY F. W. PARSONS

In the larger fields of West Virginia, there was practically no suspension of the wonderful activity in coal mining that occurred in 1906, and as a consequence the production shows a substantial increase over previous years. There are some who will claim that West Virginia is no longer a state full of opportunities, but rather has become like Pennsylvania and some of the older districts where most of the valuable coal lands have already been accumulated. This is true only in part, for although some of the fields are closely held, there are still thousands of acres of good coal land back from the railroads that is for sale at a reasonable price. There are also large land companies which are ready and willing to lease valuable tracts to competent men who can prove that they have the ability to open and successfully operate a mine.

So far as the industry as a whole is concerned, the most important happenings of 1906 were the completion and the successful operation of the Coal and Coke Railroad, and also the rapid development of the Deep Water road, which will carry coal to tidewater. Both of these railways are projected into new territories, and will consequently be the means of opening new fields.

For many years coal mining in West Virginia was unprofitable because of the destructive competition. This condition has been remedied by the consolidation of many mines in the several districts. There are still many independent operators, but they market their coal through one of the larger selling agencies. In northern West Virginia the largest operator is the Fairmont Coal Company, which controls nearly all of the mines in what is known as the Fairmont and Clarksburg fields. This company, by virtue of its wonderfully organized selling department, can dispose of all the coal its mines will produce; last year was one of unprecedented prosperity in this district. Although the Fairmont company is opening and equipping a large mine near Clarksburg, W. Va., the policy of this corporation has been to perfect and increase the output at the mines already opened, rather than to develop new properties.

Many new mines have been opened along the Coal and Coke Railroad, and the field opened by it will undoubtedly become a large producer in the near future. The coal in this region is not as good for steam purposes as the New river and Pocahontas product, but it is a first-class smithing coal, for which reason it has become famous.

The largest operators in the New river field are the New River Company which was recently organized with Sam Dixon (one of the veteran operators of the field) as president, and the New River Smokeless Coal Company. The New River company is perhaps carrying on new development work more aggressively than any other West Virginia corporation. The coal produced by it is unsurpassed for steam purposes, and because of its low volatile matter is considered almost smokeless. None of the coal is washed and a large part of the production is shipped directly as run-of-mine.

Operations in the Kanawha and Pocahontas fields were vigorously carried on. The largest operations in the Pocahontas field are controlled by the Pocahontas Collieries Company and the United States Coal and Coke Company. The main offices of the former concern are at Pocahontas, Va., while the United States Coal and Coke Company has its headquarters at Gary, W. Va. Both of these companies have large plants and convert a considerable part of their output into coke. The Pocahontas company is opening up a new mine at Boissevain, which, after completion, will be followed by other new development work.

The great problem throughout West Virginia and especially in the southern part is that of a deficient supply of labor. The scarcity of men has caused the operators considerable trouble and great efforts have been made to import miners into this field. Wages are above the average and the climate is particularly healthy. However, the region is somewhat removed from large towns and legitimate amusement is scarce. It is probable that West Virginia will continue to hold her place as the second largest producer of coke, and that before many years it will have a soft-coal output rivaling that of Pennsylvania.

Excitement prevails in the Island of Trinidad over the possibility of developing petroleum. Drilling is being conducted.

Coal in Australia

An important step was taken in 1906 by the northern colliery owners in New South Wales, when a "vend" was formed to regulate the output and selling price of coal. All but one colliery is bound by this agreement, and it is believed that the industry will largely benefit now that internal competition has been ended.

The work at all the collieries in New South Wales was very active, the increased traffic on the railways, consequent on the exceptionally favorable season, being one of the chief factors affecting the local trade. The exports were on a large scale, 2,142,000 tons having been exported during the first nine months of the year, or 488,000 tons more than for the same period in 1905.

The company formed to work the coal seams beneath the Sydney harbors completed the sinking of the two shafts to a depth of 3000 ft., and has now a face of 4 ft. of clean coal in the heading, which shows signs of increasing thickness as the entries are extended.

In Queensland, a decided improvement was noticeable in the trade of the West Moreton district, which is attributable to the concession made by the Government in the shape of a rebate of harbor dues to vessels shipping over 500 tons of bunker coal. The Newnes Oil and Shale Company is exploiting the oil-shale seams in the Capertee and Wolgan valleys, New South Wales, on an extensive scale. The preliminary work embraces the driving of a tunnel several miles in length on the shale horizon, and its connection with the State railway system.

The German Coal Industry

The coal production of Germany materially increased in 1906, and great activity was evinced in all branches of the industry. For the 10 months ending Oct. 31, the output was reported in metric tons as follows:

	1905.	1906.	Changes.
Coal	99,051,160	114,273,413	I. 14,322,253
Brown coal	42,438,507	46,098,425	I. 3,659,918
Total mined	142,389,667	160,371,838	I. 17,982,151
Coke made	12,366,680	16,720,631	I. 4,353,951
Briquets made	10,589,951	12,066,857	I. 1,476,906

The briquets are made largely out of the brown coal, or lignite. The total increase in coal mined this year was about 13 per cent.

During the first 10 months of 1906 Germany exported 16,330,426 tons of coal, which shows an increase of more than 1½ million over 1905. More than 2¼ million tons of coke and 600,000 tons of briquets were also exported. The import of coal into Germany during the same period was nearly 14,443,723 tons, which was an increase of 62,567 tons over the import of 1905.

Pittsburg District Coal

district in 1906 was the greatest in its [illegible] the large companies and to independent interests were not entirely satisfactory. This was due to the fact that many large annual contracts were taken in January and February at low prices, as it was expected the mining rate would be reduced. Instead, the United Mine Workers of America forced an advance of about 6 per [illegible] production showed a decided increase over previous years.

A general strike of miners was threatened early in the year unless a substantial advance was conceded, but operators did not seem to regard the matter seriously and continued to quote low rates for deliveries extending through the year, the minimum price being 90c. for mine-run coal, and many contracts were made at $1 a ton in January, after the national convention of the United Mine Workers at Indianapolis had made a demand for an advance of 12 per cent. Iron and steel manufacturers, fearing a suspension, began to store coal and all the mines in the district were unusually active in the first three months.

When a general tie-up of the mines of the country appeared certain President Roosevelt intervened by writing to Francis L. Robbins, chairman of the Interstate Coal Operators' Association, and John Mitchell, president of the United Mine Workers, urging them to endeavor to reach an agreement. It was due to the efforts of these men that a compromise was made at a reconvened conference held on March 19 at Indianapolis. The miners withdrew the demand for an increase of 12 per cent. for the year and agreed to accept a raise of 6 per cent. and make a contract for a period of two years, dating from April 1, 1906.

Western operators objected, but Chairman Robbins of the Pittsburg Coal Company signed the agreement for his company and its subsidiary interests, including the Monongahela River Consolidated Coal and Coke Company, and all the mines of these concerns and a number of independents who signed continued in operation. On April 6 the other independents who had vigorously opposed an increase gave up the fight and before April 10 every mine in the Pittsburg district was in full operation. The suspension in other parts of the country continued for a few weeks longer, when it was seen that Pittsburg operators were getting the business and there was a general resumption.

A shortage of railroad cars prevented the full operation of the mines throughout the year, but despite this handicap the production for 1906 was between 46,000,000 and 47,000,000 tons, compared with 42,000,000 tons for 1905, 31,000,000 for 1904, and 18,000,000 tons in 1897. The Pittsburg Coal Company, the leading interest, produced 10,000,000 tons, and the Monongahela River Consolidated Coal and Coke Company, the large river interest, 6,000,000 tons.

Shipments to the Northwestern and Southern markets from this district were greater than in any previous year. The shipments to the lake ports during the season amounted to 9,200,000 tons. In 1905, 7,460,000 tons were shipped and in 1904, 6,058,000 tons. The shipments to Southern ports aggregated about 3,500,000 tons, of which 2,500,000 tons were sent out by the Monongahela River Consolidated Coal and Coke Company. The rest of the tonnage of this big company went to the mills along the Monongahela and Allegheny rivers and to other consumers in the Pittsburg district.

John H. Jones, president of the Pittsburg-Buffalo Company, the large independent interest in this district, has compiled some interesting figures on coal tonnages. He declares that if the railroads had been able to furnish necessary transportation facilities the production in the Pittsburg district would have been fully 3,000,000 tons greater in 1906. Mr. Jones estimates that the production of coal in the United States this year will reach 425,000,000 tons, and possibly 430,000,000 tons, and that the world's production will be between 1,200,000,000 and 1,300,000,000 tons.

An unusually large number of big contracts were entered into early in the year for extended deliveries. One by the Pittsburg Coal Company with the Pittsburg Steel Company called for 1000 tons daily for a period of six years. The Monongahela River Company received a contract from the Midland Steel Company for 250,000 tons annually for five years. All contracts made by the big river interest for the year with consumers at Southern ports were at low prices, as an advance in the mining rate had not been taken into consideration. In December the company gave notice that all annual contracts to be made in January would be at an advance which will range from 10 to 20 per cent. All annual contracts are to be made at higher prices than prevailed the first of this year and 1907 is expected to be the most profitable one in the history of the coal industry.

Many improvements were made during the year and there are now but few mines operated by old methods. The Pittsburg Coal Company has installed modern machinery and equipment at nearly all of its mines. The Pittsburg-Buffalo Company in May began sinking two large shafts on a 14,000-acre tract in Washington county, which is included in the Pittsburg district. These shafts are to be the finest in the world, when completed in the spring of 1907. Each shaft will have an actual [illegible] capacity of 1250 tons an hour. The coal will be used exclusively for coking and a number of ovens are to be built.

The Pittsburg Coal Company greatly increased its coke production in 1906, and is still at work on extensions. In February the company disposed of some of its properties at a handsome profit. It sold 262 acres of coal land to the W. J. Rainey Company at $1222 an acre, having paid $280 an acre for the property a few years ago. The company also disposed of its interest in the Western Coal and Dock Company and the Whitnall Coal Company.

Preparations are being made by producers for a large output in 1907 at profitable prices. There will be no labor troubles, as the present scale will continue in force for another year, dating from April 1. It is the same scale as was in force in 1903 when the pick-mining rate was 90c a ton. A reduction to 85c., or 5.5 per cent. was made for a period of two years dating from April 1, 1904, but the rate of 1903 was restored by the new agreement.

Coal in Pennsylvania

BY E. W. PARSONS

Coal mining in the anthracite and bituminous districts of Pennsylvania was carried on with much activity during 1906 and in many ways promises to eclipse the results obtained in any previous year. The labor troubles that occurred were of short duration and, if anything, were a blessing to the industry. It is probable that had no suspension of work occurred, the operators would have been compelled to have had occasional temporary shut-downs to prevent the supply from exceeding the demand. The resumption of work on the terms accepted resulted in no particular victory for either side and tended to show that neither operators nor men have forgotten the awful experiences of the last great strike.

VALUE OF PRODUCT

It is probable that the coal output of Pennsylvania in 1906 will represent a value of nearly $400,000,000 on the railroad cars at the mines; and that this same output will show a value of from $650,000,000 to $750,000,000 at the points of distribution. Pennsylvania as a whole will produce upward of 50 per cent. of the total coal output of the United States.

SHORTAGE OF CARS

The shortage of cars was a trouble much heralded in the papers, and it may as well be realized at once that this difficulty is not without its redeeming features. If all of our mines were constantly to have plenty of cars for shipping their product it would not be long before many of them would not be working full time. This condition is an old trick that the operators often take advantage of, and many times such car trouble is to the mine manager a welcome misfortune.

EMPLOYMENT OF BOYS

Much has been said concerning the employment of boys under the minimum age in our mines and on the breakers. The responsibility for this serious fault does not rest particularly with the operators or mine inspectors, but rather may be laid at the door of the parents who secure certificates for their children by swearing to a false age. Only by strict investigation and a careful enforcement of the laws will this trouble be eliminated.

PROPORTION OF MACHINE MINED COAL

Exact figures as to the amount of coal produced by compressed air and electric power are not yet available. Preliminary estimates seem to indicate that about half of the coal produced is from the use of compressed air, while the production by electric power amounts to nearly one-quarter of the total output. This is not due to any decrease in efficiency derived from electric machines, but rather to the fact that the law prohibits electric wires and the conduction of electric current in all mines or parts of mines that are considered gassy and are worked with safety lamps. The use of electricity for driving all of the jigs, screens and rolls in the newer anthracite breakers is an innovation that is meeting with much success.

The Anthracite Market

The total production of anthracite coal in Pennsylvania was as follows, in long tons; the December shipments are estimated, and comparison is made with the figures of the Pennsylvania Bureau of Mines for 1905:

	1905.	1906.	Changes.
Shipments	62,441,144	56,162,567	D. 6,278,567
Consumed and sold at mines	7,779,420	7,169,727	D. 618,693
Total	70,220,564	63,332,294	D. 6,897,260
Total, short tons	78,647,020	70,922,880	D. 7,724,940

The decrease shown by this table does not involve any loss in consumption. The shipments of 1905 were swollen by large quantities of coal which was sent away from the mines in November and December and stored at various points along the lines of the coal-carrying roads, in anticipation of a possible strike. The suspension after April 1, pending negotiations between operators, brought the shipments to market down to 488,439 tons in April, and 3,276,310 tons in May; but at no time was there any shortage in supplies at consuming points, the stored coal being sufficient to meet all demands until full production was resumed. The movement of the miners failed, the settlement finally effected being a continuation of the terms arranged by the Anthracite Coal Commission three years before, with a very few minor modifications.

If exact figures of consumption could be compiled, it would probably be found that the consumption of domestic coal was slightly less than in 1905, owing to the mild winter. The demand for steam sizes was remarkably steady during the year, with an increasing demand at its close. Of these steam sizes pea coal is finding an increasing use for domestic purposes. In November the Philadelphia Coal Exchange decided that pea coal should hereafter be considered a domestic size, selling at 25c. below chestnut. This action has not been followed in New York or other cities.

The tidewater prices of anthracite continued unchanged through the year at the list figures of $4.75 for lump, $5 for egg, stove and chestnut. The usual discounts of 50c. in April and 40c. in May were not given, owing to the suspension. The discounts of 30c., 20c. and 10c., for June, July and August, respectively, were given. The tidewater prices of steam sizes were fairly uniform, closing at $2.80@3 for pea; $2.25@2.50 for buckwheat; $1.45@1.50 for rice, and $1.30@1.35 for barley.

THE SEABOARD BITUMINOUS TRADE

Like the anthracite trade, the seaboard bituminous trade was fairly uniform through the year. The usual summer dullness prevailed somewhat longer than usual, consumers in the East being apparently unwilling to lay in stocks early, as all possibility of strikes had passed over, and they felt sure of getting coal when they needed it. This was followed in the fall by a rush to buy, and the closing two months of the year was an active period.

The strike in central and western Pennsylvania did not seriously affect the trade, having been settled so quickly that consumers did not have time to use up the stocks that had been accumulated by them and by dealers. In the last quarter of the year there was a good deal of trouble from shortage of cars and delays in transportation. This did not affect the trade in the East to the same extent as in the West, however, though it was sufficiently annoying.

COASTWISE TRADE

The coastwise traffic, which supplies a large part of eastern New York and most of New England, showed few changes. Vessels were in good supply nearly all the year, and the fall season was measurably free from severe storms, while ice did not make until very late in the shoal-water ports of the far East. The sailing vessels and barges, in which this traffic is mainly carried, had generally a good year.

Coastwise shipments of coal from the principal Atlantic ports for the 10 months ending Oct. 31 were, in tons:

	Anthracite.	Bituminous.	Total.
New York	11,240,103	8,525,321	19,765,424
Philadelphia	1,436,044	3,228,140	4,664,184
Baltimore	184,772	2,664,746	2,849,518
Newport News		2,388,267	2,388,267
Norfolk		1,849,780	1,849,780
Total	12,860,919	18,656,254	31,517,173
Total, 1905	14,156,006	17,182,550	31,338,556

The total increase this year was 0.6 per cent. New York includes all the New York harbor shipping ports.

Coal Production in the United States

The following table has been made up from carefully collected data, and is as nearly correct as present available statistics will permit. The total output for most of the States has been obtained from the various district and State inspectors, and will be found to differ but little from the finally corrected figures.

The greatest demand for fuel throughout the year has been for industrial purposes, while the unprecedented activity in steel manufacture and the metal industry has taxed the maximum capacity of our coking plants. Domestic demand would have been greater were it not for the mild winter we have so far experienced.

PRODUCTION OF COAL IN THE UNITED STATES

States.	1905. Short Tons.	1906. Short Tons.
Bituminous:		
Alabama	11,900,153	12,500,000
Arkansas	2,000,000	2,200,000
California	48,558	45,000
Colorado	8,844,711	11,240,078
Georgia and N. Carolina	385,600	390,000
Illinois	37,183,474	38,000,000
Indiana	9,772,400	9,723,300
Indian Territory (f)	2,970,462	2,900,812
Iowa	6,728,000	6,400,000
Kansas	6,780,225	7,100,000
Kentucky	8,058,540	8,750,000
Maryland	4,855,928	4,950,000
Michigan	1,380,305	1,350,000
Missouri	4,733,164	4,800,000
Montana	1,743,771	2,000,000
New Mexico	1,576,000	1,975,000
North Dakota	400,000	425,000
Ohio	25,844,057	27,250,000
Oregon	110,000	115,000
Pennsylvania	119,361,514	129,500,000
Tennessee	5,195,200	5,275,000
Texas	1,200,000	1,200,000
Utah	1,604,483	1,800,219
Virginia	4,115,950	3,800,000
Washington	2,878,042	3,200,000
West Virginia	35,283,382	42,000,000
Wyoming	2,140,525	2,750,000
Alaska and Nevada	85,000	95,000
Total bituminous	319,285,915	345,738,409
Anthracite:		
Colorado	69,365	68,243
New Mexico	24,000	28,000
Pennsylvania	78,647,020	70,922,190
Total anthracite	78,731,523	71,018,433
Grand total	389,016,548	416,756,492

(f) Fiscal year.

PRODUCTION OF COKE IN THE UNITED STATES

States.	1905. Short Tons.	1906. Short Tons.
Alabama	2,756,598	2,900,000
Colorado and Utah	795,650	1,095,828
Georgia and N. Carolina	69,200	70,000
Indian Territory, (f)	41,193	59,088
Kansas	10,000	12,000
Kentucky	55,475	60,500
Missouri	3,100	3,500
Montana	43,500	45,000
New Mexico (f)	76,737	118,000
Ohio	112,250	160,000
Pennsylvania	18,519,810	20,750,000
Tennessee	382,300	410,000
Virginia	1,203,650	1,280,000
Washington	51,072	60,000
West Virginia	2,738,777	3,500,000
Other States	1,545,000	1,750,000
Total	28,404,112	32,568,926

(f) Fiscal year ending June 30.

The comparison of last year's output with that of 1905 is ready obtained from the table. In this connection it should be remembered that 1905 was a banner year in the coal industry and showed a gain in production of 10.7 per cent. over the 1904 output.

PIG IRON AND IRON ORE

Statistics of Production—Summary of Commercial Conditions—Review of the Industry

this wave has continued to rise throughout 1906, with no indication that it has yet reached its full hight, or begun to recede. Early in the year there were some predictions that the highest point had been reached, and that the period of recession—which long experience has taught us to look for—was coming. The brief cloud soon passed over, however, and the second half of the year was a time of unbounded activity. The result is seen in a production of iron and steel beyond all previous records; a production which exceeds that of Germany and Great Britain combined.

Notwithstanding the extraordinary output, which taxed to the full the large increase in capacity of furnaces and mills, made during the past three years, it was not possible to meet promptly the demands from consumers for material. In the closing month of the year it became necessary to import considerable quantities of pig iron to meet the demands of Eastern foundries. Though large in comparison with other years, the quantity of these imports is really insignificant when compared with the total consumption.

Iron and Steel

FREDERICK HOBART

The important transactions of the year are recorded briefly in the following columns. The changes made were the placing of the United States Steel Corporation in a position which precludes the possibility of any effective attack on its commanding influence in the iron and steel industries; and the establishment of the fact that the point where capacity of production exceeds the demands of a prosperous year has not yet been reached.

Some statements of production in 1906 [illegible]

IRON ORE

As for a number of years past, the Lake Superior region was the leading factor in the supply of raw material for the furnaces. The record of shipments from that region is very closely kept, and as the shipping season practically closes early in December, it is possible to give exact figures for that part of our iron-ore output, from which between 75 and 80 per cent. of our pig iron is made.

Next to the Lake country, the South is the most important producer of iron ore, and it is possible to make a fair approximation to the Southern output. The remaining iron-ore regions are scattered [illegible]

tivity everywhere leaves no doubt of a considerable gain in their production.

The production of iron ore in 1906 is estimated as below, in long tons:

IRON ORE PRODUCTION

	1905.	1906.	Changes.
Lake Superior	41,555,456	38,315,600	I. 3,239,856
Southern States	7,155,000	7,410,000	I. 255,000
Other States	5,550,000	4,950,000	I. 600,000
Total	44,578,456	49,083,600	I. 5,105,144
Add Imports	845,651	1,090,000	I. 244,349
Total	45,424,107	50,773,600	I. 5,349,493
Deduct exports	208,058	305,049	I. 96,991
App. consumpt'n	45,216,049	50,468,600	I. 5,252,551

The value of the iron ore at the mines was at least $100,000,000. The average consumption of iron ore per ton of pig iron made is, by the figures, 1.98 tons.

In all the different districts outside of the leading ones above mentioned, operations were carried on steadily. In the Lake Champlain and Hudson river districts in New York; in the Lehigh Valley and Cornwall mines in Pennsylvania; in Colorado and New Mexico, much was done. No important new mines were opened during the year except in the Lake Superior country; the work in that region is described in a separate article below.

Limestone Flux. The limestone and dolomite used as flux in the blast furnaces was approximately 14,228,500 tons. Limestone is the more usual flux, dolomite being used chiefly in the Alabama furnaces.

PIG IRON

In the table below we give the figures for the first and the second half of 1906 separately. Those for the first half are the figures of the American Iron and Steel Association; for the second half they are calculated closely on the known capacity of the furnaces in blast. It is believed that the total given will be found to vary but little from the final statement, which will appear later.

PIG-IRON PRODUCTION

	1st Half.	2d Half.	Total.
Foundry and forge	2,889,592	2,960,710	5,850,302
Bessemer	6,899,066	7,077,748	13,976,814
Basic	2,449,275	2,563,261	4,952,536
Charcoal	204,335	212,100	416,295
Spiegel, ferro, etc.	160,833	165,191	326,024
Total	12,602,901	12,919,010	25,521,911

The total gain shown in 1906 was 2,529,231 tons, or 11 per cent. That this was hardly as great as had been expected is due chiefly to a drop in production in the third quarter of the year. This was enforced by the condition of the furnaces, a number of which were in urgent need of repairs after long and arduous campaigns. Under the circumstances the work was hurried as much as possible. By October the active capacity was restored; in November and December there were large gains, and the year closed with the greatest iron-making capacity ever known actively at work.

The growth in production of pig iron is shown by the following table, which gives the output for 10 years past, in long tons:

PIG-IRON PRODUCTION, 10 YEARS

1897	9,652,680	1902	17,827,307
1898	11,773,934	1903	18,009,252
1899	13,620,703	1904	16,497,033
1900	13,789,242	1905	22,992,380
1901	15,878,354	1906	25,521,911

In these 10 years the production has much more than doubled, the increase of 1906 over 1897 being 15,869,231 tons, or 164 per cent. This growth has involved the investment of vast sums of money in new furnaces and auxiliary plants; in new mines of iron ore; in machinery, ships, railroads and equipment for handling and transporting the ore, fuel and flux; and in coal mines and coke ovens for supplying fuel. Besides all the new furnaces which have been constructed, there is practically no furnace in the country, which was standing 10 years ago, which has not been entirely re-constructed since then.

STEEL PRODUCTION

No official statement for any portion of the year has been published which covers the steel production for 1906. Assuming, however, the same ratio of steel to pig-iron production as in 1905, the output of steel ingots for 1906 was approximately 22,230,000 tons, of which about 12,180,000 tons were bessemer, or converter steel, and 10,050,000 tons open-hearth steel. This estimate is certainly conservative, especially as to the open-hearth steel. In the last quarter of the year an unusual quantity of scrap was used in many steel plants, owing to the difficulty in getting basic pig in sufficient supply.

In this estimate we do not include the crucible and special steels, the quantity made in 1905 having been only 121,000 tons, while there was no considerable gain in 1906.

The increase in steel output over 1905 was 2,196,249 tons, or 11 per cent. In 1897 ten years ago, the total steel production was 7,174,508 tons; showing an increase during that period of 15,055,492 tons, or 209.8 per cent.

No figures are available at this date for the production of finished iron and steel. It may be said, however, that the increase this year must have corresponded closely to that in steel ingots. There was a strong demand for all finished forms, which was especially pressing for structural material, rails and plates. Mills were generally full of work through the year; and many of them go into 1907 with their

capacity for the first half [illegible] and with contracts for delivery running into the third and even the fourth quarter of the year. This is specially the case with rails and plates. With rails there was a partial shortage from electric roads and also for light rails for mining and industrial uses.

UNITED STATES STEEL CORPORATION.

This review would be incomplete without some reference to the corporation which controls about 60 per cent. of the finished iron and steel output of the country. For three-quarters of the year we have figures of operation. The company's statement shows net earnings for the September quarter and the nine months ending Sept. 30 as follows:

	1905.	1906	Changes.
Third quarter.	$81,240,682	$88,114,624	I. $6,874,042
Nine months	84,571,894	114,874,147	I. 30,302,553

Unfilled orders on the books Sept. 30 reached a total of 7,936,884 tons; which compares with 6,809,589 tons on June 30, and 7,605,086 tons on Jan. 1, 1906.

There is no doubt that the net earnings for the last quarter of the year were very large. The probability is that the report for the full year will show net earnings of at least $155,000,000; and that the company entered 1907 with over 8,000,000 tons of material on its order books. Very large sums were set aside during the year for improvements and additions to plant. The company paid the usual 7 per cent. on the preferred stock, and also resumed dividends on the common stock, paying two quarterly dividends of ½ per cent. each on those shares.

Blast-furnace capacity is still the Steel Corporation's weakest point. This is compensated in part, however, by its command of ores which enables it to make advantageous deals with some of the outside merchant furnaces.

INCREASE IN CAPACITY FOR PRODUCTION.

New work for the year has been directed largely toward increase in productive capacity. How great that is expected to be will be seen by the statement that the number of blast furnaces under construction, recently completed, or for which contracts have been let, is 62, the yearly capacity of which, when completed, will be 7,300,000 tons of pig iron. This does not include the increased capacity which will be derived from old furnaces now being reconstructed or otherwise renewed. If we add these, the work now in hand ought to give an increase of over 8,000,000 tons yearly. Not all of this new work will be available in 1907, but more than half of it will be ready to operate during the year, and the balance will come in in the early part of 1908. There is little doubt that by the close of that year our blast furnaces will be able to turn out between 33,000,000 and 35,000,000 tons yearly. In steel production also preparations are being made for a great increase in capacity. Prominent among these are the new open-hearth furnaces which are being added to the Carnegie steel plants around Pittsburg, to the Illinois Steel Works at Joliet and South Chicago, and to the Ohio works of the American Steel and Wire Company.

The most important work now under construction is found in the new and extensive plant which the United States Steel Corporation is constructing at Gary, Indiana. This is intended to be a model plant of the largest capacity, and will include 16 blast furnaces with a corresponding number of open-hearth steel furnaces, to which the molten iron will be fed direct from the blast furnaces. These will be accompanied by rolling mills which will convert the steel from the furnaces directly into rails, plates, structural forms and other finished shapes. Only a small portion of this plant will be ready during the coming year, and the whole of it will not be in operation until after the end of 1908. This plant will be supplied, by water, with ore from the corporation's mines on the Mesabi and Vermillion ranges in Minnesota; the coke will come from its works in Connellsville region and in West Virginia.

CHANGES AND CONSOLIDATIONS.

Not many new consolidations have been recorded during the year. The amalgamation of the interests of the Republic Iron and Steel Company in the South with those of the Tennessee Coal, Iron and Railroad Company was announced a year ago. The consequent changes have not yet been fully carried out, but will doubtless be completed during the new year. They involve the concentration of work at certain points, the enlargement of some of the works owned by the companies, and other improvements which will help to increase production and reduce costs. The great innovation brought about will be a very large increase in the production of steel from Southern iron, and the consequent diversion of a large quantity of Alabama pig from the foundry trade. Already the basic open-hearth steel plant at Ensley has proved successful; so much so, indeed, that its full capacity for 1907 is already engaged for the manufacture of rails. This plant will be much enlarged and possibly supplemented by others at different points.

The most remarkable occurrence of the year, however, is found in the transfer of the Hill iron-ore lands on the northern Mesabi to the United States Steel Corporation. This transfer was foreshadowed more than a year ago, when negotiations had already been begun; but it was not completed until late in 1906. The terms of the deal were fully explained in our columns at that time. In brief they provide for the rental of the lands in question to the United States Steel Corporation on a royalty beginning at 85c. a ton and increasing by 2½c. yearly, with a high minimum. It is calculated that the average price paid by the lessee for ore in the [illegible] any leases in Minnesota. It is, of course, provided that all ores mined from these lands shall be shipped to the Lake docks over the Great Northern tracks. Computations of the quantity of ore contained in these lands vary widely, for the reason that only a small portion of them have been proved by actual operations. There is no doubt, however, that some very large mines will be developed at an early date, though it may be doubted whether among them will be found any which will equal the older giants of the Mesabi, such as the Biwabik, the Mountain Iron, or the Fayal.

The conclusion of this negotiation was foregone when Mr. Hill announced that the lands could only be disposed of in a single block. The United States Steel Corporation was then the only possible purchaser, since no other existing concern could handle so large a transaction. The delay, it is understood, was caused chiefly by discussion over the terms. Mr. Hill, however, was in command of the situation, since the main point in the whole transaction was that this transfer practically prevents the establishment of any effective competition with the Steel Corporation on a large scale. There is no other large block of iron ore, readily accessible, which could be secured by any other company. Under our present conditions no steel company is secure of its standing or future operations unless it controls its own supply of iron ore. Small mines may be picked up here and there on the Mesabi or Gogebic ranges, but no great body can possibly come upon the market; while nowhere else in the United States can be found ores in sufficient quantity to support permanently a large industry. The only possible exceptions are to be found in Wyoming and southern Utah. These iron deposits are not developed and possess the great disadvantage of being remote from all deposits of fuel and available only by a long and costly railroad haul. The Southern ores are already controlled by existing companies.

METALLURGICAL CHANGES.

As for several years past, the attention of engineers has been directed chiefly toword the facilitating of work on a large scale. Improvements in handling ore in transportation, in the feeding of furnaces, in casting machines, in mixers, and in the direct transfer of iron from the blast furnace to the steel furnace still continue. The great effort everywhere is to dispense with manual labor as far as possible, and to handle great masses of material by machinery.

The most important improvement of recent years, however, the Gayley dry-air blast, has made some progress and two furnaces with this improvement are now in active operation. The results so far obtained from these furnaces have been such that there is great probability that

verter. It is noticeable that in all the new plants now under construction the open-hearth furnace is used. The great increase in steel-making capacity mentioned above does not include a single converter. The open-hearth furnace, moreover, is being substituted for the bessemer converter in several prominent works, such as the Carnegie. The great plant at Gary, above referred to, will not have a single bessemer converter.

The utilization of blast-furnace gases is also an important point. Until a year or so ago, this improvement made little progress in this country, although it had been so widely adopted in Germany, and to a less extent in Great Britain. The first company in this country to introduce this improvement on a large scale was the Lackawanna Steel Company in its new works at Buffalo. Now, however, it has been taken up by the Steel Corporation; gas-driven blowing engines and gas engines generating electric power will be used at all the new works under construction and will be gradually introduced at many of the older plants. American practice will no longer be subject to the reproach of wasting a valuable source of power.

Another kindred improvement, however, the use of the by-product coke oven for preparing metallurgical fuel, has made little or no progress. American makers still adhere to the old-fashioned bee-hive oven, with its wasteful methods. In the Connellsville region we still have the enormous waste of power involved in the dissipation of the gases, and the loss of valuable chemical products which might be derived from the coal.

FOREIGN COUNTRIES

The iron and steel trades have been exceedingly prosperous in other countries as well as our own. In all Europe, except Russia, production has been on a high level and foreign trade unusually good.

Great Britain—Full figures are available only for the first half of the year, but the estimates give a total production for the year of 9,805,000 tons of pig iron and 6,260,000 tons of steel, of which nearly 75 per cent. was made by the open-hearth process. The export returns, so far as available, show an extraordinary foreign trade.

The exports of iron and steel and of machinery from Great Britain for the 11 months ended Nov. 30 are valued by the Board of Trade returns as below:

	1906.	1906.	Changes.
Iron and steel..	£7,628,411	£7,809,669	I. £181,258
Machinery.	4,192,670	4,754,216	I. 561,546
Total.	£11,821,081	£12,563,885	I. £ 742,804

The total increase was 6.3 per cent.

Germany—The returns of the German Iron and Steel Union for 10 months of the year indicate that the total production of iron in Germany in 1906 was about 12,495,000 tons, the largest quantity ever produced in that country, and an increase of about 12 per cent. over 1905. For steel production no definite figures are available, but it is probable that the total output of steel was not less than 10,500,000 tons. Like England, Germany had a prosperous foreign trade, showing a large increase in the exports. There was rather surprising gain in the imports, but this was mainly in raw and semi-finished material which is worked up into finished shape in the German mills.

The exports of iron and steel, and of manufactures, from Germany for the 11 months ending Nov. 30 were, in metric tons:

	1905.	1906.	Changes.
Iron and steel	2,661,602	3,044,972	I. 383,370
Machinery .	248,156	259,511	I. 11,355
Total	2,909,758	3,304,483	I. 394,725

This shows a moderate growth in the export trade.

Imports of iron and steel, and manufactures thereof, into Germany for the 10 months ended Oct. 31 were, in metric tons:

	1905.	1906.	Changes.
Iron and steel.....	263,114	520,288	I. 257,174
Machinery	65,785	70,918	I. 5,133
Total	... 328,899	591,206	I. 262,307

This shows a larger increase in the imports than for several years past.

Of other European countries there is little to be said. Belgium, Austria and Hungary showed gains in their productions. The French output was limited by coal strikes and other troubles over fuel supply.

Canada had a good year, owing to the activity of business and to the steady production of two important plants, the Dominion Steel Works at Sydney, and those of the Lake Superior Corporation at Sault Ste Marie.

The Iron and Steel Markets

The special review given below covers the important markets of the country. Pittsburg, of course, is the chief primary market. Cleveland is the center of an active producing and distributing region, while Chicago is the chief supply point for a great western and northwestern territory. Birmingham is the center for the Alabama iron country and the most important point in the foundry-iron trade. These and the seaboard markets cover practically the whole country, and there is little to be added to them in the way of general comment.

They all tell substantially the same story of a market opening strongly; then a brief period of hesitation while crop prospects were uncertain; finally of strong and steady buying for a series of months, culminating, toward the end of the year, in a scramble by consumers to secure their supplies for the first and second quarters of the new year. The leading interests made an effort throughout the year to keep prices steady, and prevent irregular and too rapid advances. In this they were largely successful, and there was comparatively little increase in quotations; much less, indeed, than might have been expected from the nature of the market.

The railroads were good customers throughout the year. While the work done on new lines was not very great, there was a great demand for rails for renewals, second tracks, etc.; for new cars and locomotives; and for bridge work. The larger use of steel cars demanded a great quantity of structural shapes and plates. There was also an excellent demand for rails and equipment for electric railroads. Structural steel for new buildings, bars for machine and other work all helped to make up the great demand of the year.

Pittsburg Iron and Steel Markets

BY S. F. LUTY

The year 1906 opened with the iron and steel markets strong in all lines. One of the remarkable features was that, despite the advance in the prices of pig iron, there were no material changes in the prices of finished steel products until the fourth quarter. It was undoubtedly a boom year for pig iron, in both tonnage and prices, but not in finished material, except in tonnage.

A runaway market was prevented by conservative management all the way through. Pig iron did not bring the prices that could have been obtained, had producers been disposed to take advantage of conditions. In the third and fourth quarters fancy prices were paid in some instances for small lots of both foundry and bessemer iron, but the market was not affected. Sales of foundry iron were made at higher prices than for bessemer in the closing months of the year.

Mild weather in midwinter permitted heavy production and the market in the first quarter was steady and satisfactory. In the latter part of March a lack of confidence on the part of both consumer and producer was developed. A drop of $3 a ton in the price of bar iron threatened to disturb conditions. Two pig-iron producers, fearing a slump in the second half, began to cut prices for second quarter, principally in the Cleveland district, but the general market was not affected. About the middle of June there was a break in the South and heavy sales of foundry iron were made on a basis of $13,

Birmingham, for No. 2 grade. These conditions did not last long, and the second half opened with the whole market stronger.

Buying was heavy, and the entire production for the rest of the year was soon under contract. The market for 1907 opened in August, and while it was not the earliest opening on record, it may be called the most sudden and unexpected. Before the beginning of the fourth quarter every producer in the Pittsburg and Valley districts was practically sold up to July 1, 1907. There was no heavy buying for third quarter, consumers evidently preferring to wait until the opening of the new year before providing for their second-half requirements.

The highest point in pig-iron production was reached in March, when it was at the rate of 26,000,000 tons a year. From that time until August there was a steady decline until production was at the rate of 23,000,000 tons a year. Furnaces had been put out of blast for repairs and the curtailment of production resulting from this cause, probably, is responsible for the subsequent remarkable strength of the pig-iron market. From the low point in August production steadily increased and in November but few furnaces were idle and the production was at the rate of 27,000,000 tons a year. Early in December there was an extraordinary spurt and production was still further increased by from 200,000 to 300,000 tons. From these figures it is roughly estimated that the production of pig iron in this country for the year 1906 will be about 25,000,000 tons. Fully 1,000,000 tons were lost through necessity for making repairs to furnaces from March to August.

Strength was given to the pig-iron market on Jan. 15, when the United States Steel Corporation bought 115,000 tons of bessemer iron, 50,000 tons from the Bessemer Pig Iron Association and 25,000 tons from W. P. Snyder & Co., for delivery in the first quarter and 40,000 tons from W. P. Snyder & Co., for second-quarter delivery, all at $17.25, Valley furnaces. The Jones & Laughlin Steel Company and other steel interests made purchases early in the year. An idea of the course of the pig-iron market may be obtained from data furnished by a leading independent producer. It is a record of all sales of bessemer iron in lots of 1000 tons or more for the entire year, and the average monthly prices from which contracts for some finished steel products based on bessemer pig-iron rates were adjusted. The tonnages and prices at Pittsburg in round numbers are as follows: January, 120,000, $18.20; February, 38,000, $18.15; March, 42,000, $18.15; April, 95,000, $18.10; May, 150,000, $18.10; June, 75,000, $18.25; July, 82,000, $18.45; August, 200,000, $18.85; September, 50,000, $19.30; October, 50,000, $20.95; November, 35,000, $22.85; December (estimated), 10,000, $23.75.

The demand for steel rails was so urgent in the last half that importations were necessary, and prices paid were several dollars higher than the figures of the average prices given in the accompanying table. Some small lots of Southern No. 2 foundry sold in this market at $23, Birmingham, equal to $27.60, Pittsburg. Northern bessemer and foundry sold above $25, Pittsburg, but these were only for small lots and were not considered in preparing the general averages.

There were no idle periods for any of the mills due to lack of orders. When a plant suspended operations it was because of a scarcity of steel, lack of coal, or for necessary repairs. In some finished lines the mills were practically sold up for the year before the second half fairly opened. Railroads began to place contracts for rails earlier than usual and before the year closed almost the entire capacity of the mills for 1907 had been booked. The railroads also contracted heavily for steel cars and bridge-work. It is estimated that orders booked for steel cars will exceed 60,000.

Important extensions were made to most of the steel plants in the Pittsburg district and included a new light-rail mill at the Edgar Thomson Works; open-hearth furnaces at the Homestead and Duquesne plants of the Carnegie Steel Company; additions to the Park and Crescent works and a new spring plant to the McKees Rocks plant of the Crucible Steel Company of America. The Pittsburg Steel Company is preparing to build two blast furnaces, open-hearth furnaces and a blooming mill. Contracts were let by the Jones & Laughlin Steel Company for four blast furnaces to be built at Aliquippa, a few miles below Pittsburg on the Ohio river, where the company also will build a large steel plant, the details of which have not been definitely arranged. Contracts were also closed for two blast furnaces for the Carnegie Steel Company at McKeesport. The open-hearth steel capacity of different subsidiary interests of the United States Steel Corporation is being enlarged, as some steel rails for 1907.

Although the price of pig iron was high during the year, there was no change in the price of structural material, the rate remaining on the base of 1.70c. for beams and channels. Tank plate remained at 1.60c. until December and steel bars were 1.50c. until advanced to 1.60c. in November. Wire prices were irregular until November, when an advance of $1 a ton was ordered, followed in December by an increase of $2 a ton. Advances of finished products during the year were as follows: Jan. 8, black sheets, $2 a ton to 2.40c.; galvanized sheets, $2 to 3.45c.; galvanized corrugated roofing, 10c. a square to $3; tin-plate, 10c. a box to $3.50; wire products, $1 a ton, making nails, $1.85 a keg, plain wire, 1.70c. and galvanized barb wire, 2.30c. Feb. 9, hoops, $1 a ton to 1.90c. April 2, light rails, $1 a ton to $29. April 7, tin-plate, 10c. a box to $3.60. May 18, tin-plate, 15c. a box to $3.75. June 5, black and galvanized sheets, $2 a ton to 2.50c. and 3.55c. Oct. 13, merchant steel pipe, two points, or about $4 a ton. Oct. 25, tin-plate, 15c. a box to $3.90; black and galvanized sheets, $2 a ton to 2.60c. and 3.65c. Nov. 7, hoops, $2 a ton to 2c. Nov. 10, wire products $1 a ton, making nails, $1.90 a keg, plain wire, 1.75c. and galvanized barb wire, 2.35c. Nov. 13, light rails, $1 a ton to $32. Nov. 15, steel bars, $2 a ton to 1.60c. Nov. 26, plates, $2 a ton to 1.70c. Dec. 1, splice-bars, $3 a ton to 1.65c. Dec. 3, wire products, $2 a ton, making nails, $2 a keg, plain wire, 1.85c. and galvanized barb wire, 2.45c. Dec. 5, merchant steel pipe, one point, or about $2 a ton. The Carnegie Steel Company advanced sheet-bars for the second quarter from $26 to $28, for the third quarter to $29 and for the fourth quarter to $30. Lake Superior iron-ore prices were fixed for 1097 on Nov. 2, base prices being advanced 75c. on bessemer and 50c. on non-bessemer, the basis of iron content being reduced, making the actual advance greater. The new prices named are: Old Range bessemer, $5; Mesabi bessemer, $4.75; Old Range non-bessemer,

AVERAGE PRICES AT PITTSBURG, 1907.

Month.	Pig Iron				Steel.					Nails	
	Bessemer	No. 2 Foundry, Northern	Gray Forge	Ferro-Manganese, 80%	Bessemer Billets	Rails	Sheets, No. 27	Tank Plates	Steel Bars	Wire, per keg	Wire, per keg
	$	$	$	$	$	$	Cts.	Cts.	Cts.	$	$
January	18.20	18.40	17.35	135.00	28.00	28.00	2.40	1.60	1.50	1.85	1.75
February	18.15	18.10	17.10	150.00	28.00	28.00	2.40	1.60	1.50	1.85	1.80
March	18.15	17.85	17.00	140.00	27.50	28.00	2.40	1.60	1.50	1.85	1.80
April	18.10	17.90	16.90	105.00	27.00	28.00	2.40	1.60	1.50	1.85	1.80
May	18.10	17.85	16.90	105.00	27.00	28.00	2.40	1.60	1.50	1.85	1.80
June	18.25	17.85	16.90	90.00	27.00	28.00	2.50	1.60	1.50	1.85	1.80
July	18.45	17.60	16.90	85.00	27.50	28.00	2.50	1.60	1.50	1.80	1.75
August	18.85	17.85	17.85	85.00	28.00	28.00		1.60	1.50	1.85	1.80
September	19.30	19.85	18.35	83.00	28.50	28.00		1.60	1.50	1.85	1.80
October	20.95	21.10	19.35	78.00	28.50	28.00		1.60	1.50	1.85	1.80
November	22.85	23.00	20.40	83.00	28.50	28.00		1.60	1.50	1.90	1.95
December	23.75	24.35	22.85	83.00	29.50	28.00		1.60	1.50	1.90	1.95

There were no labor disturbances of any consequence during the year to interfere with production. The strike of the International Association of Bridge and Structural Iron Workers against the American Bridge Company and members in this district of the National Erectors' Association was continued all year but was not effective. Strikes of iron molders and machinists were threatened, but the labor organizations could not muster enough strength to carry out the plans.

The annual convention of the Amalgamated Association of Iron, Steel and [illegible] in May and the existing wage scales were reaffirmed except for boiling, where an increase of 25c. a ton in the base was decided upon; but the demand was withdrawn at the conference with manufacturers held in June. All the old scales were signed for the year ending June 30, 1907, but a few modifications were made in some of the foot notes. The bi-monthly adjustment under the Amalgamated Association scale, on Jan. 11 showed the average price of bar iron to be 1.5c., an increase of 0.1c., which advanced the pay of puddlers from $5.50 to $5.75 and the finishers' wages were increased 2 per cent. The bi-monthly settlement on March 13 showed another increase to 1.6c. and the puddling rate was increased to $6 a ton and the finishers got a proportionate increase. The next settlement on May 11 showed no change. On July 11 the settlement showed a decline of 0.1c. and the puddling rate dropped to $5.75, where it remained during the rest of the year.

The Cleveland Iron Market

H. [illegible]SHING.

The Cleveland market opened the year 1906 with a brisk demand for all commodities. The preceding year had been one of exceptional possibilities, and there were those who believed the market was surely riding for a fall. A survey of conditions disclosed the fact the use of material had not been such as to lend itself to a reaction as had been the case during 1902 and the early part of 1903. There had also been no price advances of note. In the two vital particulars, therefore, the market was on a different plane from that of 1902 and 1903 and conditions seemed to be shaping themselves for a further expansion of activity.

In the pig-iron trade the market opened with the same strength which had characterized it during the preceding year. Prices, on the foundry grades, ranged, according to delivery, from $14 to 15.50 [illegible] until well along toward the end of the first half of the year. In May and June there began to appear evidences that prices were going to advance and some of the more astute began to lay in a supply, on a speculative basis, to be disposed of later in the year when the prices should advance, making the speculation profitable.

Shortly after the turn of the half-year the price of No. 2 Northern foundry began to mount to higher levels and was soon selling at $18 in the Valleys, and higher for immediate delivery, with almost as high prices on contracts. At this time, the Bessemer Association, influenced largely by the stable price policy of the Steel Corporation, was trying to keep the price of bessemer and basic on the basis of $16.50 in the Valleys for both immediate and future delivery. It was not far along in the third quarter when the price of foundry iron began to climb and by the opening of the fourth quarter it was a runaway market. By the close of the year No. 2 foundry for spot shipment was selling on the basis of $25@26 for immediate shipment, at about the same price for first-quarter delivery in 1907, and at $23 @24 for second quarter. At the same time sales were made for second half of 1907 delivery at $21@22 at furnace and buyers were in a scramble to obtain the amounts they might need. As for the Bessemer Association its position was first shifted from a price of $16.50 in the Valleys to $17.50, where it was desired to hold the market, if possible. Later it was admitted conditions called for $18 in the Valleys and the next step was the admission that buyers had taken the market out of sellers' hands and were forcing prices upward with dangerous rapidity. Before the opening of the fourth quarter the price of bessemer and basic was on a parity with that of foundry and it was actually the case that consumers of steel-making irons led in covering needs for second half of 1907 delivery at $21 in the Valleys. The last half of the year was one of grief for the consumers, many of whom had extreme difficulty in covering their needs, either for immediate shipment or for use during the first quarter of next year. Conditions began to approach those of 1902, where the consumers in this territory sought relief by buying abroad.

In steel it was apparent the Pittsburg mills had increased the percentage of their output set aside for the use of the car companies, the railroads and the Lake ship-builders. This was due to extraordinary demands in all these quarters, especially, as far as Cleveland is concerned, in the ship-building trade. This lessened the amount going into general lines, where the demand was exceptionally good, despite labor difficulties. The only relief was found in the increase in productive capacity of the larger mills, mainly the Carnegie Steel and the Jones & Laughlin companies. The market was compelled to hobble along with a smaller amount of structural shapes, plates and even rails than it could have consumed. Toward the end of the year there was a movement to supply the deficiency through importations, since mills were unable to supply the demand. The last half of the year saw many consumers in this territory going into the East, where small mills had reserved part of their capacity for such an emergency, and paying premiums for immediate delivery. As the price of pig iron rose, scrap also advanced and this affected the price of bars, but without reducing the buying. Bar steel which appeared weak, early in the year—so weak in fact a recession of $2 a ton was made, to get in the agricultural implement works—strengthened after this buying had stopped and closed one of the strongest elements in the situation. Notwithstanding the enormous increase in productive capacity of sheet steel, there was such a shortage during the last half of the year that prices were advanced by the association, without checking buying. At the close of the year all of these conditions were aggravated and there was enough business on the books of the various companies to assure prosperity through the new year.

The Chicago Iron Market

BY E. MORRISON

General conditions of the iron trade in the year 1906 have been very satisfactory to Chicago furnace agents and dealers in finished products. The first half of the year was sluggish for pig iron, though sales of iron and steel products were heavy, particularly of railroad supplies. But the middle of July saw a remarkable recovery from the slump of the market caused by the dissolution a month previous of the Southern Furnace Association, and an unprecedented midsummer activity followed. The market grew stronger week by week, and prices advanced to such an extent that by December many melters refused to buy except for the most urgent needs.

The year opened with heavy contracts for finished products, but only a moderate demand for pig iron. Large contracts for structural material were placed in January, but pig iron sold only in small lots, melters being reluctant to contract ahead for supplies. The same condition continued until late in February, when there was a slight boom in Southern iron due to the announcement of an advance in the rate from Birmingham to Chicago territory, effective March 1, from $3.65 to $3.90. This rate of $3.90 continued throughout the rest of the year, despite efforts of the Southern operators to secure a reduction of 50c. early in July.

In May a large number of foundries shut down because of labor troubles with the molders, reducing the demand for foundry iron materially. The molders'

strike caused of many other in May [illegible] June and the market for pig [illegible] its lowest point for the year in the two weeks following the dissolution of the Southern Furnace Association in the middle of June. Southern No. 2 sold at $14; Birmingham ($16.90 Chicago) and Northern No. 2 at $18, the drop in Southern due to the dissolution being 50c.@$1. Early in July the price of Southern rallied to $13.50 and melters hastened to cover their needs for the last half of the year.

By the end of July there was heavy buying of both Southern and Northern and this continued unchecked, with a steady rise of prices, until the middle of October, when it was announced that furnaces generally were sold out for deliveries before the end of the first quarter of 1907. From the middle of October to the end of the year the demand for quick-delivery iron became more and more urgent, with a moderate amount of contract-making for deliveries in the second and third quarters of 1907. The lots available for quick deliveries were small and heavy premiums were paid for such lots by melters whose requirements outran their contract supplies.

The following table shows the range of prices during the year, compared with the range in 1905:

	1905.—		1906.—	
	Highest.	Lowest.	Highest.	Lowest.
L. Superior Charcoal	$ 0.50	$16.50	$20.50	$19.00
North'n No. 2 Foundry,	19.75	15.50	27.00	18.00
South'n No. 2 Foundry,	18.65	14.65	26.90	16.90
Connellsville Coke	6.40	5.15	6.90	5.40
Bar Iron	1.90c.	1.50c.	1.85c.	1.665c.
Structural Material,*	1.865c.	1.665c.	1.865c.	1.863c.

*Beams and channels, 3 in. to 15 in., and angles 3 in. to 6 in., ¼ in. or heavier.

The demand for coke was large throughout the year and in the last quarter much difficulty was experienced in getting supplies, because of car shortage. In January Connellsville 72-hour sold for $3@3.25 at the ovens, or $5.65@5.90 Chicago. The price weakened slightly by March 1—$2.75 at ovens being the minimum—and continued $2.75@3 until the end of August, when $3.25 became the standard quotation. In November the price rose to $3.75 at ovens ($6.40 Chicago) on contracts, with spot coke commanding 50c. more.

The Seaboard Iron Market

The two more important iron markets on the Eastern seaboard are Philadelphia and New York. Of these Philadelphia leads, partly because it is a primary market for the mills and furnaces of eastern Pennsylvania, as well as a distributing point; and partly because it serves a very active manufacturing region. New York serves mainly the Hudson river country, southern and western New England. Eastern and northern New England buy from Boston, but that city follows the others closely in its fluctuations. New York, it may be added, is an important distributing point for Southern iron.

One of the chief points in 1906 was the strong and steady demand for structural steel. In the cities an unusual amount of construction of large buildings was in progress, or planned, in which steel is needed. There was also a great number of smaller buildings in which the use of a certain quantity of steel is required by law. Bridge work throughout the country was active. The nominal, or base prices of structural shapes were steady, but in the second half of the year—especially in the fourth quarter—there were real advances in the shape of premiums to secure delivery, while jobbers advanced their prices largely on small lots. Among the important contracts let in New York were those for several very large buildings, and the superstructure for the Manhattan and Blackwells island bridges over thy East river.

Business in rails of standard section is generally done direct with the mills. There have been in the East a good many transactions in trolley rails, and in light rails for industrial works. The machine shops and boiler shops have been generally full of work, causing a steady demand for bars, pipes, tubes, boiler plate and similar material.

City improvements have been many, sharing the activity of all construction work. This has been the case in the smaller towns and villages, as well as the large cities, causing a strong demand for cast-iron pipe. Prices steadily advanced during the year, closing high at a basis of $35 per ton for 6-in. pipe, with premiums asked on orders for special deliveries.

Foundries throughout Eastern territory were well employed. In fact, many found, as the year passed on, that they had not contracted for enough iron. This brought many into the market in October and November, seeking pig iron for early delivery, and there was a rush to buy at any price, as the iron must be had. By the end of November the market was practically bare of spot iron, and only small lots from jobbers and second hands could be had. Prices were wild and irregular for a time, and considerable importations of Scotch and Middlesboro pig from England failed to quite meet the demand. December was marked by heavy contracting, running over the first half of 1907, and even into the third quarter. Closing prices are high, Northern pig selling at tidewater, for 1907 delivery, at about $25.50 for No. X foundry; $24.50 for No. 2 X; $23.50 for No. 2 plain; $23 for basic pig. Southern iron for first quarter was about on the basis of $24.50 for No. 2 foundry, New York or Philadelphia. Imported iron sold at $23.50, ex-ship, for Middlesboro and $24.50 for Scotch pig.

Although there were some resales, there does not appear to have been any large quantity of speculative iron on the market. The attempt to push sales of pig-iron warrants on the New York Produce [illegible] the daily calls were small, and attracted no attention from the trade.

There was a considerable growth in the [illegible] the increases being chiefly in rails, bars, plates, wire and nails. Official returns are available at this date only up to the end of October.

Exports of iron and steel, and of machinery, from the United States for the 10 months ending Oct. 31 are valued by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1905.	1906.	Changes.
October	$12,6[illegible]	$[illegible]	[illegible]
Ten months	11[illegible]	14[illegible]	[illegible]

The increase in October was 25.5 per cent.; for the 10 months it was 23.4 per cent. Mexico and the West Indies are large buyers, while South American countries are moderate customers only.

Imports of iron and steel, including machinery, into the United States for the 10 months ending Oct. 31 are valued by the Bureau of Statistics as below:

	1905.	1906.	Changes.
October	$2,665,191	$3,406,761	[illegible]
Ten months	21,829,949	27,784,[illegible]	[illegible]

The increase in October was 51.1 per cent., for the 10 months it was 27.3 per cent. The largest increase was in pig iron.

The Alabama Iron Market

BY J. W. [illegible]

Even with difficulties—labor troubles, labor shortage and last, but by no means least, a railroad car shortage—the year 1906 was a most favorable one to the iron and steel industry in Alabama. The production, in the face of serious obstacles, has been satisfactory, though not as great as it might have been had there been every commodity at hand. The quality, as well as the quantity, met expectations; the State's output of iron and steel, both in crude and manufactured form, has been large.

Transportation, probably, was the greatest difficulty of the year. When the demand for the manufactured product became brisk, and there was a desire to increase production, there was a lack of cars and locomotive power was short, causing delay in handling not only the raw material, but the finished product, blocking the production at both ends. The labor problem asserted itself early also, and while there was hope for relief in the importation of desirable labor through New York, New Orleans or last, Charleston, the task was not so easy and the men brought into the district were not numerous, and they did not fill the want.

The year 1906 witnessed much concentration and much acquisition of property by the producers of pig iron and steel in Alabama and prospective [illegible]

developments took place, all looking toward a better production.

there was an active demand for iron. pressed no apprehension at the short period of depression will be able at the close

The labor problem was a hard ward introducing labor-saving devices mines, furnaces and mills, the demand for the product and the anxiety to increase the production grew faster. As a consequence, there was complaint of shortage of raw material at the furnaces and steel mills. Transportation facilities during the latter half added to the difficulty.

The first half of the year, according to the statistics, fell below the last half of 1905 in the production of pig iron. The production of pig iron in Alabama during the first half of 1906 was 830,040 tons. The reports indicate for the second half that there will be but little difference from the production during the last half of 1905, when the figures were 860,515 tons. With an increase of 86,493 tons for the first half of 1906 as compared to the first half of 1905, it is reasonable to expect an increase for the year, the total to be approximately 1,680,000 tons.

As to quotations there was a good price for the product through the year; 1906 opened pretty strong. There was some iron on the yards, but not much. In June and July there was a little depression, compared to what had been experienced market was startled when it was announced that two of the larger companies had cut prices on iron. Explanation was given that efforts were being made to get another company into an amalgamation, but this was denied. It transpired, however, that the original cutters of price were the only ones to sell iron at the low price. With iron down to $12 per ton for No. 2 foundry, at that time, the lowest price was reached for the year. The high-water mark was reached after October and in November No. 2 foundry, immediate delivery, was not to be had, with $21 to $17 50 for iron to be delivered with three and six months. Before the close of the year announcement was made that the probable make for the first six months of ing year had been well covered for the first three months all iron steel would have to be termed "spot"

One of the Tennessee furnaces at Ens- rebuilt. The Woodward Iron Company completed its new furnaces and started work rebuilding one of the old furnaces. The Birmingham Iron Company (Tutweiler Coal, Iron and Railroad Company) started work on a new furnace at Vanderbilt. The Southern Steel Company acquired by purchase during the year 1906 the properties of the Lacey-Buck Iron Company, including a furnace, the properties of the Chattanooga Iron Company, including a furnace, and the properties of the Georgia Coal and Iron Company, also including a furnace. The Tennessee Coal, Iron and Railroad Company acquired 2200 acres of ore lands from M. L. Potter during the year and organized the Potter Ore Mining Company as a subsidiary organization, capital stock $800,000. Other purchases were made by iron and steel companies during the year, every deal indicating faith in the district and preparing for the future making of iron.

The cost of iron making was increased in 1906 on account of the labor problem and the transportation charges. The labor troubles in the coal-mining district were expensive.

The only financial troubles of the year were those of the Lookout Mountain Iron Company, furnace and properties located at Battelle, in DeKalb county. The properties were placed in the hands of a receiver and were sold by a special master, bringing less than one-fourth the original cost of the plant. One other small mining corporation was thrown into court.

An important happening of the year was the change in directors of the Tennessee Coal, Iron and Railroad Company, the largest iron and steel corporation in the Southern territory. The directors, after looking over the field, decided on immense investments in development and improvements. The erection of a larger steel plant at Ensley was one of the decisions arrived at and already much work has been done on the foundations. Contracts have been let for the buildings and machinery and by the end of 1907 it is believed the industry will be completed and in operation. The present steel plant, which has been working steadily since its erection, will be improved and enlarged later on. The steel and finished products manufactured at this point have been sold a year ahead. Another important move made was to purchase from the Southern Railway and the Louisville & Nashville companies the Birmingham Southern Railway, which is a line operating between the plants and mines of the Tennessee Company. This railway line formerly belonged to that company, but was sold during the depression several years ago to the two railroads mentioned and was operated as the Birmingham Southern Railroad. Already plans are being worked out looking to an extension of the road so that much of the [illegible] mines and factories will be under direct control.

The Southern Steel Company, a large independent producer of steel rod, wire and nails, made during the year some important additions to the plant at Ensley, including endless-wire machines, the patent of which is controlled by Moses Taylor, president of the company. Other improvements were made about some other large plants, and the year closes with nearly all our industries operating with improved modern plants.

The Lake Superior Iron Ore Region

BY DAVID H. BROWNE.

Iron-ore shipments out of Lake Superior mines for the past two years have been as follows, including whatever has been shipped from the Michipicoten mines on the Canadian side of the lake, and also all-rail business, the latter as closely as it can be estimated at this time:

Range.	1905.	1906.	Changes.
Mesabi	20,154,699	23,759,156	I. 3,605,457
Menominee	4,495,451	5,282,910	I. 787,459
Marquette	4,210,522	3,687,494	D. 523,028
Gogebic	3,705,207	3,588,111	D. 317,096
Vermillion	1,677,186	1,799,247	I. 122,061
Michipicoten	169,527	121,555	D. 47,972
Total	34,522,965	38,038,473	I. 3,515,508

Shipments of the various districts on Lake Superior, not including Michipicoten, with dates of commencement of operations, have been as follows:

Range.	First Year.	Total to date.	Per Ct.
Marquette	1855	80,488,108	23.83
Menominee	1877	58,861,307	17.42
Gogebic	1884	50,222,971	14.87
Vermillion	1884	28,497,151	7.35
Mesabi	1892	122,709,212	36.33
Total	1855	337,767,569	100.00

Shipments by the various railroad systems that handle ore from mines to upper lake ports have been as follows:

Railroad.	1905. Tons.	Per Ct.	1906. Tons	Per Ct.
Duluth, Missabe & N.	8,804,443	25.9	11,220,218	29 5
Minn. & Iron Range	7,77[illegible]8	22.9	8,205,128	21.6
Chicago & North'w'n	6,729,975	19.8	6,706,986	17.7
Great Northern	5,118,385	15.1	6,133,057	15.8
Chic., Mil. & St.Paul	1,310,021	3.9	1,931,244	5.1
L. Sup. & Ishpeming	1 844 823	6.4	1 889 031	5 6
Duluth, S.S.& Atlan'c	1,243,388	3.6	1,074,045	2 9
Wisconsin Central	793,394	2.3	693,852	1.9
Wis. & Mi. (car ferry)	[illegible]		62,767	0 2
All rail, not included	198,000	0 6	.....	
Algoma Central	169,527	0.5	121,555	0.3

All these figures do but emphasize the importance of the Mesabi, which furnished 62.4 per cent. of the year's total, and all but 100,000 tons of the increase over 1905.

There has been one overshadowing event of the year, which was not only important in itself, but has had its influence on almost everything that has taken place on the iron ranges. That was the so-called "Hill deal" for the sale of the Great Northern and associated ore deposits on the western Mesabi to the United States Steel Corporation. This transaction placed in the hands of the Steel Corporation the great bulk of remaining independent iron-ore tonnage, thus eliminating [illegible] than ever before the possibility of

was. To be sure the seller gets a higher royalty than had before been given for [illegible] product. But there is little question that the road could mine this ore for the market and make a larger profit than the 85c. a ton it secures from the Steel Corporation. In the matter of annual minimums, others than the Steel Corporation stood ready to make contracts that would have insured as high a product and as favorable terms as were finally obtained. The estimates of tonnage in sight from these lands vary greatly, but it is generally understood that it is less than has been frequently stated. That there are [illegible] upon complete exploration along the miles of Mesabi formation held under this lease [illegible] and one of the important matters to be considered by the lessees is the immediate development of that land.

Royalties of 85c. a ton, increasing annually by the amount of the interest charge, and minimums of 750,000 tons the first year, increasing by the same volume annually, have set a new pace for Mesabi range owners. About the same time this deal was closed another was made to an interest in need of good ores, for even a higher price—$1 a ton—and now the owners of undeveloped lands are putting up their figures to something far above any rate ever made in the past.

The Hill deal was one of the factors directly responsible for the construction of the West Mesabi branch of the Duluth, Missabe & Northern road, the other being the Steel Corporation's purchase of the Canisteo lands, made a year ago and commented upon in the review of that time. Upon portions of these lands the ores are quite sandy, and will be concentrated before shipment. Experiments looking to the solution of the problem of concentration are under way, and it is expected that they will be settled very shortly. The Oliver Iron Mining Company is building at Coleraine, on the western Mesabi, the first 1000-ton unit of a series of washeries, and will make tests in a few weeks. The problem is not regarded as especially difficult, but it is taking considerable study to determine the most economical process. These ores, once washed, are desirable, both from their grade chemically and their structure physically. The character of the western Mesabi enterprise was such that it naturally fell to the lot of a great company to carry it forward; no small concern could undertake operations of the nature and extent required to make it a success. [illegible] the construction of long lines of railway, of suitable machinery for concentration, with the attendant experiments, the opening of enormous deposit for steam-shovel mining on a large scale, and the building up, from the beginning, of every item going toward the makeup of a vast mine proposition. As an instance, one of the stripping operations consequent upon this undertaking covers a total of more than 13,000,000 cu.yd. of material.

The marked tendency toward the substitution of open pits for underground mines is still in evidence. Labor costs are advancing, and what is worse, it is hard to get labor commensurate with the work to be done. Then timber is rising in price very fast, now in a greater ratio than ever, and the two items have completely changed former conditions governing the depth to which stripping might be carried. The deepest open pits now on the Mesabi are about 90 ft., but a mining company operating in a large way is to let contracts for striping an orebody of 168 ft. of overburden, and another company is considering the stripping of 125 ft. of surface. The question of depth of overburden that may economically be taken from over ore is somewhat complicated, far more than by the mere ratio of thickness of stripping to depth of ore. Questions of location of pit, grades into it, spoil banks, regularity of the ore chemically, probable tonnage to be produced annually, are among the more important questions, and lead many to continue underground operations rather than adopt what might seem far more suitable for their situations. Few Mesabi deposits cannot be economically stripped, so far as depth of overburden is concerned, but there will doubtless be underground mines there so long as the district is a producer. Many large and far-reaching plans for stripping operations have been made of late, and the Oliver Iron Mining Company especially is undertaking or is soon to begin, the stripping of important groups of mines from which an annual tonnage of enormous proportions may be secured. Costs of stripping have been steadily lowered, and now range well below 18 to 20 cents a yard. These figures are, of course, somewhat exceptional, and are for favorable operations and well located properties. One development of the stripping of deep mines is sure to come soon—that of hoisting the ore by other means than by the standard railway car attached to a locomotive. In the milling process ore is hoisted in skips, but where ore is sticky when wet—and in open-pit mines it must be wet whenever there are rains—this is no slight difficulty. The time will soon come, doubtless, when instead of the long and costly approach at grade into a mine there will be a stationary engine above the pit and railway cars will be loaded by shovels and hauled out by cable, to be made into trains above.

During 1907 from 35 to 40 large steam-shovels will be constantly employed in [illegible] on the Mesabi range, [illegible] by mining companies. The average work of a shovel is about 35,000 yards per month. These shovels should move during the season of operation about 10,000,000 yards of material. One contracting firm is moving at the rate of 3,000,000 yards per annum.

The concentration of ore into few hands has been maintained during the year, though, with the exception of the Hill deal, there have been few large purchases. This is for the reason—and it might as well be faced now as later—that there are few deposits to be sold. It is well within the mark to say that there is not one 40-acre tract on the Mesabi that has not been explored at least once, and thousands of them many times. The orebodies that have escaped this search are few and small. With the lowering of grade that has been going on during the past few years properties are now workable that a short time ago were useless, and most of the so called new discoveries are of this nature.

A year ago this review stated that: "There has been talk of a greatly increased shipment during 1906. Some estimates have gone so far as 40,000,000 tons for the year out of Lake Superior region. It is hard to see how such an increase can be made, or where the ore is to come from. It is undoubtedly true that the old ranges have reached their maximum; the additions of the immediate future must be from the Mesabi. After such a magnificent jump as this range has made in 1905, 7,171,000 tons, is it capable of another five or six million tons in a single year? It does not so appear. Neither railroads nor mines are now in position to stand such a strain, nor are the contemplated betterments of the winter calculated for such a tonnage, extensive and elaborate as they are."

That this prediction was well founded is evident enough now. Today estimates for the coming year are for more than 40,000,000 tons. It is a practical impossibility that they pass that. The same causes that militated against such a stupendous advance in 1906 will continue their effect. So far as the railways are concerned, they can probably make a greater increase than during the past year. Terminal and dock capacity is materially improved, while 3000 to 4000 new 50-ton cars and equivalent motive power will be added in time for a part, at least, of the traffic of 1907. So far as shipping is concerned, it will be ahead of the demand the coming season. The brakes will be put on by capacity of lower lake docks and, possibly, of mines. Lower lake docks have always been a bar to the greatest increases, but mines have usually responded to any demands. Now, owing to a variety of causes, they cannot be so depended on. One of these causes is labor, another is the requirements for specific grades of

ing, the wildest expectations of one year are weak beside the realizations of the [illegible] of 13,000 gross tons of iron ore, or 380,000 bushels of grain. These cargoes are not equaled by freight ships on any ocean, and it can now be asserted that the largest cargoes in the world are carried regularly by the vessels plying the inland lakes of America, with iron ore and other freights. Together with additional size has come more rapid handling of cargoes, and it would be no surprise if a 13,000-ton ship should be loaded in one hour. Of course conditions must be right, the ore must be of a character easily handled, it must be in a solid block so the ship will not lose time by shifting from place to place, and the vessel must be handled expeditiously. The record cargoes of the past year have been those of steamship "J. P. Morgan," from Lake Superior, 11,868 gross tons, and "H. H. Rogers," from Escanaba, 13,333 gross tons. Both ships might have loaded deeper if channels and harbors had permitted, though the "Rogers," on account of running through no connecting channels, was able to carry nearer capacity than the sister vessel. These ships are 600 ft. long. The steamship "Earling," with about 10,000 gross tons, was loaded at the Duluth, Missabe & Northern docks in 135 minutes, of which period only 70 minutes were consumed in actually running ore into the vessel. The fastest time ever made in loading was a year ago, when the ship "Wolvin" took 10,000 tons in 90 minutes. Unloading records have been speeded up also. Several times this year ships have left the head of the lakes Wednesday morning with cargoes for eastern Lake Erie, and have started back up lakes again on Sunday morning. The "W. E. Corey," with 9574 gross tons of ore, was at Conneaut docks but four hours and 29 minutes, while the net unloading time was three hours and 32 minutes. Automatic electric unloaders of the Hulett and Brown types handled out of this ship at the rate of 389 and 284 tons per hour, each, respectively. Of this cargo more than 7000 tons was put on board railway cars, as part of the unloading operation, the rest being dumped into dock stocks.

The average iron-ore freight for 1906 has been 75c. per gross ton, the distance carried being 880 miles. This was 0.076c. per net ton-mile. Probably freights are carried nowhere else at such a figure. The average rate for the past ten years has been 88.5c. per ton. For 1907 it has been fixed at the same price as during the season now closed.

Exploration has proceeded during the year along Lake Superior with the vigor [illegible] advancing market for ore, and an increasing consumption of metal all over the country. Exploring syndicates and drilling firms have never been more busy than now, and are limited not so much by the amount of work offered as by the lack of suitable drill runners. In this respect the situation, while not unique, is unusual. [illegible] furnishes the bulk of drill operations. This is carried on, not alone in a search for mineral, but in redrilling of previously explored properties, with the idea of development for mine operations in a more scientific and accurate manner than has been the general rule in the past. No great tonnage of new ore has been uncovered on the Mesabi during the year; deposits found have been small and scattered. Orebodies that a few years ago would not have been considered worth developing, on account of their slight tonnage or their low iron content, have now been carefully explored and are being turned to account. The great bulk of ores found during the year on this range has been at the west end, and development has proceeded west of the Mississippi river, where some good indications of orebodies have been cut into. It is very hard to make any estimate of tonnage thus shown up during the year, for the operations of one year tie themselves into that succeeding so closely that any differentiation is impossible. But it is probably safe to say that as much tonnage has been added to the ore in sight on the Mesabi as has been taken out during the same period. This, indeed, has been an annual occurrence on that range.

On the eastern Mesabi, where original discoveries of the district were made, 30 or 40 years ago, developments during the late months of 1906 indicate that ore will be found in workable quantity, and it is possible that a considerable tonnage may be found during the coming year. These ores are flat, and lie in thin beds, chiefly of a hard hematite. Exploration is now proceeding with considerable vigor.

NEW RANGES

On the Cuyuna range, 100 miles west of Duluth, there is little to report. For the past three years it has been the unfortunate fact that my own opinion of results secured there, and prospects of the future, have been diametrically opposed to that of those chiefly interested there. Another year's operations have not been such as to satisfy iron-ore men that merchantable ore exists in workable quantity on the Cuyuna. From 20 to 40 drills have been punching holes along both formations there for the past twelve months, but few claim the range looks better than it did a year ago. Operating mine concerns, which had taken lands there, have abandoned explorations, and in most cases have given up their options. This is true of such concerns as the United States Steel Corporation, which has quite recently dropped options on a large acreage around Rabbit lake. Pickands, Mather & Co., who sank a shaft last year, have ceased work, and abandoned most of the properties they held. A large amount of money has been spent in the district without commensurate results, and the number of drills at work will probably dwindle. The facts as to the Cuyuna seem to be that it contains a very large amount of lean iron ore, running from 35 to 45 per cent., largely non-bessemer, and frequently manganiferous.

Work has been carried on during the year west of the Mississippi river, in an attempt to connect the Mesabi and Cuyuna districts on an ingenious but unnecessary and improbable theory. This is over and was without result. Some rainbow-chasers worked farther south along the Mississippi river, in Morrison and Crow Wing counties, where float indications are present, but found nothing.

In the Palmer district, Cascade range, south of Marquette, everal large interests have been drilling all the year, and one of these alone has discovered more than 40,000,000 gross tons of ore, while others are finding lesser amounts. There is, doubtless, an enormous quantity of ore in that district. It is low-grade, silicious ore, close to, and in part under, the bessemer limit, and quite dry. In addition to this it is close to surface and can be cheaply mined. It may be that the quantities of such ores which may be found in the Cascade district and on the Menominee range will far exceed any prognostications, and that hundreds of millions of tons of ores ranging from quite lean to fairly good will be opened there. But, notwithstanding tonnages discovered, the use to which these ores can now be put is rather limited, and none of the operators is able to mine to capacity.

Considerable work has been done along the Menominee during the year, and a few good deposits have been opened, while several others give promise enough to warrant careful exploration.

Some work is under way along the western Gogebic, which has been a discarded territory for years, and while the region is not liable to produce large mines, it may reveal small deposits of good ore.

The Gunflint district of northeastern Minnesota, idle for many years, is under exploration. That ore exists in the district is well known, but it is magnetic; some of it carries titanium and some sulphur, though neither of these elements is present where development is now proceeding. The discovery of a minable property at Gunflint would stimulate exploration over a large area where surface conditions are most favorable for the deposition of iron ore.

CANADIAN IRON ORES

On the Canadian side, work has lagged. The Atikokan Iron Company is still pre-

perior, for its new furnace at Port Arthur. The Lake Superior Corporation continues unable to carry forward exploration on the Michipicoten range, but has mined 121,555 tons from its Helen mine, which seems to promise more and more pyritic ore. There have been discoveries in the Port Arthur neighborhood the final significance of which cannot yet be determined. The United States Steel Corporation and other parties are exploring this winter in northern Ontario, where the surface indications are excellent. In the Moose Mountain region, where parties connected with railway enterprises in Canada and with the Republic Iron and Steel Company own important tracts, operations have not been as rapid as expected. Little has been done further than to test ground and crosscut formations. Activity is awaiting the arrival of a railway and the construction of ore docks on the north side of Georgian bay, when developments will proceed with considerable rapidity. Indications are that this will be one of the important newer iron-ore fields of the northern country.

A fact, of which the importance can scarcely be overlooked, is the diminishing iron content of ore shipped from Lake Superior. While this has been unofficially appreciated for a year or two, it has now been officially recognized in the lowering of the grade of standard ore. In the base price of ore for the year 1907 this lowering showed as follows:

	Old Ranges.		Mesabi.	
Bessemer ores	1906.	1907.	1906.	1907.
Iron, % natural	56.50	55.00	56.50	55.00
Moisture, %	10.00	10.00	10.00	10.00
Iron, dried, %	63.00	61.12	63.00	61.12
Phosphorus, %	0.045	0.045	0.045	0.045
Base price	$4.75	$5.00	$4.00	$4.75
Non-bessemer ores:				
Iron, % natural	52.80	51.50	52.80	51.50
Moisture, %	12.00	12.00	12.00	12.00
Iron, dried, %	60.00	58.52	60.00	58.52
Base price	$4.50	$4.20	$4.50	$4.00

It has been a common complaint for a year or two that Mesabi ores, originally very low silica, were becoming high in silica, and were to that extent less advantageous. The capacity of the furnace was slightly diminished, the amount of coke and limestone increased, and the costs of iron making thereby hightened. Of course, this is not due, as some seem to think, to any change in the character of Mesabi ores, but to the shipment of a leaner iron than heretofore. It is still the fact that merchant firms shipping off that range are unable to dispose of an ore much under 56 to 57 per cent. dry, which would be, say, 51 to 52 per cent. natural iron. To be sure, concerns shipping to their own furnaces are able to dispose of an ore considerably leaner, and are doing so, to an ever increasing extent, conserving as far as may be their richer ores. The bessemer process is waning, and the proportion of non-bessemers mined on all ranges is increasing; but this is not due to any loss of popularity of bessemer iron, though it is now contended that open-hearth can be made at less cost, but to the [illegible] that the majority of consumers have been [illegible].

Sales of Lake Superior iron ores for 1907 were practically all closed before Dec. 1, 1906, and at that time open bessemer ores were sold up for the coming year. Few of these ores are now on the market, and the demand from furnace concerns not sufficiently fortified with ores on Lake Superior was very insistent and urgent. Even with sales made and most of the mines utterly unable to accept more orders for ore than they have disposed of, not a few furnaces are insufficiently supplied for the year. It is no wonder, therefore, that of new steel-making works now contemplated or going in, the proportion of bessemer works is so small.

Metal Market

NEW YORK, Jan. 2

Gold and Silver Exports and Imports.

At all United States Ports in November and year

Metal	Exports.	Imports.	Excess.	
Gold:				
Nov. 1906	$1,963,757	$ 8,934,958	Imp	$6,971,201
" 1905	1,137,318	5,202,790	"	4,065,472
Year 1906	44,831,203	147,961,827	"	103,130,624
" 1905	44,125,935	46,264,524	"	2,138,589
Silver:				
Nov. 1906	4,411,830	2,914,157	Exp.	1,497,673
" 1905	5,361,819	4,306,838	"	1,054,981
" 1906	53,400,246	39,790,748	"	13,609,498
1905	49,316,953	31,246,389	"	18,070,564

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Dec. 29 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 240,410	$ 410,120	$1,165,335	$ 23,453
1906	6,000,845	94,035,741	50,412,974	2,636,749
1905	44,884,743	10,821,486	34,961,216	4,161,314
1904	10,222,000	7,492,887	35,210,691	1,145,420

Exports of gold for the week were to Argentina and Haiti; of silver to London. Imports of gold for the week were from France, Cuba and South America; of silver from Mexico and the West Indies.

Other Metals

Daily Prices of Metals in New York.

Dec. and Jan.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
27	23⅝ @24	23⅝ @23¾	107⅜	42½	6.00	6.70	6.55
28	23⅝ @24	23 @23¾	104	42⅝	6.00	6.70	6.55
29	23⅝ @24	23⅞ @23¾	.....	42⅝	6.00	6.70	6.55
31	24 @24¼	23⅝ @23⅞	105¼	42	6.00	6.70	6.55
1	.....	.....	.....	.....	.....	@6.75	@6.60
2	24 @24	23⅝ @23⅞	105¾	42⅝	6.00	6.70	6.55
						@6.75	@6.60

Copper—The position of the market is practically unchanged. Business has been rather light, but the conditions are such that the market has further advanced on small transactions, and some small sales have been made at fancy prices; as high as 24⅛c. for electrolytic, and 24½c. for Lake copper having been paid. Inquiry from Europe, particularly, has shown a decided falling off, as buyers over there have been somewhat shocked by the severe decline in the standard brands. The closing is steady at 24@24¼ for Lake copper and 23⅞@23⅞ for electrolytic in ingots, cakes and wire bars. The average at which business has been done in casting copper is 23@23¾ cents.

The cabled reports from London give the close as £105 5s. for spot, £106 12s. 6d. for three months.

Statistics for the second half of December show an increase in the visible supplies of 1900 tons.

Refined and manufactured sorts we quote: English tough, £109; best selected, £110@111; strong sheets, £114@115.

Tin—In sympathy with the decline in Europe, tin is very dull and weak. Quotations have declined violently in London, the close being cabled as £191 15s. for spot, £192 5s. for three months. It is not surprising, therefore, that domestic buyers should be holding off, and quotations are altogether nominal at 41⅞.

Statistics for the month of December show an increase in the visible supplies of 400 tons.

Lead—The market is unchanged at 6c. New York.

Reports from London indicate a steady tone in the market there, which closes at £19 17s. 6d. for Spanish lead, £20 for English lead.

Spelter—There has been a very good inquiry for near-by shipment, and as supplies are well-nigh exhausted prices have been advancing steadily. The close is firm at 6.70@6.75 New York, 6.55@6.60 St. Louis.

The London spelter market is steady at £28 for good ordinaries, £28 5s. for specials.

Antimony is quiet. Quotations are 25¾@26¼ for Cookson's; 25@25¾ for Hallett's; and 23¾@24½ for ordinaries.

Nickel—Quotations for large lots, New York or other parallel delivery, as made by the chief producer, are 45@50c. per lb. for large orders, according to size of order and terms. For small lots, 50@65c. is charged.

THE MINING INDEX.

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-[illegible] handled for $5.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM

[illegible] MINI M CASTINGS [illegible] Working Aluminum Castings [illegible] Wld. Dec. 1906; 2 [illegible] the use of the particular [illegible] the difficult [illegible]

[illegible] SOLDAGE [illegible] BATTERIES [illegible] Aluminiumzellen. M. Büttner. (Zeit. f. [illegible] Nov. 1906; 10 pp.) A [illegible] the use of aluminum for storage [illegible]

ANTIMONY

[illegible] ANTIMONIAL LEAD [illegible] Wld., Dec., 1906). Discusses the suitability of this material for artistic castings. 20c.

1743—ANTIMONY INDUSTRY—F. T. [illegible] & Mg. J., Dec. 1, 1906). Describes the various sources of antimony ores, the method of smelting them, and outlines the present condition of the antimony market. 20c.

ASPHALT

[illegible] ASPHALT [illegible] Ozokeritlager [illegible] bau in Galizien. Werber. (Chem.-Industrie, Nov. 15, 1905. A brief note on [illegible] ozokerite with remarks on its commercial utility. 40c.

CEMENT

[illegible] CEMENT INDUSTRY) Recent Progress in the Cement Industry. Bertram Blount. (Jl., Soc'y of Chem. Industry, Nov. 15, 1906; 12 pp.) Outlines the old and the new methods of making cement, [illegible] involved, and statistics on the production of portland cement. 80c.

[illegible] CEMENTS [illegible] H. (Can. Engr., Dec., 1906). Dis-[illegible]

COAL AND COKE

[illegible] [illegible] 1905. 4 pp.) Review of the conditions and causes of fatal accidents in coal mines, with sta-[illegible]

[illegible] Matanuska Coal Field, Alaska in [illegible] C. Martin. (U. S. Geol. Surv., Bull. [illegible]

[illegible] at the end of Knik Arm, Alaska. [illegible] J. W. De Ennis. (Elec. Wld., Dec. 1, [illegible]

[illegible] BOILERS for Colliery Purposes. [illegible] the So. Staffordshire and [illegible] [illegible] Oct. 1906). Describes the [illegible] in regard [illegible]

[illegible] Jurgle. Oct. 1, [illegible] applied to the result obtained by testing hydro-carbon fuels in the ordinary calorimeter as designed for solid fuels. 80c.

1753—CHINA—Coal Deposits and Methods in China. E. Blackwelder. (Mg. Wld., Nov. 24, 1906). Describes the mining development and the economic importance of the Shan-Si district of China. 20c.

1754—COAL DUST The Prevention and Removal of Accumulations of Coal Dust. C. Brown. (Sci. & Art of Min., Nov. 17, 1906). Paper read before the So. Yorkshire Mining Students' Assn., Oct. 20, 1906, discussing simple means for preventing the accumulation of coal-dust in mines. 40c.

1755—COAL FORMATION—The Maximum Deposition of Coal in the Appalachian Coal Field. George Hall Ashley. (Econ. Geol., Sept.-Oct., 1906; 5½ pp.) Describes the occurrence of coal at those points where it reaches its thickest development. 80c.

1756—COAL MINING—Aus- und Vorrichtungsarbeiten der Zeche Zollverein Schacht III. speziall der VIII. and IX. Tiefbausohle. W. Schormann. (Bergbau, Dec. 6 and 13, 1906; 5 pp.) Describes the lay-out and system of working at this German coal mine. Illustrated. 60c

1757—COAL MINING—Betriebsplan Fragen. Dr. Herbig. (Glückauf, Dec. 1 and 8, 1906; 10½ pp.) A practical discussion of the numerous questions that arise in the laying out of a new coal mine. 80c.

1758—COAL MINING—The Technics of Coal Mining. Geo. H. Winstanley. (Mg. Engineering, Dec., 1906). An elementary discussion of the art of mining. 20c.

1759—COAL POCKETS—Retail Coal Pockets. E. F. Quirke. (Coal Tr. Jl., Nov. 28 and Dec. 5, 1906; 6½ pp.) Describes the construction of bins for the handling of coal at retail points. 60c.

1760—COKE OVEN PLANT—Koppers Regenerative Coke Oven Plant. (Iron and Coal Tr. Review, Dec. 14, 1906). Illustrated description presented to the National Assn. of Colliery Managers, of the Baum washer and Koppers coke ovens in use at the Barnsley Main Colliery, Barnsley, England. 40c.

1761—COKE OVENS—An Innovation in Coke Ovens. (Iron Tr. Rev., Nov. 22, 1906). Describes and illustrates a new type of coke oven, in use at Mt. Braddock, which is provided with two opposite doors for facilitating the removal of the coke. 20c.

1762—COKE OVENS and Coking. J. M. Van Harlingen. (Yale Sci. Monthly, Nov., 1906; 8 pp.) Discusses the general principles of coal coking and construction of bee-hive ovens. 40c.

1763—ELECTRIC MACHINERY — L'Electricité dans les Mines. Essais effectués dans la galerie d expériences [illegible] Bismarck sur la sécurité des machines et appareils électriques dans les atmosphères explosibles des mines. Bergassessor Beyling. (Annales des Mines de Belgique, T. XI, 4 livr., 1906; 19 pp.) Continuation of article previously indexed, giving results of experiments on the dangers to be apprehended from the use of electric machinery in explosive atmospheres.

[illegible] ELECTRIC PLANT in a Large Belgian Coal Mine. E. Guarini. (Mg. Wld., Dec. 1, 1906). Describes the apparatus employed at this electrically op[illegible]

1765—ELECTRICAL EQUIPMENT of the United States Coal and Coke Co., in the Pocahontas Coal Field. G. R. Wood. (Mines & Min., Dec., 1906; 4 pp.) Description of the electrical equipment at this mine. 40c.

1766—GAS DETECTOR—Discussion on the McCutcheon Gas Detector. (Trans. Mining Inst. of Scotland, Vol. XXIX, Part 1). Discussion by various members of the Institute.

1767 HAULAGE—Goodman Rack Rail Haulage in Service on Light Grades at Rossiter, Pa. (Elec. Mining, Dec., 1906; 10 pp.) Describes a combined system of ordinary and rack rail electric haulage installed at a large coal mine at Bernice, Pa. 20c.

1768—HAULAGE—Secondary Haulage. D. Ross. (Sci. and Art of Mining, Nov. 17, 1906.) Paper read before the So. Yorkshire Mining Students' Assn., Oct. 20, 1906, describing briefly the various methods of haulage from the coal face to the main haulage. 20c.

1769—HAULAGE AND HOISTING—Förderung auf Zeche Prosper. Schacht II. W. Haarmann. (Bergbau, Nov. 15 and 22, 1906; 5½ pp.) Describes and illustrates a modification of an endless rope haulage system in use at this German coal mine. Also deals with the construction and operation of a multiple-deck hoisting cage in use at the same mine. 40c.

1770—INDIA—The Abandonment of the Collieries Worked by the Government of India at Warora, Central Provinces. R. R. Simpson. (Records, Geol. Surv. of India, Vol. XXXIV, Part 2, 1906; 2 pp.) Note on the character of coal previously obtained from this mine.

1771 INDIAN TERRITORY—Report of the Mine Inspector for Indian Territory to the Secretary of the Interior for the Year Ended June 30, 1906. (Washington 1906: Government Printing Office; 58 pp.) Gives details of the production of coal and coke in Indian Territory for the above period, with details of plants and operations, statistics of accidents, etc.

1772—MINING LAWS—Laws Relating to Protection of the Lives of Coal Miners in the Territories, and Opinions of the Assistant Attorney-General for the Interior Department, Construing the Same. 1891—1906. (Washington, 1906: Government Printing Office; 12 pp.)

1773 PEAT A Commercial Peat Fuel Plant. F. J. Bulash. (Engineer, Dec. 15, 1906). Describes the operation of a successful plant for making peat briquets. 20c.

1774 PEAT Mining Peat Bogs. R. Lee. (Eng. & Mg. Jl., Dec. 15, 1906). A general note on use of peat. 20c

1775 POWER GASES Characteristics of Some Power Gases and their Treatment. L. L. Brewer. (Power, Dec., 1906; 3 pp.) Describes the various gaseous fuels now employed, with a discussion of their relative efficiencies. 20c.

1776—SAFETY LAMPS—Siege d'Experiences de l'Etat a Frameries. Examen de Quelques Types Recents de Lampes de Surete et Recherches nouvelles sur la Resistance des Verres. V. Watteyne and S. Stassart. (Annales des Mines de Belgique, T. XI, 4 livr., 1906; 126 pp.) Results of exhaustive tests of a variety of safety lamps, subjected to every possible combination of conditions. Profusely illustrated.

1777 TIPPLE A Modern Coal Tipple. F. R. Willson. (Eng. & Mg. Jl., Dec. 1, 1906). A description of the installation and operation of a highly developed coal tipple. Illustrated by drawings. 20c

1778 TRANSVAAL The Coals of the

[illegible] E. A. De H. Mosse [illegible] Report of Mosse Gold Mines, N. [illegible] pp. [illegible] [illegible] Supt. Mosse Gold Mines, N. [illegible] [illegible] [illegible]

colm Maclaren. (Records, Geol. Surv.

Brief description of methods, other than ores of this district. 20c.

1833—MEXICO—The History of Min- & Sci. Press, Dec. 15, 1906; 2½ pp.) Short historical sketch of the mining in-

1834—MEXICO—The Mines of Plan- & Mg. Jl., Dec. 15, 1906). Describes the geology, ore occurrence and method of mining in this district of northern

1906). Describes this Mexican mine in Chihuahua in which rich silver ore of a superior nature is obtained. 20c.

1836—MILLING—High Stamp Duty in Gold Milling. A. McA. Johnston. (Eng. & Mg. Jl., Dec. 1, 1906). Compares the operation of two stamp mills on the Rand, one of which uses tube mills and the other does not, while the use of screens is also different. 20c.

1837—MILLING GOLD ORES—Algernon Del Mar and H. P. Gordon. (Mg. & Sci. Press, Nov. 17 and Dec. 8, 1906). A discussion on the subject of fine grinding for gold ores, with particular reference to the resistance of gold to amalgamation. 40c.

1838—MINING COSTS—West Australian Gold Mining Costs. (Mg. & Sci. Press, Dec. 8, 1906; 2½ pp.) Valuable and detailed article on methods of apportioning costs of mining in Western Australia. 20c.

1839—NEVADA—The Johnnie Mining W. A. Reet (Mg. Wld., Nov. 24, 1906; 4 pp.) General description of this new Nevada mining camp. 20c.

1840—ORE TREATMENT — Apuntes practicos sobre el beneficio de minerales Mineria, Aug. 31, 1906; 5½ pp.) Brief notes on the working of gold minerals, dealing with crushing, amalgamation, retorting of mercury, loss of mercury, etc.

1841—PATIO PROCESS—The Patio Process. (Three Weeks in Mexico). T. A. Rickard. (Mg. & Sci. Press, Nov. 17 and 24, 1906; 3½ pp.) Continuation of this series of articles, describing in these instalments the operation of the Patio process, together with notes on

Ground. R. M. Downie. (Mg. & Sci. Press, Dec. 8, 1906). Reply to Mr. D'Arcy Weatherbe's article on this subject, which was previously indexed, defending the drill method of prospecting dredging ground.

1843—QUEENSLAND—The Seven-mile (Nananga) Goldfield. L. C. Ball. (Queensland Gov. Mg. Jl., Oct., 1906; 2½ pp.) Describes the geology and the mining development at this Queensland locality, 80 miles northwest of Brisbane, with particular reference to the occurrence

1844—SAMPLING AND ASSAYING of Colcord. (Eng. & Mg. Jl., Dec. 22, 1906). Description of the method used in sampling cobalt ores and two different procedures for assaying them. 20c.

Deep. A. McA. Johnston. (Eng. & Mg. speed and costs of sinking this deep

1846—STAMP MILL—The Palmer illustrates a new electrically operated

1847—TUBE MILL LINING. A. E. Drucker. (Mg. & Sci. Press, Nov. 17, of lining tube mills, with flint pebbles set in a framework of steel rails and cement. 20c.

1848—TUBE MILLS—Comparison of the Crushing Efficiency of Tube Mills. Chem. Met. & Mg. Soc'y of So. Afr., Oct., 1906). Discussion by H. A. White of the above paper which was previously read before the Society. 60c.

1849—TUBE MILLS—The Economics of Tube Mills. (So. Afr. Mines, Oct. 27, Nov. 3 and 10, 1906). A discussion of costs of milling in South Africa, showing the advantage of using tube mills. 60c.

1850—WESTERN AUSTRALIA—Industry and Politics of Western Australia. R. Stokes. (Mg. Wld., Dec. 8, 1906). A discussion of the economic resources of Western Australia, including water, timber, fuel, and labor. 20c.

1851—WESTERN AUSTRALIA—Records and Progress of Kalgoorlie, Western Australia. R. Stokes. (Mg. Wld., Nov. 24, 1906). Enumerates the producing mines at this West Australia gold field. 20c.

1852—WESTERN AUSTRALIA—Third Report on the Geological Features and Mineral Resources of the Pilbara Goldfield. A. Gibb Maitland. (Geological Survey of W. A., Bull. No. 23, 1906; 92 pp., 7 maps, 13 figs.) Detailed description of the geology of the above region, together with account of mining methods. 40c.

1853—WESTERN AUSTRALIAN MINING PRACTICE. (W. A. Mg. Jl., Nov. 10, 1906). Describes the smelting plant and the process at the Lancefield mine of Western Australia. 40c.

GYPSUM

1854—GERMANY—Das Gipsgeschäft in Jahre 1905 nach Handelskammerberichten. (Tonindustrie-Zeit., Nov. 17, 1905). A review of the German gypsum indus- districts. 10c.

1855—PLASTER OF PARIS—Manufacture of. C. O. Bartlett. (Eng. & Mg. Jl., Dec. 8, 1906). Describes the machinery and method for making plaster of paris. Illustrated. 20c.

IRON AND STEEL

1856—BESSEMER PROCESS—Thermo-Chemistry of the Bessemer Process. Metallurgical Calculations. J. W. Richards. (Electrochem. & Met. Industry, Dec., 1906; 4 pp.) Quantitative discussion of the heat values in converting steel, together with several applied problems. 40c.

1857—BLAST FURNACE PRACTICE, Notes on. H. Pilkington. (Iron & Coal Trades Rev., Dec. 7, 1906). Abstract of an address before the Brit. Foundrymen's Assn., outlining the development of the iron smelting industry in central England. 40c.

1858—BRITTLENESS IN STEEL. Observations made in English Boiler Plate Practice. C. E. Stromeyer. (Iron Age, Nov. 22, 1906). Discussion of the heat treatment and the time effect as affecting the suitability of steel for boilers and furnaces. 20c.

1859—CALIFORNIA—The Iron Ore of Shasta Co., California. D. F. Campbell. (Mg. & Sci. Press, Nov. 17, 1906). Geological description of the district, with note on its iron occurrence. 20c.

1860—CAST IRON—Combined Influence of Certain Elements on Cast Iron. A. H. Hiorns. (Iron & Coal Tr. Rev., Nov. 30, 1906). A physical and microscopic study of cast irons, containing various proportions of different combinations of impurities. 40c.

1861—CAST IRON WHEELS and Their Chemical Composition. J. Andrews. (Street Ry. Jl., Dec. 8, 1906). A discussion of the effect of impurities on the grade of iron from which car wheels are made. 20c.

1862—CASTINGS—A New Process for Avoiding the Formation of Flaws in Heavy Steel Castings. A. Gradenwitz. (Practical Engr., Nov. 23, 1906). Methods and principles of obtaining uniformity of structure in the production of large castings. 20c.

1863—CASTINGS—Converter Steel Castings. A. Simonson. (Fdy., Dec., 1906; 4 pp.) Continuation of article previously indexed, discussing the operation of converting steel, and showing how the various impurities are successively eliminated. 20c.

1864—CEMENTATION—Sur Quelques Points Obscurs de la Théorie de la Cémentation. M. Partiot. (Bull. de la Soc. d'Encouragement pour l'Industrie nationale, Revue de Metallurgie, Oct. 1, 1906; 5½ pp.) A study on the absorption of carbon by iron during cementation. 60c.

1865—COPPER IN IRON—Kupfer im Eisen. H. Wedding. (Stahl u. Eisen, Dec. 1, 1906; 2½ pp.) Micrographical study of irons containing various proportions of copper. 40c.

1866—CUTTING OF STEEL—Essai d'une Scie dans Dents pour le Sectionnement d'Aciers durs Ordinaires et d'Aciers a Outils. C. de Fremnville. (Revue de Metallurgie, Oct. 1, 1906; 2½ pp.) Results of tests with an apparatus for cutting steel. 60c.

1867—ELECTRIC FURNACE and Its Application to the Metallurgy of Iron and Steel. R. S. Hutton. (Paper read before the Sheffield Soc'y of Engineers and Metallurgists, Oct. 1, 1906, and published in *Engineering*, Dec. 7, 1906). Discussion of the cost of steel production by the electric furnace. 40c.

1868—ELECTRIC FURNACE: Its Evolution, Theory and Practice. A. Stansfield. (Can. Engr., Dec., 1906; 3½ pp.) Continuation of this series of articles, dealing in the present instalment with the production of pig iron from iron ores, carbon and fluxes in the Heroult and Keller furnaces. 20c.

1869 — ELECTRIC FURNACE — Steel Making in Electric Induction Furnaces. J. Harden. (Iron & Coal. Tr. Rev., Dec. 7, 1906). Abstract of lecture before the Sheffield Soc'y of Engineers and Metallurgists, Dec. 3, 1906. A historical outline of the early progress of this metallurgical process, together with general notes on its application. 40c.

1870—ELECTRIC FURNACE METHODS of Iron and Steel Production. J. B. C. Kershaw. (Iron Tr. Rev., Nov. 29, 1906; 3 pp.) Continuation of serial previously indexed, this instalment dealing with Conley, Galbraith, Gin, Girod, Harmet, Hiorth and Ruthenburg furnaces, illustrating and describing their construction, and methods of operation. 20c.

1871—FOUNDRY — The Bonvillian Molding Machine. (Iron Tr. Rev., Nov. 29, 1906; 7½ pp.) Detailed discussion of foundry methods and practice, and description of special machines in use. 20c.

1872—FOUNDRY COSTS—The Reduction of Foundry Costs. H. C. Estep. (Foundry Dec., 1906; 4 pp.) Describes a number of ways in which small savings may be accomplished in the foundry. 20c.

1873—FRENCH PROGRESS IN THE METALLURGY OF IRON AND STEEL —La Situation de la Grosse Metallurgie in France. Saladin and Charpy. (Revue de Metallurgie, Oct. 1, 1906; 41 pp.) Outlines the progress in the art of metallurgical construction and processes for the manufacture and treatment of iron and steel in France. $1.00.

1874—HEAT TREATMENT—Les Experiences du Prof. Heyn sur la Trempe et la Revenu des Aciers Leurs Résultats et Leurs Conséquences. F. Osmond. (Revue de Metallurige, Nov., 1906; 11½ pp.) A study of the behavior of steel subjected to different heat treatments. $1.00.

1875—HEAT TREATMENT—Ueber die Wärmebehandlung einiegr hochgekohlter Stahle. Wm. Campbell. (Metallurgie, Nov. 22 and Dec. 8, 1906; 15½ pp.) Detailed article on the heat treatment of a high carbon steel. $1.00.

1876—HUNGARY—Die Hüttenwerke der Priv. Oesterreich-Ungarishen Staats-Eisenbahngesellschaft in Resicza und Anina (Ungarn). F. W. Lürmann. (Stahl u Eisen, Nov. 15, 1906; 5½ pp.) Describes the ores, the plant and working methods at this Hungarian steel mill. 40c.

1877—INGOTS—Etude sur la Trempe de l'Acier. P. Leloune. (Revue de Metallurgie, Oct. 1, 1906; 6 pp.) A study on the cooling of steel ingots. 60c.

1878—IRON AND STEEL WORKING - Le Travail du Fer et de l'Acier a la Temperature Critique. Olry and Bonet. (La Metallurgie, Dec. 12, 1906). Continuation of article, dealing with the working of iron and steel at their critical temperature.

1879—IRON ORE DEPOSITS — Die Roteisensteinlager bei Fachingen a. d. Lahn. C. Hatzfeld. (Zeit. f. prak. Geologie, Nov., 1906; 14 pp.) Complete description of these interesting bedded iron ore deposits. 40c.

1881—METALLOGRAPHY. [illegible] Rec., Dec. 8, 1906. 4 pp.)

1882—MINETTE MINING. [illegible] Rec., Dec. 8, 1906. 4 pp.)

1883—MINING METHODS. The Pyramid Mining Co. [illegible] Rec., Dec. 8, 1906. 4 pp.) A description of the various means used for [illegible]

1884—MINING METHODS. [illegible] Mg. Wld., Dec. 8, 1906.) Describes an interesting method of mining [illegible]

1885—MINERS' Gas Proof Tubing. [illegible] Mines & Coal, 79 Rev., Nov. 30, 1906). Describes the construction and operation of a number of types of crucibles for the treatment of cast iron.

1886—NICKEL AND CARBON IN STEEL.—The Influence of Nickel and Carbon on Iron. G. B. Waterhouse. (Electrochem. & Met. Ind., Dec., 1906; 3½ pp.) Conclusion of article previously indexed. Micrographical and thermal studies of the effects of nickel and carbon on iron and iron alloys. 40c.

1887—NICKEL STEEL. Acier Nickel Chrome. M. Guillet. (Revue de Metallurgie, Bull. de la Soc. d' Encouragement pour l'Industrie nationale, Oct. 1, 1906; 21½ pp.) A microscopical, chemical and mechanical study of the properties of three kinds of nickel steel, subjected to a wide range of treatment and physical conditions. $1.00

1887—NITROGEN IN IRON.—Ueber die Bedeutung des Stickstoffes im Eisen. H. Braune. (Stahl u. Eisen, Nov. 15 and Dec. 1, 1906; 12 pp.) Discusses the manner in which included nitrogen affects the physical properties of iron, with methods for its determination. $1.00

1888—NITROGEN IN IRON AND STEEL. Hjalmar Braune. (Jern-Kontorets Annaler, May 30, 1906; pp. 656-762). A comprehensive article dealing with the influence of nitrogen on the physical, chemical, electric, and magnetic properties of iron and steel. 80c.

1889—PIG IRON—The Grading of Pig Iron for the Foundry. (Engineering, Nov. 16, 1906). A discussion of the different grades of pig iron on the market with a description of their varying qualities. 40c.

1890—STEEL, DISTORTION.—Studie ueber die molekularen Veränderungen eines durch Zug beanspruchten Stahlstabes M. Kralupper. (Oest. Zeit. f. Berg- u. Hüttenw., Dec. 8, 1906; 2½ pp.) Continuation of article, discussing the molecular alteration which take place [illegible]

1891—STEEL, DISTORTION.—Sur quelques Effets microscopiques Produits sur les Métaux par l'Action des Efforts. F. Rogers. (Bull. de la Soc. d'Encouragement pour l'Industrie nationale. Revue de Metallurgie, Oct. 1, 1906; 9½ pp.) A study on the microstructure of iron and steel after being subjected to various strains. 80c.

1892—STEEL RAILS, Their Composition and Cross-section. R. Job. (Eng. News, Nov. 29, 1906). Discussion of the [illegible] sound rails, with particular reference to brittleness. 20c.

1893—STEEL WORKS—The Productive Efficiency of Steel Works. J. Waite. (Iron & Coal Trades Rev., Dec. 1, 1906). Abstract of paper read before the Cleveland (England) Instn. of Engineers; discusses some of the factors of steel plant operation tending to greater economy [illegible]

1894—STRUCTURAL STEEL—On the Suggested Change in Grade of Structural Steel. J. P. Snow. (Amer. Ry. Eng. & Maintenance of Way Assn., Bull. 80, Oct., 1906; 7½ pp.) A discussion of the proposal to increase the specified strength of structural steel from 60,000 to 62,000 lb. per sq. in., in which opinion seems to be evenly divided.

1895—TEMPERATURE INFLUENCE. [illegible] count of tests of the strength of steel [illegible]

1896—TITANIFEROUS SLAGS. [illegible] of Titaniferous Slags. C. N. Cox, Jr. and L. C. Lennox. (Electrochem. & Met. Industry, Dec., 1906; 4½ pp.) Detailed tests of the fusing points of titaniferous slags, and a discussion of their constitution as affecting their fusibility. 40c.

1897—VANADIUM STEEL. [illegible] pp.) Conclusion of serial previously indexed, being a study of the physical and mechanical properties of the various vanadium steels. 60c.

LEAD

1898—BRITISH COLUMBIA. [illegible] Mining in British Columbia. (B. C. Mg. Rec., Oct, 1906; 2½ pp.) A review of the progress of lead mining and smelting in British Columbia. 40c.

1899—FUSIBLE ALLOYS. [illegible] flüssige Legierungen. K. Heine. (Chem.-Zeit., Nov. 17, 1906; 3½ pp.) Results of [illegible] fusible alloys of lead, tin, bismuth, etc., tabulated according to ascending fusion temperatures. 40c.

1900—ORE DEPOSITS of the Joplin District. F. L. Clerc. (Proceedings of Colo. Sci. Soc'y, Vol. VIII, pp. 199—220. Nov., 1906). A compilation of the authorities on the subject of ore deposition in Missouri.

PETROLEUM

1901—ELECTRIC POWER STATION. Winding Gear and Pumping Plant of the Tarbrax Oil Company, Ltd. Jas. Caldwell. (Trans., Mg. Inst. of Scotland, Vol. XXIX, Part 1; 3½ pp.) Discussion by members of the Institute of the above paper which was previously indexed.

1902—FUELS AND COMBUSTION. S. A. Moss. (Power, Dec., 1906). Continuation of article previously indexed, discussing the suitability of the several liquid fuels for power purposes. 20c.

1903—HEATING VALUE. Ueber den Heizwert von Petroleumkoks und die Methode von Bethier. (Chemiker-Zeitung, Nov. 10, 1906). A discussion of the thermal capacity of petroleum residue, and of the methods for determining it. 40c.

PHOSPHATE ROCK

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1906—TRANSVAAL. [illegible] of Platinum in the Transvaal, with Notes on the Metallurgy of Gold Containing Platinum and Associated Metals. W. Bettel. (So. Afr. Mines, Nov. 10, 1906). Describes a discovery of platinum in South Africa, together with a discussion of the methods of assaying gold containing [illegible] metals. 10c

SODIUM

1907—EXTRACTION of Metallic Sodium. C. F. Carrier, Jr. (Electrochem. & Met. Ind., Dec., 1906; 5½ pp.) Conclusion of article previously indexed, being a detailed discussion of the application of electrolysis to the production of sodium. 40c.

PRECIOUS STONES

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RARE MINERALS

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1910—MINERALS. [illegible] trium-Thorium-Uranium Titanate. W. E. Hidden and C. H. Warren. (Amer. Jl. of [illegible]

SALT

1911—[illegible] (Mg. Wld., Dec. 8, 1906.)

1912—TURKEY—Die Gewinnung des Kochsalzes in der Türkei. C. Mayer. (Chemiker-Zeitung, Nov. 10, 1906). Describes the methods of extracting sodium chloride from sea water and brine wells [illegible]

STONE

1913—GRANITE [illegible] Granite von Schweden. P. J. Holmquist. (Bull., Geological Instn. of the University of Upsala, Sweden, Vol. VII, No. 13—14, 1906; 192½ pp.) An exhaustive study, chemical and micrographical, on the granites of Sweden.

1914—GRANITE—Ueber das quantitative Verhältnis zwischen Feldspat und Quarz in Schriftgraniten. A. Bygden. (Bull., Geological Instn. of University of Upsala, Sweden, Vol. VII, No. 13—14, 1906; 18 pp.) Micrographic and analytic study of the graphic granites.

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TUNGSTEN

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ZINC

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1920—ORE DEPOSITS of the Joplin District. F. L. Clerc. (Proceedings, Colo. Sci. Soc'y, Vol. VIII, pp. 199—220, Nov., 1906). A compilation of the authorities on the subject of ore deposition in Missouri.

1921—WISCONSIN Zinc and Lead Deposits. A. A. Hoskin. (Mg. Rep., Nov. 29, 1906). Notes and discussion of the genesis of the ore deposits in the zinc and lead fields of Wisconsin. 20c.

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ECONOMIC GEOLOGY—GENERAL

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Umwandlung des Feldspats in Sericit Geol. Instn. of the Univ. of Upsala.

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and Metallurgy of Igneous Rocks. E. A. Ritter. (Ores & Metals, Dec. 1, 1906). A discussion of the genesis of minerals

Igneous Rocks. (Mg. Rep., Nov. 22, 1906). Explanation of a phenomenon often seen

of Igneous Rocks. W. Cross, J. P. Iddings, L. V. Pirsson and H. S. Washington. (Jl. of Geology, Nov.-Dec., 1906). Proposes a number of new terms for describing the texture of igneous rocks.

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CANADA Beyond the Clearings. J. McKay. (Can. Mg. Rev., Dec., 1906.). Account of a prospecting trip made in the Chibougaman region of Canada, with brief notes on the minerals

1946—CARBONIC OXIDE—The Action of Carbonic Oxide. F. E. Thompson. (Iron & Coal Tr. Rev., Nov. 23, 1906). Paper read before the So. Staffordshire Mining Schools' Old Boys' Soc'y, Oct. 27, 1906, discussing the formation and properties of carbonic oxide, and its effect

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1981—AIR COMPRESSOR—The Compressor Plant of the Rand Mines. [illegible] (Zeit. d. Ver. deutsch. Ing., Dec. 8, 1906). Illustrated description of an electrically driven compressor.

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1986—SULPHIDE ROASTING. A Process for Oxidizing Metallic Sulphides in [illegible] N. Laschenko and E. Pomeranzeff. (Eng. & Mg. Jl., Dec. 8, 1906). Describes [illegible] sulphides by mixing the [illegible] and subjecting the mixture to a current of warm air. 20c.

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SOME NOTES ON GREENWATER

The New Copper District of California — Its Developments and Prospects

BY EDWARD R. ZALINSKI*

The Greenwater mining district is located in Inyo county, southeastern California. (See map.) It is bounded by the Echo cañon mining district on the north, Nevada on the east, the Resting Springs mining district on the south, and Death Valley on the west. The district, roughly speaking, covers an area of 25 by 45 miles.

GENERAL GEOLOGY

From exposures seen near Rhodes' Well, in the southern part of the district, the main core of the range appears to be granite and gneiss, also some crystalline schists. This is broken and largely covered by later rhyolite, andesite and basalt flows, which conceal the granite except in some of the deeper cañons and washes. A succession of rhyolite and andesite flows have covered one another with great irregularity, though in some case the rhyolite is the younger of the two. Rhyolite tuffs and volcanic breccias are common. Pitchstone was found in place in some of the rhyolite tuffs, and obsidian occurs in the district. Basalt is the youngest of the volcanic rocks, and as a rule covers the other flows. Limestone is found in some parts. The Grapevine range to the northeast of the Funeral mountains is largely limestone, and has also its share of eruptives.

FIG. 1. ASH MEADOWS, LOOKING NORTH

MODES OF ACCESS

Greenwater is reached from Salt Lake City by the San Pedro, Salt Lake & Los Angeles Railroad to Los Vegas, and the Los Vegas & Tonopah Railroad to Amargosa. From Amargosa, a stage makes the trip daily to camp, a distance of 48.6 miles by the wagon road. Another route is by way of the new Borax Smith railroad (Tonopah & Tidewater Railroad), now being built north from Ludlow, a station 44 miles east of Daggett (Cal.), on the Santa Fé. The Borax Smith is within 40 miles of Greenwater, and is being built with all speed possible. A stage line connects the end of the road with Ramsey, and this route is both cheaper

At the present time most of the copper discoveries are included in an area six miles east and west by 18 miles in a northwesterly direction. The center of activity is spoken of as Greenwater, comprising the three camps of Kunze, Ramsey and Clark. These camps are in the main ridge of the Funeral range, a chain of mountains extending northwest in three or more nearly parallel ridges. The Grapevine mountains and Amargosa desert are on the north and east, and the range rises abruptly from Death Valley on the west. Death Valley, in places, is 370 ft. below sea-level. On its western side the Panamint range rises to a hight of over 12,000 ft. The general direction of the Greenwater ridge, separating the Furnace creek valley from Death Valley is N. 30 to 40 deg. W. The slope is gradual on the Furnace creek side and steep toward Death Valley. The summit of the range reaches an altitude of 5000 to 6000 ft.

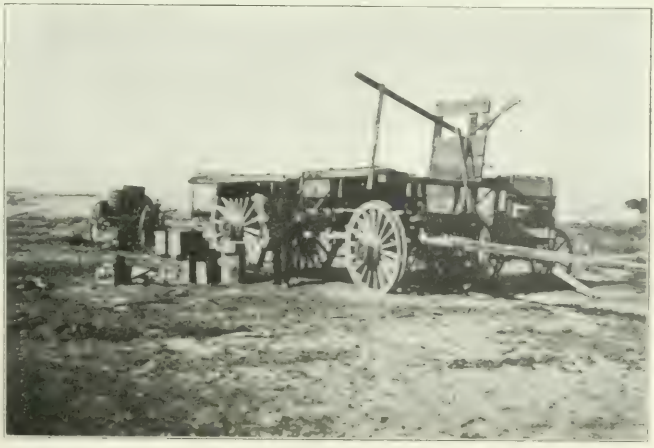


FIG. 2. LARGEST FREIGHT WAGON ON THE [illegible]

*Mining engineer, New York City.

water can be reached from Tonopah in 15

the district, but little definite information about this can be had.

At present all freight comes in by way

pah company, Judge L. O. Ray and associates, and it is proposed to establish a

copper camp. The distance by the road from Ash Meadows to Kunze is 36.6 miles and for a pipe line would be considerably less. The difference in altitude is 2340 ft.

FIG. 1. ASH MEADOWS, LOOKING NORTHWEST.

Meadows over sandy roads to Greenwater.

Amargosa or Johnnie Siding, as it was formerly called, is on the Los Vegas & Tonopah railroad, 50 miles from Rhyolite, the end of the line. Water has been obtained here by boring. The town is mostly of tents with the exception of the depot and freight buildings, and presents a lively appearance with its large freighting wagons and teams.

Arriving on the afternoon train at Johnnie Siding, you take your place, if you are lucky enough to obtain one, in the six-mule stage coach, and are off about dusk for Ash Meadows, a distance of 12 miles. The stage fare to Greenwater is $18 one way, or $32 for the round trip; 50 lb. of baggage is allowed. The night is spent at Ash Meadows or at Longstreet's ranch, a mile and a half farther on. The freight wagons stay at Ash Meadows, and good travelers' accommodations can be obtained there, at Fairbank's.

ASH MEADOWS

Ash Meadows is of importance as the real starting point for Greenwater, and on account of its large springs. The water flows from two main holes, 5 to 8 ft. deep, in the calcareous country rock. The water contains very small quantities of alkali, no cloudiness being observed by the addition of citric acid. Small quantities of borax are said to be in solution. The water is like warm. The flow is constant, varying little between summer and winter, and has been variously estimated at from 170 to 220 miners' inches. This ground has

The surface rock in the neighborhood of the springs and for a considerable distance surrounding appears to be a deposit of calcareous sinter, or travertine. Fig. 1 is a view of Ash Meadows, looking north, and shows tents, wagons, springs, etc. It is probable that following the great volcanic period in this region, the springs were especially active. North of the camp is a deposit of sinter, shown in the photograph, forming a butte many feet higher than the present surface. The sinter is in irregular layers and full of cavities. It was undoubtedly deposited by the present Ash Meadows springs at a time when they were heated by some of the igneous intrusions; the springs are slowly cooling. Pebbles which show cracks from drying are found, showing a similarity to the siliceous sinter at the lower geyser basin in the Yellowstone. This deposit is said to be 90 per cent. lime. A test on a piece of the rock shows strong effervescence with hydrochloric acid, and some trace of gelatinous silica. The deposit has been reserved for flux for the proposed Rhyolite smelter to be erected at Ash Meadows.

MEANS OF TRANSPORT

Freightage from Johnnie Siding to Greenwater costs $60 a ton, whether to Kunze, Ramsey or Clark; to Willow Creek it is about $65 a ton. It takes seven to eight days for a freighter to make the round trip. One of the large teams of 12 horses can carry about 7½ tons, beside their feed and water. Hay costs $40 a ton and grain $2.50 a sack of 80 lb. at the siding. The approximate cost to the teamster per horse per day is $1.50. For a team hauling about 7½ tons the net receipts for a week's trip are over $300. Teams of four up to 22 horses or mules are used.

Fig. 2 shows the largest freight wagon on the desert, with the exception of one belonging to Borax Smith, in Death Valley. Mr. Fairbanks in the picture is 6 ft. 2 in. and shows relatively the great size of the wagon. The axle is 4½ in., tires 6 in. and diameter of back wheel is 6 ft. 8 in. This wagon is owned by the Tonopah Lumber Company and used for hauling large machinery, hoists, etc., to Greenwater. It will carry any load that can be put on it and requires 22 horses to haul. It may be of interest here to note that the 25-h.p. gasolene hoist hauled in for Patsey Clark's Furnace Creek Copper Company, weighed 13,000 lb., and this was put on the ground without trouble or injury

FIG. 2. GEARED HEAD FRAME, COPPER GLANCE NO. 2 SHAFT.

to the machinery. The 50 hp. hoist being installed on Schwabs Copper Queen No. 2 shaft worked 23,800 lb. and this is safely on the ground.

The road from Johnnie Siding to Ash Meadows is sandy, but good. Automobiles make the trip to Greenwater every day. It is 40 miles from Ash Meadows to Beatty and Rhyolite over a sandy road and takes three days for freight teams. Before the railroad reached Beatty all the freighting was done by teams from Los Vegas, a distance of over 80 miles. With good luck the teams could make two trips from Las Vegas to Beatty in a month. At present no freighting is done from Beatty to Greenwater, the haul being shorter from Amargosa.

FIG. 5. COPPER QUEEN NO. 2 SHAFT.

The following table of distances and elevations from Ash Meadows to Greenwater was taken with an odometer by P. J. Maguire, chief engineer of the Clark railroad, in October, 1906:

	Elev. Ft.	Dist. Miles.
Ash Meadows	2,470	0.0
Longstreet's Ranch (Ash Meadows)	2,470	2.4
Watkins Ranch	2,320	6.0
Skeleton Mountain Wash	2,170	8.0
Amargosa River	2,000	11.5
Fairbanks Well No. 2	2,000	13.4
Kelly's Well (Struck Water at 130 ft.)	2,130	16.5
Dry Station in Cañon	3,170	26.9
Summit	3,780	31.0
Kunze's Camp Greenwater	4,710	36.6
Johnnie Siding (Amargosa) to Ash Meadows		12.0
Ash Meadows to Fisk's Well No. 2, via Longstreet's Ranch		13.4
Ash Meadows to Kelly Station via Freight Road		8.4
Kelly Station to Fairbanks No. 2 Well		4.3

It will be seen that there is a difference of elevation of 2340 ft. between Ash Meadows and Greenwater, in a distance of 36.6 miles. There are no heavy grades and were it not for the deep sand on the Amargosa desert, and lower part of Dead Horse cañon, it would not be a difficult haul. At it is at present, with lack of water, horses sometimes die on the way.

From Ash Meadows to Greenwater, the general direction is southwest. By leaving Ash Meadows in a light two-horse rig in the morning, it is easily possible to make Greenwater before sundown. The freight road to Kelly's Station, across the Amargosa desert is sandy and level. Greesewood, Brigham Tea, some sage brush and mesquite, are the only vegetation. Where the mesquite grows, the sand collects and forms dunes in places fifteen to twenty feet high.

The Grapevine mountains rise from the west side of the desert and Amargosa wash is entered near Kelly's Station. Kelly's well here struck water 6 ft. below the surface; the Amargosa river underflow is from 4 to 10 ft. below the surface, and water can be obtained nearly anywhere by digging.

The next station is Fairbank's well No. 2, 4.3 miles from Kelly's. Water can be obtained here at moderate cost. The well is about 30 ft. deep. Leaving here, the road swings more to the west, and the next station is Kelly's dry well, about four miles distant. The dry bed of the Amargosa river trends southeast and passes Eagle mountain, a lone peak rising steeply from the desert; some distance to the south, it turns westerly around the south end of the Funeral range, north into Death Valley.

Kelly's dry well, elevation 2130, struck water at 130 ft. depth, showing the Amargosa water level in this neighborhood to be close to 2000 ft. elevation.

The road now passes over boulders of basalt float in the wash from the south end of the Grapevine range and enters Dead Horse cañon. The Lila C. borax mine is about two miles south of the road in the foot hills just before entering the cañon. Over seven miles of development work has been done here, and the Lila C. mine was Borax Smith's objective point in building his railroad from Ludlow. The pull up Dead Horse cañon to the dry station is a hard one. The cañon cuts through rhyolite and andesite flows and rhyolite tuffs and volcanic breccias in places covered by later basalt flows.

At the dry station, water may be had at $1.50 a drink for two horses. A tent saloon, the stage-line station and water tanks are all there is in sight. This is one of the stop-over points, and is 10 miles from Greenwater. The cañon turns sharply to the left above here and the summit is reached about five miles from the dry station. A large basalt flow covers the hills to the north at this point.

FIG. 6. HEAD FRAME AND ENGINE HOUSE ON [illegible]

The road to Greenwater from here is good though there is a rise of 1000 ft. to camp. About a mile beyond the summit is passed the old stage road to Dagget, leading to the southwest. Ramsey is the first camp. It lies to the west of the main road on a flat gentle slope leading to the Death Valley divide. Kunze, the cen-

Ramsey. Clark is a mile from Kunze,

small gulch close to the largest properties at an altitude of 4700 ft. It is a

resulted from pneumonia. Kunze is in the center of the mining ground.

The Greenwater and Death Valley Copper Company (Schwab's company) has 16 claims in a group to the south and east of town.

The Copper Glance No. 2 shaft is being

gasolene hoist is being installed. The hanging wall of the ledge appears to be andesite, and the footwall rhyolite. The cañon here marks the contact, and the color difference between east and west side is marked, rhyolite being on the west.

Across the gulch from the shaft are old workings 10 to 15 ft. deep; the ledge shows plainly here and can be traced northeast toward the Copper Queen No. 1 shaft. In the saddle of the ridge northeast of Copper Glance No. 2 is a prospect shaft, sunk 20 ft. on a ledge and all in ore. The ledge strikes N. 50 deg. E., dips 80 deg. E. and has andesite foot and hanging. A heavy iron-stained cropping lies to the northwest about 50 feet.

Schwab's Copper Queen No. 1 shaft, on ground formerly owned by Kunze, is northeast of Copper Glance No. 2 and on the same ledge; it is some 300 yards east of town.

A 15-h.p. gasolene hoist is being installed here; the shaft is about 80 ft. deep on the ledge, but is vertical and leaves it here, the ledge dipping to the north. There is about 2 ft. of solid ore in the bottom of the shaft, and a fine showing on the dump, said to run over 22 per cent. copper. Malachite and chrysacolla are the chief copper minerals. Barytes occurs plentifully with calcite and quartz as vein minerals. The ledge can be followed east down the gulch from No. 1 Copper Queen, striking almost east and west. The north side of the gulch is whitish rhyolite, as near as can be determined in a hand specimen, but a calcite veinlet, which has

and it would be a great expense to build railroads there. The owners of the townsite are considering moving the town to Ramsey, 1½ miles to the east. Ramsey has a better location for a town and is more accessible for teams and railroads.

Water in Kunze all comes in by wagon; it ranges in price from $7.50 to as high as $30 per bbl. The townsite owners aim to supply it as cheaply as possible. Mr. Salisbury, of the Tonopah Lumber Company, has three teams hauling, and by selling water at $7.50 per barrel claims that he loses about $200 a team a month. When water supply cannot fill the demand, which frequently happens, prices rise, and $10 is quite common. Coal sells from $85 to $90 a ton.

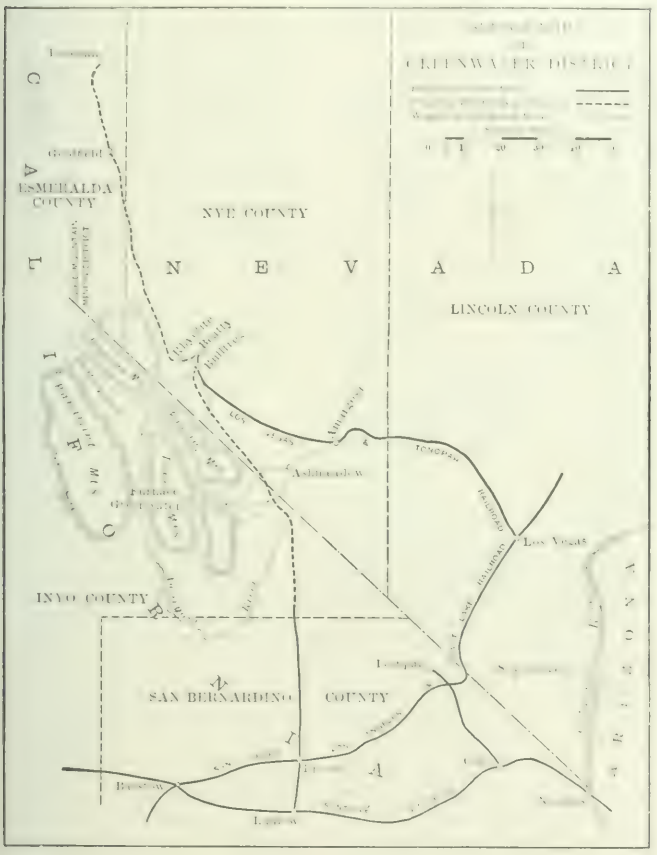
Most of the dwellings in Kunze are tents, though several large frame buildings are in course of construction. Fig. 3 is a view of Kunze looking northwest toward Furnace creek. Funeral range is in the background. The town has 400 to 500 inhabitants. A newspaper, the *Greenwater Times*, is published weekly and a post office has been established, and the town has an air of life and bustle. Everything is expensive in Greenwater; but, considering the distance and difficulties, meals and beds at 75c. each are not expensive. Miners can board for $1.50 a day. There are about 200 men employed in camp; wages are from $4.50 to $5.50 per day—$5.50 underground. There is little sickness in camp, though one death has

sunk in the wash, south of the post office; this shaft, whose surface accessories are shown in Fig. 4, is down 125 ft. vertically. The Copper Glance ledge strikes N. 15 deg. E. (true) at the shaft and dips 75 deg. east. The surface showing is good, with an outcrop 6 to 10 ft. wide in the cañon. It is an iron-stained silicious ledge, and from 5 to 8 ft. has strong malachite and chrysacolla staining. The shaft was sunk with a horse whim and struck the ledge at 90 ft. A new Fairbanks-Morse 25-h.p.

been found, suggests a lime-soda feldspar and the rock may be a light-colored andesite instead of a rhyolite. For convenience, the rock will be spoken of as rhyolite. It is younger than the andesite on the south side of the gulch, and contains rough angular fragments of the latter, over a considerable distance along the contact.

The cañon follows the contact, but the [illegible] having here andesite both in foot and hanging. In the small north and south gulch [illegible] ledge is exposed in an open cut on a N. 75 deg. E. fissure, dipping 85 deg. north. Malachite and chrysacolla ore, 2 ft. wide, is exposed, with some hematite.

The Copper Queen No. 2 shaft is inclined 70 to 80 deg. north and follows the ledge. The shaft is all in ore, 6 ft. wide. Fairbanks-Morse gasolene hoist 15 on the ground, and will soon be in operation. This is the largest hoist in Greenwater at present. The ledge east of the shaft follows the contact of rhyolite and andesite, and in places outcrops 20 ft. wide. Barytes, calcite and quartz are the gangue minerals. In places, 2 ft. of solid barytes are exposed on the outcrop, with copper staining as a rule along the foot wall side. Fig. 5 is a view looking west up the gulch, and shows Copper Queen No. 2 shaft, with windlass and ore pile in the foreground; the rhyolite hill is to the right and andesite is to the left. Copper Queen No. 1 shaft is just over the pass to the west.



Malachite, chrysacolla and hematite form the ore, with occasional chalcocite. The shaft is down 65 ft., and has 8 in. of chalcocite in the face at bottom. A specimen illustrating gradual oxidation and alteration from the original sulphide showed a black chalcocite kernel in the center, surrounded by a red cuprite layer, and this in turn enveloped in malachite and chrysacolla. At this depth, 65 ft., the occurrence of chalcocite would indicate that sulphides will be found in quantity at no great depth. Oxidation seems to be superficial and sulphides have been found at various places on the surface. A new 50-h.p.,

Copper Queen No. 5 is located ¼ mile to the south in the north and south gulch leading from Copper Queen No. 2. The shaft is down 80 ft. on a ledge which outcrops from 5 to 15 and 20 ft. or more wide. The strike is east and west, and dips 75 deg. south. An open cut is driven south into the ledge from the cañon, and the shaft is sunk in a copper-stained zone 6 ft. wide in face of cut. Malachite and chrysacolla are the chief minerals; some barytes float was found in the gulch above the shaft, but no chalcocite was noted. The outcrop can be followed both east and west from the shaft across the cañon to the summit of both ridges. The zone of strongest copper staining is 10 to 15 ft. wide. On the ridge east from No. 5 shaft, across the gulch, a prospect shaft is down 25 ft. on the ledge, and exposes fine chrysacolla ore. On the surface by this shaft, solid chrysacolla, 4 to 6 in. thick, was seen.

CLARK

The Furnace Creek Copper Company (Patsy Clark company) is located about a mile west of Kunze; the main shaft is on the Copper Blue claim at an altitude of around 5200 ft. The shaft is vertical and 200 ft. deep; the ledge is in andesite and strikes about N. 30 deg. E., dipping 65 to 70 deg. east; the outcrop is not prominent. Shaft No. 2 is sunk on the ledge about 600 ft. southwest of the main shaft, on the Copper Matte claim. It inclines 65 deg. to the east. Fig. 6 is a view looking east, and shows the head frame and engine house of the main shaft. A 25-h.p. gasolene hoist has been installed.

Fig. 7 is a view taken from the divide between Furnace creek and Death Valley, at an altitude of 5600 ft. Kunze lies in the center at the foot of the dark mountain.

The main Clark vertical shaft on the Copper Blue claim is down 290 ft., and a cross-cut from the 250-ft. level shows the ledge to be 35 ft. wide at this point. A Fairbanks 25-h.p. gasolene hoist is used. The upper shaft is down 80 ft., and is in good ore. On the dump, solid chalcocite and malachite 2 in. thick was found. This is a partial alteration of chalcocite to malachite, and occurs as an intimate mixture. There are three open cuts to the west of this shaft, and all have strong copper showing.

On the dump of the main shaft may be seen pieces of solid chrysacolla 1 to 2 ft. thick, also lumps of chalcocite and malachite, 12 or 18 in. through. Apparently some black oxide of copper, possibly tenorite, occurs with the chrysacolla. No cuprite was noted. The chief minerals here, as in the rest of the camp, are chrysacolla and malachite; some partially altered sulphides occur in varying amounts. There is a noticeable absence of azurite.

The Clark townsite has been moved from near the main shaft lower down the slope to the north, on ground covered by the several Copper Blue claims. Water is hauled at a cost of less than $6 a barrel from Furnace creek, 18 miles distant. The new town will be called Furnace. At present a number of interested companies have made arrangements for a single boarding house to accommodate their employees. There are already two business places on the ground and town lots command a premium.

To the northwest of Clark, valuable ground is being developed. On the Clark

and other properties in this direction have some good surface showings. The following is a partial list of Greenwater companies: Furnace Valley Copper Company, Furnace Creek Consolidated Copper Company, Greenwater and Death Valley Copper Company, Greenwater Bimetallic Copper Company, Greenwater Black Jack Copper Company, Greenwater Pay Copper Company, Greenwater Copper Mining Company, Greenwater United Copper Company. Others are rapidly being incorporated.

Ramsey lies about 1½ miles east of Kunze. It is situated in a better place for a town than Kunze, being located on a gradual incline, and on relatively level ground; it is also easily accessible for freight and railroad. Mr. Salisbury, who has taken over the Ramsey townsite, has offered to all property holders in Kunze an equally good lot in Ramsey, and he will pay all costs of moving. Should this be settled on, Ramsey will be the chief town of the camp, and will be known as Greenwater.

The population of Ramsey, Nov. 15, 1906, was 75 to 100. It is not as central to the mines as Kunze, but good property is being developed near town. Some of the companies in the neighborhood are: Red Boy Copper Mining Company, Saratoga Copper Mining Company, Greenwater Copper Mining Company, United Greenwater Copper Mining Company, Greenwater Consolidated Mining Company.

Lots on the main street are worth around $500; others from $50 up. There are 2200 lots in town; 32 claims cover the townsite. Ramsey has a bank, the Greenwater Banking Corporation, which is said to have done a $20,000 business in one week. Two stories, two rooming houses, two eating houses, a corral, a few saloons, besides residences, and the district recorder's office, are in town; four surveyors, an assayer, and a notary public do business there. The town is already laid out in streets.

The Red Boy and Greenwater Consolidated properties have copper glance on the surface. Red Boy is 1½ miles south of Townsite, and has a good showing in a shaft 40 ft. deep. Greenwater Consolidated also has a fine surface showing, but not much work is done. Copper staining extends over a zone about 1000 ft. wide, associated with large barytes ledges, one of which is 40 ft. wide, and has copper staining through it. The ledge strikes east and west, and dips to the north.

Ramsey is at 4700 ft. altitude. The divide separating Death Valley and Furnace creek valley, above town, is 5400 ft. Southeast from here to Resting Springs district boundary is 10 miles. The country is practically all staked out from two miles over the summit on the Death Valley side to the Amargosa range on the north side of Furnace Creek valley—4 to 5 miles. The Schwab company is boring for water in the Furnace Creek valley below the townsite. From where the well is being bored ground is all claimed north to the foot of the range. Considerable property on the Death Valley side has recently changed hands. The Gladstone group of four claims, almost due south of the Furnace Creek Copper Company's ground, on the steep Death Valley slope, is said to have been sold for a large cash consideration. Fig. 8 shows a copper discovery in the foothill southeast of Rhodes' Well. In the foreground is granite; in the background is Calico peak, composed largely of rhyolite and andesite flows, with sharp color contrast.

Four surveying parties are in the field: the Clark party, for the Tonopah & Los Vegas Railroad; the Borax Smith party, for the Tonopah & Tidewater Railroad, and the surveyors for the telephone and telegraph lines.

It is extremely probable that the next year will see many of the present difficulties removed.

A fine view of Death Valley is obtained from one of the andesite peaks northwest of United States mineral monument, No. 113, at an altitude of 5800 ft. The valley lies far below, in places below sea-level, with white alkali along its borders and apparently small thread-like rivers through its center and on the sides. Panamint mountains, 12,000 ft. high, lie in the background. Rhyolite and andesite flows and entire mountains of rhyolite in red, white and gray colors, beautiful and impressive beyond description, are close at hand. The main part of the valley is swampy alkali, 12 to 15 miles across, and 20 miles or more to the Panamint range. From the summit, on the Death Valley side, a large dike or ledge is seen cutting across the country striking northeast and dipping to the east, and the outcrop can be seen for miles. Parallel to this are three smaller ledges, apparently crossing the ridge in the neighborhood of Patsy Clark's property. The ridge and peaks here are all andesite, with the exception of a granite peak to the east.

John Gillie, superintendent of all mines of the Amalgamated Company, in Butte, Montana, estimates that each foot of shaft in that district cost not less than $100, average; for while many cost less, many cost more, nearly all sinking below the 1000 averaging $150 per foot. Taking it for granted that the total length of these shafts combined is 108,000 ft., the cost of this part of mining in Butte foots up $10,800,000. There are about 150 shafts in Butte, in 30 of which sinking is in progress. The deputy inspector of mines estimates that the underground openings from the shafts aggregate 800 miles.

The Mt. Bischoff Tin Mine, Tasmania

The general manager, H. W. F. Kayser, on Oct. 8, reported as follows: "After having thoroughly examined the different workings, in accordance with instructions from the directors, I have come to the conclusion that it will be unwise, in fact almost impossible, to continue a high fixed output in future. Speaking generally, the greater part of the crushing material is low in grade, and the higher grade ores still in sight have to be handled very judiciously to maintain anything like a regular output, and to extend the life of the mine. The No. 3 bench giving out so suddenly was unexpected, and the only explanation I can make is that the last slip from the higher part of the face forced all the good material out both east and west, leaving only the poor dirt behind. This, with the loss of the brown face, quickly affected the output, and, although there is still some good ore on the No. 3 bench in the solid face going west, and in all probability underfoot also at the north alluvial, and some nice patches here and there in other portions of the workings, I do not think it will be advisable to attempt to maintain, at least for the present, a higher output than about 60 tons per month. This may be increased if the underground works improve. So far, however, the deep ground has been disappointing.

"The pyritic ore on hand, and such surface deposits as are known to exist, may help matters to a certain extent as soon as we are ready to treat this material. With this in view, the erection of a 10-head battery will be started immediately at the old Happy Valley site, but unless new pyritic supplies are discovered the plant will not be kept constantly at work. The pyritic deposit met with in the rise from the main tunnel to the brown face may prove a valuable factor in this respect, and prospecting works are now under way to prove the extent of this formation. The porphyry dikes supply a large portion of the crush dirt, but they are mostly low in grade, and we have to depend on better material to maintain the output; and, as the porphyry is considerably intermixed with pyrites of no value, which has to be picked out, the working expenses have increased by not being able to carry on blasting and stone-breaking work in a wholesale way. This is not the first time anxiety has been felt for the future, but matters have always righted themselves, and, although the mine is not young, there is still hope of improvement."

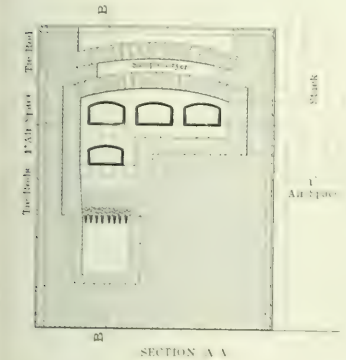
Some changes in the silver markets may be expected in 1907 from the currency changes in Mexico. The general prospect is that the price of the metal will not fall much below its present level, at any rate during the first half of the year.

A Multiple-Muffle Assay Furnace *

BY H. C. FARMELEE

The conventional styles for assay furnaces make use of from six to eight muffles, and the latter has usually been considered a furnace of as large capacity as was expedient to build in single units. In the assay offices of smelting plants or other large reduction works, it has been the custom to duplicate the three- or two-muffle furnaces in order to secure the necessary capacity.

Probably no assayer has failed to be struck with the extravagant waste of heat in the ordinary assay furnace and has realized that the fuel burned was capable of doing much more work than the style of furnace would permit. This has been indicated by red-hot stacks, and by the appearance of carbon in the unburned gases around the muffles; for not only has the fuel burned been capable of heating more muffles, but by reason of the construction of the furnace, the muffles already in it do



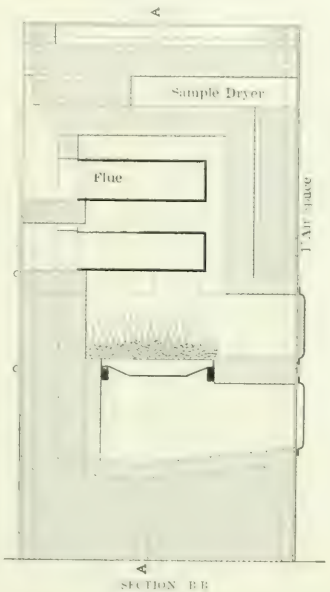
SECTION A A

not receive the full effect of the combustion of the gases.

With a view of accomplishing several things not yet accomplished in assay-furnace construction, J. I. Brown has devised a style of furnace which is worthy of the attention of the members of this association. It has five points of superiority which commend it to assayers having a stress of business.

First, it has larger capacity than the ordinary furnace, being capable of being built for either four or five muffles. This enables the operator to conduct several different operations in the furnace at the same time, thus greatly hastening the completion of the day's work. Fusion, scorification and cupellation can be carried on at the same time, and by constantly advancing the assay through the necessary stages, it is possible to run through a large number of samples. Fusions are made in the lower and upper muffles directly over the fire box; scorifications in the next right-hand muffle and cupellations in the last. The theoretical capacity of this four-muffle furnace is 90 assays per hour. Practically, Mr. Brown has repeatedly handled 400 assays per day of 10 hours, and states that the furnace could easily be made to turn out between 500 and 600 assays per day of 10 hours.

Second, it has a sufficiently large combustion chamber to permit of almost complete combustion of the gases before they escape into the flue. This means that the full effect of the heat is received, with



SECTION B B

the result stated in the preceding paragraph. Five tons of coal per month are required to operate this furnace to its full capacity, running ten hours per day.

Third, it is provided with a sample dryer which is a valuable adjunct when large numbers of mine samples are to be assayed. This sample dryer makes use of the heat above the muffles, and has greater capacity than a hot plate or similar contrivance, at the same time being absolutely inexpensive.

Fourth, the fire-clay linings are conveniently replaced when burned out. The front of the furnace surrounding the muffles is made of the ordinary molded blocks found on the market especially for this purpose. These can be removed and the inside of the furnace is then open for the purpose of replacing the burned-out interior layer of fire-brick. It will be noticed in this connection that between the pressed-brick body of the furnace and the fire-brick interior there is a 1-inch air space. This permits of the successive expansion and contraction of the fire-brick without placing the stress on the outside walls and tie-rods.

Fifth, it is a forced-draft furnace, the blast being supplied by an electrically operated blower. To prevent the burning out of the grate bars which would ensue under the great heat generated, the ash-pit is provided with a cement water pit which is kept full with water up to the level of the ash-pit door.

The materials used in the construction of the furnace are those commonly used everywhere. The outside walls are of red pressed brick. The inner linings are of fire-brick, and the lining of the ash-pit is of cement. A study of the drawings will supply any ideas that have not been expressed in these notes.

* An article in *Western Chemist and Metallurgist* November, 1906, compiled from notes and drawings furnished by J. I. Brown, Cripple Creek, Colorado, in whose assay office the furnace is installed, and by whom the furnace was designed.

Negro Mortality in the Transvaal

BY T. LANE CARTER

In the heat of politics some wild statements are made. At a meeting of one of the innumerable factions into which the British element of the Transvaal seems to have divided itself, the leader, Mr. Solomon, made some wild statements regarding unskilled labor on the Rand. He maintained that the high mortality among the natives imported from Central Africa was due to the neglect of these natives by the mining companies. Three of the leading physicians of the Rand have come forward, not as politicians, but as experts, to disprove what Mr. Solomon maintains. There has been a great improvement in the treatment of Kafirs since the war, so that today no one can find fault with the treatment as a whole. The doctors give a most interesting table, showing the death rate of natives from different parts of South Africa, resident on the mines of the Rand. The appalling death rate of the Central African natives shows the absurdity of solving the labor question by drawing from that part of the country. The figures are as follows:

	Mortality per 1000
From temperate areas	
Orange River Colony	13.9
Natal and Zululand	14.9
Cape Colony	19.8
From sub-tropical areas	
Southern Portuguese East Coast districts south of lat. 22 degrees	35.8
Transvaal	36.0
From tropical areas	
Northern Portugal East Coast districts, Mozambique	65.8
Orange River	75.6
Rhodesia	79.8
Bechuanaland	113.8
British Central Africa	166.3

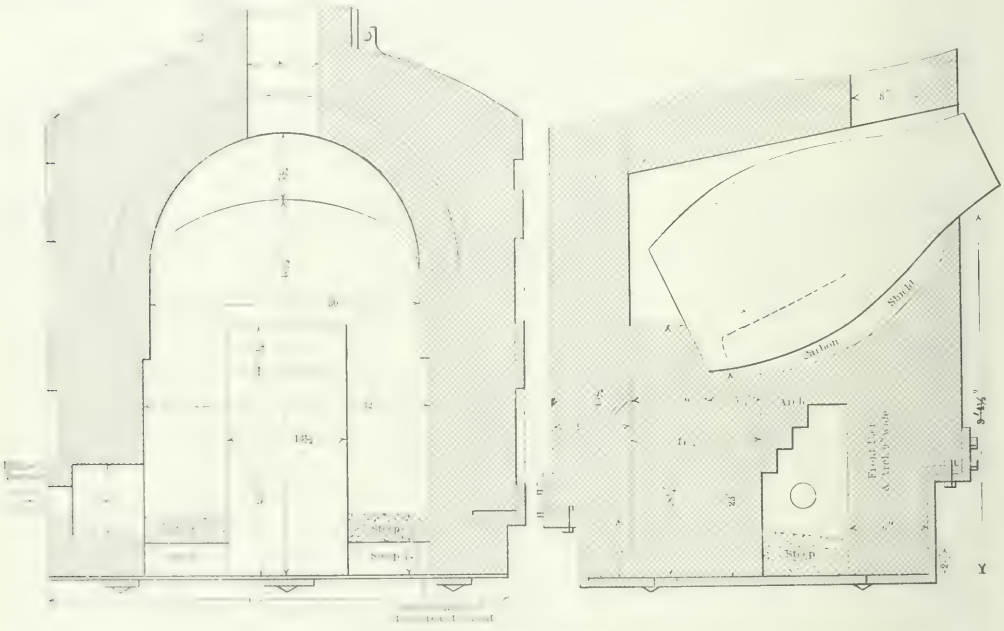
The tropical areas are highly malarial. The general death rate from disease of all natives employed on the Rand mines was 40.3 per 1000 last year. That of the tropical natives averaged 99.3 per 1000; the others, sub-tropical and temperature combined, come out at 33.3. Yet the tropical natives number only 10 per cent. of the total supply. People are beginning to see the folly of importing the Chinese before a substitute is found.

The Faber du Faur Zinc Furnace

States for distilling silver-zinc crusts from lead desilverization? Especially how is it arranged for heating by the combustion of crude petroleum, which I understand is the general practice?

A. B. C.

The Faber du Faur furnace is a fire-brick box of cubical form, built into a cast-iron frame-work which swings on trunnions. The furnace is closed at the top by an arched roof, through which the products of combustion pass off to a flue. The construction of the furnace, as used at the Perth Amboy plant of the American Smelting and Refining Company, is



FABER DU FAUR FURNACE

shown in the accompanying engravings. In connection with this furnace the Billow burner, furnished by the National Supply Company, of Chicago, is used. This also is shown in the accompanying engravings. It has been found that this burner gives excellent service, with low oil consumption. The carbon shield, shown in the drawing of the furnace, is simply a part of an old retort, used to protect the bottom of the retort in the furnace from the intense oxidizing heat of the oil.

A discovery of quicksilver ore, running from 1.5 to 7 per cent. mercury, is said to

couver Island.

Oil in Alberta, Canada

SPECIAL CORRESPONDENCE

Eugene Coste, of Toronto, who has been actively engaged during the summer in connection with the exploitation of the oil resources of the Canadian Northwest, states that so far no oil in any quantity has been developed, for the reason that drilling operations have not been conducted on a sufficiently extensive scale to thoroughly test the country. When this has been done it will possibly be found that two kinds of oil are obtainable —fuel oil to be used directly for engines and heating purposes, and the more valuable product for refining. Near Pincher creek, south of the North Kootenay pass, a well 1585 ft. in depth has been drilled by the Alberta Oil Company, of Vancouver and Seattle, which has struck a little oil and some gas. The company intends to sink deeper and has ordered a new cable for this purpose. At Dunmore Junction the Canadian Pacific Railway has a well for which Mr. Coste is acting as engineer. The well has been put down 800 ft., obtaining a show of gas, and will be sunk 2000 ft. more, if necessary. A complete outfit worked by five men is on the ground. The company proposes to use the oil, if obtained in sufficient quantities, as fuel for its engines. There is a gas well alongside the railroad shops at Medicine Hat; the gas is used for lighting the station and the municipality has two wells from which gas is supplied to the town. Mr. Coste is also superintending operations at the Canadian Northern Railway Company's well, near Langham, on the North Saskatchewan river, which has now reached a depth of 1000 ft. It is expected that oil will be struck at about 1700 ft. The Rocky Mountain Development Company and the Western Oil and Coal Consolidated Company are also working in southern Alberta, but have not as yet reached oil in commercial quantities.

Old Colony Copper Company

According to the official report of this company for the year ending Nov. 30, 1906, the total development work of the year consisted of 44 ft. of shaft sunk, 140 ft. of crosscuts, and 514.5 ft. of drifts. Copper has not as yet been struck in paying quantities, but indications in one level were good enough to warrant stoping there. Mineral was found in pieces varying from a few ounces up to 15 lb. The appearance of the lode is promising enough to make it expedient to sink to 1000 ft. in order to prospect the formation at that depth.

The treasurer's report shows receipts and equipment to the value of $33,181.55 for the past fiscal year, and expenditures of $22,843.44 for the same period, leaving a balance of $16,845.48. There was due on Oct. 1, 1906, on account of unpaid assessment, $13,853.

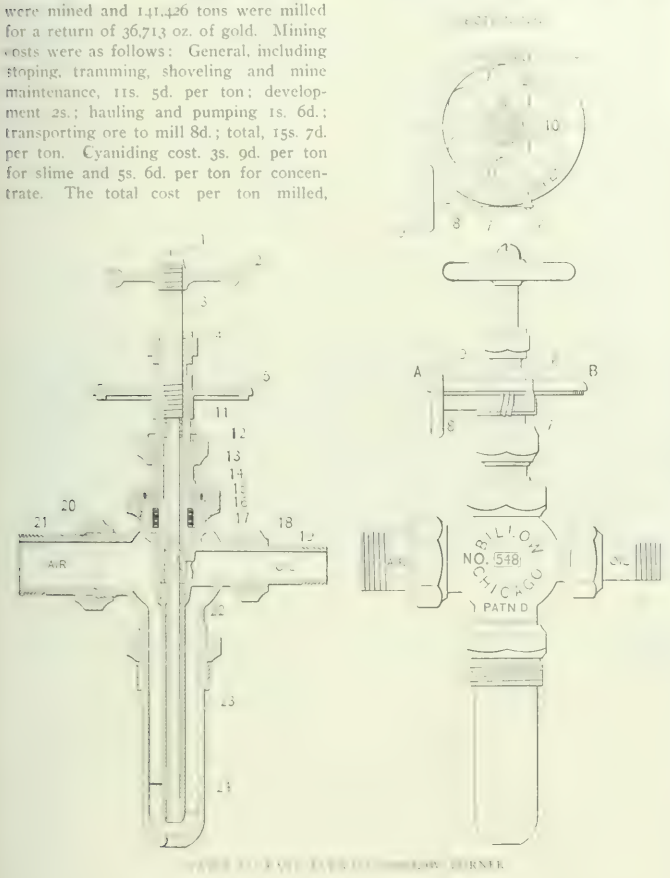
The Jumpers Gold Mining Company

The report of this [illegible] for the [illegible] ended July 31, 1906, the shortage of native labor prevented the uninterrupted running of the full number of stamps, and the unsafe condition of the mine workings greatly restricted the use of rock-drills, and consequently necessitated the employment of a large proportion of the Kafirs in hand drilling.

During the year [illegible] were mined and 141,426 tons were milled for a return of 36,713 oz. of gold. Mining costs were as follows: General, including stoping, tramming, shoveling and mine maintenance, 11s. 5d. per ton; development 2s.; hauling and pumping 1s. 6d.; transporting ore to mill 8d.; total, 15s. 7d. per ton. Cyaniding cost, 3s. 9d. per ton for slime and 5s. 6d. per ton for concentrate. The total cost per ton milled, which in the previous year was 24s. 7.5d. was reduced to 23s. 9.6d. during the year reviewed. The average extraction was 79.15 per cent.

The ore reserves are estimated at 150,385 tons of payable ore, and including ore in the pillars ,the amount of developed ore may be placed at 220,000 tons. Allowing for waste sorted out on the surface, that tonnage will keep the mill running 18 months. During the year, extensive prospecting was carried out on a banket reef which lies to the southward of the south reef. At the surface its distance from the south reef is about 100 ft. It shows medium gold values near the surface.

A large amount of prospecting and sampling was also done in various localities by mining companies with the view of locating, if possible, the pyritic band formation known to exist underlying the banket in several of the Rand mines. This resulted in locating the band in the company's mine, but the only points where promising values were obtained are in the first level crosscut north at No. 1 shaft, and in a vertical ore chute above that crosscut. The band is about 3 ft. wide and assays 14 dwt. gold per ton. In the crosscut from the level immediately below, the band was cut, but did not assay well.



The mine is expected to be completely worked out within two years, and the company will then depend upon its holdings in their Jumpers Deep Mining Company, and the new slime plant. The plant was recently erected and has a capacity of 6000 tons per month. When in full operation the directors anticipate it will require five or six years to exhaust the accumulated slime dumps, and it is possible that the re-treatment of accumulated tailings, of which a huge quantity is stored, may result in large annual profits.

The net profit on the operations during the period reviewed was £65,732, which with the balance brought forward from the previous year, made a total surplus of £70,729. This sum was dealt with as follows: Two dividends of 20 per cent. and 30 per cent., respectively, absorbed £50,000; depreciation of plant, £10,682; directors' and auditors' fees, £2000; and balance carried forward £7959. The capital expenditure during the year was £17,144 of which £10,000 was spent in the construction of the new slime plant.

Metal Production in Montana

The report of B. H. Tatem, who is in charge of the Government assay office in Helena, Mont., to the treasury department, in Washington, shows that during 1905 the output of copper in Montana aggregated 308,949,818 lb., of which all except 460,298 lb. was produced in Butte. The figures show that the average month's production in the entire State was 25,745,818 lb., and that of Butte 25,707,460 lb. The total gold produced in the State was 236,517 oz., valued at $4,889,234; silver, 13,454,651 oz. Fergus county was the largest gold producer, its total being 60,869 oz., valued at $1,258,279, and Butte was second with 58,017 oz., valued at $1,199,316. The figures show also that from 1862 to the end of 1905 Montana yielded $296,117,370 in gold, $421,799,490 in silver, $498,493,035 in copper, and $13,878,235 in lead, a total of $1,230,288,130 in value.

Coal in Utah

The annual report of Gomer Thomas, State coal-mine inspector, has been issued and covers the operations of the carboniferous mines of Utah during the fiscal year ending Nov. 30. During the period there were produced 1,839,219 short tons, an increase over the preceding year of 236,691 tons. The production of coke was 282,915 short tons, an increase over the preceding year of 66,483 short tons. There was also produced 11,531 short tons of gilsonite, valued at $403,585.

The number of men employed in and around coal mines was 1895, and the average number of days worked was 295. A total of 176,414 lb. of black powder and 95,015 lb. of dynamite were used. The average amount of coal produced per man in and around coal mines was 1107 short tons, and the number of fatal accidents per thousand men was two. There were 28 accidents in Utah coal mines during 1906, of which seven were fatal. Three out of this number were employed in coal mines and four in hydro-carbon mines.

The London Mining Market

connection with the zinc tailings at Broken Hill has been persevered with. The Sulphide Corporation has built zinc smelters in the north of England for the purpose of treating the concentrates, and the Zinc Corporation is contemplating a similar policy and smelting in South Wales. The latter company has adopted the Potter flotation process and has made contracts to ship some of the concentrates to Germany until the smelters are ready. The company has also been converted from an Australian into an English one, and arrangements have been made to issue new shares to provide additional working capital. Of other zinc propositions the San Francisco del Oro, in Mexico, is of special interest, as there is some hopes that the complex ore may yet prove amenable to treatment. The zinc deposits in Rhodesia are being actively exploited, in spite of the rather pessimistic report of R. J. Frecheville, and, as the railway has now reached the mine, operations will be considerably expedited. Among lead-mining companies, an interesting flotation was that of the celebrated silver-lead mines in Burma, under the name of the Burma Mines, Railway and Smelting Company. It is suitable to mention here, also, that the Australian Smelting Corporation reorganized here last year has now settled down to a definite policy, and is removing its works from Dapto to Port Kembla.

The continued demand for tin has led to extensive developments among the old and disused mines in Cornwall and considerable sums of money have been subscribed for this purpose in London. Many mines that shut down owing to the low price of tin or because of the other metals present have been reopened, and before long the output should increase notably. The pioneer of the new order of things, the Clitters United, is now in full working order. The increase in the price of the metal has brought large profits to Dolcoath, and at Carnbrea and Tincroft it has turned a chronic debit balance into a profit. Other large producers, working on the old cost-book system, such as the Levant and the Grenville, have made increased profits. The most interesting reopening has been that of the Botallack. Among foreign tin-mining companies owned in London, the Briseis, Tronoh, and Kinta have done well, though for some reason or other the bears made an onslaught on the first named.

In the copper section a number of new properties have been introduced, such as the Mitterberg, in the Tyrol, the Choicas, in Argentina, the Boldal, and the Lake, in Norway; the Bruce Mines in Ontario, and the Great Cobar in New South Wales. Of these the last named was the most notable flotation, owing to the very large sum of money paid as purchase price, and owing also to the extent of the known ore. Of the others, the Choicas, owned by the Mining Exploration Company, promises to become a most important producer in the near future. The Rio Tinto Company continues to hold the premier position among copper producers controlled in London. The ordinary shares of £5 par value stand at the time of writing at £89, which is a high price, even considering that an interim dividend at the rate of 100 per cent. per annum has just been declared. The Mountain Copper Company, of Shasta county, Cal., and San Francisco, controlled by the same group as Rio Tinto, has spent large sums during the year in extending operations, and has in consequence postponed the further redemption of the debentures arranged for under the scheme of 1902, but this application of profits to extending the operations of the company will put the company in a very strong position. The Spassky mine in Siberia, where such rich deposits have been opened up, is proceeding slowly, owing chiefly to political and racial reasons, and a company has had to be formed locally to be the immediate owner of the property in order to comply with Russian requirements. The Caucasus Copper Company, which met with so great difficulties in concentrating, has got the magnetic separators in place, and the hopefulness as to the result may be gaged by the fact that the quotation of the shares has gone up. The Etruscan Copper Estates, so long the laughing stock of the mining profession, has fallen from favor even among its own directors, and prospecting is now going on in a hopeless sort of way. The Capillitas, in the Argentine, of which so much was expected, is opening up indifferently, and it has become necessary to undertake systematic prospecting instead of relying on the traditions of ore left by former owners. The Tyee Copper Company, on Vancouver island, has continued to be disappointing, the main body approaching depletion, and no new bodies being discovered by the developments. The collapse of the Fresno Copper Company, of California, is fresh in your readers' memories. The shares of several American copper companies have been placed in London this year. The only ones of any reliability are those of the Butte Coalition, introduced by the Exploration Company. Among the others the most important are the Penn-Wyoming, but, considering the history of the company, the value of the shares is a doubtful quantity.

In the South African market there has been an entire absence of life. The future of the mines is too well known to afford any chance for speculating. As the months and years go on, the extraction of the gold gradually decreases the capital value of the shares in a very well defined manner. The efforts of the controllers of the market are now chiefly directed to economies in working. In many cases there have been amalgamations with a view to economy, and much more extensive amalgamations are discussed. The new schemes for supplying electrical energy wholesale, one from Vereeniging, and one from the Victoria falls, are nearing completion, and will have an important effect eventually on economies and merging of interests. The labor problem still causes trouble and the Chinaman is the center of political storms. The future is still unsettled, for no one knows what the approaching Transvaal constitution will bring forth.

There has been no noteworthy incident in connection with West Australian mining. Ivanhoe, Great Boulder, Golden Horseshoe and others continue to be large producers. Lake View Consols has nearly dropped out, and is now utilizing its funds for investment in other schemes. Perseverance is now a low-grade proposition. Great Fingall has been obliged to reduce its output during developments, owing to the gradual drop in the value of the ore.

In the Indian group of mines, the most important event has been the falling off in the grade at Champion Reef. Egyptian mining continues within narrow limits.

Among American gold mines owned here, Camp Bird has recovered from the disastrous snowslide of last spring and should again be making profits before long. El Oro has resumed dividends after spending so large an amount of money on extending the mill. Its subsidiary company, the Mexico Mines of El Oro, will shortly be in working order. The Tomboy Company is making good profits out of the Argentine claim. Le Roi Company, under Mr. McMillan's control, has made a profit, and Le Roi No. 2 continues to pay dividends.

Incidents in connection with British mining which deserve mention are the falling of the St. Davids gold mine in Wales into barren rock, and the capture of some of the most valuable coalfields in South Wales by German and French syndicates.

Mexico's Railroad Commission

The *Mexican Investor* says that government regulation of freight rates in Mexico is virtually complete. It is done through a commission, consisting of a president and six members. No freight rate can go into effect unless it be approved by the commission, and a rate once in effect can be changed only by convincing the commission of the advisability from the standpoints of shippers, the public and the government, as well as of the railroad.

THE RESOURCES AND STRATEGIC POSITION OF THE COLORADO FUEL AND IRON COMPANY

The Water Supply—Coal and Iron Mines—Production and Earnings

BY LAWRENCE LEWIS *

A perfectly [illegible] water supply is as essential to the operations of an iron and steel plant as are coke and ore. The problem is all the more serious in a semi-arid region, where the demand for water for irrigation is far in excess of the supply. The Colorado Fuel and Iron Company has therefore taken the precaution to fortify itself against a failure of water, and has spent an immense amount of money for reservoirs, ditches and water rights.

When the iron and steel industry at Pueblo was first inaugurated in 1881, dependence was placed in an artificial lake of 450,000,000 gal. capacity, covering 183 acres (now designated by the company as reservoir No. 1, or Lake Minnequa), located about a mile from the plant. This lake is supplied by an open ditch about twelve miles long, drawing water from the St. Charles river, a tributary of the Arkansas river. The company subsequently bought water rights, that is, purchased the right to take a specific number of "second feet" from the Arkansas river, but failing to appreciate that the industry would ultimately grow to great proportions, these rights, unfortunately, were subsequently sacrificed. As the iron and steel works developed at Pueblo it became necessary to procure a larger water supply, and for this purpose two storage reservoirs were constructed upon the [illegible] these, of 500,000,000 gal. capacity, designated as reservoir No. 2, or Lake Savard, covers 190 acres. The other, of 1,000,000,000 gal. capacity, designated as reservoir No. 3, covers 298 acres. These last two were connected by another and larger ditch, six miles in length, and a natural water course five miles long, to convey storm water from the St. Charles river.

These two new reservoirs, however, are solely dependent upon storm water, with the exception that No. 2 receives a limited amount of water from the original St. Charles ditch. This dependence was too uncertain for an industry of the present magnitude of the Minnequa works, producing several thousand tons of manufactures daily. Accordingly a more comprehensive scheme was determined upon.

LAKE MINNEQUA OR RESERVOIR NO. 1

INCREASING THE SUPPLY

After various sources of possible supply had been examined, different routes surveyed and general estimates prepared, the entire subject was taken up by a commission headed by the president of the company and by John Birkinbine, of Philadelphia, consulting engineer for the company. This commission united in a report approving the plan under which an increased water supply is being provided. The prospective demands of the Minnequa works, at Pueblo, were fixed by the commission at 50,000,000 gal. of water daily, and accordingly the water-supply system has been planned to supply this quantity. Some idea of how great an amount 50,000,000 gal. of water a day is can be gained from the fact that Denver, with a population of about 160,000 people, uses only 30,000,000 to 40,000,000 gal. a day during midsummer, when lawns and trees are being irrigated, streets sprinkled, etc. Each of the large blast furnaces at the Minnequa works uses about as much water as a city of 40,000 people.

The scheme decided upon to supply the Minnequa works included the utilization of a storage reservoir constructed by the Colorado Fuel and Iron Company close to the snow-covered mountains, near the head waters of the Arkansas river, to supplement water rights on the Arkansas river, purchased to supply the works with the quantity required. This storage basin is known as Sugar Loaf reservoir, and occupies the bed of an ancient lake, near Hagerman pass, six miles from Leadville, upon which the water is raised some 30 ft. by an embankment, giving a capacity of 5,674,000,000 gal., the water surface of 815 acres being over 10,000 ft. above sea level.

WATER RIGHTS

The allotments for water rights for irrigation purposes along the Arkansas river and its tributaries, as on other Colorado streams, greatly exceed the normal flow.

*The writer of this article is indebted for the facts concerning the water supply of the Minnequa works to the report made under date of July 6, 1906, to the president of the company by John Birkinbine, of Philadelphia, consulting engineer for the Colorado Fuel and Iron Company.

Note.—In the article on the Colorado Fuel and Iron Company in the JOURNAL for Dec. 29, 1906, the illustration which read "General Offices and Hospital" should have been entitled "General Offices at the Pueblo Plant"; the illustration entitled 40-in. Blooming Mill" should have read "Soaking Pits at 40-in. Blooming Mill."—[Ed.]

will not be consumed, but will pass through the works, being applied en route to cooling, condensing, steam generation, and to hydraulic machinery. That the water lost by evaporation will be much less than the proportion which would be actually taken up by vegetation, if used for irrigation, is demonstrated by systematic gagings of the overflow in the Minnequa works sewer system, careful records of which have been maintained.

This so called "Arkansas Valley conduit" has been under actual construction since early in November, 1905, and will be completed by Jan. 1, 1907. Surveys were first made about two years ago. The water is to be taken from the Arkansas river, below Florence, at the level of 5088 feet above tide. After passing through four skimming pools, 60x100 ft., it is carried through and around hills, across arroyos and plains, 37 miles to a series of settling basins, after which it empties into reservoir No. 3. There are 27 pipe siphons, with a total length of 43,000 ft. (one a mile long under the town of Portland). All of the crossings over arroyos and the siphons are made of wooden stave pipe, 48 to 60 in. in diameter, and vary in length from 100 to 5200 ft., the head on the pipe in some cases reaching 150 ft. In several cases the pipe is supported on bridges or by walls, and some of the siphons have intermediate summits, which are provided with air vents. Part of the conduit along the face of the bluffs (about four miles in all) is open ditch, protected by means of concrete lining; there are also five tunnels, one of which is 1100 ft. in length, and there are also a number of deep rock cuts.

Naturally the most difficult work is where the conduit line is in the river bottom lands, or passes along the shale or limestone bluffs, forming the boundary of the mesa or plains section, and defining the original shore of the Arkansas river. Deep rock cuts, some of them through overhanging ledges, supporting walls filling nearly vertical gashes, or acting as dams for sharp depressions of greater width, are features of construction.

The creek or arroyo crossings have demanded special care and attention, the nearly vertical sides making the construction of the pipe lines difficult, and requiring that these be anchored. In crossing the stream-bed in these arroyos, piling and crib construction is necessary to protect the pipe, for these beds, while normally bare of water, carry great volumes rushing down in times of freshets, which move sand, gravel and boulders. The mesa country, which lies between the line of conduit and the mountains, from 20 to 30 miles distant, supports only the sparse vegetation incident to an unirrigated section with a scanty rainfall. Consequently there is but little to retard the immediate run-off of water, and so called cloudbursts may, in a short interval, transform a normally dry stream-bed into a torrential stream, discharging at high velocity an enormous volume, heavily charged with solid matter.

The conduit has been proportioned to convey 80 second feet of water, or say 52,000,000 gal. daily. The total length of the conduit, from head-gates to the plains reservoirs, is 196,300 ft., or slightly over 37 miles, and the difference in elevation between the head-gates on the Arkansas river and the full water surface of the higher reservoir is 130 ft., most of which is taken up by frictional allowances.

Water from the conduit can be diverted into either reservoir No. 3 or No. 2, or fed from No. 3 into No. 2 at will, and also to the original reservoir No. 1.

The plains reservoirs Nos. 2 and 3, which are now in use, have water surface 4920 and 4958 ft., respectively, above sea level, and are connected with the Minnequa works by a wooden stave pipe line, 28 in. in diameter. The improvements under contract include the addition of another line of wooden stave pipe, 48 in. in diameter, nearly 4.5 miles long. The Minnequa works, for which this water supply is designed, has a mean elevation of 4770 ft. above tide, or 150 ft. below the lower plains reservoir, and 23,200 ft. distant.

With the Arkansas Valley conduit in successful operation, the Minnequa works will have an ample supply of water under natural head, and the charges for interest on investment, for maintenance and repair, will be much below similar items for furnishing an equal quantity by pumping

WIDELY SCATTERED PROPERTIES

Like the original Carnegie Steel Company, the Colorado Fuel and Iron Company owns or controls sources for all its raw materials, including iron lands in Colorado, Wyoming, New Mexico and Utah; some 600 square miles of excellent coal, anthracite, as well as coking and non-coking bituminous, one tract being 250,000 acres in extent, all easily accessible from the steel plant; limestone and dolomite quarries; manganese mines; etc. It has 39 coal mines and 3500 coke ovens. Most of the coke ovens are of the "bee-hive" and a few of the "stack" type. There are no by-product ovens in use by this company for the reason that there is no market for by-products, other than gas, sufficient to warrant the extra expense entailed in the construction of this class of ovens. They are comparatively costly and provoke considerable prejudice because of the contention of some experts that the quality of coke produced in by-product ovens is inferior. Including those not yet fully opened up, the Colorado Fuel and Iron Company has in various parts of Colorado, Utah, Wyoming and New Mexico, 65 properties scattered over an area of 260,000 square miles, a region as large as that included in Germany, Belgium, Holland, Denmark and Switzerland. Sunrise, Wyoming, and Fierro, New Mexico, respectively the extreme northern and southern properties, are distant from one another 1000 miles by rail. To visit all the forty-odd properties now in active operation would require a journey of 3600 miles, and a vertical ascent from the lowest to the highest of all, about 1.25 miles.

There is under contemplation at present the opening of two, and probably three, additional coal mines in Las Animas county, Colorado, which, when completed, will not only add to the tonnage of coal for commercial purposes, but will enable the coke ovens in that district to be more fully operated. The product thereof will materially increase the supply, both for commercial purposes and for consumption at the Minnequa works.

During the past year expenditures for improvements and betterments at the Minnequa works, coal and iron-ore mines, and limestone quarries have been made upon a generous scale. The physical condition of these properties and their equipment have been carefully maintained so that they are in good condition for future continuous operation.

PRODUCTION

The production, in tons of 2000 lb., for the fiscal years ended June 30, 1904, 1905 and 1906 is shown in the accompanying table.

MATERIAL.	1904.	1905.	1906.	INCREASE IN 1906 OVER 1904.	INCREASE IN 1906 OVER 1905.
Coal	3,391,547	4,504,752	5,056,377	49%	12%
Coke	508,000	948,553	1,096,133	115%	15%
Iron ore	192,870	483,670	* 803,383	317%	66%
Limestone	122,762	213,077	369,921	240%	74%
Pig iron and steel	711,...	1,444,177	1,900,168	155%	32%

* Net increase of 72,902 long tons of iron ore for year, based from Lake Superior.

The percentages of increase for the year ended June 30, 1906, over 1905 and 1904, respectively, are shown in the table.

EARNINGS

The gross earnings from operations for the year ended June 30, 1906, were $22,320,046, an increase of $3,705,028, as compared with the preceding year. The gross earnings of the iron department show an increase of $3,283,441, and the industrial (fuel) department an increase of $428,450, and the miscellaneous a decrease

BESSEMER FURNACE DEPARTMENT

GENERAL VIEW OF WORKS

of $0.802. The net earnings from operations were $2,550,020, showing an increase of $1,142,083. After the payment of all fixed charges, interest, taxes, sinking funds, rentals, etc., there is left a surplus of $671,812, carried to the credit of profit and loss, against a deficit for the preceding year of $341,993. By reason of inability to develop the iron-ore properties with sufficient rapidity, the operations of the past year were burdened with an expense of $238,844 for the excess cost of Lake Superior ore purchased, over what it would have cost if it could have been produced from the company's own mines. It is not probable, however, that this contingency will again arise, and the net results from operations for the current year should be correspondingly increased.

Throughout all processes of mining and steel making the company uses the most improved labor-saving machinery. Indeed, from the time the iron ore lies in the earth until it is put into its final form as finished iron or steel it is, in many cases, not handled over once or twice by manual labor, but almost altogether by automatic machinery.

That the Colorado Fuel and Iron Company operates the only large steel plant west of the Chicago district, and that it is one of the comparatively few large fuel and iron companies not a constituent part of the United States Steel Corporation, are important points to be borne in mind in considering this company's place in the iron trade. By owning all the sources of its raw materials it is absolutely independent of competitors. Furthermore, the Colorado Fuel and Iron Company has always been protected to a great extent in its natural market—the far West—by reason of the geographical position of the steel plant at Pueblo, and the long haul for competitors, from at least as far east as Chicago. In the early days of the plant, the Colorado steel products were nevertheless discriminated against in the Pacific coast market by the railroads in favor of Joliet and Pittsburg steel. Several appeals were made in the days of the Osgood-Kebler régime to the Interstate Commerce Commission, with but indifferent results. If the present railway rate bill is found to be a success in preventing such discriminations in the future, it will be of immeasurable benefit to the Pueblo plant. Colorado steel products will then have the virtual monopoly in the great region from a north and south line running through Kansas and Nebraska, west to the Pacific coast and from Canada to Mexico (rapidly growing regions which are absorbing immense quantities of rails and all forms of steel products). Furthermore, when the plant reaches the magnitude which the management has planned, Pueblo-made rails, wire, etc., will enter the Oriental and South American markets by way of Galveston and the Pacific ports. With the completion of the Panama canal Colorado steel products will have two outlets to the Orient—south and west. Even should the present rate bill be a failure, the fact that the steel plant at Pueblo is located on the main transcontinental Gould railroad system—made up of the Wabash, the Missouri Pacific, the Denver & Rio Grande, the Rio Grande Western, and the Western Pacific, now under construction from Salt Lake to San Francisco, is a protection against fatal railway rate discriminations in the future.

STRATEGIC POSITION

The advantage to the company of having its plant located on the main line of a "friendly" railroad was shown in the winter and spring of 1904 during the depression then existing in the iron market. The American Steel and Wire Company secured at that time, according to press despatches, a heavy reduction in rates on one or more railroads to Colorado common points, for its nails and other wire products. This was almost immediately met by an even greater cut made by the Missouri Pacific Railway, to Missouri river common points and farther east on the Wabash, for the benefit of the products of the wire mill at the Minnequa works. Pueblo-made wire began to compete in the markets long conceded to the Joliet product, in retaliation for the invasion of Colorado by Illinois wire. The result was that the old railroad rates were soon restored, and the Colorado Fuel and Iron Company was allowed to enjoy its own natural market.

It is well to consider the unusual natural and economic difficulties with which the successive managements of Colorado's iron and steel industry have had to grapple. The problems of development of the industry in the Rocky mountain region are fundamentally different from those which confronted the iron and fuel corporations in the middle West. When development of the iron and coal resources was begun on a large scale in the latter region, means of transportation were to a great extent already provided, or by the construction of short spurs of railroad and the utilization of the means of cheap transportation offered by natural waterways, raw materials could be transported to the furnaces and thence to the market at comparatively small cost, and without great preliminary expenditure. Water was abundant and free. Moreover, in the comparatively thickly settled middle West the securing of an abundant supply of labor near at hand was possible and, in many cases, towns and dwellings for workmen already existed at or nearby the seats of industry. The pioneers of the iron and fuel industry in the Rocky mountain region found no such ready-made conditions. No navigable lakes or rivers exist in the region in which the Colorado Fuel and Iron Company operates. To reach new properties high up in the hills or far off in the desert, existing railroads had to be induced to make costly extensions or the steel company had to go to the great expense of building its own lines. It now operates 178 miles of railroad, and has supplemented existing lines of electric communication by 1835 miles of private telegraph. In fact, in many cases in addition to the task of opening mines and providing means of transportation, the company has had the burden of building towns, of providing people to live in them, and of supplying water, food and merchandise. Besides the ordinary problems of coal and iron mining, coke and steel making, the Colorado Fuel and Iron Company has had those of general development of many almost uninhabited and wild districts.

American Interests in the Congo

According to the official newspaper of the Congo Free State, the *Bulletin Officiel de L'Etat Independent du Congo, a royal* decree, dated Nov. 9, 1906, transfers to the Ryan syndicate the right to prospect for metals over the whole of the unassigned public domain for six years. Whatever mines may be established by this exploration may be worked for 99 years, one out of every three becoming immediately the property of the State.

A company known as the International Congo Lumber and Mining Company has been organized to finance this concession with a capital of 3500 shares, half of which are taken by the American syndicate and the other half by Belgian capitalists. The American syndicate paid $150,000 down and is pledged to bring the total payment for its half of the concession up to $1,500,000. The grant covers an area of about 2,500,000 acres. Besides its mining rights, the company has obtained a grant of about 741,000 acres of forest land and the right to harvest a rubber-producing plant over an area of 2,470,000 acres. The syndicate has obtained additional rights to 12,000 acres on each bank of navigable streams and a 10-year option on 1,000,000 acres more.

The American directors of the company are Wm. H. Page, attorney for the Continental Rubber Company; A. Chester Peatty, of the Guggenheim staff of mining engineers, and J. G. Whitley, consul-general of the Congo Free State to the United States.

A new copper company has been formed in Brussels to mine deposits in Upper Katanga, a grant of which has been obtained from the Congo State. The capital is 10,000,000 francs, one-half of which has been subscribed by the English company, Tanganyika Concessions, Limited, and the other by the Société Générale de Belgique

ELECTRICAL PLANT OF THE DAHLBUSCH MINE

The Equipment, Arrangement, and Method of Operation at a German Colliery

BY ALFRED GRADENWITZ*

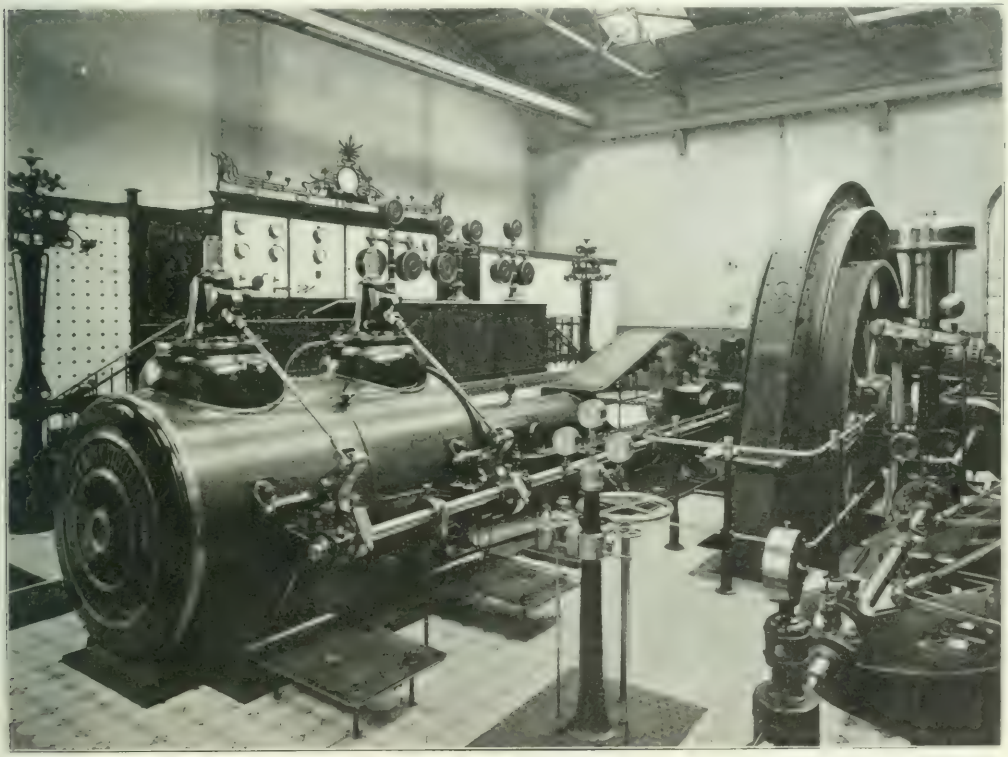
The Dahlbusch Mining Company [illegible] has been extending its works ever since 1900, and recently decided to utilize the excess gases from the newly installed coke ovens with a view to raise [illegible].

The electrical central station was originally installed by the Siemens-Schuckert Works, of Berlin, is one of the most important electrical mining plants in the Rhenanian-Westphalian coal district, and as the whole of its features can be taken as typical for similar plants in large mining concerns, a description of the same will not be amiss.

The six hauling pits of the company are arranged in three separated pit plants, namely, pit A, pit B, and pit C, respectively. Between the pits B and C, there is in addition an air shaft.

PLAN OF INSTALLATION

In planning the electrical central station, it was found advisable to install two power stations, one in each of the second and third pits, owing, on one hand, to the relatively great distances, and on the other with a view to better utilize the existing boiler battery. The two central stations, the more important of which is located in the pit A, are connected together by two iron-band armored lead cables, each 3x50 sq.mm. in cross section, to which pit B as well as the air pit are also connected: 400 h.p. can be transmitted by their aid between the two plants with about 3 per cent. loss. Should either of the cables become damaged, the other would be quite sufficient to supply energy to the more important electrical installations. In normal operation, one of the cables is used as lighting cable, and the other as power cable, thus avoiding any [illegible]



GENERATOR AT DAHLBUSCH MINE

those in the power circuit. Should either of the central stations be disabled, these [illegible] to practically all the current-consuming places, while on the other hand, operation is made economical, for each of the central stations can be used temporarily to operate the whole plant in case of a deficit or surplus of steam in either of them.

The two cables branch off from the switchboard of the power station in pit A, leading through the ground across pit B to the switchboard of the other central station. In the pit B, a branch conductor leads from each cable to the bus bars of the switchboard in the substation there located. The air shaft above referred to, [illegible]

is fitted with an electrically operated Capell ventilating fan.

In installing large electrical central stations, the result aimed at should be to produce sufficient energy to operate even the most remote machines, both above and below ground, with a maximum efficiency, this energy being generated under conditions as economical as possible. In connection with mining plants, the possibility of ready extension of the central station [illegible]

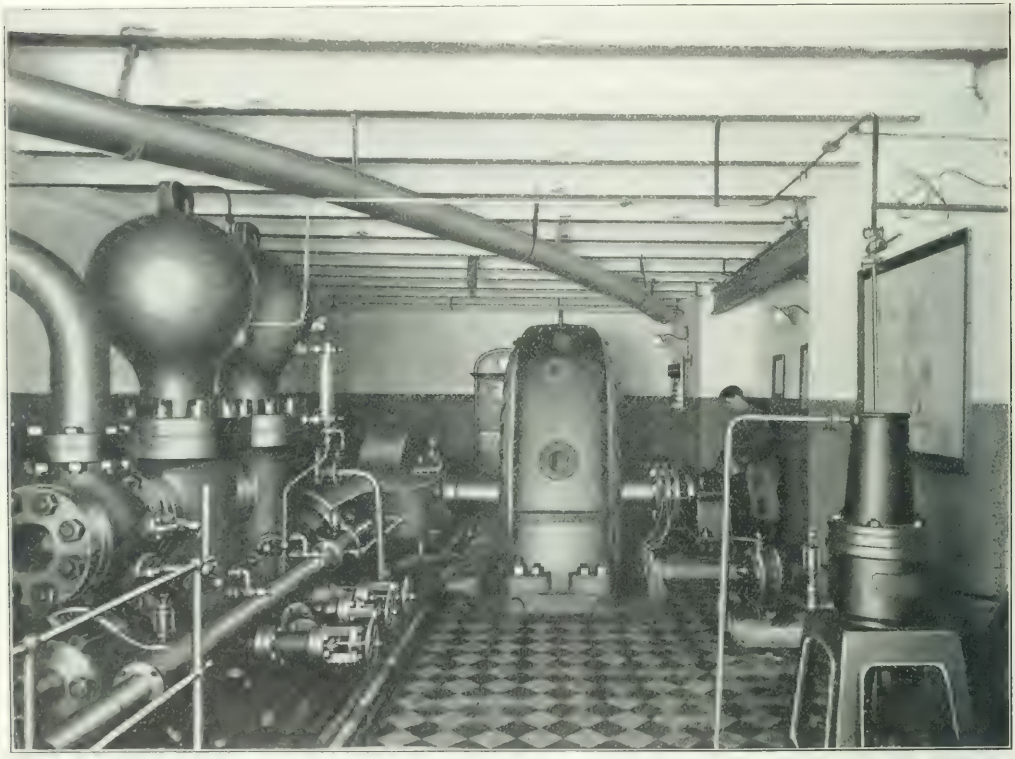
*Korner Strasse 25, Berlin W. 35.

found to be most suitable to comply with the above conditions.

have been installed for the beginning. The twin-compound steam engine of the horizontal type driving these was supplied by Kuhn, of Stuttgart-Berg; it works at 100 r.p.m., the admission tension of the steam being 7 atmospheres in connection with a central condensing plant, and yields normally 400 efficient h.p. and a maximum

and are so arranged as to exclude any risk of an accidental contact.

To generate the direct-current energy required for the permanent excitation of the steam dynamo, a special direct-current rotary-current transformer of 32 kw. direct current capacity at 110 volts has been installed; this suffices for the excitation of 3 sets. The rotary-current motor direct connected to the dynamo is of 40 h.p. capacity at 2000 volts and 730 r.p.m. In order to provide the first excitation required on beginning operation, independently of the rotary current machine, a main switch-outs, and for the long-distance transmission, while the switch-outs themselves are located on the frame in the cellar. A special column containing any necessary measuring instruments has been provided for each machine and another for the parallel switching outfit. The panel containing the switch-outs, fuses and measuring instruments for the exciter dynamo and for the converters as well as the low-tension apparatus for the main power and light circuits, is placed somewhat to the rear on the same platform. Behind this is the lighting switchboard proper. The whole switching plant has



PUMP MOTOR IN DAHLBUSCH MINE

part of the generator is keyed direct to the shaft of the steam engine, and has been designed heavy enough to contain any fly masses required for parallel operation and for producing a uniform working, thus doing away with the necessity of a special flywheel. The coils are readily accessible from both sides, and the poles of the magnet rim are so screwed to the edge of the rotor that it may be removed sideways, after loosening some screws, without dismounting the stator. The coils in which the rotary current of 2,000 volts working tension is generated are on the inner side of the external stationary part. The terminals from which the current is collected

small dynamo, driven by a high-speed rotary steam engine has been added.

Another generating set has been installed in the shape of a Brown-Boveri-Parsons turbo-alternator of 900 kw. output.

The high-tension current generated by the rotary-current dynamo is transmitted through iron-band armored lead cables to the high-tension bus bars located in the cellar, high-tension fuses and high-tension tube switches provided on its path.

The switchboard is located on a platform situated about 3 ft. above the floor, and consists of panels containing the levers for the rotary-current generator

been so designed as to be susceptible of an extension of up to 3000 kw. Apart from the turbo-dynamo, supplied by Brown, Boveri & Co., all the electrical machinery has been constructed by the Siemens-Schuckert Works.

The daily work of a grown man has been found by a French physiologist to be about 0.47 h.p. per hour. He calculates that 250 workmen at three francs per day, or a total of 750 francs, would yield 100 h.p., which would be supplied by horses at a cost of 60 francs, and by a gas motor for 3.50 francs. This is interesting if correct.

Coal in Illinois in 1906

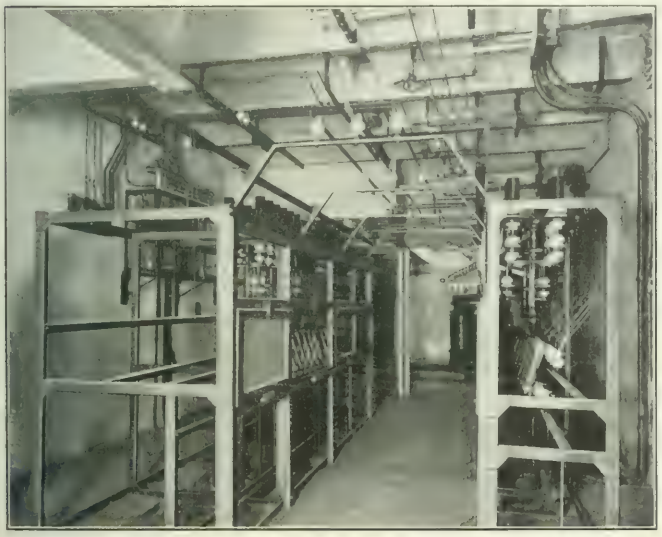
It is probable that 1906 will prove to be the banner year in the history of Illinois coal mining. Great activity has taken place in the development of new fields, and the opening of many new mines. The general tendency has been toward a consolidation of the smaller independent concerns, and the forming of larger, stronger corporations. The entire State may be said to be thoroughly unionized, and as a partial result of this condition, the operators are receiving a more uniform price for their product.

One of the difficulties in coal mining throughout Illinois is the attempt on the part of the operators to observe general laws that cannot be fairly applied to all the mines because of the differing conditions. While this is an advantage to some, it is a serious impediment to others. The O'Gara Coal Company, Dering Coal Company, and the Vandalia Coal Company have all pursued an active policy of expansion and aggressive development. The greatest improvement in operating the mines in this State has come from the efforts of these larger companies to abandon the irregular and unsystematic methods that have heretofore been used, and to follow some general plans that is thought to be suited to the mine in question.

Of all the coal States of any importance, Illinois has probably lost more coal through inefficient methods of mining than any other terrntory. It is a fact that in many districts the local conditions seem to prevent the systematic robbing of pillars; however, it is certainly true that acres of coal that have been lost through squeezes, might have been recovered, had a more systematic plan been adopted.

The year has not shown much advancement so far as coal washeries and methods of treatment are concerned; but in the construction of steel tipples, modern screens, self-dumping cages, and the installation of modern power plants, the State has shown a noteworthy advance.

New railroads are being built, new companies formed, and greater activity than has heretofore been witnessed is taking place. The present outlook is that Illinois will probably show a greater new development during 1907 than any other one State.



HIGH-TENSION BUS BARS IN DAHLBUSCH MINE

The British Coal Trade

The coal exported from Great Britain up to Nov. 30 amounted to 70,055,072 tons, which shows an increase of nearly 9,000,000 tons over the exports of the same period in 1905. The increase in exports in 1906 will amount to more than 15 per cent., which large increase is principally due to the greater demand for fuel that came from France, Italy and Germany. More than one-third of the coal shipped from Great Britain was destined to one of those countries.

The exports of coal to the United States during the year will show a decline of about 60 per cent. In 1905 the exports to Atlantic and Pacific ports were 131,769, while the estimated exports this year to the United States ports is 38,800 long tons.

The Belgian Coal Trade

The foreign coal trade of Belgium for the 10 months ending Oct. 31 was very satisfactory. The imports and exports of coal were nearly equal, and both showed a substantial increase. The imports amounted to 4,430,454 tons, showing an increase of 1,055,484 tons during the 10 months; the exports were 220,000 tons less than the imports, and showed an increase of 305,135 tons. If, however, the exports of coke and briquets are included with the coal, the total amount of fuel shipped exceeded the imports by nearly 600,000 tons. The coke industry in Belgium made practically no advance during 1906, but the manufacture of briquets showed great improvement, increasing from 52,000 tons in 1905 to 110,000 tons in 1906. Germany and Belgium are the largest manufacturers and exporters of briquets.

Coal Mining in France

The coal industry in France during 1906 was seriously disturbed by the disastrous explosion at the Courrières colliery. As a result of this accident the production does not equal that of 1905. The exports of fuel from France for the first nine months of 1906 amounted to 1,223,360 metric tons, a decrease of 78,300 tons from the figures of 1905. The imports of coal into France during 1906 were about 10 times as large as the exports.

A Nova Scotia Electric Plant

At Chignecto, in Nova Scotia, the new electrical plant of the Maritime Coal, Railway and Power Company will shortly be put into operation. Considerable interest has been aroused by the introduction of a system for using the slack coal and waste of the company's coal mines at Chignecto, for the production of electric power, to be transmitted to Amherst and other neighboring points. This is stated to be the first application of slack to the purpose of generating power for transmission to a distance, though it is often used by mines to supply electrical energy for their own operations. J. F. Wyse, of the engineering firm of Wyse & Middlemist, who has made a careful examination of the Chignecto coal properties, reports that about 20 per cent. of the coal is of low grade, disintegrating rapidly into culm, and not good enough to ship. This coal can be used for generating power, and transmission lines will carry the power to Amherst, at a distance of 6½ miles, where many thriving industries are located. A number of important contracts have been secured, and it is expected that the plant will be ready to transmit power in about six weeks.

In the first nine months of 1906 Prussia produced 95,953,110 tons of stone coal and 34,671,252 tons of brown coal.

The Uses of Bore-holes in Coal Mining

[illegible] have to [illegible] a decision concerning the importance of drilling a property before final development, besides many other advantages that result from the use of bore holes. Various drilling machines have lately been introduced and some of them have met with considerable success, although nothing has yet been produced that will duplicate the results furnished by a diamond drill.

Many large coal companies now own their own drill and keep a prospecting party busy all the time with this machine. This practice is less expensive than to spend thousands of dollars in driving rock entries without knowing what the nature of the seam is on ahead. In cases where the coal bed is dislocated and the face of the fault is vertical, it is sometimes difficult to determine whether it is an upthrow or downthrow, and unprofitable exploratory work is often prevented by proving the seam with a bore hole. In this way, the operator can also determine the pitch required to drive the slope that will intersect the faulted seam.

When the workings are thought to be dangerously near a body of water or reservoir of gas, boring should always be resorted to. Into the main hole that is first drilled under such conditions, a tube about 4 ft. long, whose outer end should be provided with a flange, is inserted. [illegible] this flange and extend a foot or more out from the hole; a side-outlet pipe (closed by a valve) should be fitted into this extension. This side-outlet pipe points toward the floor, and when the valve is open, the water or gas is allowed to flow out. The whole arrangement should be supported by a timber frame heavily braced, and the boring tools pass through the horizontal pipes.

Other important uses to which bore holes can be subjected is to carry steam and ropes into a mine. Bore holes from 6 to 10 in. in diameter are now often put down and a substantial casing is inserted. Where holes are wet, a casing is generally needed, although in several instances, the bore holes are so dry that even steam is conveyed underground in a pipe without any other casing being put in. This latter case, however, is exceptional, and it is generally known that where steam is carried underground in an incased hole, if but a small stream of water trickles down, [illegible] that the pressure is often reduced more than half.

Where it is desired to have the engines on the surface and to use bore-holes as rope-ways for hoisting up an underground slope, it is best to place the two holes about 7 ft. apart, and have them 8 in. in diameter if the holes are to be more than 500 ft. deep. These holes should be cased and cemented.

At several collieries, bore-holes 5 or 6 in. in diameter are used for putting down speaking tubes and bell-wires. One 5-in. hole will accommodate two such lines laid with 2-in. gas pipe. One pipe can be used for a speaking-tube and the other for the bell-wire. The space between the casing and the gas pipes should be filled with cement.

Although bore holes have not yet been extensively used for rescue work; the idea of their adaptability is being advanced by a number of competent coal managers. The suggestion is to use these holes to connect with safety chambers in the mine and to carry fresh air, food and water to the miners, as well as to use them to connect the underground workings to the surface by a telephone line.

Australian Coal Trust

According to a recent U. S. consular report, all but one of the coal-mining companies in the Newcastle district, N. S. W., and the shipping companies controlling the sea carriage of interstate commodities, have been combined. There are 31 collieries and six steamship companies represented in the combination, which will control the coal mined, and will regulate the sales.

The output is to be governed by an agreement by which each mine is allowed to mine coal equal to the average annual output for the last three years. If a colliery sells more coal than the amount allotted, such colliery must pay into a fund 98c. per ton for each ton below their allotment; but the penalty imposed and the compensation made will vary with the grade of the coal, there being three grades. After Jan. 1, 1907, the minimum price of the highest grade will be $2.43; of the second grade, $2.25; of the third grade, $1.75 per ton. There is a committee of management in Newcastle and a board in London, England. Through the latter all contracts for coal destined beyond Australia are arranged.

Torrington, N. S. W., is a center from which a fair quantity of wolfram is won. In the Hillgrove district, N. S. W., some 50 miners have found constant and remunerative employment during the year mining for scheelite. The search for precious opal at White Cliffs, N. S. W., has been attended with good results, and the operations of the year have proved a considerable extension of the opal-bearing areas.

Sault Ste. Marie Canal Traffic

A late closing of navigation permitted the passage of 1,558,248 tons of freight through the Sault canals after Dec. 1. This brought the total freight passing both canals up to 51,751,080 net tons; of which 41,584,901 tons, or 80.4 per cent., were east bound, and 10,166,175 tons, or 19.6 per cent., west bound. A total of 16,475 vessels, carrying 45,180,292 tons of freight, passed through the United States canal, while 5680 vessels, with 6,570,788 tons of freight, used the Canadian canal. The total number of vessels passing the locks was 22,155, of which 18,138 were steamers, 2817 sailing vessels and 1200 were unregistered, or small craft. The average cargo carried was 2236 tons. The United States canal was open April 13 to Dec. 17, a total of 249 days; the Canadian canal, April 14 to Dec. 22, or 253 days. The average daily passage was 89 vessels and 207,004 tons of freight.

The total freight reported for the season of 1905 was 44,270,680 net tons, showing an increase this year of 7,480,400 tons, or 16.9 per cent.

The items of mineral freight included in the total were, in net tons, except salt, which is in barrels:

	1905.	1906.	Changes.
Anthracite.....	984,701	1,011,375	I. 26,674
Bituminous.....	5,624,365	7,728,255	I. 2,203 900
Total coal.....	6,609,056	8,739,630	I. 2,230,574
Iron ore.....	31,332,637	35,357,042	I. 4,024,405
Pig & manuf. iron	237,696	391,105	I. 153 409
Copper.....	106,520	107 633	I. 1,113
Silver ore.....	41	.....	D. 41
Building stone....	10,899	6,222	D. 4,677
Salt, bbl.....	423,122	468,162	I. 45,040

The increase in coal was 34.3 per cent.; in iron ore, 12.8 per cent. The table shows the great importance of the canals to the mineral interests of the country.

European Petroleum Trust

The European Petroleum Union was recently registered at Bremen, with a capital of $5,000,000. The promoters of the new company include the firms which are associated with Nobel Brothers, of St. Petersburg, and Rothschild Brothers, of Paris, together with the Deutsche Bank and others interested in the petroleum industry. According to the London *Times*, the object is to effect an amalgamation of all the European organizations for the sale of petroleum to compete directly with the Standard Oil Company for the supremacy of the continental market.

There is considerable excitement in the Island of Trinidad over the possibility of developing petroleum. Drilling is now being conducted.

It is said that 1 lb. of zirconium will supply 50,000 filaments for Professor Wedding's zirconium lamp. The life of the lamp is calculated at 700 to 1000 hours.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

Do not use emery paper for cleaning the commutator, as emery is a conductor and may cause short-circuiting between the bars.

All motors that are installed about tipples or other dusty places should be of an inclosed type, with all bearings carefully protected.

Oil cans that are to be used around dynamos or motors should be made of brass, so they will not be attracted by the pole pieces.

When installing a dynamo or motor, the distance between the driving and the driven centers should be at least four times as great as the diameter of the larger pulley.

In operating a dynamo the copper brushes should always be lifted just before the machine comes to a stop, and should not be let down again until the dynamo is under headway.

Only very little oil should be used on the commutator of a machine. To lubricate it, grease one side of a canvas cloth, or other similar material, with vaseline, then fold the cloth and let the commutator get only what lubricant will pass through the pores.

Every dynamo or motor of 30 h.p. or greater should have a substantial foundation, separate from the walls and floors of the building. In constructing such a foundation, solid brickwork, capped with a hardwood frame, is considered best. The wood acts as an insulator, and as a cushion to take up all vibrations.

Besides the lesser costs of undercutting when mining machines are used, there also results an increased production from a specified length of working face and the employment of fewer men. One advantage thus gained is that a smaller amount of entry has to be constructed and maintained for any given output; furthermore, a mine can be developed more quickly.

For carrying electricity into a mine for operating machines and other similar purposes, many managers prefer a cable insulated with pure vulcanized rubber and covered with a protective sheath of hemp, and having a standard insulation of about 2000 megohms per mile. Concentric and twin cables may not only cause short-circuiting, but are objectionable on account of their want of flexibility.

At all mines, more especially drift mines, the connection between the fan-house and the mouth of the airway should be built most securely. If this passageway is weak and indifferently built, it is liable to be blown down by an explosion occurring in the mine, in which case the ventilation would be destroyed and serious loss of life might occur before the connection could be built up and fresh air again sent into the workings.

The form of bit most commonly used in machine drills is shaped like the letter X. Bits like the letter Z have given satisfactory results so far as boring is concerned, but are difficult to sharpen. Although an expert blacksmith under favorable conditions can sharpen and temper 30 chisel bits in an hour, there is a great demand for a satisfactory sharpening machine. Several such machines are on the market, but none have given general satisfaction.

The past year has witnessed the installation of acetylene lamps in many coal mines. The use of this kind of miners' light has met with much success and many managers are evincing considerable interest in the subject. There is no doubt but that lighting by acetylene is cheaper than any other practical method; also that the quality of the light is far superior to that obtained from an ordinary oil lamp, and no smoke is formed. Acetylene is said to consume only one-fifth as much oxygen, and gives off one-sixth as much CO_2 as an ordinary oil lamp or candle. The average acetylene lamp requires one-half pound of carbide for 10 hours' use. This means that such a light costs 2½ to 3c. per day.

In opening a new mine, one of the problems is to provide a safe haulway. More attention and expense is devoted to this subject in Europe than in America. The best practice, however, where the haulway has two tracks and is more than 12 ft. wide, is to use brick in building the side walls and arching the gangway. There is no doubt that when the life of the mine is expected to be from 25 to 50 years, this initial expense is justified. When falls of roof occur on this main entry, the daily output is often retarded. Besides the frequent expense incurred in this way, practice has proved that timber supports used in a haulway will last only from 10 months to two years while brick and stone arches put in 20 years ago stand perfectly solid at the present day.

Recently published statistics show that during the past year hard-coal miners received on an average $690.34 each. Upon examination it is found that this rate of pay to coal miners is higher than the annual wages received by the skilled and unskilled employees of nearly all other manufacturing industries. Investigations show further that the average rent paid by the miner is less than that paid by the manufacturing employee. Figures collected in the bituminous district of West Virginia and several other States show that bituminous miners are even better paid than the anthracite workers. This disproves the many reports that coal miners are poorly paid; however, the risks incurred are greater, and the employment not so pleasant as is found in other industries.

As to the advisability and economy of using machines in coal mining, much depends upon local conditions at the mine. Where the roof of the coal seam is good and requires little timber, there is no doubt that after considering the additional initial cost, machines are to be recommended. When the roof is bad, the difficulties attendant upon machine mining are: First, the difficulty of moving the machine about in a narrow place where many props are used; second, the danger of miners being caught under a fall of roof, because the noise made by the machines makes it difficult for the workmen to hear the warning sounds that occur previous to a fall of top. For this reason, it is generally best to occasionally stop the machines and listen for any sound that would indicate the working of the overlying strata.

Several years ago, much trouble was experienced by large railroads, due to the improper and careless location of vertical curves in building the lines. At this time the old-fashioned link coupling was in use, and after all the cars had been bunched together in descending a grade, when a quick ascent began, the slack due to the cars holding back often amounted to several feet in a long freight train. The consequent jerk on the last cars often caused a derailment or pulled out a coupling. Trouble of this sort is not so evident on railroads today because of better engineering practice and a different style of coupling; however, the point here brought out is deserving of the attention of coal superintendents, and should be considered in mine development. When an entry runs into a swag, it often happens that the superintendent of engineer pays little attention to properly locating and grading a vertical curve, but instead, the point marking the end of the descent and the beginning of the ascent may almost be described as an apex, so that the trip of cars, which is crowded together on the descent, abruptly lengthens out and is subjected to a severe jerk when the up-grade travel begins. On any mine road where care is exercised, there should be at least a vertical curve 150 ft. long separating the descent from the beginning of the up-grade.

THE MINES AT COBALT

Workings, Equipment, Location, Production, etc., of the Leading Shipping Mines

BY REGINALD MEEKS

township all the producing mines lie in Coleman township, and are situated within an area of about 6.5 sq. miles. The country is rolling and between the hills into Lake Temiskaming. The town of Cobalt is surrounded by a circle of producing mines, while to the south there are many others in what is known as the Kerr lake district.

The various mines are accessible by means of good, though narrow, wagon roads. All ore is sacked and brought to the cars on wagons or sleds and owing to the comparatively short distances the cost of loading is not excessive. Each mine has its own teams and about two tons are transported at a time. Since the present production of even the largest shipper is small compared with that of lower-grade mines in other districts, there seems to be no necessity for constructing spurs from the railroad to the mines, for the present at least.

In the description of the Cobalt mines which is to follow it should be stated that no reference will be made to the probable value of the mine or to mining stocks. The idea of the description is to state conditions as I saw them without reference to market conditions or possible movements of stock.

THE MINES

The mines surrounding the town of Cobalt, situated in what might be termed the "inner circle," beginning at the south are as follows: McKinley-Darragh-Savage, Cobalt, Silver Queen, Temiskaming and Hudson Bay, Buffalo, Coniagas (J. B. 6), Trethewey (J. B. 7), La Rose, O'Brien and Nipissing. The Right of Way extends through the town and for a distance of four miles. Other properties within the town site are the City of Cobalt, the Nancy-Helen and the Townsite.

There are several mines, notably the Drummond, Kerr Lake, Peterson Lake Silver Leaf, and Nova Scotia, which will not be mentioned. The reason for this is not because they have no value but because time was lacking to visit the properties.

East and to the south of Cobalt there are many producing mines. There are the Colonial, King Edward, Nova Scotia, Drummond, Kerr Lake (Jacobs mine), Silver Leaf, Lawson, Hargraves, University and Foster. These mines will not be taken up in any particular order either of location or importance.

and to legitimate mining is the abuse which has been made, by unscrupulous stock-jobbing concerns and "fake" mine ... ernment, of claims before title is allowed. ... have acquired any right or claim under this act, or any regulations thereunder to a mining claim, unless a discovery of valuable mineral has been made thereon by or on behalf of such licensee." The term *"valuable mineral"* is defined on p. 5 as follows: "'Valuable mineral' shall mean a vein, lode or other deposit of mineral or minerals in place containing such quantities of mineral or minerals other than limestone, marble, clay, marl, peat, or any building stone, as to make it probable that the said vein, lode or other deposit is capable of being developed into a workable mine."

Unprincipled promoters in the United States flaunt an attractive advertisement in the eyes of an unsuspecting public, and make much of the fact that the claim or claims have been passed by the Canadian Government and therefore must have *valuable mineral.*

When a claim has been filed in the office of the recorder, the inspector visits the property, and, if staking and all other details have been properly complied with, he ... claim, provided that, in his ... vein, lode or other deposit ... process of becoming a workable mine. He has no fixed rule that the vein ... a minimum value, but he lets ... judgment and experience to go on, and it would be perfectly proper for him to pass a claim with a vein of calcite carrying "cobalt bloom," and perhaps a few, a very few, ounces of silver or a little smaltite. In time this showing may prove to be a mine, but the fact that the Government inspector has passed the claim certainly does not in itself prove it to be one.

FREIGHT AND SMELTER CHARGES

Before taking up the description of the mines of Cobalt it may be of interest to mention the final disposal of the ore from this district. While there are rumors of a smelter being built near the mines for the treatment of their ores, still, so far as can be ascertained, they are only rumors. Experiments are being conducted at Hamilton, Ont., which are said to be successful and moreover it is claimed that mine owners of Cobalt are financially interested in the venture. But at present all the ore is treated in three smelters, and must be hauled a long distance, and at considerable cost.

From correspondence which I saw at Cobalt the following smelter charges were derived: The American Smelting and Refining Company agrees to pay for 94 per cent. of the silver contents, and charges a flat rate of $10 per ton. The terms are cash immediately after the agreement of assays, and no payment is made for nickel, cobalt or arsenic values. The matte containing the nickel and cobalt becomes the property of the smelters, and it is claimed that this is shipped to

THE TOWN OF COBALT

charge which amounts to $10.20 per ton.

Company, of Newark, N. J., has a sliding scale, as follows:

700-800 oz..... 2

800 oz. or more—no charge.

They agree to pay for 93 per cent. of the silver contents at New York market prices on the day of contract, settlement to be made 14 days after agreement of assays or 1 per cent. less for cash. In this case also the shipper pays sampling and freight charges to Perth.

This property, as was mentioned before, lays claim to the first discovery in the camp. The mine is situated at the southern end of Long or Cobalt lake and water. They also own the 40 acres formerly known as the Savage mine.

On the first named property work is progressing satisfactorily. Three shafts are being sunk and drifting has been started. No. 1 shaft was sunk to a depth of 75 ft. and a 15-ft. crosscut entered the vein. Drifts have been extended 30 and 47 ft. from the crosscut and disclose a 6-in. vein running rather high in niccolite and native silver. Sinking has been continued to the 105-ft. level where drifting has been started in ore. The vein dips at an angle of 55 deg. from the vertical. No. 2 vein is very similar to No. 1 in character and dip. It is wider, however, and is considered richer. The shaft has

depth of this part of the lake is 17 ft. When this structure is completed the water will be pumped out and the gravel, known to be rich, will be treated in the mill which has been ordered. One vein at least is known to extend under the lake but the rich gravel is the main reason for building the coffer dam.

The present equipment consists of two 60-h.p. boilers, one 5-drill compressor, one 6x8 hoist and one 5x5 hoist.

There have been ordered for delivery in January, two 90-h.p. boilers, one 10-drill compressor and one 8x10 hoist.

The Allis-Chalmers-Bullock Company is to install a mill consisting of a 5-stamp battery and two 8-ft. frue vanners. No mill tests have been made in the district and the results from this mill will be watched with the greatest interest by all mining men at Cobalt. The usual bunk and boarding houses, office, power-house, etc., are on the property.

The authorized capital of the company is $2,500,000, of which 2,000,000 shares have been issued, the par value being $1. The officers are: F. B. Chapin, president and general manager, A. E. Osler, secretary, G. R. McDonald, superintendent.

COBALT FROM THE "SAVAGE"

NO. 2 SHAFT ON THE [illegible] MINE

Corroborated particulars relative to the charges made by the Canadian Copper Company, at Copper Cliff, were not available, but they are said to be as follows: The smelter makes no charge for smelting or sampling, and agrees to pay for 93 per cent. of the silver contents at market rates, and also agrees to pay for cobalt, providing it is in excess of 15 per cent., and that the nickel values are low. The freight charge to this smelter from Cobalt is $5.20, or practically one-half that charged to New Jersey. There is besides a direct saving of $5 to $6 for sampling, depending upon the value of the ore. In some districts a freight and treatment charge of possibly $25 per ton, would be the determining factor between profit and loss.

I wish to take this opportunity of thanking E. N. Skinner, 71 Broadway, New York, for the use of some of the photographs illustrating the mines of Cobalt.

drifting on the vein has been started. Fifty and 25 ft. on each side of the shaft has been opened and a vein from 5 to 14 in. wide was disclosed. It is claimed that at depth cobalt decreases with no diminution of silver values.

No. 3 vein is being opened by a vertical shaft, there being no dip to the vein, which has been sunk 55 feet. In this vein the niccolite occurs in smaller quantities, the values being mainly silver and smaltite. Drifting has just been started at the 50-ft. level.

The veins on the McKinley-Darragh occur in conglomerate and slate and strike northeast-southwest. So far no stoping has been done but five cars of ore have been shipped on development work alone.

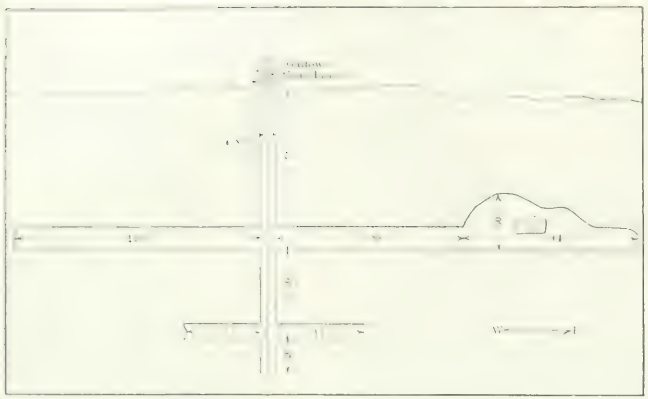
The company is building a coffer-dam so as to cut off a portion of the lake 400 ft. long and 100 ft. wide. The average

Cobalt Silver-Queen

Lying west of the McKinley-Darragh property is the Cobalt Silver Queen, Ltd., formerly known as the Stormont mine. The land was purchased from the Temiskaming & Hudson Bay Company and consists of 58¾ acres situated at the southwest end of Cobalt lake. Only one vein has been found and but 18 acres have been prospected. The vein strikes northwest-southeast and dips to the south at an angle of about 35 deg. A two-compartment shaft, 4x8 ft. inside dimensions, has been sunk to a depth of 145 ft. At the 75-ft. level drifting to the west for a distance of 127 ft. disclosed very poor values and to the

electric-lighting plant, one 6x8 hoist (to be superseded by an 8x10), bunk house, office and boarding-house combined, blacksmith shop, storehouse, barns, etc.

The Cobalt Silver Queen is capitalized



CROSS-SECTION OF THE SHAFT AT COBALT SILVER QUEEN

of the shaft the values were high enough

[illegible]

The drift has been extended for 149 ft. and in the portion between the 85- and the 140-ft. points the vein widens from 6 to 22 in. and consists of high-grade niccolite and smaltite. The vein at the point most remote from the shaft shows a width of 22 in. of clean shipping ore.

At the 125-ft. level a 35-ft. drift to the west encountered the same barren rock as in the upper level and the easterly drift has been driven only 40 ft. Superintendent Leyson expects to encounter the same character of ore when the level has been extended 20 ft. farther. In the upper level 50x30 ft. of stoping has been done by the over-hand method, leaving a pillar in the middle.

At the bottom of the shaft, at a depth of 145 ft., is a sump. Sinking will not be continued until the lower level has opened

The ore is sorted into three grades, [illegible] No. 2 is sacked, but none has been shipped. [illegible] shipped, and upon the results of these shipments the company declared a divi-

It is the intention of the management to install a skip which will dump into a car on a trestle, and this will be run into the new rock house. This house is 20x30 ft. and about 30 ft. high. All rock will be handled by gravity, and when in operation the capacity of the plant may easily be

The present equipment consists of two 60-h.p. boilers, one 5-drill compressor, an

at $1,500,000, consisting of 1,500,000 shares at $1 each. The officers are: J. I. Davidson, president; F. L. Culver, treasurer, and Captain Leyson, superintendent.

Swedish Iron Ore

The Swedish government is apparently discouraging exports of iron ore. The proposal to put an export duty on iron ore failed in the Diet by a very small majority. Orders have been issued that the government railroad from Kiirunavara to the port of Narvik shall carry only 1,200,000 tons of iron ore in 1907, although the Grangesberg Company was preparing to mine and ship 600,000 tons more. The rates charged on ore over the railroad have been increased.

Much of the Kiirunavara ore goes to Germany, and the limit thus placed on exports has disturbed the German iron trade.

If all mine shafts in the Butte district, in Montana, were placed end for end they would make one continuous opening 108,900 ft. long, or 20 miles 1650 ft. These figures have been obtained by adding the number of feet in 93 shafts, and estimating the remainder at 4 miles, which may be too great. The 93 aggregate 86,130 ft. Of the total, 30 range from 1000 to 1900 ft. each, and 10 are between 2000 and 2575 ft., the deepest being the High Ore of the Anaconda Company, 2575 ft. In no mine in the district has ore been struck deeper than 2400 ft., which is the depth at which the veins have been crosscut in the Anaconda mine. The shaft on the Neversweat is 2500 ft. deep, and crosscutting is in progress at the 2400-ft. level.

Considerable deposits of mica have recently been discovered in the Vitimiribi mountains, in German East Africa. Specimens examined at Berlin have been pronounced equal to Indian mica. The yield of the mica deposits in the Oulongourou mountains, near Urogoro, has shown a notable increase of late, the exports for this year being estimated at 100,000 marks. It is said by the London *Mining Journal* that the production would have been even greater but for the scarcity of labor due to the numbers employed on railway construction.

CALLOWS HEADFRAME AT COBALT SILVER QUEEN

Metallics

The present tendency among metallurgists appears to be to deal with the process of smelting the ore, substituting therefor a sintering of the material. This has been done very successfully, in a special apparatus, at Cananea, Sonora, and at other places. The American practice of pot roasting is really a specialized sintering process.

The smelting works of the Amalgamated Copper Company at Great Falls, Mont., are being enlarged so as to have 25 to 40 per cent. increased capacity. The improvements are being made closely along the lines of the Washoe works, i.e., with enlarged large blast furnaces and reverberatory furnaces. In connection with the latter, however, producer-gas firing will continue to be used.

Iron bisulphide or iron pyrite may be changed into the magnetic oxide if it be roasted carefully at dull red heat. Practically, however, it is difficult to obtain all of the iron in that form and it is sometimes necessary after the sulphur has been removed to introduce some carbonaceous matter so as to reduce the ferric oxide to magnetic oxide. When the iron is present originally as ferric oxide, as in limonite ore, a similar reduction by carbon may be necessary.

The separation of blende from other minerals is accomplished with great success by the aid of magnetism; since the introduction of the Wetherill separator this has been done even with minerals which show no marked magnetic properties and cannot be converted into magnetic forms, for example, certain kinds of blende can be separated thus from both pyrite and galena. The mixed sulphide ore of Broken Hill, N. S. W., and of Leadville, Colo., is treated successfully in that manner.

In Western lead-smelting practice the use of concrete for the smoke and dust-settling flues has been found unsatisfactory, because of its liability to crack. The dangers pointed out in a recent discussion in the *Transactions* of the American Institute of Mining Engineers, appear to have fully materialized. In the more recent constructions, the flues are being built of brick, the arch having the form of an inverted catenary, the same form that has been used in connection with the concrete flues of Monier construction.

When siderite is calcined it is decomposed according to the reaction $FeCO_3 = FeO + CO_2$ and the molecule of FeO is subsequently converted to Fe_2O_3 by taking oxygen from the air. The roasted carbonate is always strongly magnetic, but in execution of the process the temperature must be regulated carefully to avoid sintering the ore, which because of the possibility of ferrous oxide and silica may easily happen. According to Le Chatelier the decomposition [illegible] takes place at 800 deg. C.

The process of pot roasting employed in the various plants of the American Smelting and Refining Company has not proved to be entirely satisfactory, chiefly because of the slowness of the operation (about 18 hours being required to desulphurize a charge), and the large percentage of fine material that is produced, and has to be reworked. There is evidently a distinct difference in the behavior of the ore subjected to this process and the behavior of galena ore, mixed with limestone, in the Huntington-Heberlein process, from which the process of pot roasting was developed in America.

The smelters of Kansas conducted their early experiments on the smelting of Colorado ores with many discouraging experiences, but after a few years they succeeded in treating them profitably, and drove the European buyers out of the Colorado market. The increased price for spelter, the continuing shortage of ore, and the severe competition for what Joplin could supply forced these smelters more and more into the country west of the Rocky mountains for their ore supply, and raised the prices for such ore, in which the smelters were aided by gradual improvements in their processes.

Iron sulphide, carbonate and sesquioxide may under certain conditions be converted into the magnetic oxide, Fe_3O_4, in which form it is easily attracted by the magnet and thereby may be separated from compounds of zinc, all of which are non-magnetic, or at least only feebly magnetic. Processes depending upon this principle were first applied many years ago, perhaps as early as 1855. Similarly iron bisulphide may be changed into magnetic sulphide. The conversion of non-magnetic iron minerals into the magnetic forms requires considerable care and many failures have been due to ignorance of the correct conditions.

For certain purposes, such as the blowing of cupola furnaces, a comparatively small volume of air is required, but under high pressure. For exhausting, blowing boiler fires, and the like, the volume required is greater and the pressure relatively less. The former wheel requires to be narrow at the circumference, thus providing for the escape of only a small amount of air. When a fan is employed for exhausting hot air or gases, the speed required to maintain a given pressure difference is evidently greater than that necessary when cold air is handled, the difference being due, and inversely proportional, to the absolute temperature.

Stringent rules for the handling of explosives have been adopted by the Pennsylvania Railroad. Only cars in good condition and of at least 60,000 lb. capacity may be used for this purpose. Such cars may not be placed in a train nearer to the engine and 10 cars of the caboose. No cars loaded with explosives will be allowed in a mixed train. The cars at either end of the one loaded with explosives must not be loaded with oil, lumber or other inflammable material, nor iron bars, pipe or other articles likely to break through the end of the car from rough handling. Cars containing explosives must be inspected by the trainmen each time the train stops.

At Bendigo, Victoria, mechanical ventilation as an auxiliary to natural ventilation is operated to a large extent in all the mines, says a correspondent of the London *Mining Journal*. The deepest mines use a water jet to lay the dust from boring machines. Water for this purpose is usually brought from a cistern in the shaft at from 300 to 400 ft. above the lowest level that is opened from it. Sometimes the faces are upward of 2000 ft or more from the shaft, but a pipe of 1 in. diameter is usually found sufficient, with such heads of water, for one "end." Hoses are attached at the service end. The greatest distance to which air is supplied by a rotary blower (Root's) is 4710 ft. This is at the Band & Loch mine, and includes the whole distance covered by air pipes from the surface to the faces at the 2300-ft. level. The Star of the East mine has 12-in. air pipes carried to faces at 1900 ft. from the shaft. Some years ago, in an alluvial mine known as Winter's Freehold, in this district, one rotary blower was operated to ventilate faces at over two miles distant from a shaft 400 ft. in depth.

In calcining blende-siderite ore, to make the siderite magnetic, it is necessary to expose the ore to a bright, cherry-red heat (850 deg. C.) for only 10 to 20 minutes. The particles of siderite blacken and become so strongly magnetic that comparatively large pieces can be lifted by a very small horse-shoe magnet. The ore loses weight through the expulsion of the carbon dioxide of the siderite and the second atom of sulphur of any pyrite that may be present, but the heating should not be prolonged so as to cause the blende to roast. The ore is withdrawn from the furnace red hot, and emitting a strong odor of sulphur dioxide, but the latter disappears immediately and the particles of blende are observed to be coated with an infinitesimal film of white zinc oxide. These are evidences of a properly conducted calcination. When the calcination has been properly conducted, the siderite can be lifted out by a magnet of extremely feeble intensity and a very clean separation can be made from the blende. A low intensity of magnet is desirable not only because of its less consumption of electrical power, but also because a higher intensity of magnetism may lift out some of the blende, when the latter contains combined iron.

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The Gold Movement

[illegible] made to the large production of gold in 1906, and some effort was made to trace the disposition made of the great sum thus added to the world's wealth. The total, according to the preliminary figures, was $404,650,000; and of this the United States production was $97,650,000, or one-quarter. This did not represent the whole addition to our gold stock by any means, for the net imports into the United States for the year were $103,120,000; so that a little over $200,000,000, or about half of the total production, came to this country. Most of these imports were drawn from Europe, though we received some gold from Mexico, and also a considerable proportion of that produced from the Yukon placers in Canada.

There were several causes which determined the movement of gold in this direction. Sales of American grain, cotton, copper and other materials in Europe were unusually large. The known business activity and the rapid growth of trade and development of the country tended to increase foreign investments here. The San Francisco disaster brought considerable sums, in payment of the losses incurred by foreign insurance companies. Finally, the growth of trade and speculation was so great that still more gold was needed to sustain credit, and this country was able to offer interest rates high enough to attract capital from the European markets. The exact amount of foreign loans made here cannot be easily ascertained, but it was certainly large. This money, of course, will have to be repaid in time, either directly in money, or in produce exported; but this will extend over a considerable space of time, unless a panic should intervene, which does not now seem probable.

All the Americas, indeed, as well as the United States, took gold from Europe last year. Canada has entered on a period of rapid growth and development, and drew largely from Great Britain in the way of capital for new railroads, and the purchase of lands, and in money brought by immigrants. Mexico sold silver for gold to help on the gradual change in its currency and money standard. In South America there were heavy imports, the chief causes being large grain exports from Argentina and heavy investments of European capital in that country; and the so-called "coffee valorization" plan in Brazil, which involved heavy gold loans by the government to aid its efforts to regulate the prices of coffee. It is a curious reversal that Mexico and South America, which supplied Europe with great quantities of gold in the sixteenth and seventeenth centuries should, in the twentieth, be reversing the process and drawing gold away. The total gold exports from Great Britain to Argentina last year were $17,029,000; and to Brazil, $10,330,000. Besides this both countries took some gold from France.

Another determining cause of gold movement last year was found in the efforts to repair the waste and loss of the Russo-Japanese war. Both Japan and Russia borrowed large amounts of gold in Europe; and Russia would probably have borrowed much more, had not domestic troubles seriously impaired her credit. This cause for the absorption of gold has not yet disappeared, by any means; it will probably be a factor for several years. The destruction by earthquake at Valparaiso and Santiago in Chile, where European capital is largely invested, is also worth mentioning, though it will be a more apparent factor in 1907 than it was in 1906.

The great absorption of gold by the United States may be considered as at once a cause and a consequence of our growth and business activity. There is a strong probability that it will continue during the present year, or at least a considerable part of it. No country in the world is growing so rapidly in population, or in the development of its resources. While these movements continue the country will be in a position to command the capital it needs.

The Nipissing Company

Considerable surprise has been expressed at the failure of the Nipissing directors to publish in full the report on the property recently made by H. W. Hardinge, only brief extracts of this having been given out, although the report itself is open to the perusal of stockholders at the office of the company. We surmise that this action is due to the feeling that the report is of such optimistic character that if it were published the directors would be charged with attempting to boom the stock after having intentionally

depressed it, a manipulation of which indeed they have been freely accused.

We have reason to believe that Mr. Hardinge's report is in fact of an optimistic character and straightforwardly expresses great confidence in the future prospects of the company and of the district as a whole. There is no question as to the wonderful mineralization of the district, where many crevices, which may be compared to shrinkage cracks, have been enriched with silver ore of extraordinary richness over a wide area. The formation is such that the sudden disappearance of a single vein should cause no alarm, indeed is to be expected. On the other hand, it is to be expected that many blind veins, i. e., veins which do not come to the surface, will be found. In the veins there will be found local enrichments and conversely lean spots. Vein 49, of which so much has been said, has not petered out. At the bottom of the cut the ore is of lower grade than higher up, but there is more of it. In other words, as the grade has gone down the ore has thickened, which is a common occurrence.

We think that the directors of the Nipissing company make a mistake in not publishing Mr. Hardinge's report. The company is one in which many persons are interested, and they are entitled to full information. Mr. Hardinge is an engineer of such high reputation that no excuse for the honest optimism of his report is required, and there is no good reason why its publication should be misconstrued.

There are already signs of a revival in the general mining interest and in the Cobalt stocks. The Nipissing affair has done much to clear the air. There is talk of the appearance of new figures in the Nipissing company, which may relieve it from some of the suspicions connected with the old. It is to be hoped that investments in the Cobalt stocks will now be considered on a more rational basis than a little while ago. The district has merit and ventures in its mines are attractive; at present they can be safely regarded only as highly speculative. Until more is known as to the character of the mines it is ridiculous for even the dividend-paying stocks to be bid up to the 8 per cent. basis, which is reasonable only in the case of mines with a large supply [illegible]

Mining Stock Exchanges

We have chronicled the rise and fall of many mining stock exchanges. History [illegible] can continue to exist only when there is a real need for them. When they are organized as a means for unloading worthless stock upon a gullible public, or degenerate into that, they quickly die.

The Boston Stock Exchange is the best modern American example of an honest mining stock exchange, which is thriving and active because there is a real need [illegible] can be entered into and disposed of. Nominally the Boston Stock Exchange is a good deal more than a mining stock exchange, but since Boston lost its railway interests, the trading on its exchange has been chiefly in mining and a few industrial stocks.

The gigantic growth of trading on the New York curb is proof positive of the need for a mining and industrial exchange at New York. The mart is already here, but it lacks the organization and rules that experience has shown to be necessary. This has been because the New York Stock Exchange will not permit its members to have dealings on any other exchange in this city, and many of its members are active on the curb. Consequently the curb is a place where "admittance" is easy, and while many highly reputable securities are traded in, there are many which are foul. Many evil practices have developed. For all of this the New York Stock Exchange is to a considerable extent responsible, because it has been unwilling to permit the curb to organize.

Now the Produce Exchange, which is an old and reputable organization, is making arrangements to list mining and industrial stocks. There is every reason to believe that its management will be commendable, although its plans have not yet been announced. Its importance as a mart will depend chiefly upon the way it is managed, and the attitude of the New York Stock Exchange toward it. If the latter extends its coöperation the curb could be practically wiped out—a consummation to be wished. If the curb continues to exist the New York Stock Exchange will be responsible. There is no real conflict of interest between the two exchanges, and it ought to be possible to devise a suitable [illegible]

The United Engineering Building

On Tuesday evening, Jan. 8, 1907, the American Society of Mechanical Engineers held an informal meeting in the auditorium of the Engineering Societies building, to listen to a paper by F. P. Fish on "The Ethics of Trade Secrets." In introducing the speaker the president, Professor F. R. Hutton, stated that the meeting was strictly an informal one, and that the official opening of the building would be held in April, 1907, at which time the donor, Andrew Carnegie, was expected to be present, and all of the societies would take part in the exercises. In [illegible] date. The president announced that the various societies expected to hold informal meetings once a month, and that the American Society of Mechanical Engineers would meet each second Tuesday.

Mr. Fish then read his paper. He outlined the methods of guarding trade secrets used in former times, and took up the moral and legal obligations of employees in respect to their employers' secret processes, and cited cases wherein redress had been obtained for divulgence of such secrets. The speaker discussed the advisability of patent protection, as compared with keeping processes secret, and stated some of the advantages of each.

After the address the audience remained seated, while a flash-light photograph was taken. The meeting then adjourned to inspect the building.

Everything which could add to the comfort and convenience of the societies has been thoroughly carried out. There are large connecting offices on several floors for the use of the officers, and on the thirteenth floor there is a large reading room, convenient to the library shelves. Throughout the building are a number of small lecture rooms, and on the third floor is the auditorium, with a balcony and a seating capacity of about 1000. The lighting and acoustic effects are exceptionally good.

The woodwork throughout the entire building is finished in "fumed" oak, and the floors are rapidly being covered with oriental rugs, linoleum or the hard wood is left uncovered. The coat-rooms are situated on the second floor and are spacious.

The entrance to the building opens into a large lobby finished in mottled green marble and furnished with rugs and red leather furniture. There are two bronze tablets, one showing a portrait in bas-relief of the donor, Andrew Carnegie, above his letter of 1904 offering to donate one and one-half million dollars; the other contains the combined seals of the engineering societies amalgamated under one roof. The lighting of the building is effected by incandescent lamps hidden in [illegible]

Portland Cement

country, the record of the industry stands without a parallel. One has merely to recall the fact that 82,000 bbl. of portland to be told that the estimate for 1906 has 000,000 bbl. or more to be convinced that the development of the industry in this country has been truly marvelous. To present the matter in another form, the estimated output for 1906 would mean a per capita production of a half barrel of cement for every man, woman and child in the United States, whereas the output in 1880 distributed in like proportion would not have supplied the residents of a single city of the size of Washington. It is in looking at the situation in this light that the true perspective is obtained.

The great growth of the cement industry from the manufacturer's standpoint was the natural sequence of the remarkable development of the uses of cement. The United States stands preëminent in this respect if measured by the quantity used. Her engineers and builders were not content to be entirely on this side of theory and experiment, but possessed the courage of their convictions, and thus the work of the builder has kept pace with the research of the laboratory.

Grouping imports under the term hydraulic cements, there is shown a marked decline in imports. The following figures indicate what took place up to 1906, when domestic consumption reversed the figures:

IMPORTS OF HYDRAULIC CEMENT INTO THE UNITED STATES IN 1903-1905.

	1903	1904	1905
United Kingdom...	16,393	16,365	33,978
[illegible]	737,576	394,398	335,154
[illegible]	14,[illegible]	34,912	18,864
[illegible]	[illegible]	[illegible]	456,325
[illegible]	27,415	7,508	692
[illegible]	1,421	98	417
[illegible]	9,265	7,691	1,237
[illegible]	[illegible]	[illegible]	[illegible]

figures are as follows:

EXPORTS OF DOMESTIC HYDRAULIC CEMENT, 1903-1905.

Year.	Quantity.	Value.
1903	285,163	$ 443,984
1904	774,910	1,104,086
1905	891,686	1,387,906

The increase in cement in 1906 changed the figures. The exports for 10 months ending October, 1906, were 877,510 bbl., and imports 656,337 bbl., while the exports for the 10 months ending October, 1906, were only 480,318 bbl. and imports 1,686,426 bbl., thus showing the marked increase in domestic consumption.

ENORMOUS CONSUMPTION

There is cause for congratulation upon the situation in the United States as matters stand at present, and it is entirely within the scope of probability that official figures covering the current year will show the large estimates already made to be far under the mark. Certain it is that both the production and uses of cement are constantly increasing, and not solely because of great enterprises like the construction of the Panama canal, the reclamation of deserts and the rebuilding of cities, but because there is growing appreciation and understanding of the value of cement. The last has operated to give the cement trade a tremendous impetus in the United States. It can best be likened to the early development of our great railway enterprises and probably its true explanation is what has happily been termed the initiative impulse of the American people. Where other nations have manifested the conservative spirit which waits upon the decree of the scientist and the laboratory, the people of this country have been quick to discern the practical value of cement, and the immense demand following its successful application in large structural enterprises a few years ago has been doubled and over to meet the needs of practically every community in the United States. Not only does America easily take first place among the cement producing using countries in the world, but so unprecedented is the demand for cement and so thoroughly established is the industry that no one can safely predict its future magnitude. A potent factor in all this has been the gradual decline in the cost of manufacture and the selling price as compared with the situation of the early nineties. The wide distribution of the industry has been another important consideration. It has afforded the people generally an opportunity to become familiar with the many virtues of cement and concrete construction and it is now extensively used in communities in which a barrel of cement would have been a novelty a short time ago.

FUTURE OUTLOOK

To reflect upon the development of the past few years is to become convinced that, after all, this country has merely crossed the threshold in the evolution of the cement industry. Cement in factory construction may be said to have fairly begun. In the matter of dwellings and kindred structures the field has scarcely been touched. Granting that there can be no further saving effected in the cost of production, no increased competition in manufacture and that progress in structural methods is about to cease, even so, under present conditions, the use of cement must increase far beyond the present output. In a recent interesting review of the American portland-cement industry, Richard K. Meade says: "Few people realize how much concrete construction is done in the United States. If all the portland cement made in this country last year (1905) had been used for sidewalks, these would have been equivalent to a sidewalk over 16 ft. wide, reaching entirely around the world at the equator. If this same cement had been made into a solid cube of concrete, an edge of this would be 3/16 of a mile in length." Mr. Meade's interesting illustration of the sidewalk suggests that American cement is finding its way around the earth since we have become exporters instead of importers. In many foreign countries American consuls write home urging our manufacturers to invade the field, and it can only be a question of time when they will enjoy a full share of foreign trade. The demand at home has been such that comparatively little attention has been paid to foreign markets, but with factories springing up in all sections of the country to meet local demand it is altogether likely that new territory will soon be invaded. To sum up the situation briefly, America has first and foremost a large home demand. Cement is sold at a reasonable price within the reach of all classes of consumers, but at a price which allows a fair profit to the manufacturer. The consumption of cement is constantly expanding, but the establishment of new factories precludes the probability of exorbitant prices. Viewed from every standpoint the cement industry in this country appears to be on a substantial and wholesome basis.

Cobalt Companies

The number of Cobalt mining companies which have obtained Ontario charters of incorporation now amounts to 249; in addition to which, 14 companies incorporated elsewhere have been licensed to operate in the province. The Ontario capitalizations amount to a total of $171,148,000. At the price paid by the public for shares in some of the larger companies the selling price represented is estimated at about $250,000,000 in all.

The London Copper Market in 1906

[illegible]

[illegible] producers had already disposed of their [illegible] months ahead. Threatened re-sales of large quantities which had been shipped to [illegible] eventually [illegible] unsigned. The political and industrial ferment in Russia, which had been the one disquieting feature, already showed welcome signs of abatement, and confidence was imparted to the Stock Exchange in consequence. The opening prices for standard warrants were £79 15s. for spot, and £79 7s. 6d. for three months, and there was an active demand for refined and manufactured sorts, all at full prices. The market was forthwith affected, partly by speculative holders, who desired to realize, partly also by "bear" selling. This latter feature developed strongly under the disturbing announcement of a general election, and under the political uneasiness caused by the Moroccan question, which at one time threatened to become acute. Under these adverse influences, three months' standard gradually relapsed until £75 12s. 6d. was recorded, a loss of £4. Spots warrants meanwhile were firmly held; and as bear sales matured, the premium on these warrants was at one time as much as £2 5s. per ton. Thereafter the standard market was less active, the speculative element having subsided; but the tendency was firm, and the statistical position favorable. A recovery of nearly £2 was recorded in the price of three months' standard before the month closed, when spot warrants stood at £78 10s., and three months' at £76 17s. 6d.

February opened with a firm tendency induced by further shrinkage in the visible supply; but an early relapse followed, due to large realizations combined with the pressure of bear sales, which brought down the price of three months' standard [illegible] £75, [illegible] £76. Thereafter bears showed more caution, in view of active consumption, firmness on the part of producers, revival of demand for sulphate, and further depletion of stocks. The market was steady in consequence. One or two transitory relapses toward the end of the month were only the signal for renewed enterprise, followed by advanced prices. Spot copper continued to be firmly held, and to command a premium. It was abundantly evident that the market was heavily oversold, and that the official American prices were merely nominal, holders refusing to accept them. The month closed with improved demand for consumption, with spot warrants at £78 15s., and three months' at £77 2s. 6d.

March opened with every indication of firmness, prompted by three successive advances in American prices, as also by the statistics, which disclosed a visible supply of only 8340 tons. Producers of refined copper had already sold largely and were unwilling to increase their commitments unless at a substantial advance in prices. Manufacturers who had held back in hope of lower prices, now hastened to cover their requirements, and the demand for consumption was consequently brisk and at full prices. This was particularly noticeable in America, where consumers readily bought for delivery over April-June. The covering of bear sales, which had been less active in the early part of the month, developed new importance toward the end. By this time the prolonged Moroccan dispute had been satisfactorily adjusted, and the political situation was free from disturbing elements. Stocks in English warehouses were computed at the dangerously low figure of 4783 tons. The market was fully responsive to these influences, and the month showed a steady advance in the standard cash price from £79 at the outset to £83 15s. at the close, three months' warrants closing at £80 17s. 6d.

April showed early evidence of confidence, evinced principally in increased orders for standard copper for forward dates, both from speculators and consumers, and a gradual advance in values was recorded throughout the month. At one time the speculative market was neglected in favor of tin, in which there was considerable excitement; then followed the usual cessation of business at Easter, and the general dismay caused by the appalling disaster at San Francisco; but at no time was there any great pressure to sell. On the contrary, bears were active in covering their sales; investors also bought largely. India sent large orders for yellow metal and copper sheets; tubes and fire-box plates were in good request for locomotives; the electrical industries continued to take large quantities in wire and other forms, and the American demand was such that by the end of the month the leading American producers had practically sold their output up to July. The standard market consequently closed strong, with cash warrants at £85 5s., and three months' at £83 5s.

May opened with a downward tendency, due to disturbing influences in American finance, and during the first eight days the value of spot warrants relapsed gradually. Producers, however, were well sold and would make no concessions, though second-hand holders were restive. Refined copper continued in good demand for consumption, notably in Germany and chiefly for electrical work. American consumption was no less active, and it was known that the Amalgamated company had sold largely for delivery extending into July and August. The situation was therefore ripe for improvement, which commenced early in the month, by which time the financial outlook had greatly improved. With the approach of the Whitsun holidays the turnover dwindled, and operators hesitated to initiate any movement either way. Closing prices were, for spot standard warrants, £85, and for three months', £84 10s.

June opened quietly under holiday influence, but with favorable indications of general trade. The long impending labor troubles in Germany were happily averted. American trade gave plentiful evidence of increased expression, and producers had everywhere sold well ahead. Values gradually advanced until, on June 12, spot warrants commanded £86 5s., and three months' £85. By this time demand was temporarily satisfied, and the disquieting aspect of Russian affairs tended to disturb the money market. Bears were alert to take advantage of the opportunity, and no support was forthcoming. Meantime there was some active business in spot warrants which were in request chiefly for the covering of bear sales, but later values relapsed in the absence of any pressing demand, and under unfavorable reports from Wall street, where industrial shares were sharply attacked. The close of the half-year was thus naturally quiet, in view of general stock-taking, and little attention was given to copper. There was, however, a manifest disposition to buy in the neighborhood of £80, and producers would make no concessions. Closing values were £81 5s. for cash standard, and £80 10s. for three months'.

July opened uneventfully, with little speculative enterprise. A further increase in the visible supply, and a general depression in the stock markets, combined to initiate a gradual decline which, followed by heavy liquidations induced by losses on tin, brought down the prices to £78 5s. for cash, and £77 15s. for three months' warrants, at which figures the market closed, July 13. At this point support came in, notably from America, where the stock markets had become more buoyant and operators noted London as the cheapest source of supply. Offerings, however, were small, and it was obvious that there was no real surplus of material in the market, while consumers generally were working down their stocks with every prospect of having to replenish shortly on a large scale. American prices meanwhile were steadily maintained. Toward the close of the month the market became free of extraneous influence, and stocks were strongly held. Manufacturers bought largely, and raised their basis price for the rolled metal by £2 per ton. Bears became alarmed, and hastened to cover their commitments. Pressure by this time was eased, and speculative accounts mostly

the first week of August and of the customary exodus of holiday makers at that season. Consumers' demand continued brisk, and the month closed with cash warrants at £82 10s., and three months' [illegible]

August was an active month throughout, marked by increased evidence of large requirements extending over long periods, with consequent bookings in many cases extending into the next year, and at persistently advancing prices. One natural result was the early disappearance of the backwardation, which had ruled so long. Aug. 13 found the price uniform for cash, three months', and intermediate dates, and thus it continued for the rest of the month, with sometimes a fractional premium for the later dates. The speculative element gradually dwindled so that the public turnover was often very meager, and official prices little more than nominal, but the consuming industries were none the less active in absorbing all that offered. German consumption, in particular, was on a larger scale than had hitherto been known. India supplied numerous orders, contrary to her custom when prices are high, and China did likewise. The home consumers alone showed any timidity, for which they had to pay the penalty after their stocks were worked down and replenishment could no longer be delayed. By the end of the month American producers had sold immense quantities and had to hold for advanced prices. Other producers were similarly situated, and stocks in public warehouses were ominously low, with every indication of consumption outrunning supply. There was a slow but steady advance in prices all through the month, closing at £85 5s. for cash warrants, and £85 7s. 6d. for three months'.

September fully justified the optimistic opinions based on the foregoing indications, and a steady advance was registered throughout the month. Leading producers had already sold out for some months ahead, consumers' requirements were in many cases only partly covered, there was but little of the metal left in dealers' hands, and consumption had obviously overtaken supply. It soon became known that Japanese supplies had been liberally taken for the first half of 1907, and that consumers had secured important contracts extending well into the spring. As the month advanced, important orders came in from India and China, and inquiries were received concerning large quantities required for government and railway work. Toward the end of the month events developed rapidly, and it was manifest that manufacturers were committed to a larger output than production could furnish. Bears hastened to [illegible] bulls were no less prompt in paying the already advanced price for forward warrants. Speculation, however, was comparatively unimportant beside the enormous business passing between producers and consumers. New York prices were raised almost daily, and a heavy tonnage of American copper was booked for delivery over January-March. Home consumers were for the most part late in apprehending the real significance of the situation, and in some cases they paid full prices for delivery up to June, and even beyond. Sulphate of copper was in good demand, and manufacturers had to draw upon the scanty supply of raw material in public warehouses—a source already depleted by large exports to the European continent. The closing prices of standard copper were £91 5s. for prompt delivery, and £91 for three months'.

October opened with a sharp advance to £93 for all deliveries, followed by a slight check due to bear enterprise, which latter was, however, quickly closed at a loss in a market which was too strong to justify such attacks. American prices were early advanced, most producers having already sold out for February, and in some cases for March. There was furious buying in the English market, particularly of refined sorts, and outside speculative operations intensified the excitement. Progress was rapid until, on Oct. 16, the round figure of £100 was paid, as had been long predicted by a leading authority. On Oct. 18, £103 10s. was paid, and this proved to be high-water mark. Thereafter enterprise was sobered somewhat by the official bank rate of interest being raised from 5 to 6 per cent., as also by the failure of a prominent city house having large commitments in copper on the bear side. Brokers hastened to cover their liabilities in this direction, and tension was relieved by the liberality with which holders met this demand. Meanwhile American finance became disturbed, causing a fall in negotiable securities, and prompting bear selling of copper, whereby prices were forced down to £97 5s. on Oct. 25. Consumers naturally held aloof, but their requirements were obviously large, while there was nowhere any indication of any appreciable expansion in production. Thus the selling power was soon spent, weak bull accounts were liquidated—thereby eliminating an element of instability—while the outstanding bear accounts sufficed to impart strength to the market. The month closed in comparative quietness after recent feverish activity, and with practically the entire production of the metal engaged for four months to come. Closing prices of standard warrants were £97 for cash, and £97 15s. for three months'.

November was clouded at the outset by uncertainty connected with the New York election, on which important commercial issues were supposed to hang. The result was judged favorable though not inspiring, and the market improved accordingly. It soon became known that American consumers had bought Lake Superior and electrolytic copper to the extent of about 20,000 tons which, in conjunction with other business, rendered producers independent for some considerable time. The financial situation also improved, and prompted a revival of speculative interest in the metal. European consumers showed some reserve, and their inquiries were spasmodic, but the volume of business increased with each advance. Top prices were recorded Nov. 19, when cash warrants commanded £102, and three months' £103 5s. A slight reaction followed, but American advices continued optimistic, with urgent calls for delivery, and with demand only partly satisfied even at the high price. Nov. 21 cash warrants closed at £100 15s., and three months' £102, but further bear attacks were repulsed, and the market thenceforward strengthened with increasing demand for refined sorts and in the absence of any indication of increased production in the near future. The month closed with every sign of prices advancing further, cash warrants being quoted £102 10s., and three months' £103 7s. 6d.

December amply justified the foregoing estimate of the situation, the advance being persistent and with few interruptions. Early in the month the American quotation reached a high point. At the same time came tidings of the partial destruction of the Arizona Copper Company's smelter by a disastrous flood, indicating curtailment of production in that quarter. The next remarkable episode was the sale of over 2000 tons by the Rio Tinto Company at the record price of £110, for January and February delivery, besides a large volume of miscellaneous business with consumers. Toward the middle of the month it was found that electrolytic copper was practically unobtainable for earlier delivery than April, demand being particularly keen for this class of copper. Speculative business also became lively, and a large bull account was manifest toward the close, whereby a contango of 30s. was established for three months' warrants of standard. Even the Indian markets—which usually offer a passive resistance to a high range of prices—now found outlets for appreciable quantities of manufactured material, while demand from the European continent—especially from German manufacturers—was very brisk. Toward the close there was considerable stringency in the money market, which tended to restrain the advance in prices, and the approach of the Christmas holidays restricted the volume of business. The open market may be said to have closed on Dec. 21 with a very firm tendency, cash standard being held for £106 15s., and three months' for £108 5s., or 30s. above spot.

For the first nine months of 1906, Germany imported 333,600 tons of pig iron as compared with 271,400 for the corresponding period of 1905.

Personal

[illegible]

[illegible] mines in northern Kentucky.

W. A. Pritchard, of San Francisco, is in Mexico on professional business.

John B. and Fred G. Farish, of Denver, are both in Mexico on professional business.

J. G. McConnell, of Chicago, has been in Gilpin county, Colo., looking after mining interests.

James Ross, president of the Dominion Coal Company, Sydney, N. S., sails for [illegible]

W. W. Degge, of Boulder, Colo., has been out to the Goldfield, Nevada, district, looking after mining interests.

J. W. Duntley, president of the Chicago Pneumatic Tool Company, has returned from a business trip to Europe.

C. W. Kempton, mining engineer, left New York Dec. 21 for Chile, South America, on professional business.

Percy E. Barbour has gone to Goldfield to look after interests of Boston people. He will be in Nevada several months.

W. H. Knowles, of Denver, Colo., left this week for the Greenwater district, California, in the interests of Easterners.

A. H. Wethey, manager for W. A. Clark, at Butte, Montana, has been a recent visitor in New York. He returns to Butte this week.

Theo. L. Lammers, of Spokane, Wash., has been appointed general manager of the Panhandle Smelting Company, Ltd., of Ponderay, Idaho.

G. W. Miller, of Denver, Colo., is now engaged in making examinations of mining properties in northern Colorado, for New York people.

Arthur P. Heinze, brother of F. A. Heinze, is spending a few weeks in Butte in the interest of the mining property in which he is connected.

George Wesley Davis, a director in the Davis-Daly Estates Company, has returned to Butte, Mont., from a business trip to Boston and New York.

Victor Rakowsky, of Duluth, consulting engineer for the Butte & Superior Copper Company, is in Butte, Mont., on business connected with the company.

Harry A. Lee, formerly commissioner of mines for the State of Colorado, has been made consulting engineer for the Unity Mines Corporation, of Alta, Utah.

We shall be obliged if the contributor who favored us a little while ago with an article on "Determination of Sulphur" will send us his name and address.

Hugh D. Pallister, mining engineer, formerly of Cleveland, Ohio, has become connected with the Chisos Mining Company, of Terlingua, Brewster county, Texas.

R. R. Lund, of Breckenridge, Colo., has gone to Leadville, Colo., where he has accepted a position as chemist with the American Zinc and Extraction Company.

J. E. Lemay, a banker of Montreal, Canada, has been visiting in Routt county, Colo., and has become interested in some mining property in the Hahn's Peak section.

Robert Linton, of R. M. Atwater & Co., Helena, Montana, accompanied by R. de Sallier, has just returned from an examination of property south of Goldfield, Nevada.

Donald B. Gillies, manager of the Tonopah Extension property, and the confidential agent of Charles M. Schwab, spent several days in Butte, Mont., recently.

C. F. Moore, of Salt Lake City, is in Mexico, in connection with the Real del Monte mines, Pachuca, of the United States Smelting, Refining and Mining Company.

A. J. Smith, of Denver, a well-known operator in Gilpin county, left recently on a trip to New Mexico, to look at some mining properties, in the interests of Eastern people.

George E. Howard, for some time past assistant manager of the Sahuayacan Mining Company, has been appointed manager of the company's mines and mill at Ocampo, Chihuahua, Mexico.

R. V. Norris, consulting engineer, of Wilkes-Barre, Penn., will begin next week the delivery of a course of lectures on coal mining to the students of the Lawrence Scientific School, of Harvard University.

Arthur W. Stevens, superintendent in charge of the Boise King Placers Company property, in Elmore county, Idaho, is at present visiting Chicago. He expects to return to the property in February.

Professor Rutherford, of McGill University, Montreal, has been appointed to succeed Professor Schuster as Langworthy professor and director of physical laboratories at Manchester university, England.

Robert K. Painter, who has recently been engaged in mining and exploration work, in Newfoundland, has accepted the position of general manager of the San Carlos Copper Company, at San Jose, Tamaulipas, Mexico.

Woolsey McA. Johnson, metallurgical engineer, of New York, returned last week from an extended trip through the West, where he has been engaged in connection with the smelting projects of the Tri-bullion Smelting and Development Company, which owns the Kelly mine, at Magdalena, New Mexico.

Norman Carmichael, who has been superintendent of the Arizona Copper Company's mines, and concentrators at Morenci for some time past, has been appointed assistant general manager of the company and second vice-president of the Arizona & New Mexico Railroad, with headquarters at Clifton, Arizona.

Alfred C. Sieboth has resigned as superintendent of the Lake Superior & Arizona Mining Company, Pinal county, Arizona, the resignation to be effective Feb. 1. Mr. Sieboth will again enter into the general mine-engineering practice, and has engaged to do some professional work in the States of Oaxaca and Vera Cruz, Mexico.

Prof. Robert H. Richards, of the Massachusetts Institute of Technology, Boston, Mass., is at work upon an appendix to his treatise on "Ore Dressing," which will be supplementary to the two volumes of that work already published, and will bring the work up to date. Professor Richards will be glad to receive information concerning new improvements in machines and mill plants.

H. W. Hardinge, mining engineer, of New York, returned last week from Cobalt, Ont., where he made an examination of the Nipissing property in behalf of the company. He then made another trip to Cobalt, from which he expected to return Jan. 7, then to proceed to Colorado, where he will be engaged for two or three weeks on professional business. Mr. Hardinge has taken an office at 43 Exchange place, New York.

Prof. William Gowland has been nominated to succeed Arthur C. Claudet, as president of the Institution of Mining and Metallurgy, and will assume office in March next. Professor Gowland has been head of the metallurgical department of the Royal School of Mines, South Kensington, since the death of Sir W. C. Roberts-Austen. In earlier days he was metallurgist to the Broughton Copper Company, Manchester, and to the Japanese mint. He is an old School of Mines man, having obtained the associateship in 1870. As a professor he is a great success, both personally and professionally.

Simon Guggenheim will be elected United States senator from Colorado. He was born at Philadelphia, Dec. 30, 1867, and was educated in the public schools of that city. In 1889 he went to the Philadelphia Smelting Works, at Pueblo, Colo., which was built by the Guggenheim Brothers, and since then has been largely identified with mining and smelting in Colorado. He is now a member of the executive committee of the American Smelting and Refining Company, and makes his headquarters at Denver. It has been stated in the papers that upon his election to the Senate, he will withdraw from active connection with the American Smelting and Refining Company.

Obituary

[illegible] the Watt Mining Car Company, Barnesville, Ohio, [illegible] age of 40 years. He was born in the city where he died, and where he lived all his life. The business, of which he was head, [illegible] was well known and highly respected for his integrity and high standards as a manufacturer.

Winfield Scott Keyes died in San Francisco, Dec. 27. He was born in Brooklyn, N. Y., [illegible] graduated from Yale college in 1860, and three years later from the School of Mines at Freiberg, Saxony. He was employed in California for several years, and about 1870 went to Eureka, Nev., where he was manager of the Eureka Consolidated mines. Some years later he was at Leadville, Colo., and was for several years in charge of the Crysolite mine there. During the Centennial Exposition [illegible] in 1876 he was a member of the board of judges. In 1878 he was honorary commissioner to the Paris Exposition. Mr. Keyes was an expert in many mining suits, and was a contributor to mining and scientific magazines. [illegible] a director in the California State Mining Bureau and a member of the executive committee of the California Miners' Association. He was vice-president of the Humboldt bank, and [illegible] in the Pan American Development Company, operating mines in the State of Sinaloa, Mexico. Mr. Keyes was a member of the American Institute of Mining Engineers, National Geographical Society, and the California Miners' Association. Among his books are "Resources of California" and "Resources of Alaska."

Societies and Technical Schools

[illegible] —The secretary gives notice that all communications, etc., should hereafter be addressed to the Institute at "United Engineering Society Building, 29 West Thirty-ninth street, New York."

[illegible] twentieth annual meeting will be held in Butte, Mont., Jan. 10, 11 and 12. The program includes visits to the Washoe Reduction Works, at Anaconda; visits to Butte mines, surface plants and the School of Mines; business meetings; reading pa-

Space is now being assigned for the exhibits of the first international exposition [illegible] two weeks. The exhibits will include safety devices for wood and metal-working machinery; stamping, grinding and polishing machines; safeguards for boilers, elevators, windlasses, cranes and hoisting machinery; textiles and building trades; safety lamps and explosives; quarrying and agriculture; chemical industries, safety from fire; railway and trolley safety. All those wishing to exhibit safety devices in any of the above classes should apply at once to W. H. Tolman, director, 287 Fourth avenue, New York, for space. As the object of this exposition is to awaken the American public to the necessity of doing something to lessen the causes of accidents to American life and labor by means of a permanent museum of safety devices, where all problems of safe-guarding life and limb can be studied in their working details, there will be no charge for space.

Industrial

Among recent contracts received by the Crocker-Wheeler Company, Ampere, N. J., are large engines and generators for the Interstate Iron and Steel Company, Chicago, and for the Republic Iron and Steel Company's plant at Youngstown, Ohio.

Recent orders received by the Buffalo Forge Company, Buffalo, N. Y., include two 160-in. pulley fans for the mill of the Utah Copper Company, Garfield, Utah; a two-stage centrifugal pump for the Canadian Copper Company, Copper Cliff, Ont., and several large export orders.

The Utah Mining Machinery and Supply Company, Salt Lake City, has secured an order for twelve 24-in. belt duplex Callow screens and 140 eight-foot Callow tanks for the new concentrator of the Nevada Consolidated Copper Company at Ely, Nev. This is in addition to a large order previously placed.

G. & O. Braniff & Co., agents in Mexico City for the Westinghouse Electric Company, have received orders from the Moravillas y Anexas Mining Company, of Pachuca, for an electric double-drum hoist, of the J. G. Leyner Engineering Works, Littleton, Colo., connected to 225-h.p. Westinghouse motor, on a 2000-volt, 50-cycle circuit; and from the Castillo Hacienda, Jalisco, for two centrifugal pumps, operated by 100-h.p. Westinghouse motors from a 200-kw. generator of 2200 volts at the Juanacatlan power-house of La Electra, near Guadalajara.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Witte Iron Works Company, Kansas City, Mo. Witte Engines. Pp. 40, illustrated; paper, 6x9 in.; 1906.

Morris Machine Works, Baldwinsville, N. Y. Centrifugal Pumping Machinery. Pp. 90, illustrated; indexed, paper, 6x9 in.; 1906.

Ekert High Resistance Materials Company, Dayton, O. Ekert High Resistance Elastic Materials. Pp. 10, illustrated; paper, 5x7 in.

The Crown Drilling Machine Company, Akron, O. Catalog C. Crown Well Drilling Machinery. Pp. 63, illustrated; paper, 7x10 in.; 1906-7.

General Electric Company, Schenectady, N. Y. Bulletin No. 4468, Electric Mine Locomotives. Pp. 62, illustrated; paper, 8x10½ in.; November, 1906.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1503. Allis-Chalmers Direct-Connected Reynolds-Corliss Engines. Pp. 12, illustrated; paper, 8x10½ in.; September, 1906.

Hendryx Electro-Cyanide Company, Denver, Colo. Catalog No. 3. Descriptive of Apparatus for Cyaniding of Gold and Silver Ores and the Treatment of Copper Ores. Pp. 21, illustrated; paper, 5x8½ in.; 1906.

Construction News

Gold Butte, Nevada—The Nevada Gold Butte Mines Company is preparing to build a mill, and will soon be in the market for machinery. A. B. Greeson, Atlas block, Salt Lake City, Utah, is secretary.

Kendall, Montana—The Barnes-King Development Company will be in the market for all kinds of equipment, including rolls, crushers, belt conveyors, elevators and mechanical distributors of all kinds; electric hoists, machine drills, mine and mill equipment generally, cyanide equipment and supplies. Manufacturers and houses interested in this class of equipment are requested to send catalogs and lists to the mine office, at Kendall, Montana.

Carman, Manitoba—The Commercial Cement Company is making active preparations to begin the manufacture of cement at Carman, about 70 miles southwest of Winnipeg. A side track has been constructed connecting the company's plant with the main line of the Canadian Northern Railway. The works, including the factory proper, power-house and chemical laboratories, are approaching completion, and a quantity of the heavy machinery is on the ground. A large volume of water is supplied from a spring on the hillside above the works. The rock supplying the raw material is also procured at a considerable hight above the mill, and is transported through the various processes almost entirely by gravitation. Manufacturing will be begun in the early spring. The company, the head office of which is in Winnipeg, has $150,000 capital, N. P. Alsip, of that city, being president, and Otto Babcock, general manager and secretary-treasurer.

Special Correspondence

San Francisco Jan. 1

Fred H. Hazard, of the Oriental Refractories Works, of Portland, Oregon, is making an examination of the ocean beach black sands of Humboldt and Del Norte counties, Cal., and also of the placers of the interior where black sands occur. This company now owns the magnetic separation plant established at Portland, Oregon, during the Fair by Dr. D. T. Day, on behalf of the Geological Survey. The company is building a smelter and other reduction works at Portland, where it will handle their black sands.

There seems to be no diminution of the rush to the Greenwater and other copper camps of Inyo county and considerable development work is being carried on. All classes of labor are in demand. Freight teams are hauling in supplies and machinery in large quantities. An important consolidation of several of the principal copper properties in Greenwater is projected.

Good gold and copper prospects are drawing the attention of desert miners to the region about Silver Lake, in San Bernardino county, and a tent town of about 200 men has grown up there within the past four months. Silver Lake is a station on the Tonopah & Tidewater, about 30 miles north of Ludlow. Beeson and Newlin, the original locators, have claims showing streaks of ore carrying high gold values and copper, which they are developing, but the size of the veins has not been determined. Silver Lake appears to be on the southern extension of the copper belt in which Greenwater is located. There is plenty of good water in the camp.

After spending a great deal of money in Colusa county drilling for oil a few years ago, the principal operators gave it up as a bad job. Oil in paying quantities was not found. The failure of others, however, did not seem to dampen the ardor of the Williams Oil Company, of Colusa. When the oil boom was at its hight it started a well on the Brim place and another at Van Gilts. Both of these were failures, and the work was abandoned. At the present time the company is boring the third well near the Mountain House. New leases in the vicinity of the present well are being secured and recorded.

Word comes from New York, that the directors of the Balaklala Copper Company, of Shasta county, are planning to double the capacity of its smelter under construction at Coram, making it of 2000 tons capacity instead of 1000. In order to provide the necessary funds for this enlargement the company contemplates issuing bonds for $3,500,000, taking up the $1,500,000 bonds now outstanding and having a margin of $2,000,000 for improvements.

The Trinity River Mining Company, operating four miles above Lewiston, Trinity county, in carrying out its project of turning the Trinity river from its bed to get at the auriferous gravel, had to tunnel through a rocky point across a horseshoe bend. In driving this tunnel, which is now almost 500 ft. long, the company struck quartz carrying values in gold. The working force has been withdrawn from the tunnel so as to build a quartz mill to work the ore encountered unexpectedly.

The new electric line from Kennett, Shasta county, to the Holt & Gregg lime quarry has been completed. Since the introduction of smelting in Shasta county, well-located limestone quarries have become valuable, because of the necessity of a flux. At present the Holt & Gregg company furnishes daily to the Kennett smelter about 100 tons of limestone, while it delivers to the calcining works and to the railroad station for shipment to other points almost twice that quantity.

The famous Harrison Gulch townsite case, after years of litigation, has been decided by the Commissioner of the General Land office, who rejects the application of the townsite company for a patent. The decision involves the entire town of Harrison Gulch, Shasta county, which is thickly settled. It is held that the application for a townsite patent is invalid because the townsite was described by metes and bounds instead of by legal subdivisions. This is a point overlooked by all the lawyers who have been engaged on either side in the interminable litigation over the Bonanza claim and the townsite. The point was never raised in any of the innumerable trials in the Land Office and in the superior court. The department itself admits, too, that it was in error in not noting the fact when the application was first submitted to it, and then cites the section of the Revised Statutes. The decision is in no way a victory for E. P. Sherk, Andrew Fletcher and Frank Large, who claim a patent to the Bonanza mining ground, which is also wanted by the townsite people. That issue is still before the land office, although it has no legs to stand on until the townsite people make application anew, if they care to do so.

It is now expected that the independent oil producers of McKittrick, Sunset and Midway oilfields to the west of Bakersfield, Kern county, will organize to construct a pipe-line to Port Harford on the coast. The tide-water line will not be over 75 miles long.

It has been decided by the mine-owners and superintendents of Grass Valley, Nevada county, to give the men an eight-hour day from Jan. 1. This virtually means an increase of pay, as there will be three instead of two shifts daily. This will stop the talk of possible strikes.

Salt Lake City Jan. 1

Lake valley. In Salt Lake coal retails at $8.25 a ton.

Mine Inspector Thomas attributes the late coal famine in Utah principally to a scarcity of labor, while he does not exempt some of the transportation companies from blame on account of the lack of proper equipment. The report that a smelter will be built at Good Springs, Nev., by the Good Springs Consolidated Mining and Smelting Company of Los Angeles, has been revived. Salt Lake mining men are interested in seeing the project go through, as a good deal of Utah capital is invested in Good Springs mining property. Joseph Dederick, of Los Angeles, is president of the company.

It has been announced officially that the San Pedro, Los Angeles & Salt Lake Railroad Company will begin the construction of its branch line from Caliente to Pioche, Nev., a distance of about 30 miles, soon after the beginning of the new year. More mining activity is in evidence in the district than there has been for many years. An effort is being made to merge the properties owned by the Nevada-Utah Mines and Smelters and Ohio-Kentucky Mining Company. Samuel Newhouse, president of the latter named concern, is said to be taking the initiative in the matter.

The management of the Nevada Gold Butte Mines Company, with headquarters in Salt Lake, but operating at Gold Butte in the St. Thomas mining district in southeastern Nevada, has secured an option on some additional property. A. B. Greeson, Atlas block, Salt Lake, is secretary of the company.

The coal famine in Utah, although the situation is somewhat improved as to what it was several weeks ago, still handicaps mining operations in several camps. The districts along the route of the San Pedro, Los Angeles & Salt Lake Railroad appear to be worse off than those reached by other lines, which is due to the fact, no doubt, that the road penetrates no coal-mining districts, and is at the mercy of connecting lines. The Cactus mill, in Beaver county, was forced to close on account of a scarcity of fuel. The Consolidated Mercur company has been running on short tonnage, handling no sulphide ores which require roasting.

The business men of Murray and Bingham Junction, where the principal smelting operations of the Salt Lake valley are carried on at the present time, have awakened to the seriousness of the situation if the smelters move elsewhere, which they will be compelled to do if the injunction from Judge Marshall's court becomes effective. Meetings have been held and a petition is being circulated among the farmers of the valley, which is

easement, or modification, of the decree.

companies are looking for other sites, and it is a certainty that the Utah Consolidated management will not change its plans to move out of the valley entirely.

Scranton Jan. 8

The sensation of the anthracite district this week was the announcement that the board members of District No. 1, of the United Mine Workers, with headquarters in Scranton, had decided to work without pay. This is due to the depleted condition of the treasury, there being no money with which to pay the salaries. The board members and organizers who make this sacrifice state that they will continue to do the work, without salary. Those who give up their salaries are Stephen J. Rea, Olyphant; J. P. Kearney, Archbald; M. S. Healy and Richard Rowlands, of Scranton; Thomas J. Llewelyn, Avoca; Frank Gonglefski, Forty Fort; William Carne, Wilkes-Barre, and Con Gallagher, Plymouth. The only officers in the district who will draw salaries are President T. D. Nicholls, Vice-President Adam Ryscavage and Secretary John T. Dempsey. Many of the locals are in arrears with their assessments, so that the district would have been in bankruptcy had the officers not taken this drastic course.

General Manager W. J. Richards, of the Philadelphia & Reading Coal and Iron Company, has authorized a statement in connection with the discussion on child-labor at the recent meeting of the Civic Federation in New York, in the course of which he states: "We have in Pennsylvania a mining law prohibiting the employment of boys under 16 years of age in the mines, and of boys under 14 years outside the mines. The operators took a prominent part in aiding the passage of that law, and have not in any way connived at its being broken. From my knowledge of the people of our mining community I am positive that they have not permitted their sons, who are under legal age, to work in the mines to any such extent as has been stated, or to any appreciable extent."

State official statistics, recently published, show that there are but two classes of labor in Pennsylvania as highly paid as the anthracite miner. Last year the anthracite miners received, on an average, $690.34 each. In 82 out of 84 industries cited and tabulated the average wages fell much lower than the above figures, and in 42 instances the employees received more than $200 less than the anthracite miner.

For the first time in its history the Delaware, Lackawanna & Western Railroad takes second place in the rank of the anthracite-producing companies, a place which for so many years was held by the Lehigh Valley Railroad, which this year falls into the third place. The production for the year was as follows in the northern basin: Delaware, Lackawanna & Western, 9,050,000 tons; Lehigh Valley, 8,500,000 tons; Delaware & Hudson, 5,401,398 tons; Erie, 5,760,000 tons; Ontario & Western, 2,500,000 tons; Temple Iron Company, 1,800,000 tons. The first place [illegible] held by the Philadelphia & Reading company.

Toronto, Ont. Jan. 4

[illegible] tenders recently received for the mining rights to the bed of Kerr lake, Cobalt, with an area of 23 acres, having all been rejected as insufficient, the Ontario government called for fresh tenders which must be received by Jan. 9. The property is offered this time subject to a royalty of 10 per cent. on the gross value of the output, bidders being asked to name the additional cash bonus they are willing to give.

Paul Rasch and Louis Haas, two German prospectors, have arrived here from Larder lake with numerous samples of gold- and silver-bearing quartz.

Active operations in boring for oil are being carried on at Manitoulin island, Lake Huron, where about 100 wells have been put down at an average cost of $500 cash. It is claimed that operators in this field have an important advantage, owing to the small expense in well sinking. Attention is also being directed to St. Joseph's island in the neighborhood of the Sault Ste. Marie, as a probable oil-producing region, the formation being similar to that of Manitoulin. The Hickey Oil Company, of Detroit, which two years ago struck two or three gushers in the Leamington oilfield, has been wound up. The wells gave out and the receipts were insufficient to cover cost of construction and machinery, a deficit of $14,000 being left.

The first gypsum plaster made in Winnipeg has been turned out by the Manitoba Gypsum Company, at its works in that city. The raw material is brought from a large deposit of gypsum on Manitoba lake. The company had works in that neighborhood but they were destroyed by fire in July last, and the industry was transferred to Winnipeg. About 70 hands are employed.

London Dec. 29

A good deal of controversy has been raging lately among people interested in the shares of the San Francisco del Oro Mines, Ltd., an English company floated three years ago to acquire the silver-lead-zinc mines of that name, near Parral, Chihuahua. Your readers may remember that at the time of flotation I referred to this company, pointing out that, as zinc had appeared at depth, the local owners were pleased to get rid of it. I mentioned also that in the prospectus the directors gave as the value of the ore "in sight" the total market value of the separate metals and not the actual commercial value of the ore. During the last three years developments have proceeded and there are already blocked out very large bodies of ore averaging 26 oz. silver, 11 per cent. lead and 25 per cent. zinc. At deeper levels the ore is stated to run higher, 58 oz. silver, 20 per cent. lead, and 28 per cent. zinc. The discovery of this lower orebody was announced in England first by one of the daily financial papers, and not by the company; in fact the directors say they knew nothing of the discovery at the time. Shortly afterward the Paris edition of the *New York Herald* published a disparaging article on the mine. The directors have waxed indignant at this article and have made fun of "Yankee" journalism, but I would point out that laudatory articles in certain English financial papers have equally to be taken with a grain of salt.

During the time that the San Francisco del Oro has been worked by the English company, a considerable income has been made by picking out salable ore and shipping it to smelters. To what extent the ore shipped consisted of unexhausted carbonates from the upper levels and what consisted of sulphides cannot be said with certainty, but the total amount shipped was 50,000 tons up to the end of 1905, and the receipts from it were £120,000. The attention of the directors has always been keenly applied to the metallurgical treatment of this ore, and it is probable that they will decide before long on a system similar to that pursued at Broken Hill.

About a year ago I referred to the change in control of the Copiapo Copper Company (working in Chile) by which the direction of affairs was handed over from Henry Bath & Son and James & Shakespeare to a board consisting of nominees of the Siemens group. For some years the company had only been jogging along, and the chief shareholders desired to try their luck by making a change. The new board has now been in charge long enough to grasp the situation and to decide on a new course of policy. Hitherto the ore has been hand-picked up to 16 per cent., and shipped either to England or to smelters on the coast. It is now intended to erect smelters on the spot, and ship the matte. In this way the dumps of low-grade ore will also become available. It has been necessary to write down the assets drastically, and bring the reserve fund into current account. The subscription of new capital for the smelters will also have to be considered before long. Many of the shareholders are rather sad because under the new régime their immediate prospects of a dividend are apparently as far off as ever. It must be remembered that the company has been in operation seventy years, and has paid large dividends in its time; but during the last 15 years the profits have been small, and nothing has been distributed since 1902. There are still very large quantities of ore.

General Mining News

got, J. B. Giraud and K. B. Smith, of

corporation to be known as the Haggott-Giraud-Smith Company, the purpose of which is to do a general mining and civil engineering business. The new company is now equipping offices and laboratories for its use.

This company has let a contract to the Phœnix Iron Works for the erection of a five-stamp mill; also some other necessary machinery to be used in connection with the mill.

reports a new strike at its mines, south of Prescott. The Ten Spot Ledge was cut at the depth of 298 ft., where it is found to be 5 ft. in width, with good values all the way across.

Gold King Mining Company—This company has developed a large body of sulphide ore, the chief value of which is copper. Its mines are in the Bradshaw mountains, 25 miles south of Prescott. It had been thought that this mine would prove to be a gold mine, but the latest developments tend to prove that it is distinctly a copper proposition.

ARKANSAS

A large number of the Arkansas mines are idle, because the miners refuse to work under the screened-coal agreement entered into between the operators and miners at the close of the strike last summer. They claim that it is a violation of the Arkansas mine-run law. The officers of the union have ordered the men to continue at work, but they refuse to do so.

CALIFORNIA

Irish—This old copper mine is about to be reopened. The property was sold for $65,000 a few weeks prior to the confirming of the grant title to the land where the mine is situated.

Gold Ridge Mining Company—This company has been organized to acquire and operate the old Defender mine in Pioneer district. The directors are F. B. Joyce, E. E. Endicott, R. Ousby, B. C. Austin and G. W. Brown.

Water Supply—All the mines on the Mother Lode in Amador county were compelled to close down for a few days for lack of water, but the storms brought a supply quickly and there will be no more trouble of that kind for many months.

Standard Unit — At this mine, near Greenwood, Samuel Beese, superintendent, work is being pushed on the lower tunnel and the mill has been started up.

Vivian — A five stamp mill has been brought to this mine at Greenwood. If the mill tests on the ore are satisfactory, more stamps will be provided.

Danube—This company is working the French Hill mine near Greenwood and is sacking the concentrates until the cyanide plant is completed.

Cranes Gulch—This old mine, near Georgetown, yielded an $8000 pocket last week, one of the pieces weighing $850. It is owned by J. W. Morgan, V. Fornia and Fred Smeeder.

Copper—In the mine owned by Captain Van Simmons, at Buchanan, a 2-ft. ledge of high-grade copper ore has been found.

Discovery — Frickstadt & Nemo have located four claims near Raymond and in one of them a 4-ft. ledge showing free gold has been found.

NEVADA COUNTY

Masonic District—New companies are being formed in Nevada county to take over claims in this district. The Masonic Investment Company has taken over the Oro Grande, Golden Mammoth, South Side and Emporium. The Caliverde Mining and Milling Company, another Nevada corporation, has purchased the Golden Reef and Golden Crown. The Myrtle, Julia and Valley View claims are also about to be incorporated as one company. The Masonic Mining Company is doing extensive work on the True Friend claim.

NEVADA COUNTY

Keller—This mine, near Graniteville, has been purchased by T. A. Garbutt, of Los Angeles, and T. Torpie, of Nevada City, who will extend the 500-ft. tunnel to 1500 ft. The mine is rich in spots, but dependence is laid on a wide ledge of low-grade ore.

Murchie Mining Company—Wm. J. Organ has obtained a two-year lease from this company on a ledge on which he first worked over 30 years ago.

Boss—This mine, near Sweetland, has been bonded by the same San Francisco men who own the Golden Eagle mine in Lassen county. Edward H. Benjamin is the manager and J. H. Collier, superintendent. The mine was formerly worked for gold, but will now be exploited mainly for copper.

Pennsylvania Mining Company—This company has ordered two of the largest size pumps to be placed on the W. Y. O. D. mine, thus showing that the bottom workings of that mine are to be operated. The pumps are of Cornish type, 18 in. in diameter and 8 ft. stroke, the capacity being 600 gal. a minute.

Le Compton—This old mine, in Deer Creek, near Nevada City, formerly owned by Senator George Hearst, is about to be reopened. The mine has pumps, hoist and mill, and the shaft, now 500 ft. deep, is to be sunk several hundred feet deeper.

Hathaway—At this mine, Ophir, A. B. Eastwood, superintendent, the foundation for the new plant has been laid and the compressor is on the ground.

Mountain Meadows Copper Company—This new company owns property in Lights cañon, Plumas county, as well as in Mountain Meadows district, Lassen county. Both are to be developed.

Plumas-Eureka—The new mill at this old mine, Johnsville, is completed. The starting up of this mine after several years of idleness has stimulated mining throughout the district.

Colorado River & Ely Copper Company—This corporation has bought from J. L. Carden, of Los Angeles, the Desert Light and Big Foot copper groups, four miles from Klinefelder. They are copper properties and among the promising ones of the desert region.

Orange Blossom—From this mine, 14 miles from Bengal station on the Santa Fe line, the first 52 tons of ore taken out yielded $3000. Fifteen men are at work. The mine is owned by Seburn Brothers.

Goldbend District—In this new district, southwest of Needles, a number of veins have been discovered, notably the Gold Dollar group, now taken over by the California Hills Mining Company. There is a road from the camp to the smelter at Needles.

SANTA BARBARA COUNTY

Santa Maria Oil and Gas Company—The new oil well No. 5 in the Santa Maria field is now spouting 2500 bbl. of oil daily, but embankments had been made and no oil was lost. It is one mile south of the famous Hartwell No. 1 well. The land belongs to the Union Oil Company, of California.

TRINITY COUNTY

Quimby Mining Company—There has been some dissension among the stockholders, but as soon as this is settled work will be prosecuted vigorously. Superintendent J. A. Brent is running the 400-ft. tunnel on the lower level.

TUOLUMNE COUNTY

Santa Ysabel—E. C. Loftus, of Groveland, now in New York, has secured capital to continue work on this mine and will sink the shaft to the 1500 level.

COLORADO

BOULDER COUNTY

Modoc—This property in the Ward district, after an idleness of 11 years, is to be reopened again, the mill is to be remodeled and heavy machinery will be installed. Property is located at Ward.

New Mill—The 500-ton Langridge mill located on South Boulder creek is nearing completion, and will treat ore from a big dike of outcroppings reported to be over

CLEAR CREEK COUNTY

company, near Idaho Springs, has been [illegible] and New York capitalists, the reported consideration being $2,000,000. The property [illegible] through the Newhouse tunnel and the plans of the new company include the erection of a concentration plant of from 500 to 1000 tons capacity at the mouth of the tunnel to treat the ores from the Gem properties as well as to do a large custom business. W. E. Renshaw, Idaho Springs, Colo., will be manager and the new officers include J. H. Galey, Pittsburg, Penn., president, W. E. Renshaw, Idaho Springs, Colo., vice-president, J. E. Watson, Pittsburg, secretary and treasurer.

Calla—This property, in the Peruvian district, has been leased and bonded to Denver people, with Otto Haussing of Idaho Springs, Colo., in charge and it is [illegible] concentrating plant.

[illegible]

Hoffer Shaft—Much interest is being manifested by local mining operators in the deepening of the old Hoffer shaft, and many of them predict that if the project discloses any big body of ore it will mean the indefinite extension of the Leadville mining district to the north. There was a time when the old-timers thought that the orebodies such as those contained on Carbonate hills were restricted to a certain area and did not extend to the north. This theory has been exploded, however, for in 1891 a drill hole was put down on the Hoffer which showed conclusively that the same geological conditions that prevailed on Carbonate and Fryer hills obtained as far north as the Hoffer at any rate. The Hoffer, or rather the Bob Ingersoll, property was staked off in the early days of the Fryer hill excitement and the claims have had a varying experience since that time. Only the required amount of assessment work was done on the Ingersoll for several years; the Hoffer shaft not being started until 1880. The starting of the shaft at that time caused considerable excitement, and many of the knowing ones pronounced the claim to be in the proper location to be worth working. The work on the Hoffer went ahead rapidly until water was encountered, after which the work of development went on more slowly. The water problem was a new one at that time to the Leadville district, and everything now known about battling with this enemy was yet to be learned. Up to the year 1882 the heaviest outlay made in the entire district for the handling of the water was made by Mr. Hoffer. At that time he had installed four Cornish lift pumps with a capacity of 350 gal. per minute. Later a No. 9 Cam- [illegible] 250 per minute. This plant was entirely inadequate to the handling of the water, however. Intermittent work has been kept up since that time, but little progress has been made in sinking the shaft. Now, however, Mr. Hoffer has interested Eastern capital and work has been started on an extensive scale. The Midas pumps have so drained the Ingersoll group that work can be carried on without putting in any big pumping plant. Recently two remarkably good bunches of ore have been encountered, but they were not followed up, as Mr. Hoffer is determined to push the shaft down to the Cambrian quartzite, believing that there he will encounter the same big bodies of ore that are found in that formation in the Coronado.

Weston Pass Section—This is a locality which was more talked of in the freighting days than it is at the present time. Mining operations have been carried on here for more than 20 years but with varying success, for the distance from Leadville, the long haul and the bad roads have made costs almost prohibitive. The best and most promising mine in this district is the Ruby, which has been operated since last October. The Ruby lies on both slopes of the range, being both in Park and Lake counties. The apex of a large vein can be traced the entire length of the claim in an easterly and westerly direction, the outcrop showing every few yards. The development work consists of a tunnel and an incline. The breast of the tunnel is all in ore, now being taken out, and of values that will pay a profit. There are several more good properties in the Weston Pass section and if the roads can be improved this will prove a good camp.

Rock Hill—A fine body of sand carbonates running high in values and accompanied by a large vein of galena has been encountered in the Sequin over on Rock hill. The Sequin lies a few hundred feet to the west of the Bessie Wilgus, on Rock hill, both properties being operated for some time by C. B. Wilgus. The Sequin has been a regular shipper for several months past, as has also the Bessie Wilgus, but the last strike makes it prominent. A contract has been let for the deepening of the Bessie Wilgus 300 ft., which will carry the shaft down to 800 ft. depth.

SUMMIT COUNTY

The total value of the mineral output for Summit county for the year 1906 is as follows: Gold, placers and dredges, $152,600; stamp mills, $50,000; smelting ore and concentrates, $100,401; nuggets and specimens, $5000; total gold, $306,001. Silver, ores and concentrates, $289,400. Lead, ores and concentrates, $140,290. Zinc, ores and concentrates, $107,197. Iron, ores used for fluxing, $20,000. Copper ore, $8023. The total value being $963,631, which is over $100,000 increase above 1905. With the outlook at present it bids fair to be doubled during 1907.

With the increase in the number of producing mines added to the list, Summit county is beginning to receive some of the attention which it has long deserved; and with its mines of gold, silver-lead, zinc, iron, copper and bismuth, its bountiful water supply, its abundance of timber and other natural advantages, combined with its accessibility, is now attracting the notice of experienced mining men, as well as of the Eastern capitalist. The consolidation of holdings and interests is an important feature of the past year, and there are now on the tapis a few new consolidations being considered.

Jessie—New incorporations for 1907 are to be looked for and this month gives a good starter with the Jessie Gold Mines Company. This company has been organized by James T. Hogan, after working the Jessie mines and mill on a bond and lease for over a year. The Jessie, Diana and Florence groups, which comprise in all about 500 acres, are consolidated in the organization, which is incorporated for $1,500,000, in 1,500,000 shares of $1 each. The property has been favorably reported on by David H. Lawrance, of Denver, and the process of cyanide treatment worked out by Mr. Knappe, of Denver. It is the intention of the new management to install a mill of 400 or 500 tons daily capacity, with a cyanide plant for treating the tailings.

TELLER COUNTY—CRIPPLE CREEK

The past year in this district has been one of considerable activity in mining. While there has been no particular boom during the year, a large amount of ore has been shipped both on company account and by lessees. It is now an absolute certainty that the drainage tunnel will be put through. Just which one will be chosen has not yet been decided, but it is thought that it will be the intermediate one known as the Gatch Park project. This is somewhat shallower than the longer or Window-in-the-Rock. The executive committee will meet in a few days to decide definitely which one will be chosen.

Ore-Treatment Rates—The announcement a few days ago of a very low rate of treatment of the low-grade ores by the United States Reduction and Refining Company is good news to ore shippers. Just how long the new rates will last is not known. The Golden Cycle mill, at Colorado City, is about ready to run, and a number of contracts have been made with the mine owners for ore. It is the advent of this mill that has given rise to very low rates by its competitor. No contracts, however, have been made on the basis of this low rate.

Acacia—This company recently held its annual meeting, and the same directors as last year were elected. The reports of the officers of the company show its affairs to be in very good shape. Considerable money has been received in royalties during the past six months from the lease of

the South Reins, which is being operated by the Standard Company.

Work—The Little Clara lease, on the Work property, which has been such a wonderful producer, still continues to put [illegible]

[illegible] One of the important recent developments has been the discovery of good ore on the property of the Western Union, on Rhyolite mountain, which lies north of the town of Cripple Creek. Heretofore no ore of any great value has been found on this hill.

INDIAN TERRITORY

CHOCTAW NATION

On Dec. 18 a serious gas explosion occurred in the Degnan-McConnell Coal and Coke Company's slope mine No. 19, at Wilburton. The tipple was badly damaged, but no one has been able as yet to tell how much damage was done in the mine. About a month ago a serious explosion occurred in the same mine, setting it on fire inside in such a way that it was impossible to get at the fire to extinguish it. Water was run in till it was thought the fire was all submerged, and then the mine was closed up. The coal pitches there about 20 deg., and it would seem that the fire was not entirely covered with water, for when it was opened, on Dec. 18, and before anyone had entered it, when sufficient air had mixed with the accumulated gas to form an explosive mixture, the fire evidently set it off.

MISSOURI

ST. FRANCOIS COUNTY

Increase in Wages—The St. Joe, Doe Run and Desloge companies have raised the wages of the underground men about 8 per cent., to take effect at once.

[illegible] The lands of this company have been optioned until April 30, 1907, to the Doe Run Lead Company for $660,000, of which $12,000 is cash, with interest at the rate of 6 per cent. on the purchase price.

Doe Run—The old No. 1 mine at Flat river, that has been drowned out for years, is to be recovered by unwatering it through a drift to be driven from No. 4 mine.

Negro Miners—The negro labor that has been employed since the slavery period in mining, smelting and tributing has been discontinued, and the negroes have been ordered to vacate the company's houses.

MONTANA

BUTTE DISTRICT

North Butte—This company has cut a 16-ft. vein of first-class ore by a crosscut from the 1600-ft. level of the Jessie, in Gem ground, making four veins from which it can secure ore, the Speculator, Edith May, Jessie and Gem. The opening is going north to tap the vein of the Berlin. The company is maintaining its output of 1200 tons of ore a day, but like other companies has difficulty in securing cars for transporting the product to the smelter.

Anaconda—The shaft on the High Ore has reached a depth of 2600 ft., the deepest in the district, and a station is cutting at the bottom. Drifting on the vein at the 2400, which was stopped some time ago, has been resumed. The 2400 and 2600 levels will be connected by raise and winze. Operations in the Anaconda mine will be resumed early in January. Work in it was stopped Nov. 23 to permit of repairs in the shaft, and while it could have been resumed at any time the company decided not to start until the car-shortage condition could be partly overcome. Crosscutting for the vein at the 2400 of the Neversweat, which was also suspended several weeks ago, has been resumed, but two months will elapse before the vein is cut.

Reins Copper—There are 10 ft. of copper ore on the 1000-ft. level, 4 ft. of which is almost solid glance, the remainder being a mixture of glance and quartz. J. P. Reins, former president of the company, says the company netted $10,000 during December, and could have earned double the amount, had it been able to ship its ore. Mining is in progress on the 800-, 900- and 1000-ft. levels, and the vein will soon be opened on the 1100.

Original—This company is sinking in the barren zone, and is depending upon the upper levels for its supply of ore. It expects to penetrate the zone in a few weeks. As a result of ore shortage from its own mines, it has entered the open market with bids for ore, and is securing enough to keep its plant in operation most of the time, barring the concentrator, which is often down for a day or two at a time.

Boston & Montana—This company will equip the Leonard mine with the electric haulage system first, but will not be ready for the engines until April. The system will be installed on the 800-, 1100- and 1400-ft. levels, in which 17 horses are now used. The company is shipping only 3000 tons of ore a day to its plant.

Butte & Bacorn—This company has cut a 35-ft. vein south of the 500-ft. station of its Calumet claim and a 17-ft. vein north of the same station. Neither vein carries commercial ore, but both are highly mineralized. In the opinion of the company, greater depth is necessary. This company is backed by 40 Pittsburg men, each of whom contributed $10,000 to the original development and equipment fund.

Bullwhacker—The lease on a portion of this property expired Dec. 31, with about 150 tons of 3½ per cent. copper ore on the dump. The estimated earnings of the lessees for December were $67,500. The company will work the mine hereafter.

NEVADA

[illegible]

[illegible] the official returns of the Tonopah mining companies, 121,375 tons of gold and silver ore were shipped to the smelters in 1906, and the returns netted $2,200,000. The producing mines were as follows: Tonopah, 67,000 tons of ore, yielding dividends amounting to $1,200,000; Extension, 27,500 tons; Belmont, 15,350 tons, yielding $800,000 in dividends; Montana, 4650 tons; Midway, 4000 tons, yielding $200,000; West End, 1000 tons; MacNamara, 750 tons; North Star, 650 tons; Jim Butler, 200 tons; smaller mines, 275 tons. All the above mines have large ore reserves, and as the newly erected mill of the Tonopah Mining Company is now working and other reduction works are in process of construction, there will be better facilities in the near future for treating the ore. This will lead to a largely increased production.

Unsatisfactory transportation facilities and inadequate reduction mills are the chief causes in limiting the rapid expansion of this great camp. It is possible that, with its new mills operating to their full capacities of 650 tons per day, the Tonopah Mining Company will be able to declare larger dividends. The Belmont, Midway and North Star should be great yielders in the near future. They all have large bodies of high-grade ore blocked out awaiting crushing facilities.

[illegible]

Manhattan Consolidated Extension—A drift run out from the 44-ft. level a distance of 175 ft. has cut a ledge of high-grade ore. About 10,000 tons of ore are blocked out, which are estimated to run from $20 to $50 per ton. The showings in other parts of the mine are also promising and the directors of the company, after a recent inspection of the mine, determined to arrange for the erection of a mill immediately.

Broncho—The ledge in the 100-ft. level is 8 ft. in width and averages $75 per ton. The vein matter is a calcareous quartz carrying sulphides. A crosscut is being run with all speed from the 200-ft. level to cut the ledge at depth.

Copper Belt-Bonanza—The shaft of this East Manhattan copper mine is down 130 ft. A good orebody is being developed, which averages 8 per cent. copper. Several of the adjoining mines are developing the ledge.

Manhattan Mammoth—The tunnel has been driven a distance of 475 ft. and it is estimated that it will require to be continued 40 ft. farther before intersecting the vein. Surface prospecting is being continued with satisfactory results, several quartz bodies streaked with copper and gold having been found.

Pine Hill—Work has been resumed on this property and the shaft will be sunk

and the owners believe that they are ap-

highly mineralized.

700 ft. level is showing up better than ever before. It is 18 ft. in width and assays over $20 per ton.

Globe—The vein in the main tunnel is improving in size and value. It is between 3 and 5 ft. in width and assays from

Jasmine Gold and Copper—This mine has recently changed ownership and the new company, in which J. Ross Clark is a prominent director, is putting on a number of men with the view of rushing development work. The prospects of the mine are good.

North Star—A 5-ft. ledge has been cut in the main working tunnel in Ladd mountain. It is composed of a bluish, manganese-stained quartz resembling that occurring in the Hobo.

Gibraltar—Development work is progressing rapidly. Large ore reserves have been blocked out and some of the richer ore is being sacked for shipment to the smelters. J. H. Shockley, of New York, the company's consulting engineer, is engaged in designing a milling plant of a capacity of 200 tons daily, which will be erected as soon as possible.

The shaft has been sunk to a depth of 240 ft. and is in excellent ore. The gallows frame has arrived and the new gasolene hoist is on the way from Tonopah. As soon as they are placed in position development work will be carried on vigorously in all parts of the mine.

Golden Sceptre—A new prospecting shaft has been started on the Hobo vein and work is proceeding steadily in the main shaft and tunnel. The prospects are improving and a larger force of men will soon be put on.

Shoshone—The litigation which has delayed work on this great property has been ended in a manner satisfactory to Chas. M. Schwab, the principal owner, and mining will now be resumed on a larger scale.

NEW MEXICO

San Pedro District—The stimulation of the high price for copper has at last reached San Pedro. The Santa Fe Copper Company is reopening its mine and is hiring all the men that apply, in order to get affairs in shape to start up its smelter as soon as possible. This company is controlled by Amalgamated interests and, like many other mines in the district contains large quantities of 6 per cent. copper oxides and sulphides. Some years ago the camp exhausted its high-grade 10 to 20 per cent. copper ores, and it is only the 20c. price for copper that has rendered feasible the smelting of the 6 per cent. ores with their silicious gangue. The orebodies resemble those of Kelly in being flat lenses in stratified limestone, but their value is in copper instead of zinc.

PENNSYLVANIA

Philadelphia & Reading Coal and Iron—This company's report for November and the five months of its fiscal year from July 1 to Nov. 30 is as follows:

	November.	Five Months.
Earnings	$ [illegible]	$14,024,010
Expenses	[illegible]	13,475,314
Net earnings	$ [illegible]	$ 548,705

For the five months there were decrease of $[illegible] in earnings, of $272,440 in expenses, and of $381,802 in net earnings.

Enterprise Colliery—The fire in the Enterprise mine, Shamokin, which was partly extinguished after an unusually long and stubborn fight, cost the proprietors $275,000. The fire is still burning in one part of the old workings, but this will not interfere with the operation of the colliery. This fire will go down in history as the most expensive fire in the anthracite region, and the above amount represents the actual cost of extinguishing the fire alone, without regard to the loss sustained by the mine being idle.

Oxford Colliery—The men and boys employed in the Oxford colliery, of the People's Coal Company, in Scranton, received New Year's gifts amounting to about $20,000 from the company, this making the fifth annual distribution of the gifts, ranging about the same amount annually. One or two of the miners earned, including the gifts, in the neighborhood of $2000 during the year. The gifts were based on the earnings and length of service.

Pennsylvania Colliery—Although about 1000 gal. of water a minute are being poured into the burning portion of No. 9 mine of the Pennsylvania colliery, in Pittston, the fire seems to be unabated. Two bore-holes have been sunk into the workings and powerful streams run through these day and night. The gangways leading to the burning section have been closed up airtight with thick brick walls and the entire mine is to be flooded. This work will take several weeks.

SOUTH DAKOTA

CUSTER COUNTY

Clara Belle—This company, at Oreville, has discontinued work, excepting that which is necessary to keep the water out of the mine and keep the pipes, etc., from freezing, until further survey can be made. This is now being completed and the work will be resumed soon, probably early in January. The shaft has a depth of 265 ft. and the drifting about 240 ft. in all.

Lillian Belle—This company has sold its seven mining claims to R. G. Gillespie, of Pittsburg, for $7500, with a cash payment of $500 down and the balance in three months. The main vein is about 25 ft. wide and composed of quartz, mineralized slate and iron oxide. Work will be pushed on this and the Granite Reef adjoining it, with a view to consolidating and erecting a reduction plant.

LAWRENCE COUNTY

Echo—A special stockholders' meeting was held in Deadwood and it was voted to increase the capital stock from $300,000 to $800,000. The company has been working about three years and in preliminary exploration has cut several veins, all near the apex. Plans are now made for deep mining and sufficient equipment in the way of hoist, engines, air compressor and drills.

Minnesota—The foundations and grading for the new mill building are completed. The work of frame construction is now going on. The mill will be 154x127 ft. and will be a wet cyanide plant of 200 tons.

Homestake—Richard Blackstone, chief engineer; B. C. Yates, assistant engineer; J. A. Spargo, master mechanic, and W. S. O'Brien, foreman, have left for a trip through different mining sections to look into the matter of putting in skips in the mine in place of cages. This change is under consideration and if the committee reports that this will be more practical and economical, it will be done at once.

Hidden Fortune—The sale set for Dec. 15 was again postponed for 45 days. All parties agreed to this when they learned of H. J. Mayham's plan to save the property. He is sending out men to visit all Columbus and Hidden Fortune stockholders for the purpose of disposing of the bonds of the new company. He thus hopes to take up the judgment of the Colorado Iron Works Company, the company's principal creditor.

Dakota—The management is considering whether to move the mill from Deadwood to Bald Mountain, or to increase its capacity. Under present conditions it is not paying well. The average value of the ore is $6, but in breaking with drill the barren or low-grade ore is mixed in, reducing the values to about $4. Freight rates to Deadwood are about 50c. a ton, in addition to moisture charged for. The capacity of the mill is only 100 tons.

Castle Creek—A Colorado company has bought 400 acres of ground on Castle creek and will build a hydraulic plant of a capacity of 2000 cu.yd. of gravel per day. A ditch and flume three miles long, with a pipe line 42 in. diameter, will be built

The ground lies along Castle creek for a

BREWSTER COUNTY

capacity in the near future. At present

of three miles to a leased furnace.

UTAH

BEAVER COUNTY

ment will soon place an order for a large gasolene hoist. Developments of late have been of such an encouraging nature that it is the intention to sink the shaft deeper.

a new organization, of which Newton Dunyon is president. It owns property in Beaver county, near the Talisman mine. Plans are being laid for a vigorous campaign of development.

Blue Bird Copper Company — Eastern parties have become extensively interested in this property and development will be resumed under the management of G. D. Turner, of Salt Lake.

SALT LAKE COUNTY

Copper Glance—This company has recently been reorganized, with B. F. Grant, president; F. R. Snow, secretary—who, with J. E. Edmunds, W. P. Davis, L. H. Gray, L. A. Marks and R. E. Miller, constitute the board of directors. The capital stock of the company is to be increased to 1,000,000 shares. The company's property in Bingham.

Bingham Standard — Officials of this company report an important ore discovery at a point 500 ft. in the tunnel, assays showing 50 per cent. lead, 5 per cent. copper and $1.60 in gold.

TOOELE COUNTY

St. George Copper Company—Explorations are being made on the contact on the 500-ft. level.

New Stockton—This company, operating in the Stockton district, has recently placed a large block of treasury stock, from which it will derive a fund of $150,000 with which to carry on further development. During the past year some large bodies of low-grade ore were opened. It is anticipated that, with the shaft down another hundred feet, there will be a change for the better, as the present lowest workings of the mine are just on the edge of the sulphide ore zone.

WISCONSIN

Hibernia — One of the most important announcements of concentrating-plant construction that has been made in the [illegible] made a week ago when the Hibernia interest awarded a contract to the Galena Iron Works for the construction of a 75-ton mill. It will be remembered that the JOURNAL reported about a year ago that this property was supposed to be ready for a mill; at about that time one of the larger mines was found to be less rich in mine-run than at first reported. This announcement caused the Hibernia directors to recall a tentative contract. Since that time a more thorough exploitation of the ore deposits has been pursued, with gratifying results, and after carefully going over the whole matter they have concluded to erect a two-jig mill of Gooley type, seven cells each. The power will consist of a 16x36-in. Bates-Corliss engine, operating non-condensing, steam to be furnished by two 60x16 boilers. A 12x12-in. belted compressor will be driven by the mill engine from a countershaft. The Hibernia mine is in the outskirts of the city of Platteville and is managed by representative business men. J. W. Murphy is president. The erection of a roaster and magnetic separating plant is contemplated in the near future, probably as soon as the percentages of the mill concentrates can be obtained.

PHILIPPINE ISLANDS

MASBATE

Mount Cogon Mining Company—The latest report is that on the company's Big Medicine claim, near Arroroy, the main vein has been crosscut at a depth of 100 ft. A general sample, taken across 10 ft. of the vein, ran high in gold.

Foreign Mining News

CANADA

NOVA SCOTIA

The total output of the Nova Scotia coal mines for 1906 was 5,213,000 tons, an increase of 53,000 tons over the production of 1905.

NIPISSING DISTRICT

Cobalt Lake Mining Company, Ltd.—This company has been organized with $5,000,000 capital to take over and develop the bed of Cobalt lake, recently bought by a syndicate from the Ontario government. Sir Henry M. Pellatt, of Toronto, is president, the other directors being Britton Osler, Toronto, Thos. Birkett, G. F. Henderson, D. B. Rochester, H. S. Southam and Hon. Frank Latchford, Ottawa, John H. Avery, Detroit, and George E. Drummond, Montreal. The amount required for the purchase money was largely over-subscribed and considerable ill-feeling resulted. An action is being already brought against the company by subscribers who claim to have been wrongfully left out of the deal. The operations of the company, it is stated, will be pursued by sinking a shaft on the shore and drifting under the lake bed, the water being only 40 ft. deep. As the gravel at the bottom of the lake is rich, it is also proposed to dredge

event of the week occurred on the Kerr Lake (Jacobs) mine when, at the 65-ft. level, a cross-cut driven to the west, 12 ft. from No. 3 vein (supposed to be the main vein), encountered 12 in. or better of ore which is said to assay 25 per cent. silver.

Nipissing—A significant feature with reference to the Nipissing property is the the fact that there is at the property several hundred tons of unshipped ore.

The statement by the company that the net profits from production for the past six months amounted to $600,000 and the statement also by the company that the production for October alone amounted to $600,000 do not coincide.

J. S. Kuhn and W. S. Kuhn, of Pittsburg, Penn., have purchased 4000 acres of mineral lands in the neighborhood of Parry sound. Thomas A. Wood, engineer, of Parry Sound, acting on their behalf, has for some time been securing options on copper properties in this region, which were inspected by American mining engineers. On Dec. 29 these options, which include the McGowan, Wilcox and Spider Lake properties, were taken up, the sum invested amounting to $700,000. The most important of these mines is the McGowan, situated about 1½ miles from the town of Parry Sound. The property covers 140 acres. Development work was begun some three years ago, and there are three shafts, one of which is down 140 ft. The Wilcox is a low-grade proposition, 160 acres in extent, six miles south of Parry Sound. There are three shafts on the property, of 130, 20 and 30 ft. The Spider Lake mine lies to the west and carries what is practically a continuation of the Wilcox vein. The Kuhn purchases also include deposits on Moon river, some 12 miles south of Parry Sound. The latter place last fall secured direct railway communication with Toronto, 149 miles distant, by the opening of the Canadian Northern Ontario Railway. The principal properties are near deep water, assuring excellent shipping facilities. The plans for development will probably include the erection of a smelter in the district.

QUEBEC

The graphite deposits in the Laurentian district of northwestern Quebec are to be developed on a large scale by American capital. A. L. Dubois, vice-president of the Dry Concentrator Company, of New York, states that his company, which has secured 20 properties situated between Buckingham and Lavelle, will commence active mining operations shortly. There is already $500,000 worth of machinery on the spot.

MEXICO.

JALISCO.

[illegible] learned [illegible] of the Estado Mining Syndicate, the English [illegible] on the small smelting plant in Guadalajara, owned by José S. Diaz and associates of that city has made none of the payments, [illegible] at the end of last month, it looks very doubtful whether the deal will be consummated, though the English people have paid out several thousands of dollars for various extensions on the option. It is strange too, that this option should be allowed to pass, for the smelting company has a nice little plant, conveniently located, and ready, on the completion only of stack and flue chambers, to blow in. Moreover, the English company has just purchased a large tract of mineral land in El Favor camp, near Tecalitlan, and is installing new machinery on the same, and is said to have some £200,000 for the furtherance of its plans, so that should it chose to go into custom smelting, as well as to smelt its own ores, it would be hard to find a better place than Guadalajara, whose growing importance as a railroad center makes it most desirable. As soon as men can be spared from the Mexican Central Railroad's Colima branch to the Pacific coast, they will be rushed onto the line to Autlan, about 50 miles distant from Colima, the center of a copper district, and to which point the locating engineers are running out from Colima; that finished the Guadalajara—San Marcos branch of the Mexican Central will be extended to San Blas and the Pacific. By that time the fast approaching lines of the Southern Pacific from Guaymas, Sonora, will have reached Guadalajara; all making that city the center of some of the richest mining and agricultural lands in the Republic.

Atrevido Mining and Milling Company—This company, made up principally of capitalists from, and with offices in, San José, California, has properties in the State of Jalisco, about 25 miles west of Ameca. It is now, after about four years' development work, under the management of Glanville Hart, making a splendid showing with its little 11-stamp mill and cyanide plant. Some 40 tons a day are treated, and from $10,000 to $12,000, United States currency, worth of gold bullion is being produced monthly. The ore itself averages about $10 in gold per ton. About 20 per cent. of the values is caught on the plate in front of the battery, whence it goes to the sand tanks—five of 41½x20 ft. diameter—and the slime [illegible] by which a total extraction of 90 per cent. is obtained, with 36 hours' percolation in the sand tanks and 48 hours, with slight agitation, in the slime tanks. The resulting bullion runs from 800 to 900 fine gold, and the cost of mining and milling is said to be only $3, Mexican, per ton. Whether this includes administration or not was not learned, but this could not exceed at the most $1, Mexican, per ton, making a total say of $2 gold, or a profit of $8 gold per ton. The mine at present is less than 250 ft. deep.

OAXACA

Oaxaca District—Encouraged by excellent showing of his recently acquired San Juan mines, Chas. A. Hamilton, of Oaxaca, is getting control as far as he possibly can of the lead mines in the Oaxaca district, so they may be got in shape to put the Oaxaca Smelting and Refining Company, on whose smelting plant work is rapidly progressing and in which he is largely interested, on an independent footing as soon as it is ready to blow in. Mr. Hamilton is also preparing to start work on his San Geronimo & Taviche Railroad, which is to cross the Oaxaca & Ejutla at kilometer 40 of the latter, and to connect with the Zimatlan Railroad at San Pablo. This will aid greatly in the transportation facilities and development of the Taviche and Oaxaca districts. The San Martin, operated by F. Augustus Heinze, in Ejutla, is showing up some fine copper ore, and the Marscilles Mining Company, five miles southeast of Ejutla, has opened up about 15 ft. of copper ore on the 100-ft. level. The San Juan, in which Texas capital is interested, near the rich Conejo Blanco, of Hampson & Smith, has cut into a 6-ft. vein of rich sulphide ores, high in silver and lead. La Ventura Mining and Milling Company has been organized in West Virginia, with a capital of $400,000 Mexican, and G. I. Bentley, formerly of Cripple Creek, as president and general manager, to develop some 21 pertinencias (50 acres) in the Ocotlan district of Oaxaca, and adjoining El Guebesha, which is being operated by Kansas City people.

Coal Trade Review

NEW YORK, Jan 9

In the West the car situation seems to be rather less acute, though there is still a great deal of complaint, both at mines and at delivery points. There seems to be more trouble at smaller towns than at the large consuming centers. Doubtless the railroads make stronger efforts to supply the large cities. The car shortage has served generally to keep up prices, preventing any flooding of the markets.

In the East trade has been quiet, especially in anthracite, the domestic use of which is small for the season, owing to the continued mild weather. The demand for steam coal is strong, and trade has been good in that class of coal all through the Eastern territory.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Dec. 29 were as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	4,615,888	4,541,749	D. 74,139
Bituminous	30,386,521	32,204,912	I. 1,818,391
Coke	11,327,153	12,679,357	I. 1,352,204
Total	46,329,562	49,426,018	I. 3,096,456

There was a decrease of 1.6 per cent. in anthracite; increases of 6 per cent. in bituminous and 11.9 per cent. in coke; making an increase of 6.7 per cent. in the total tonnage.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the week ending Dec. 31 were 24,906 tons; for the full year 1906 they were 833,818 tons.

Lake shipments of anthracite coal from Buffalo for the season were 2,785,362 tons in 1905, and 2,681,808 tons in 1906; a decrease of 103,554 tons. The larger shipments in 1906 were to Chicago, 939,407 tons; Duluth and Superior, 768,304; Milwaukee, 511,421; Fort William, Ont., 105,716 tons.

Shipments of Nova Scotia coal, by companies, for the 11 months ending Nov. 30 were as follows:

Companies.	1905.	1906.	Changes.
Dominion	2,726,897	2,997,780	I. 271,883
N. S. Steel	487,576	612,029	I. 124,453
Acadia	238,748	247,466	I. 8,718
Intercolonial	183,851	257,190	I. 73,339
Inverness	125,912	186,664	I. 60,752
Cumberland	377,108	358,832	D. 18,276
Total	4,139,092	4,659,961	I. 520,869

The total increase this year was 12.6 per cent

New York Dec. 26

ANTHRACITE

The situation in the anthracite market remains practically the same as when last reported. There has been a great shortage of cars, and all producers have been complaining on this score. However, during the past week some operators report that this shortage has been relieved to a slight extent, whereas others still state that their needs are by no means supplied. The production at the mines is necessarily curtailed to a great extent, and the smaller sizes of coal are almost entirely out of the market. Pea, buckwheat and barley are very scarce. The call for domestic sizes continues strong, but the present warm spell has taken the edge from immediate demands. This has materially aided the railroads in moving coal to the New York market, and has enabled the operators to fill partially some of their back contracts. Prices remain at $4.75 for broken, $5 for egg, stove and chestnut. Steam sizes are $3 for pea, $2.25 to $2.50 for buckwheat; $1.50 for rice; $1.40 for barley; all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic-seaboard soft-coal trade remains generally strong, and prices continue the same with the exception of a small advance in some cases. The question of car supply still continues upper

...ment with producers, and the supply of coal is limited by that factor. There seems to be a little better supply of cars on Baltimore & Ohio lines since the first of the year. This was possibly brought about by the action of some operators in taking up the question and investigating it thoroughly.

Trade in the far East is sending forward, into the hands of shippers, orders for large amounts and the demand for coal is becoming urgent from that territory. Trade along the Sound is very active and delays in unloading boats at the New Haven Railroad unloading ports are increasing, which is not helping the situation in this district. New York harbor trade is absorbing a great deal of coal. Things have been easier during the week on account of some railroad rulings, which brought considerable coal to New York harbor points. Good grades of steam coal are selling at from $2.80@3, with lower grades selling around $2.70 f.o.b. New York harbor shipping points.

All-rail trade is hauling considerable coal. In some quarters a small shortage is reported. Transportation from mines to tide is inclined to be sluggish and irregular. Car supply is an indefinite quantity, running from 10 to 50 per cent., according to territory and individual producer.

In the coastwise-vessel market vessels are in good demand and supply seems to keep fairly well up. We quote freight rates from Philadelphia to Boston, Salem and Portland, $1 and discharge; to the Sound, 85c.; all include the loading and discharging clause.

Birmingham Jan. 7

State Mine Inspector J. M. Gray has begun to receive figures as to the coal output in Alabama during the past year. The railroad car shortage has done more harm than has been anticipated. The weather in this section has not been unfavorable lately, but the congestion and the car shortage has interfered greatly with the traffic.

The demand for coke is strong and good prices obtain. There is need for all that is being manufactured and more, too.

According to official figures, 96 men lost their lives in the mines of Alabama during the year 1906.

The new interests acquiring the properties of the Woodstock Iron Company, including two furnaces, ore and coal lands, the latter being located in Jefferson county, are making preparations for active operation of the properties.

Chicago Jan. 7

Mild weather throughout the greater part of Chicago territory has made the demand for both bituminous and anthracite coal small in the last week. The Northwest, however, is calling for coal and cars for prompt shipments are being found by the railroads. In consequence the [illegible] other firms are much larger than last week. The Illinois mines will be busy with the Western and Northwestern trade for two or three weeks to come, according to today's reports.

There is little coal on track, in consequence of the out-of-town demand, and local prices of both Eastern and Western coals continue about the same as for the last two or three weeks. Prepared sizes from Illinois and Indiana mines bring in carload lots, Chicago, $2@3.25; run-of-mine, $1.75@2.25, and screenings, $1.25@1.75. These prices, of course, are averages, the range in Western coals being wide.

Of Eastern coals, smokeless is perhaps firmest, though no coal can be called very firm under present conditions. The demand for smokeless seems to continue fair, and it is asserted by selling agents that the coal holds up firmly to the market quotations of $4.30 for prepared sizes, and $3.40 for run-of-mine. It is probable that these prices, which are quoted for Pocahontas and New River, are not adhered to in many sales; discounts from them, particularly on run-of-mine, are said to range [illegible]25c.

Hocking is easier and the current quotation, $3.65, is said to be shaded as much as 25c. on important sales. The price of Hocking in the local market has for several months been considered unreasonably high by many local consumers. Youghiogheny is in better supply at $3.40 and Pittsburg is notably lower, with No. 8 at about $2.75. Anthracite is in very small demand, because of the mild weather.

Cleveland Jan. 8

The mild weather of the past week, with its attendant lack of difficulty in railroad operation and light consumption of coal, has introduced further weakening factors in the coal market. The decline in prices has not been sharp, but the downward trend is continued. The movement to this market is liberal and there is little or no difficulty in getting about all the coal a consumer needs. The mild weather is not inclined to induce the storage of coal against needs and in consequence the trade has been rather slow. It is reported that mine-run steam coal from Ohio mines is selling about on the basis of $1.15@1.20 at mines, while Pennsylvania mine-run is on the basis of $1.10 at mines. Pennsylvania slack is selling still at 85c. at mines, while Ohio slack is close to $1.

During the week a break in the natural-gas main leading into Cleveland left the city without that sort of fuel. The result was a sudden demand for domestic coal. The weather was not very cold, but the demand was active. This complicated a situation already strained. The price of domestic coal did not move up, however, and Massillon selected lump is still selling on the basis of $2.35 at the mines.

The demand for coke is increasing. The market price is strong, both for spot shipment and on contract, at $4.25 at oven for the best grades of 72-hour foundry coke. The best grades of furnace coke are selling at $3.50@3.60 at oven.

Hartshorne, Ind. Ter. [illegible]

The severe car shortage still continues in the Southwest, and the mines in many sections are working only half time or less. The railroads are demanding a large amount of what fuel is produced, so that many towns and industries are suffering a severe coal famine, and it is hard to predict how some people would pull through an extreme cold snap should one occur.

Pittsburg Jan. 8

Coal—The year opened with prices much stronger and contracts are made for the year at advances ranging from 10 to 20 per cent. When contracts were made a year ago it was believed the mining rate would be unchanged, or possibly lower. Instead there was an advance of about 6 per cent. As the present mining scale will not expire until April 1, 1908, operators expect to make some money out of the business this year. Quotations are on a basis of $1.45 to $1.55 for mine-run coal. There was a good boating stage in the rivers all last week, but there were no shipments, as all the coal loaded had gone out on the previous rise. The Pittsburg district convention of the United Mine Workers opened this morning and will remain in session all week. The national convention will be held in Indianapolis, beginning Jan. 15. These meetings are not expected to be particularly interesting, as there will be no mining scale to adjust this year.

Connellsville Coke—Furnace coke is well sold up for delivery in the first half, but production, which fell off during the holiday season, is increasing. Furnace coke for January delivery is quoted at $3.40@3.50, and for shipments extending through the year at $3@3.15. Foundry coke is quoted at $4.10@4.25 for prompt and $3.85@4 for all year.

Foreign Coal Trade

[illegible] Jan. 5

Exports of coal and coke from the United States for the 11 months ended Nov. 30 are reported by the Bureau of Statistics as below, in tons:

	1905	1906	Changes
Anthracite	2,482,480	2,445,600	D. 36,880
Bituminous	6,628,749	7,068,005	I. 439,256
Total coal	9,061,229	9,513,671	I. 452,442
Coke	2,049,940	2,[illegible]	I. 1,[illegible]40
Total	11,111,170	[illegible]	I. [illegible]

The coke went chiefly to Mexico and Canada. The distribution of the coal exports [illegible]

Italy, those to other countries, to South America. The exports to Canada—76.2 per cent. of the total in 1906—were, in detail, as follows:

There was a small decrease in anthracite but a considerable gain in bitumin-

Imports of coal and coke into the United States for the 11 months ending Nov. 30 are reported as follows, in tons:

	1905.	1906.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
Total coal	1,450,231	1,586,050	I. 135,819
[illegible]	[illegible]	[illegible]	[illegible]

Of the coal imported in 1906 there were 29,382 tons classed as anthracite. Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal are on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

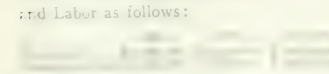
Iron Trade Review

NEW YORK, Jan. 9

The holidays interposed a check on business, and it has been quieter during the week than for some time past. This applies to new business, but not to the activity at mills and furnaces. Deliveries on contracts are being urged, and consumers seem to have use for all material which is coming to them. The holiday stops were, in most cases, made as short as possible. The loudest call just now is for structural material for buildings, and for plates, beams, etc., for Lake shipbuilding.

Car shortage and railroad delays are causing some trouble in the iron trade. Deliveries of raw material are kept back, and mill yards are congested, while consumers complain of slow deliveries. Since the opening of the year there has been a little improvement in this respect, but not much.

Iron and Steel Exports—Exports of iron and steel, and of machinery, from the United States for the 11 months ending Nov. 30 are valued by the Bureau of Statistics of the Department of Commerce and Labor as follows:



The increase was 13.5 per cent. for No-

months. The leading items of export for the 11 months were as follows, in long tons:

[illegible]	[illegible]	[illegible]	[illegible]
Rails	[illegible]	[illegible]	I. [illegible]
Structural steel	73,469	101,275	I. 27,806
[illegible]	[illegible]	[illegible]	[illegible]

The larger exports of rails in 1906 were to South America, 106,040 tons; Canada, 65,672; West Indies, 31,350; Mexico, 22,977; Japan, 22,393 tons.

Iron and Steel Imports—Imports of iron and steel, including machinery, into the United States for the 11 months ending Nov. 30 are valued by the Bureau of Statistics as below:

	1905.	1906.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
Eleven months...	23,912,947	30,840,473	I. 6,927,526

The increase for November was 46.1 per cent., for the 11 months 29 per cent. The more important items of the exports for the 11 months were, in long tons:

	1905.	1906.	Changes.
Pig iron	[illegible]	305,416	I. 119,529
Scrap	15,740	18,379	I. 2,639
Ingots, blooms, etc.	12,742	19,140	I. 6,397
Bars	34,148	31,468	D. 2,680
Wire rods	16,654	16,289	D. 215
Tin plates	[illegible]	48,929	I. 14,474

The noticeable points are the increase in pig iron and the decrease in tin-plates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the 11 months ending Nov. 30 are reported as below, in long tons:

	1905.	1906.	Changes.
Imports	771,001	992,283	I. 221,282
Exports	[illegible]	[illegible]	I. [illegible]

Most of the exports were to Canada. Cuba furnished the greater part of the imports, but some ore came from Canada and a little from Spain.

Imports of manganese ore for the 11 months were 238,828 tons in 1905, and 191,578 tons in 1906; a decrease of 47,250 tons.

Baltimore Jan. 8

Imports of spiegeleisen for the week were 730 tons; of ferro-manganese, 749 tons; of ferro-silicon, 187 cases. Arrivals of iron ore for the week were three cargoes, 12,700 tons, from Cuba; two cargoes, 10,597 tons, from Beni-saf, Algeria; a total of 23,297 tons.

Birmingham Jan. 7

Were it not for the wretched conditions with the railroads, the iron market in the South would start off in the new year as well as could be expected by anyone. There is a good demand for iron, delivery at any time during the first three-quarters of the year, while some inquiries are already in hand for fourth-quarter iron. Iron wanted during the first three months is considered the same as spot, and brings a premium. Such iron is almost out of the question. Stiff prices obtain for second-quarter iron. The railroad situation shows little, if any, improvement for the new year. The production is a little better than it was but not to a great amount. The Tennessee Coal, Iron and Railroad Company blew in one furnace at Bessemer during the past week, but put one out of commission a few days later.

Joseph Hoadley, the newly elected president of the Alabama Consolidated Coal and Iron Company, who is in the Birmingham district looking over the properties of the company, intimates that several million dollars will be expended in betterments. A rumor is afloat in Alabama that there is likely to be an absorption of the properties of the Alabama Consolidated.

All labor in the Birmingham district which laid off for the holidays has returned to work and all operations are on as they were two weeks before the holiday season.

Quotations for iron are given as follows: First quarter, No. 2 foundry, $23@24; second quarter, $20@21 per ton; third quarter, $18.50@19.50; fourth quarter, $17.50@19 per ton.

Chicago Jan. 7

The local demand for pig iron continues apparently unabated, with the prospect that there will be large sales to cover second-half requirements as soon as the business of the new year is fairly in swing. There is no weakening anywhere though immediate sales are not large. It is characteristic of the Chicago market that it does not settle down to active buying after the new year's crossing mark, until two or three weeks have given the index to business. Now there is an apprehension in the local business world, that the period of over-production is near at hand, and it would not be surprising if the iron market, one of the most sensitive of trade barometers, should feel this and become conservative.

Prices continue firm, available lots of Northern bringing $26@27 for delivery in the first half, and Southern being quoted at $22.50@23.50, Birmingham, for first quarter deliveries, $19@20 for second-quarter, and $18@19 for third-quarter. The local market for iron and steel products is strong, but there are indications of conservatism; building material especially is in a quiescent stage.

Coke continues high in price, but somewhat easier in supply, $6.40 being quoted for the best Connellsville. The supply is still inadequate.

Cleveland Jan. 8

Iron Ore—Only a few small sales have been reported during the week for 1907 delivery. In the higher-grade ores the prices have shown a slight premium over those prevailing on the regular yearly quotations. The principal matter of interest in this connection is the sale off stock-piles which has been started. The purpose

was shipped down the lakes during the past year. The movement from lake stock-piles to the furnaces has started earlier than usual and promises to wipe out the stocks on hand, before the opening of navigation.

Finished Iron—The market is showing the same dullness as is seen, generally, at the end of the year and the beginning of the next. The question is being asked whether the present quietness in the trade is a premonition of what is to come. Those who have followed the market for years are of the opinion it is only the regular year-end lull. The supply of basic for immediate delivery is more plentiful, but prices have not been forced down below $25. During the past week more receipts of foreign foundry have been obtained. These analyze about equal to southern irons and are used in mixtures. The price for spot shipment of Northern No. 2 holds at $25.50 at furnace, while second-half material is still being sold freely on the basis of $21.50 at furnace.

Finished Material—The market is about on an even keel, with a slight but temporary lessening of the demand for structural and plates, although there are heavy specifications on contracts, amounting to anticipation of needs.

New York Jan. 9

Pig Iron—There is rather a lull in new buying, and it looks like a quieter time for a week or two. At the same time holders of contracts are urging delivery on them.

There is no material change in prices, the outside figures given below being for first quarter delivery.

Current quotations for pig iron are for New York or parallel delivery:

Northern:	
No. 1 X foundry	$ 26 @ $27
No. 2 X foundry	24 50 @ 26
No. 2 plain	24 @ 25 50
Forge pig	20 50 @ 22
Southern:	
No. 1 foundry	26 50 @ 27
No. 2 foundry	25 @ 26 50
No. 3 foundry	23 @ 25 50
No. 4 foundry	21 @ 23 50
No. 1 soft	24 @ 27
No. 2 soft	24 @ 26 50
Gray forge	20 @ 21 50
Basic pig:	
Northern	22 @ 24 50
Virginia	22 @ 24 25
Alabama	22 @ 23 50
Bessemer:	
Standard, f.o.b. Valley	[illegible]
Middlesboro, No. 1 X f.o.b.	[illegible]
Middlesboro, No. 1 X f.o.b.	[illegible]

City or local deliveries are not included in prices, which are for large lots, on docks or cars. Foreign irons are quoted ex-ship, duty paid.

Cast Iron Pipe—For spring delivery $35@35.50 per ton is quoted for 6-in. pipes, carload lots, at tidewater. Orders are coming in freely.

Bars—Bars are strong at 1.845c. tidewater, for common iron, while refined is 1.895c. Steel bars are quoted at 1.745@1.845c., according to size and conditions of orders. Store trade is good at 2.59c. delivered.

Plates—For tidewater delivery, carload lots, prices are: Tank, 1.845@2.045c.; 2.445c., according to width. Eastern mills today decided on an advance of $2 per ton.

Structural Material—Prices are nominally unchanged, but premiums continue to be paid to secure deliveries.

Rail—Business here is mainly in trolley rails; light rails are in demand also.

Old Material—Foundry scrap is still wanted, No. 1 machinery selling at $18.50@19.50. Heavy steel melting scrap brings $16.25@17, and is in demand.

Philadelphia

Pig Iron—Only a small amount of business has been contracted for this week in crude iron, and even the inquiries which have been hanging around the horizon of the market, in some cases as long as a month, have not resulted in orders, because the pig-iron people are both unwilling and unable to accommodate their customers as to terms of delivery. Another reason is that the current quotations are above what some of our larger consumers believe can be maintained. These are the general conditions. A great deal of business could be done in basic iron if the makers were ready. Quotations are $26.50 for No. 1 X; $24 for No. 2 X; $23.50 for No. 2 plain; $22.50 for best gray forge and basic is nominally $24. Scotch and English irons remain about where they were.

Steel Billets—There has been no business of importance to note, though the mills have offers before them for large quantities.

Bars—The mills are reported in our city offices as booking more than usual business for this time of January. Consumers are anxious to obtain all the iron coming to them, strictly according to contract.

Sheets—The demand for all kinds of sheets in a retail way is perceptibly better than for two or three weeks, but in large lots. There have been no contracts placed worth mentioning.

Pipes and Tubes—Some additional orders have gone to the mills for tubes at the recent advance.

Plates—Our plate mills are gorged with business and the manufacturers speak of the pressure upon them both by large and small buyers. Steel plate is extremely active, and a number of the smaller buyers who use boiler plate are now arranging for supplies.

Structural Material—Nothing of importance has occurred in this market. There is a great deal of unplaced business in the background, but no efforts are being made at present to push the negotiations farther along.

very hard to define. The advance made by two or three concerns to $30, it is not thought will be followed by the United States Steel Corporation. The agents of the various rail-makers are soliciting a good deal of business in small lots, which has been hanging fire for some time, and the companies will endeavor to accommodate their little customers from now on.

Scrap—The scrap dealers are holding what supplies they have at outside figures and are more concerned in getting control of scrap than finding buyers for it.

Pittsburg Jan. 8

quiet, but there have been some fairly good transactions in pig iron. A great deal of interest is taken in the steel-rail trade. It is estimated that over 2,000,000 tons of bessemer steel rails have been booked for delivery this year at the rate of $28 a ton, which was established early in 1901. Mills are not anxious to take on any more business at present, and when some orders were booked recently by the Carnegie Steel Company from Western roads it was reported that the Illinois Steel Company was sold up for the year. It is believed, however, that the company is reserving some of its capacity. Rumors a week ago that the Cambria and Pennsylvania steel companies are quoting $30 for standard bessemer steel rails were practically confirmed this week. It is believed that these companies are not desirous of booking any orders at the ruling price, as more can be obtained for billets. There seems to be no doubt that premiums on rails will be paid, in some instances, before the end of the year for deliveries on rails ordered. As told in a recent letter the Bethlehem Steel Company has re-entered the rail market, and will begin making deliveries about July 1. It will make open-hearth rails exclusively, and although there has been no official announcement, it is reported here that the price for open-hearth rails will be at least $32 a ton, and may go higher, if bessemer rails bring a higher price than $28. The Tennessee Coal, Iron and Railroad Company has been making open-hearth rails and early last year quoted $29 at mill, or $1 a ton above the rate for bessemer. All rail quotations are f.o.b. mill, and Western roads that cannot get their requirements from the Illinois Steel Company and the Colorado Fuel and Iron Company pay a higher price delivered for rails bought from the Carnegie Steel Company, the freight rate being greater. Since the first of the year the Carnegie company has booked about 20,000 tons of standard bessemer steel rails and a small tonnage of light steel rails, on which an advance in prices was recently ordered. New prices of light rails are as follows: 25 to 45-lb., $33@34; 20-lb., $24@25; 16-lb., $35@36; 12-lb., $30

the highest prices ever quoted by this com-

...ished lines from one to four months, ...lately, all are crowded with specifications ... and in-plate are lighter than at any time at the ...pening of a new year, and it will be nec... ...ke care of the usual spring trade. The ...eading interest officially announced that, ...ntrary to reports, it does not intend to ...dvance prices. In sheets, however, pre... ...miums are being paid for prompt deliv... ...ry. The iron and steel bar markets are str...ng. Steel bars are strictly held at the recently established prices of 1.60c. and iron bars are firm at 1.80@1.85c. Pittsburg.

Pig Iron—Peculiar conditions continue in the pig-iron market, foundry iron ruling at a higher rate than bessemer, although it is made from a cheaper grade of ore. A sale of 1500 tons of No. 2 foundry was made yesterday for delivery in the third quarter at $21.50. Valley furnaces. Some bessemer and basic has sold for this delivery at $21, and the leading independent producer is quoting $21@21.25 for bessemer and $20.75@21 for basic for third-quarter delivery. Sales of small lots of No. 2 foundry were made during the past few days at $25, Valley, and a lot of 4000 tons of bessemer for delivery through the first half was sold at $22, Valley. Bessemer for delivery in the first quarter was sold late last year at prices ranging from $22.50 to $23.50. Since the first of the year it is reported that over 15,000 tons of foundry and bessemer were sold for third- and fourth-quarter deliveries. Virginia iron has advanced and No. 2 X is quoted this week at $24@24.50 at the furnaces. An advance of 25c. a ton in freight rates on pig iron from the Virginia furnaces went into effect on Jan. 1, and the rate from Birmingham, Ala., will be increased ...

Steel—Billets continue extremely scarce, and prices are nominal, bessemer being quoted at $29.50@30 and open-hearth, $32.50@33. Plates are firm at 1.70c., and merchant steel bars at 1.60c. ... and premiums can easily be obtained for prompt delivery. Black sheets remain at ... per No. ...

Ferro-Manganese—The market is irregular and quotations vary from $82 to $83 ... $80 to $8... ...ery.

Cartagena, Spain Dec. 22

Barrington & Holt report that shipments for the week were one cargo, 3900 tons dry ore, to Great Britain; one cargo, 5300 tons dry ore, to Philadelphia. The market is active, but freight tonnage is scarce.

Quotations are, for iron ore, f.o.b. shipping port: Ordinary 50 per cent. ore, ... 10s. 6d.; special low phosphorus, 10s. 3d.@10s. 6d.; specular ore, 58 per cent., 13s.; S. P. Campanil, 11s. 6d. Manganiferous ores, same terms, are 14s. 6d. for 35 per cent. iron and 12 per cent. manganese; no higher grades offered.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, ... quoted at 11s. 6d. per ton.

Metal Market

NEW YORK, Jan. 9

Gold and Silver Exports and Imports.

At all United States Ports in November and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1906...	$1,963,757	$ 8,934,958	Imp. $6,971,201
" 1905 .	1,137,318	5,202,790	" 4,065,472
Year 1906..	44,831,203	147 961,827	" 103,130,624
" 1905..	44,125,935	46,264,524	" 2,138,589
Silver:			
Nov. 1906...	4,411,830	2,914 157	Exp. 1,497,673
" 1906	5,361,819	4,306 838	" 1,054,981
" 1906 .	53,400,246	39,790,748	" 13,609,498
1905 .	49,316,953	31,246,389	" 18,070,564

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Jan. 5 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week...	$ 6,000	$ 109,247	$531 981	$ 100,384
1907.....	6,000	109.247	531,981	100 384
1906 ...	518,000	26,276	3,973,138	42 347
1905.....	2,357,370	32,100	755 921	29,699

Exports of gold for the week were to Haiti; of silver to London. Imports, both gold and silver, were from the West Indies, Mexico and South America.

The joint statement of all the banks in the New York Clearing House for the week ending Jan. 5 shows loans, $1,049,567,500, an increase of $16,694,500 for the week; deposits, $1,000,578,300, an increase of $10,277,200. Reserve account shows:

	1906.	1907.
Specie.....	$167,336,000	$172,951,400
Legal tenders.....	79,170,700	77,341,000
Total	$246,506,700	$250,292,400
Surplus.....	$571,000	$147,825

The surplus over legal requirements shows a decrease of $5,221,400, as compared with the previous week.

Specie holdings of the leading banks of the world on Jan. 5 are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$172,951,400
England..	$151 111,230	.....	151,111 230
France ...	542,364,225	$188,685,600	731 050 825
Germany ...	124,650,000	41,565,000	166,215,000
Spain ...	77,470,000	121,000,000	198,1.0,000
Netherlands .	27,687,560	28,875,000	56,562,500
Belgium ...	16,756,665	8,978,335	25,735,000
Italy	109,565,000	73,580,000	183,145,000
Russia ...	587,000,000	24,125,000	611,125,000
Aust Hungary .	233,015,000	58,755,000	291 800,000
Sweden ...	19,735,000	.....	19,735,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Dec. 27:

	1905.	1906.	Changes.
India.....	£7,240,421	£ 14,867,196	I. £ 7,636,775
China.....	886 847	430,700	D. 456,147
Straits..	38,299	1,750	D. 36,549
Total.....	£ 8 155,567	£ 15 299 646	I. £ 7,144,079

Receipts for the week were £318,000, of which £105,000 in bars and £24,000 in Mexican dollars were from New York. Exports were £177,100 in bars and £35,500 in Mexican dollars to India; £51,200 to Hudson's Bay; £203,800 in all.

Indian exchange continues steady, all the Council bills offered in London being taken at an average of 16.05d. per rupee. The Indian government is reported to be buying silver in London for coinage.

Prices of Foreign Coins

	Bid.	Asked
Mexican dollars.....	$0.53	$0.55
Peruvian soles and Chilean.....	0.47⅛	0.49
Victoria sovereigns.....	4.85½	4.87½
Twenty francs.....	3.86	3.89
Spanish 25 pesetas.....	4.78	4.80

SILVER AND STERLING EXCHANGE.

Dec.-Jan.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	January	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
27	4.82¾	69⅜	32⅜	3	4.84	70⅛	32 7/16
28	4.82¾	69¼	32¼	4	4.84⅛	70	32¼
29	4.82¾	69⅜	32⅜	5	4.84⅜	69⅞	32 5/16
31	4 83	69⅝	32 7/16	7	4.84⅜	70	32 7/16
1	....	....	32⅜	8	4.84⅜	69⅜	32 5/16
2	4.84	69 ⅜	32 7/16	9	4.84¾	69½	32⅜

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

January.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis. Cts. per lb.
3	24¼ @24⅝	23¾ @24	103½	41¼	6.00	6.70 @6.75	6.55 @6.60
4	24⅜ @24½	23¾ @24	105 1/16	41⅜	6.00	6.70 @6.75	6.55 @6.60
5	24⅜ @24⅝	23¾ @24⅛	....	41⅜	6.00	6.70 @6.75	6.55 @6.60
7	24½ @25	24 @24⅛	106 1/16	41⅝	6.00	6.70 @6.75	6.55 @6.60
8	24½ @25	24 @24⅛	106 1/16	41⅜	6.00	6.70 @6.75	6.55 @6.60
9	24½ @25	24 @24⅛	106 3/8	41½	6.00	6.70 @6.75	6.55 @6.60

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.o.'s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

There was an error in the average prices of Lake copper in December and the year 1906, as given last week, which was due to a mistake in transcribing. The correct average for December is 23.3506 c. for the year 19.0166. These figures will be found in the table on the following page.

Copper.—Toward the end of last week several good-sized orders were placed for domestic consumption at advancing prices, but since Monday the market has been quiet and extremely firm. The scarcity of supplies has brought about higher prices and small transactions continue to be reported at fancy prices. The market closes nominal at 24¼@25 for Lake copper and 24@24¼ for electrolytic in ingots, cakes and wirebars. The average at which business has been done in casting copper is 23½@23 cents.

Standard copper has been steady and fluctuated within narrow limits. The close is reported at £100 7s. 6d. for spot and £101 15s. for three months'.

Rolled and manufactured sorts we quote: English tough, £109; best selected, £113@114; strong sheets, £114@115.

Exports of copper from New York for the week were 2883 long tons. Our special correspondent reports the exports from Baltimore at 1803 tons of copper.

Copper Exports and Imports.—The exports of copper from the United States for the 11 months ending Nov. 30 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons:

	1905.	1906.	Changes.
Great Britain	25,069	22,436	D. 2,633
Belgium	2,131	2,727	I. 596
France	28,761	33,424	I. 4,663
Italy	6,465	7,883	I. 1,418
Germany and Holland	95,648	103,009	I. 7,361
Russia	8 013	3,671	D. 4,332
Other Europe	10,654	10 427	D. 127
Canada	1,172	1,764	I. 592
China	35,088	2,292	D. 32,886
Other countries	7,286	231	D. 7,055
Total metal	220,187	187,774	D. 32,413
In ores and matte	5,416	4,983	D. 433
Total	225,603	192,757	D. 32,846

The total decrease was 14.6 per cent. If, however, we omit the shipments to China in both years, there was an increase of 40 tons in 1906. The actual quantities of ore and matte exported in 1906 were 41,602 tons, of which 31,829 tons went to Canada, 9992 tons to Mexico, and 281 tons to other countries. Contents are estimated on the basis of values.

Imports into the United States of copper and copper material for 11 months ending Nov. 30, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ores, etc.	Total.
Mexico	34,748	13,153	48,001
Canada	13,134	4,391	17,585
Great Britain	9,342		9,342
Japan	2,720		2,720
South America		1,846	1,846
Other countries	12,120	1,059	13,179
Total	72,124	20,749	92,873
Re-exports	499	88	587
Net imports	71,625	20,661	92,286
Net imports, 1905	65,083	19,932	85,015

The total increase in the net imports this year was 7271 tons, or 8.5 per cent. The actual tonnage of ores and matte imported from Mexico this year was 93,100 tons; from Canada and Newfoundland, 60,842; from South America, 8781 tons.

The excess of exports over imports was 145,590 tons in 1905, and 100,471 tons in 1906; a decrease of 45,119 tons.

Copper Sheets.—The base price of copper sheets has been advanced 2c. and is now 29c. per lb. This price is subject to change without notice.

Tin.—Absolutely no interest is shown in this metal, and buyers in this market are pursuing a hand-to-mouth policy. In consequence of this transactions are of a retail nature only and prices at the close are quoted at 41½c.

The London market has been strong one day and the next day weak, but closes steady at £189 10s. for spot and £190 5s. for three months.

Imports of tin into the United States for the 11 months ending Nov. 30 are reported as below, in long tons, of 2240 lb. each:

	1905.	1906.	Changes.
Straits	17,635	13,464	D. 4,171
Australia	539	897	I. 358
Great Britain	18,016	24,025	I. 6,009
Holland	411	487	I. 76
Other Europe	763	1,377	I. 614
Other countries	42	243	I. 201
Total	37,406	40,493	I. 3,087

The increase in 1906 over the preceding year was 8.2 per cent. The metal received from Great Britain is chiefly Straits tin.

Lead.—The market remains unchanged at 6c. New York.

The London market has become a good deal stronger and closes at £19 17s. 6d. for Spanish lead; £20 for English lead.

Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the 11 months ending Nov. 30, in short tons, of 2000 lb. each:

	1905.	1906.	Changes.
Lead, metallic	4,012	11,425	I. 7,413
Lead in ores and base bullion	85,914	65,586	D. 20,327
Total imports	89,926	77,011	D. 12,914
Re-exports	56,022	44,444	D. 11,578
Net imports	33,903	32,567	D. 1,336

Of the total imports in 1906, there were 60,478 tons from Mexico, 8437 tons from Canada, and 7889 tons from Europe. Exports of domestic lead were 259 tons in 1905 and 292 tons in 1906; an increase of 63 tons.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Dec. 22, that the price of pig lead has been 89 reales per quintal, silver being paid for at 14 reales per ounce. Exchange, 27.62 pesetas to £1. The price of lead, on current exchange, is equal to £18 6s. 9d. per long ton, f.o.b. Cartagena. Exports for the week [illegible] were [illegible] tons, [illegible] tons to Swansea, and [illegible] tons to Marseilles.

[illegible] very satisfactory rate both for near-by and future shipments. The market closes firm [illegible] New York and [illegible] St. Louis.

London reports a quiet market and closes at £27 15s. for good ordinaries and £28 for specials.

[illegible] States for the 11 months ending Nov. 30 are [illegible] tons in 1906; an increase of 527 tons. Exports of zinc dross were 13,590 tons in 1906; previous to that year this article was not reported separately. Exports of zinc ore were 22,747 tons in 1905, and 24,750 tons in 1906; an increase of 2003 tons. Imports of spelter for the 11 months were 510 short tons in 1905, and 2192 tons in 1906; an increase of 1682 tons.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Dec. 22, that shipments for the week were 233 tons blende to Swansea, and 4225 tons blende and calamine to Antwerp. Prices are rather depressed, and demand uncertain.

Zinc Sheets.—The base price was again advanced 15c. on Jan. 8, and is now $8.40 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony.—There is no material change. Quotations are 26@26¼c. for Cookson's; 25@25¾ for Halletts; and 24@24½ for ordinary brands.

Imports of antimony into the United States for the 11 months ending Nov. 30 were as follows, in pounds:

	1905.	1906.	Changes.
Metal and regulus	4,952,840	6,699,667	I. 1,747,127
Antimony ore	1,660,063	1,790,740	I. 130,737

The increase in metal and regulus was 35.1 per cent.; in ore, 7.9 per cent.

Nickel.—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Imports of nickel ore and matte into the United States for the 11 months ending Nov. 30 were 12,344 tons in 1905, and 13,810 tons in 1906; an increase of 1466 tons. Exports of nickel, nickel oxide and nickel matte were 8,890,187 lb. in 1905, and 9,884,187 lb. in 1906; an increase of 994,000 lb. last year.

Platinum.—Demand continues strong and prices high, with an upward tendency. Unmanufactured platinum is quoted at $38 per oz. For good scrap $31@31.50 is paid.

lb., according to size and conditions of order. San Francisco prices are $30@40 per

export trade. The London quotation is

necksilver from the United

in 1905, and 465,401 lb. in

Platinum.—Prices are steady and demand good. Prices for ton lots, or over,

per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Exports of aluminum from the United States for the 11 months ending Nov. 30 were valued at $265,816 in 1905, and $318,915 in 1906; an increase of $53,099 last year.

Minor Metals.—For minor metals and their alloys, wholesale prices are, f.o.b. works:

	Per Lb.
	140
	90c.
	50c.
	13c.
	9@9½c.
	11c.
Ferro-Chrome (60-64% Cr., 3-4% C.)	14c.
	38c.
	1.00
	80c.
	40c.
	$7.25@7.50
	1.50
	75c.
	15c.
Manganese—Copper (30%@70%) N.Y.	$1.75
	20c.
	42c.
	1.10

$98@100 ton.

Variations in price depend chiefly on size and conditions of orders.

Missouri Ore Market

JOPLIN, Jan. 5

The highest price reported paid for zinc

ores. The average price, all

$45.00, a general advance of

The highest price reported paid for lead was $80.84 per ton, prices generally being

per ton.

The shipment of the week was 1650 tons of zinc and 197 tons of lead larger than the first week of 1906, and the value is 42 per cent. greater. Although the smelters

the bins throughout the district, which cannot be shipped on account of the car situation, the demand was stronger than for a month, and prices are being made in advance of the output. It is apparent that the smelters are preparing for a storm period, and will have ore to ship even if the output may be curtailed, without forcing an unnatural price upon the commodity.

Following are the shipments of zinc and lead from the various camps of the district for the week ending today:

	1,249,130		
	1,130,110		27,689
		186,550	18,272
			13,990
		18,970	10,131
		20,590	
		76,000	7,700
			5,520
	174,540		4,794
		12,550	3,375
Sherwood		29,300	1,284
	27,590		44
Totals	11,170,580	1,624,500	$322,162

Zinc value, the week, $254,752.

Same week last year [illegible]

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc [illegible] the prices of 60-per-cent. basis ores carrying 60 per cent. zinc.

	ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN	
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61.50	75.20
February	54.77	47.37	February	57.62	72.83
March	47.40	42.68	March	57.20	73.73
April	42.88	44.63	April	58.00	75.13
May	43.31	40.51	May	58.27	78.40
June	40.75	43.83	June	57.80	80.96
July	43.00	43.25	July	58.00	74.31
August	48.83	43.56	August	58.00	75.36
September	46.75	42.58	September	63.50	79.64
October	47.60	41.66	October	63.86	79.84
November	49.65	44.13	November	68.67	81.98
December	49.00	[illegible]	December	76.25	81.89
Year	[illegible]	[illegible]	Year	[illegible]	77.40

Wisconsin Ore Market

PLATTEVILLE, Jan. 5

The first week of the year shows a feeling of confidence among producers and buyers alike. Had there been plenty of cars, it is safe to say that nearly all of the ore in the bins would have been cleaned up. Several of the larger producers have been closed down for the holidays, which will curtail the output somewhat. The new producer at Big Patch camp has a carload of ore ready which will probably be sold without roasting, as the price offered is said to be above the usual for the same grade of unroasted ore. It is confidently expected that the price of 60 per cent. zinc ore will take a slight jump upward this month. The reason for this is that it is thought the closing down of one or two of the producers for a part of the winter will limit the output to a certain degree. Sixty per cent. zinc ore sold from $45 to $48, only a few buyers being out. A choice lot of lead at Cuba City is reported as having sold at $80 per ton. Dry house, ore, sulphur remain same as last week.

The different camps of the district loaded ore for the week ending Jan. 5, 1907, as follows:

Camps	Zinc, Lb.	Lead, Lb.	Sulphur Lb.
Highland	[illegible]	[illegible]	
Linden	[illegible]		
Peltonville	[illegible]		
Bell's	[illegible]	[illegible]	
Parker	[illegible]		
Calkins	[illegible]		
Livingston	43,000		
Earlier week	[illegible]	[illegible]	

An event of interest to the producing local zinc centers was the starting of the new concentrating plant at Hazel Green, on the Murphy property. The new station at Hazel Green will in the future be reported direct, as the railroad has permanently installed an agent for the zinc producers. Shipments are still held down owing to lack of cars.

Chemicals

NEW YORK, Jan. 9

Copper Sulphate.—The market is firm, with a strong demand. Prices are unchanged, carload lots selling for $7.25 per 100 lb., while $7.50 is asked for smaller parcels.

Exports of copper sulphate from the United States for the 11 months ending Nov. 30 were 18,607,387 lb. in 1905, and 18,702,607 lb. in 1906; an increase of 95,220 lb. last year.

Nitrate of Soda.—Messrs. Mortimer & Wisner, of New York, give the following statistics of nitrate for the United States, as of date Jan. 1, 1907, in long tons:

	1905.	1906.	Changes.
Stocks, Jan. 1	8,380	13,100	I. 4,720
Imports, 12 months	270,300	322,780	I. 52,480
Total supplies	278,680	335,880	I. 57,200
Deliveries, 12 months	265,580	322,830	I. 57,280
Stocks, Dec. 31	13,100	13,050	D. 50
Afloat for U. S.	100,000	80,000	D. 20,000

The tonnage afloat includes all cargoes reported which are due to arrive by April 15 next.

There is nothing new to report in the nitrate market this week. Prices remain unchanged at $2.25@2.60 for spot delivery with futures selling 10c. lower.

[illegible] chemicals into the United States for the 11 months ending Nov. 30 were, pounds:

Bleaching powder	96,091,274	96,321,476	I. 230,202
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Exports of acetate of lime for the 11 months were 62,878,143 lb. in 1905, and 65,648,296 lb. in 1906: an increase of 2,770,153 lb. last year.

from the United States for the 11 months ending Nov. 30 were, in long tons:

tons to Germany, 141,015 tons to Great Britain, 110,257 tons to France, 81,007

into the United States for the 11 months ending Nov. 30 were, in long tons:

Estimating sulphur contents of pyrites at the usual figure, the total sulphur im-

275,500 tons in 1906; an increase of 13,942 tons last year.

Mining Stocks

New York, Jan. 5

The year opens with the stock markets still uncertain, and inclined to be heavy. Buyers seem to be hesitating, while the period of liquidation is not yet at an end. Notwithstanding the general prosperity, there are signs that the issue of new securities has been greater than can be readily absorbed, and this weighs upon the market as a whole.

The better class of mining stocks has followed the course of the general market, the exception being found in the copper stocks. Unfortunately, there is activity in the doubtful class, and in the lower class, which is not at all doubtful, but altogether worthless. These are pushed for sale among people who know nothing of mining, and have no means of finding out their real standing, but who like to speculate in a small way, and who listen to the tempting offers of promoters.

The copper stocks are exceptionally active, as is shown by the Boston market.

Boston Jan. 8

The Boston market has been like a seething caldron the past week. The new year opened auspiciously and the pace set has been something killing. Never in the annals of the Boston Stock Exchange has business reached the volume that it did last week. Friday was a record-breaking day, with sales of over 219,000 shares, and of this 74,000 was Trinity alone, which is the record for any single stock in a day's session of the exchange. The public is in this stock as never before, thanks to newspaper advertising by Lawson. The final sale for 1906 was $20.50. In the meantime it has sold at $40, almost a 100 per cent. rise in three days, broke to $26 the same day, recovered to $37, and closed tonight at $31.50. Thursday it rose from $32 to $39.87½. Stock-exchange houses have been flooded by out-of-town investors and people had become Trinity crazy. Fortunately things have quieted down. This is due to the fact that brokers were re-

Of course other mining stocks have soared, but not to the same extent. Allouez touched $70.50 today, which compares with $54.50 Dec. 31. Centennial rose $5 to $43, both reacting substantially. Osceola rose $11 to $165, receiving a $6 setback. There is no doubt there is a combination forming, having these three stocks as a nucleus. Amalgamated sold

night. North Butte made a record price at $120, up $8.62½, and Tamarack is up $15.50 to $132. Quincy touched $116 and Wolverine $190. Tennessee Copper forged $5.25 ahead to $55.25, and Shannon made its best price today at $21. Rhode Island rose $2.87½ to $11.37½, reacting $1, and Santa Fe spurted $2.87½ to $7.37½. Wyandot is being picked up and has risen

Utah Consolidated sold up $4 to $67, reacting slightly, and United States Smelting rose $4.37½ to $70, closing at $67. The preferred sold up to $49. United States Smelting directors have declared an initial dividend on the common stock, making the first payment in April at the rate of 7 per cent., the same as paid on the preferred. Calumet & Arizona was strong on talk of an increase in the dividend. Davis-Daly has been the curb feature, selling up $3 to $19. Curb dealings are keeping pace with those on the stock exchange.

Colorado Springs Jan. 4

The holiday inactivity is still prevalent on the local stock exchange. The prices have held up fairly well, but the trading has been dull during the entire week. Work has been the most active trader on the list, with 26,500 shares to its credit, selling from 22½ on Monday, down to 20 Friday. The other active traders were Elkton, El Paso and Isabella, all of them showing a decline today from the prices earlier in the week. The mine-owners' committee in charge of the proposed drainage tunnel for the Cripple Creek district have decided on the intermediate tunnel, on which work is expected to begin Jan. 15. The tunnel will be 27,190 ft. in length. The main water course will be reached 15,550 ft. in.

Mexico Dec. 31

Mexican mining stocks during the week showed considerable animation, particularly due to Cinco Senores, a rumored rich strike in said property causing its stock to jump from $45 to $140. Other stocks, with their respective raises, were as follows: State of Guanajuato, Angustias, $114@145; Roma, $41@61; Faro, $7. State of San Luis Potosi, Santa Maria de La Paz, $240@255; Barreno, $270. El Oro district, Aldebaran, $160; Borda Antigua, $100@115; Germania, $190; Rosario, $55. In Pachuca, Amistad y Concordia, $107; Soledad, $1610; Sorpresa, $515 per share.

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

	New York.		London.	
	1905.	1906.	1905.	1906.
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December	64.850			
Year				

AVERAGE PRICES OF COPPER

	New York.				London.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	15.008	18.310	15.128	18.419	68.262	78.869
Feb.	15.011	17.869	15.136	18.116	67.963	78.147
March	15.124	18.361	15.250	18.641	68.174	81.111
April	14.920	18.375	15.045	18.688	67.017	84.793
May	14.627	18.457	14.820	18.724	64.875	84.867
June	14.673	18.442	14.813	18.719	65.881	83.994
July	14.888	18.190	15.005	18.585	66.887	81.167
Aug.	15.664	18.380	15.725	18.706	69.830	83.864
Sept.	15.965	19.033	15.978	19.328	69.667	87.831
Oct.	16.279	21.203	16.332	21.722	71.406	97.269
Nov.	16.599	24.823	16.758	22.398	74.727	100.270
Dec.	18.328	22.885	18.398	23.350	78.993	105.226
Year.	15.690	19.278	15.699	19.411	69.465	87.282

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2240 lb., standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	29.325	36.390	July	31.760	37.275
Feb.	29.262	36.403	August	32.866	40.606
March	29.523	36.662	Sept	32.095	40.616
April	30.525	38.900	Oct.	32.481	42.852
May	30.049	43.313	Nov.	33.443	42.906
June	30.329	39.260	Dec.	35.835	42.750
			Av. year.	31.368	39.819

Prices are in cents per pound.

AVERAGE PRICE OF LEAD, NEW YORK

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	4.552	5.600	July	4.524	5.750
Feb.	4.450	5.464	Aug.	4.665	5.750
March	4.470	5.350	Sept.	4.850	5.750
April	4.500	5.464	Oct.	4.850	5.750
May	4.500	5.685	Nov.	5.200	5.750
June	4.600	5.760	Dec.	5.422	5.750
			Av., year.	4.707	

Prices are in cents per pound. The London

long ton; February, £16,031; March, £15,922; July, £16,525; August, £17,109; September, £18,266; October, £19,350; November, £19,281;

AVERAGE PRICE OF SILVER

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	6.180	7.418	6.002	6.337	25.062	28.225
Feb.	6.139	7.[illegible]	5.989	5.924	[illegible]	[illegible]
Mar.	6.067	[illegible]	5.917	6.059	[illegible]	[illegible]
April	5.817	[illegible]	5.667	[illegible]	[illegible]	[illegible]
May	5.434	5.997	[illegible]	[illegible]	[illegible]	[illegible]
June	5.190	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
July	5.356	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Aug.	5.706	6.927	[illegible]	[illegible]	[illegible]	[illegible]
Sept.	5.887	[illegible]	6.051	[illegible]	[illegible]	[illegible]
Oct.	6.087	[illegible]	5.934	[illegible]	[illegible]	[illegible]
Nov.	6.145	6.475	[illegible]	6.225	[illegible]	[illegible]
Dec.	[illegible]	6.[illegible]	6.474	6.443	28.719	27.[illegible]
Year.	5.822	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2240 lb.) good ordinary brands.

STOCK QUOTATIONS

NEW YORK Jan. 5

Name of Company.	High.	Low.	Clg.	Sales.
Alaska Mine	1	1	1¼	8,700
Am. Sm. & R. pf.	95¾	95	95	200
Am. Sm. & Ref.	104⅝	103⅝	103⅝	4,100
Atlantic	27⅛	26⅝	26⅝	88,400
Balaklala	11	11	11	100
Bonanza	14⅛	13⅞	14	13,500
Buffalo Cobalt			4⅛	
Butte & Balaklala			2¾	
Butte Coalition	9⅛	8⅞	8⅞	6,100
Butte & Superior	⅞	⅞	⅞	1,200
Calumet & Corp.	⅞	⅞	⅞	5,000
Centennial	3⅝	3⅝	3⅝	5,300
Cons. Ariz. Mining	1⅝	1⅝	1⅝	7,900
Davis-Daly	18⅝	15	18⅛	19,480
Dominion Cop.	¾	¾	¾	18,000
Ely	⅞	⅞	⅞	3,000
Isabella	⅞	⅞	⅞	6,100
La Rose Consol.	3⅜	3⅜	3⅜	1,200
Mass.	8⅝	8⅝	8⅝	2,900
Mercur	10	9¾	10	3,720
Mexican	4⅝	4⅝	4¾	6,900
Mines Co. of Am.	2	2	2	7,400
Mohawk	25	17⅞	17⅞	25,500
Nevada Con. Copper & Silver	2⅞	2⅞	2⅞	200
Nevada Hills Mining & Dev.	2⅞	2⅞	2⅞	200
Nevada Packard	4¼	4¼	4¼	200
Nipissing			8⅞	
Old Dominion	29	28½	29	28,700
Osceola	7⅛	6⅞	7	14,400
Parrot	2⅛	2⅛	2⅛	14,800
Quincy	6	5⅞	5⅞	4,880
Rhode Island Coal	14	14	14	800
Rio Grande Southern			2⅞	
Rio Grande Western	4⅛	4⅛	4⅛	12,400
Santa Fe Gold & Copper	17⅛	15⅞	17⅛	2,445
Shannon	13⅞	13⅛	13⅛	154,500
Sierra Nevada			1	6,350
Standard Oil			5⅞	
Tamarack		17⅜	23⅛	14,300
Tennessee Copper	1	45	51	10,100
Tonopah Mining				8,970
Union Pacific			⅞	100
Union Pacific pf.			7	
United Copper	18	17	17½	3,000

NEW YORK INDUSTRIAL

Am. Agricultural	25	24	25	400
Am. Smelting & Ref.	154	148¾	150	61,700
Am. Smelting & Ref. pf.	116¾	114⅞	116	1,620
Bethlehem Steel	19	18½	19	200
Colo. Fuel & Iron	55⅝	51	55	37,800
Federal M. & S. Pf.	9	9¼	9	1,660
Int. Salt	20	19	19	125
Nat. Lead	78	72	75	4,431
National Lead, Pf.	103	102½	103	450
Pittsburg Coal	17⅛	15⅞	16	400
Republic I. & S.	41	37¾	40⅜	16,600
Republic I. & S., pf.	99	97¾	97	3,100
Sloss-Sheffield	77	74	75½	2,800
Standard Oil	530	510	526	136
Texas & Pac.	102	100	101½	400
U. S. Steel & Ref.	37½	35½	36	100
U. S. Steel, Pf.	47¾	47	47¾	224,040
U. S. Steel, Pf.	109	108	109¼	28,530
Va. Car. Chem.	39	37	38	1,600
Va. I. Coal & Coke	84	77	83	2,300

PHILADELPHIA Jan. 5

Name of Company.	High.	Low.	Clg.	Sales.
American Gas	10½	10	10	291
Cambria Steel	44¼	37⅜	43⅝	48,067
Consol. Gas	6	6	6	5
Lake Superior Corp.	10¼	10	10¼	40
Penn. Salt Mfg.	48	48	48	547
Tonopah Mining	1⅝	1⅝	1⅝	1,565

PITTSBURG Jan. 5

Crucible Steel	12¾	11⅞	12¾	1,000
Crucible Steel, Pf.	79	78	79	100
Harbison-Walker Ref.			1	
Oil City Boiler	16	16	16	1,000
Tonopah Ext.	6⅞	6⅞	6⅞	295

St. Louis Jan. 5

[illegible]				
[illegible]				
[illegible]				

CHEMICALS, MINERALS, RARE EARTHS, ETC. CURRENT WHOLESALE PRICES.

ABRASIVES—
Bort, good drill quality, carat.. $85.00
Carborundum, f.o.b. Niagara Falls, powd. lb. .08
Grains. .10@.17
Corundum, " .07@.10
Crushed Steel, f.o.b. Pittsburg " .05¾@.06
Emery, in kegs: Turkish flour " .01½@.02½
Grains " .02½@.03½
Naxos flour " .01@.02
Grains " .03@.04
Chester flour " .01½
Grains " .03½@.04½
Peekskill, f.o.b. Easton, Pa., flour " .01½@.01½
Grains, in kegs " .02@.02½
Garnet, per quality....sh ton 25.00@35.00
Pumicestone, Am. Powd 100 lb. 1.60@2.00
Italian, powdered " .01½@.01½
Lump, per quality " .03@.20
Rottenstone, ground " .02½@.03½
Lump, per quality " .05@.25
Rouge, per quality " .06@.30
Steel Emery, f.o.b. Pittsburg " .07½@.07¾

ACIDS—
Acetic 28% lb. .02
Boric " .10@.11
Hydrofluoric, 30% " .02½@.03
" 48% " .06
" 60% " .10@.10½
Hydrochloric acid, 20°, per lb. 1.25@4.50
Nitric acid, 38° " per lb. 4.25@4.62½
Sulphuric acid, 50°, bulk, per ton.. $12 up.
60°, 100 lb. in carboys .90@1.12½
60°, bulk, ton,..... 17.00@18.00
66°, 100 lb. in carboys 1.00@1.25
66°, bulk, ton 18.50@20.00
Oxalic " .08¼@.08½

ALCOHOL—Grain gal. 2.46½
Refined wood, 95@97% " .70@.75

ALUM—Lump 100 lb. $1.75
Ground " 1.85
Chrome Alum lb. .03½@.03¾

ALUMINUM—Sulphate, com'l. " 1.25@1.60

AMMONIA—24 deg. lb. .04¾@.05¼
" 26 " " .05@.05¾

AMMONIUM—
Bromide lb. .23
Carbonate " .07¾@.08¾
Muriate grain " .06¾
Lump " .09½@.09¾
Sulphate, 100 lb. 3.10@3.15
Sulphocyanide com. " .30
" chem. pure " .40

ANTIMONY—needle, lb. .17@.18

ARSENIC—White.... (nominal) " .07@.07¼
Red " .06¾@.06¾

ASPHALTUM—
Barbadoes per ton. 40.00@80.00
West Indies " 20.00@60.00
Egyptian lb. .06@.07
Gilsonite, Utah ordinary per ton. 50.00
Trinidad " 30.00@40.00
California " 20.00@30.00

BARIUM—
Carb. Lump, 80@90%....sh. ton. 30.00@35.00
Powdered 80@90% lb. .02@.02½
Chloride com'l " ..... ton. 34.00
Nitrate, powdered, in casks..lb. .06
Sulphate (Blanc Fixe). " .02¾

BARYTES—
Am. Ground sh. ton. 14.00@21.00
Floated " 15.50@21.00
Foreign floated " 19.50@21.00
White " 21.00

BISMUTH—Sub-nitrate lb. 1.50

BLEACHING POWDER—35%, 100 lb. 1.30@1.50

BLUE VITRIOL—(copper sulphate), carload, per 100 lb. 7.25

BONE ASH lb. .02½@.03

BORAX " .07½@.08

CALCIUM Acetate, gray " 2.35@2.40
Acetate, brown " 1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y. for Jersey City, N. J. sh. ton. 65.00
Chloride, f.o.b. N. Y. " 13.00@15.00

CEMENT—
Portland, Am. 500 lb. bbl. 1.55@1.60
Foreign " 2.25@2.50
" Rosendale, 300 lb. " .85
(in sacks) " .65
Slag cement " .75@1.25

CHROME ORE—
New Caledonia 50% ex. ship N. Y. per lg. ton 17.00@19.75
Bricks, f.o.b. Pittsburg, M.. " 175.00

CLAY, CHINA—Am. common ex-dock, N. Y. " 8.00 up.
Foreign " 11.00@18.00

COBALT—Oxide lb. 2.50

COPPERAS—Bulk.....100 lb. $0.55
In bbls " .75@.80
In bags " .70@.75

CRYOLITE lb. .06½

FELDSPAR—Ground best...sh. ton. 12.00@15.00

FIRE BRICK.
American per M. 30.00@40.00
Imported " 35.00@40.00
St. Louis No. 1 " 16.00
" No. 2 " 14.00
Extra " 20.00@23.00

FIRE CLAY.
St. Louis mill, per ton 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump sh. ton. 8.00@10.00
Ground " 11.50@13.50
Gravel " " 4.25@4.50
Foreign crude ex. dock " 8.00@10.00

FULLER'S EARTH—Lump..100 lb. .80@.85
Powdered " .90@1.25

GRAPHITE—
American, ore, common.... lb. .01@.10
Artificial " .06
Ceylon, common pulv " .02½@.03
Best, pulverized " .04@.06
German, com. pulv " .01½@.01¾
Best, pulverized " .01½@.02
Italian, pulverized " .01@.02

GYPSUM—
Fertilizer " 7.00
Rock lg. ton 4.00

INFUSORIAL EARTH—
Ground Am. best lb. .01¾
French lg. ton 55.00
German lb. .02½@.02¾

LEAD—Acetate (sugar of) lb. .07½
Nitrate, com'l " .08½@.09

MAGNESITE—Greece.
Crude (95%) lg. ton. 7.00@8.00
Calcined sh. ton. 30.00@35.00
Bricks, domes, per qual. f.o.b. Pittsburg M. 160@200

MAGNESIUM—
Chloride, com'l 100 lb. .90@1.25
Sulphate (Epsom salt)...100 lb. .90@1.25

MANGANESE—
Crude powdered:
70@75% binoxide lb. .02
75@85% binoxide " .02½
85@90% binoxide " .04
90@95% binoxide " .05
Ore, 80%-85% sh. ton. 27.00@35.00

MARBLE—Flour sh. ton. 8.00@8.50

MINERAL WOOL—
Slag, ordinary " 19.00
Selected " 25.00
Rock, ordinary " 32.00
Selected " 40.00

MONAZITE SAND—
Guar. 9% with 5% Thorium oxide, nominal lb. .08 and up.

NICKEL—
Oxide, crude, lb. (75%) for fine metal contained. .47
Sulphate, single lb. .18@.24
" double " .11½@.14

NITRATE OF SODA—100 lb. 96% for 1907 2.50
95% for 1908 2.45
95% for 1909 2.45
96% is 5c higher per 100 lb.

OZOKERITE—best lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered " .07½@.07¾
English glassmakers' " .08½@.08¾
Lith-pone " .04@.05
Metallic, brown sh. ton. 19.00
Red " 16.00
Ocher, Am. common " 8.50@9.00
Best " 16.00
Dutch, washed lb. .02½@.03
French, washed " .01½@.02½
Paris green, Am., bulk " .21@.28
Red lead, American " .07½@.07¾
Foreign " .08½@.08¾
Turpentine, spirits bbl., per gal. .70@.71
White lead, Am., dry lb. .06½@.06¾
American, in oil " .07@.07¼
Foreign, in oil " .09@.10
Zinc white, Am. extra dry.. " .05½@.05¾
Foreign, red seal, dry.. " .07½@.07¾
Green seal, dry " .07½@.08¾

PHOSPHATES Acid. 65@67½c per unit
*Fla., hard rock 7.50
land pebble 68% 4.50
†Tenn., 78@80% 6.50@7.00
78% 5.50
75% 5.00
68@72% 4.50
‡80. Car. land rock 6.00
" " river rock

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—
Bicarbonate crystal lb. $0.7[illegible]
Powdered or granulated.. " .04½@.05
Bichromate, Am. " .08½@.08¾
Imported " .11
Bromide " .16
Carbonate (80@85%) " .03½@.03¾
Caustic, ordinary " .04½
Elect. (98%) " .06½@.07
Chlorido (muriate), 100 lb.. 1.90
Chlorate powdered " .09½@.09¾
Crystals " .08@.09
Cyanide (96@98%) " 18@.19
Kainite, bag lots, bulk, 8.50; bags, 9.50.
Permanganate lb. .09½@.10
Prussiate, yellow " 16@.17
Red " .33
Sulphate 100 lb. 2 18½@2.21½

PYRITE—
Domestic, non-arsenical, furnace size per unit 11@11½c
Domestic, non-arsenical, fines, per unit 9½@10½c.
Imported, non-arsenical, furnace size, per unit .13@.13½
Imported, arsenical, furnace size, per unit 12@12½c.
Imported fines, arsenical, per unit. 8½@9c.
" " non-arsenical, per unit 10½@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl. .73@1.10
N. Y. agricultural sh. ton. 3@4.40

SALTPETER—Crude 100 lb. 4.25@4.50
Refined, crystals " 5.25@5.75

SILICA—
Ground quartz, ord'ry...sh. ton 13.00@15.00
Silex " 30.00@40.00
Lump Quartz " 2.50@4.00
Glass sand " 2.75

SILVER—Nitrate, crystals.... oz. .43½@.45½

SODIUM—
Acetate lb. .01¾@.01¾
"Alkali," per 100 lb., 58/48 .80@.87½
Bicarb. soda, per lb 1.20@1.50c.
Soda, caustic, per 100 lb., 70/60.... 1.80@1.90
" " powdered " .02¾@.03
Salt cake, per 100 lb .65@.85
Soda, monohydrate, per lb 1¼c.
Bichromate lb. .06¾@.06¾
Bromide " .16
Chlorate, com'l " .09@.09
Cyanide, ("100% KCN") " .18@.19
Hyposulphite, Am " 1.40 up
German " 1.60@1.70
Phosphate 100 lb. 1.90 up
Prussiate " .11½@.12
Sal soda, f.o.b. N. Y. 100 lb. .70@.80
Foreign, f.o.b. N. Y. " .90
Silicate, com'l (Glauber's salt) 100 lb. .75@1.00
Sulphate, com'l (Glauber's salt) 100 lb. .50@.60
" " calcined " 65@.85

STRONTIUM—Nitrate lb. .08½@.08¾

SULPHUR—
Balt., Phila., N. Y., Boston, lg. ton... 22.12½
Louisiana (prime) to New York, Boston or Portland lg. ton 22.00
To Philadelphia or Baltimore.... " 20.50
Roll 100 lb. 1.85@2.15
Flour " " 2.00@2.40
Flowers, sublimed " " 2.20@2.60

TERRA ALBA—French & Eng. 100 lb. .90@1.00

TALC—Domestic sh. ton. 15.00@20.00
French, best " 20.00@25.00
Italian, best " 35.00@40.00

TIN—Bi-chloride, 50% lb. .12½ up
Crystals " 20 up
Oxide, lb .44

URANIUM—Oxide " 3.80

ZINC—Metallic ch. pure " .15
Chloride solution, com'l " .02½@.04
Chloride, granular " .04@.04
Dust " .05½@.06
Sulphate " 02½@.02

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

DIVIDENDS.

Metal and Mining Companies—U. S.

Name of Company and Location.	Author. Capital	Shares. Issued.	Par $	Dividends. Total to Date.	Latest. Date.	Amt.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	$ .30
[illegible]	[illegible]	9,035,000	[illegible]	Oct. 1906	1.50	
[illegible]	[illegible]	216,240	July	1906	0.30	
[illegible]	[illegible]	1,530,879	100	[illegible]	Nov. 1906	2.00
[illegible]	[illegible]	500,000	100	9,375,000	Jan. 1907	.5
[illegible]	[illegible]	580,000	100	23,476,553	Jan. 1906	1.75
[illegible]	[illegible]	[illegible]	[illegible]	1,175,000	Dec. 1906	1.50
[illegible]	[illegible]	300,000	100	[illegible]	[illegible]	1.25
[illegible]	[illegible]	1,200,000	25	[illegible]	[illegible]	1.75
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	4,682,520	[illegible]	6,182,361	Apr. 1906	.05
Atlantic, c	Mich.	[illegible]	[illegible]	990,000	Feb. 1905	.5
[illegible]	[illegible]	400,000	1	40,000	Dec. 1905	.05
[illegible]	[illegible]	1,000,000	1	195,000	Dec. 1906	.04
[illegible]	[illegible]	[illegible]	[illegible]	22,500	Sept. 1906	.10
B [illegible]	[illegible]	[illegible]	[illegible]	47,875,000	Nov. 1906	12.00
[illegible]	[illegible]	100,000	10	2,518,400	Oct. 1906	.05
[illegible]	[illegible]	[illegible]	[illegible]	8,046,000	Jan. 1907	.1
[illegible]	[illegible]	1,000,000	15	[illegible]	Dec. 1906	.10
[illegible]	[illegible]	200,000	10	6,000,000	Dec. 1906	4.00
[illegible]	Mont.	100,000	25	98,350,000	Dec. 1906	2.00
Camp Bird, g., s	Colo.	[illegible]	[illegible]	3,382,500	Feb. 1906	.24
[illegible]	[illegible]	500,000	1	55,000	Nov. 1906	.01
Central Eureka, g	Cal.	398,425	1	778,921	Mar. 1906	.07
[illegible]	[illegible]	1,500,000	5	45,000	Jan. 1907	.1
[illegible]	[illegible]	[illegible]	[illegible]	688,000	Sept. 1906	.15
Con. Mercur, g	Utah	1,000,000	1,000,000	1	1,205,000	Dec. 1906
Continental, z. l	Mo.	[illegible]	22,000	25	286,000	Jan. 1907
Copper Range Con	Mich.	[illegible]	[illegible]	3,791,334	Dec. 1906	2.00
Cresson Pathed, g	[illegible]	[illegible]	[illegible]	214,053	July 1906	.00
Cripple Creek Mi	[illegible]	[illegible]	[illegible]	180,000	Mar. 1905	.00
[illegible]	[illegible]	[illegible]	[illegible]	112,500	Jan. 1907	.12
Daly West, g., s	Utah	[illegible]	[illegible]	5,490,000	Dec. 1906	6.00
De Lamar, g., s	Ida.	[illegible]	[illegible]	2,926,370	May 1905	.12
Dillon, g	Colo.	[illegible]	[illegible]	21,875	July 1905	.01
Dome Creek Con	Colo.	[illegible]	[illegible]	268,000	July 1906	.00
Doe Run, l	Mo.	[illegible]	[illegible]	333,010	May 1906	.50
Elkton Con., g	Colo.	[illegible]	[illegible]	1,681,960	Sept. 1906	.00
El Paso, g	Colo.	[illegible]	[illegible]	1,022,750	June 1906	.01
Fed. Sm., com	Idaho	[illegible]	[illegible]	1,748,250	Dec. 1906	.00
Federal Sm., pf	Idaho	[illegible]	[illegible]	2,441,250	Dec. 1906	1.75
Findley, g	Colo.	[illegible]	[illegible]	325,000	Aug. 1906	.01
Francisco M [illegible]	Nevada	[illegible]	[illegible]	141,000	Dec. 1906	1.10
Gemini-Keystone	Utah	[illegible]	[illegible]	1,850,000	July 1906	10.00
Gold King Con	Colo.	[illegible]	[illegible]	1,407,504	May 1905	.01
Gold Sovereign	Colo.	[illegible]	[illegible]	10,000	Jan. 1906	.00
Grand Central, g	Utah.	[illegible]	[illegible]	1,116,250	Dec. 1906	.00
Gwin Mine, Dev., g	Cal.	[illegible]	[illegible]	35,000	Mar. 1906	.25
Hecla, s. l	Idaho	[illegible]	[illegible]	780,000	Sept. 1906	.02
Homestake, g	S. D.	[illegible]	[illegible]	15,316,150	Dec. 1906	.50
HornSilver, g. s. c. z. l	Utah	[illegible]	[illegible]	5,502,000	Sept. 1906	.05
Isabella Nickel, pf	N. Y.	[illegible]	[illegible]	524,490	Feb. 1907	1.50
Iron Silver	Colo.	[illegible]	[illegible]	3,900,000	Jan. 1907	.20
Jamison, g	Cal.	[illegible]	[illegible]	247,270	July 1906	.01
Jerry Johnson	Cal.	[illegible]	[illegible]	61,700	Apr. 1906	.03
Kendall, g	Mont.	[illegible]	[illegible]	1,035,000	Dec. 1906	.03
Liberty Bell, g. s	Colo.	[illegible]	[illegible]	110,857	Jan. 1906	.15
Lightner, g	Cal.	[illegible]	[illegible]	295,694	Aug. 1905	.05
Mammoth, g. s. l	Utah	[illegible]	[illegible]	2,080,000	Oct. 1906	.05
Mary M. Kitney, g	Colo.	[illegible]	[illegible]	758,500	Oct. 1906	.06
Mass [illegible]	Mich.	[illegible]	[illegible]	900,000	Jan. 1907	.20
Mc [illegible] Porch	Mont.	[illegible]	[illegible]	9,447,274	Jan. 1907	15.00
Monument, g	Colo.	[illegible]	[illegible]	27,124	Apr. 1905	.01
New Century, z	Mo.	[illegible]	[illegible]	211,500	Nov. 1906	.01
New Idria, q	Cal.	[illegible]	[illegible]	880,000	Jan. 1907	.20
New Jersey z	U. S.	[illegible]	[illegible]	1,286,250	Dec. 1906	.40
[illegible]	Mont.	[illegible]	[illegible]	8,400,000	Feb. 1906	3.00
North Star, g	Cal.	[illegible]	[illegible]	3,400,000	Dec. 1906	2.00
Northern Light, g. s	Utah	[illegible]	[illegible]	1,286,250	Dec. 1906	.40
Old Dominion Cop	Ariz.	[illegible]	[illegible]	20,000	Feb. 1904	.05
Old [illegible]	[illegible]	[illegible]	[illegible]	280,843	May 1906	.50
Ophir, g	Nevada	[illegible]	[illegible]	10,506	Mar. 1906	.05
Osceola	Mich.	[illegible]	[illegible]	1,797,400	July 1904	.25
Parrott	Mont.	[illegible]	[illegible]	6,362,600	Jan. 1907	6.00
Pennsylvania, g	Cal.	[illegible]	[illegible]	6,635,262	Dec. 1906	.25
Platteville, l. z	Wis.	[illegible]	[illegible]	993,625	July 1906	.10
Portland, g	Colo.	[illegible]	[illegible]	89,500	Dec. 1906	10.00
Quincy	Mich.	[illegible]	[illegible]	7,417,086	Oct. 1906	.05
Rio [illegible]	[illegible]	[illegible]	[illegible]	16,470,000	Dec. 1906	2.50
[illegible]	[illegible]	[illegible]	[illegible]	9,600	May 1906	.01
[illegible]	[illegible]	[illegible]	[illegible]	112,000	Dec. 1906	.02
Salvator, g. s. l	[illegible]	[illegible]	[illegible]	245,000	Nov. 1906	.03
[illegible]	[illegible]	[illegible]	[illegible]	6,500	Aug. 1904	.01
[illegible]	[illegible]	[illegible]	[illegible]	4,658,357	June 1906	.15
Silver Hill, g. s	Utah	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Ida.	[illegible]	[illegible]	[illegible]	Oct. 1906	.50
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Dec. 1906	.50
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Oct. 1906	.05
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Jan. 1905	.01
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Dec. 1906	.10
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Jan. 1907	.10
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Jan. 1907	.10
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Apr. 1906	.05
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Oct. 1906	.10
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Apr. 1905	.001
[illegible]	[illegible]	[illegible]	[illegible]	85,325	Dec. 1904	.75
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	10,000	Nov. 1906	.05
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	67,000	Dec. 1906	.04
[illegible]	[illegible]	[illegible]	[illegible]	3,450,000	Oct. 1906	9.00
[illegible]	[illegible]	[illegible]	[illegible]	75,000	Dec. 1906	.02
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Coal, Iron and Other Industrials—United States.

Name of Company and Location.	Author. Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Allis-Chalmers, pf	U. S.	$2,500,000	24,638	100	$905,265	May 1905	$1.75
Amer. Ag. Chem., pf	U. S.	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
[illegible]	Pa.	20,000,000	181,630	100	6,831,280	Oct. 1906	3.00
[illegible]	Pa.	2,000,000	200,000	10	1,028,000	Jan. 1907	.40
American Coal	Md.	1,500,000	50,000	25	1,820,000	Sept. 1906	1.25
Associated Oil	Cal.	21,000,000	21,000,000	1	630,000	Aug. 1906	.01½
Bethlehem Steel, pf	Pa.	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel	Pa.	50,000,000	900,000	50	7,650,000	Oct. 1906	1.00
Caribou Oil	Cal.	100,000	80,000	1	56,000	July 1905	.07
Central C. & C., com	Mo.	5,125,000	51,250	100	1,845, 00	Jan. 1907	1.50
Central C. & C., pf	Mo.	1,875,000	18,750	100	1,242,188	Jan. 1907	1.25
Centrana	W. Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil	Cal.	500,000	450,000	1	68,500	June 1906	.01
Col. & Hock. C. & I	Ohio	7,000,000	69,244	100	173,086	Feb. 1906	.25
Consolidated Coal	Ill.	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal	Md.	10,250,000	102,500	100	8,442,900	Oct. 1906	1.50
[illegible] Steel, pf	Pa.	25,000,000	250,000	100	1,000,000	Sept. 1906	1.50
Empire S. & I., pf	N. J.	5,000,000	25,000	100	637,500	Jan. 1907	3.00
Fairmont Coal	W. Va.	12,000,000	120,000	100	840,000	Feb. 1906	2.00
Four Oil	Cal.	500,000	300,000	1	105,406	July 1906	.01
General Chem. Com	Ill.	12,500,000	125,000	100	1,656,919	Sept. 1906	1.00
General Chem., pf	U. S.	12,500,000	100,000	100	4,376,178	Jan. 1907	1.50
George's C'k Coal	Md.	2,500,000	22,000	100	1,188,000	July 1904	3.00
Home Oil	Cal.	100,000	100,000	1	507,500	Oct. 1904	.02½
Ill. Crude Oil	Cal.	200,000	200,000	1	12,500	Dec. 1904	.01½
Imperial Oil	Cal.	1,000,000	100,000	100	880,000	July 1906	.20
International Salt	[illegible]	30,000,000	182,280	100	927,060	Dec. 1906	1.00
Jeff. & Clf. C. & I	Pa.	1,500,000	15,000	100	330,000	Aug. 1906	1.00
Jeff. & Clf. C. & I., pf	Pa.	1,500,000	15,000	100	825,500	Aug. 1906	2.50
Kern River Oil	Cal.	2,000,000	20,000	100	39,500	May 1905	.13
Lehigh Coal & Nav	Pa.	14,345,650	346,897	50	24,920,891	Nov. 1906	2.00
Maryland Coal, pf	Md.	2,000,000	18,850	100	1,617,160	Dec. 1906	4.00
Monon R. Coal, pf	Pa.	10,000,000	100,000	100	3,154,945	Jan. 1906	.97
Monte Cristo Oil	Cal.	500,000	500 000	1	120,000	July 1906	.01
National Carbon, pf	U. S.	5,000,000	45,000	100	1,947,500	Jan. 1907	1.75
National Lead, com	N. Y.	15,000,000	149,054	100	1,788,648	Jan. 1907	1.00
National Lead, pf	N. Y.	15,000,000	149,040	100	15,801,688	Dec. 1906	1.75
Nat'l Steel & Wire, pf	N. Y.	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal	Md.	1,000,000	50,000	20	330,000	Nov. 1906	.40
New River Coal, pfd	W. Va.	4,000,000	3,761,700	100	564,255	Nov. 1906	1.50
Pacific Coast Borax	Cal.	2,000,000	19,000	100	2,086,500	Aug. 1906	1.00
Peerless Oil	Cal.	1,000,000	92,000	10	396,320	May 1906	.14
Penna. Salt	[illegible]	3,000,000	60,000	50	13,988,000	Oct. 1906	3.00
Penna. Steel	Pa.	25,000,000	168,214	100	7,026,995	Nov. 1906	3.50
Phila. Gas, com	Pa.	28,953,029	579,061	50	6,684,142	Nov. 1905	.75
Phila. Gas, pf	Pa.	5,744,813	114,896	50	1,583,505	Mar. 1905	1.25
Pittsburg Coal, pf	Pa.	32,000,000	297,010	100	11,434,962	Apr. 1906	1.75
Pocahontas Coll., pf	W. Va.	1,500,000	15,000	100	415,000	Nov. 1906	1.50
Republic I. & S., pfd	Ill.	25,000,000	204,169	100	3,371,282	Jan. 1907	3.75
Sloss-Sheffield, com	Ala.	7,500,000	75,000	100	750,250	Jan. 1906	2.50
Sloss-Sheffield, pf	Ala.	20,000,000	67,000	100	3,093,500	Jan. 1907	1.75
Standard Oil	U. S.	100,000,000	970,000	100	319,285,000	Dec. 1906	10.00
Tenn. C. & I., com	Tenn.	22,553,600	225,536	100	2,680,889	Nov. 1906	1.00
Tenn. C. & I., pf	Tenn.	248,000	2,480	100	375,130	Nov. 1906	2.00
Texas & Pacific Coal	Texas.	2,000,000	20,000	100	1,930,000	Mar. 1906	2.00
Thirty-three Oil	Cal.	500,000	100,000	5	430,000	July 1905	.10
Union Oil	Cal.	10,000,000	100,000	100	1,118,766	May 1905	.50
U. S. Steel Corp., com	U. S.	550,000,000	5,083,025	100	60,988,516	Dec. 1906	.50
U. S. Steel Corp., pf	U. S.	360,281,100	3,603,141	100	168,539,389	Nov. 1906	1.75
Va. Carolina Ch., pf	U. S.	20,000,000	180,000	100	11,460,869	Jan. 1907	2.00
Westmoreland Coal	Pa.	3,000,000	60,000	50	8,580,000	Oct. 1906	2.50

Canada, Mexico, Central and South America.

Name of Company and Location.	Author. Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Amistad y Conc'rdia	Mex.	$480,000	9,600	50	$258,064	Jan. 1906	$1.71
Buffalo, g	Ont.	1,000,000	900,000	100	£4,000	Jan. 1907	.03
Butters' Salvador, g	Salv.	750,000	150,000	5	600,000	Apr. 1905	.25
Cariboo McKin'y, g	B. C.	1,250,000	1,250,000	1	546,837	Feb. 1904	.04
[illegible]	B. C.	5,500,000	46,988	100	352,410	Nov. 1906	2.50
Copiapo, c	Chile	1,125,000	112,500	10	3,000,900	Oct. 1904	1.20½
Crow's Nest Pass	B. C.	3,500,000	140,000	25	1,581,148	Apr. 1906	.62½
Dominion Coal, com	N. S.	15,000,000	150,000	100	1,050,000	Dec. 1906	1.75
Dominion Coal, pf	N. S.	3,000,000	30,000	100	3,330,000	Jan. 1908	6.00
Dos Estrellas, g. s	Mex.	150,000	3,000	50	1,020,555	July 1905	13.66
[illegible]	Mex.	5,750,000	1,080,000	5	2,708,800	July 1904	.18
Esperanza, s. g	Mex.	2,275,000	455,000	5	4,373,849	Oct. 1906	2.52
[illegible]	Ont.	1,000,000	1,000,000	1	50,000	Jan. 1907	.05
[illegible]	B. C.	15,000,000	150,000	100	1,753,630	Dec. 1906	.30
Greene Con., copper	Mex.	5,840,000	584,000	10	5,468,600	Nov. 1906	.40
[illegible]	Mex.	5,000,000	500,000	10	300,000	July 1906	.06
[illegible]	Mex.	3,500,000	700,000	5	74,250	Oct. 1906	.07½
Guggenheim Expl.	Mex.	17,000,000	340,000	100	2,910,000	Jan. 1907	2.50
[illegible]	B. C.	1,000,000	1,250,000	25	687,600	Oct. 1906	.48
McKinley-Darragh, s.	Ont.	2,000,000	2,000,000	1	60,000	Dec. 1906	.03
[illegible]	Mex.	5,000,000	50,000	100	600,000	Dec. 1905	3.00
[illegible]	[illegible]	[illegible]	240,000	[illegible]	480,000	Nov. 1906	.50
Mines Co. of Am	Mex.	2,000,000	2,000,000	1	$ 120,000	Dec. 1906	.02
N. Y. & Hond. Ros	U. S.	1,500,000	150,000	10	2,212,000	Dec. 1906	.20
Nipissing, s	Ont.	6,000,000	1,200,000	5	780,000	Jan. 1907	.25
North Star	B. C.	1,500,000	300,000	1	351,000	Dec. 1904	1.00
N. S. St. & Coal, com	N. S.	5,000,000	15,750	100	788,600	Nov. 1904	2.00
[illegible]	N. S.	1,030,000	10,300	100	329,600	July 1906	2.00
Penoles*	Mex.	250,000	2,500	100	7,763,375	June 1906	20.00
[illegible]	Mex.	3,000,000	300,000	10	5,588	Sept. 1906	.01
Reco, g. s. l	B. C.	1,000,000	1,000,000	1	327,082	Apr. 1906	.02
Silver Queen, s	Ont.	1,500,000	1,500,000	1	130,000	Jan. 1907	.08
Slocan Star	B. C.	500,000	500,000	1	575,000	Dec. 1904	.05
St. Eugene Con	B. C.	5,000,000	5,000,000	1	402,120	Oct. 1906	.02
[illegible]	Mex.	1,000,000	10,000	100	[illegible]	Jan. 1907	2.00
Tilt Cove, c	N. F.	1,000,000	80,000	2	21,360	Jan. 1906	.48
[illegible]	Ont.	1,000,000	1,000,000	1	40,000	Dec. 1906	.04
Tyee, s	B. C.	940,000	180,000	5	136,800	Dec. 1904	.24

*Mexican Currency.

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THE HYDRAULIC COMPRESSED-AIR POWER PLANT AT THE VICTORIA MINE

Pressure Secured Without Moving Machinery—Cost and Efficiency

BY D. E. WOODBRIDGE*

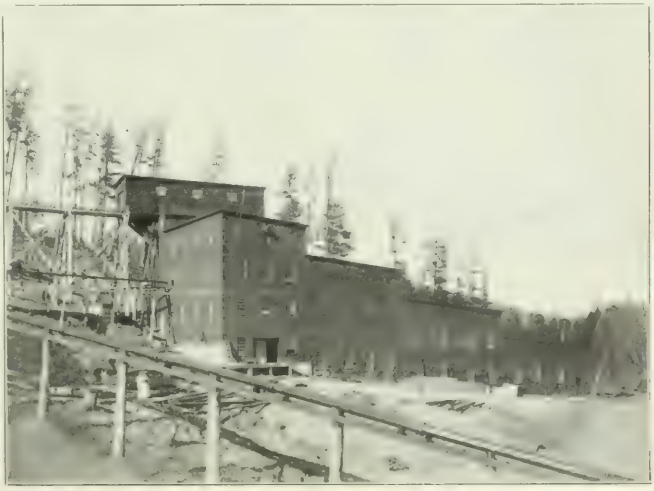
The clever adaptation of an old method of air compression in successful operation at the Victoria mine and mill, Ontonagon county, Mich., is now running every power consumer around the property. More than 82 per cent of the actual power of the water is transferred to compressed air under a pressure of 117 lb., without the aid of any moving machinery, delivered to the air main dry and at the temperature of the water. As the installation of this compressor, including all expenditures, cost less than $22 per h.p., and the construction of the dam and canal with all accessory expenditures was about the same, the cost of this power averages about $2.25 per h.p. year, allowing 5 per cent. interest on first costs. It is practically automatic and, as there are no moving parts, it is a most durable installation. The plant was designed and built by C. H. Taylor, of Montreal, under a guarantee to develop over 4000 h.p. with an efficiency of 70 per cent.

VIEW OF THE DAM, A PORTION OF THE CANAL, THE COMPRESSOR HOUSE AND THE BLOW OFF

DETAILS OF CONSTRUCTION

Water is taken from the Ontonagon river, and is returned to it a mile farther down stream, after the benefit of a net fall of 71 ft. has been secured. A concrete dam 300 ft. long and 10 ft. high was built across the river, and from this a sufficient flow for the works was diverted to a canal that conveys the water needed a distance of 4000 ft. down stream. This canal has a sectional area of 350 sq.ft. There is a net drop of 71 ft. to the level of the river. At the foot of the canal three vertical, circular and smoothly cemented shafts were sunk 330 ft., each being 5 ft. in diameter, and ending in the roof of a large chamber. Down into this chamber project conical steel tubes. They continue the shafts 16 ft. and flare to a diameter of 7 ft. 4 in. at the base, set above concrete spreading piers built upon the chamber floor. The concrete bottoms of the rock shafts, the conical spreading piers and the steel tubes between are shown in the illustrations.

The chamber into which the water from the canal falls is at this point 57 ft. wide by 22 ft. high, and carries these dimensions for 50 ft. and then narrows to a width of 18 ft. and a hight to the center of its arched roof of 25 ft. and so continues till it has reached a total length of 282 ft. Here the chamber becomes a tunnel with a hight of 10 ft., and continues

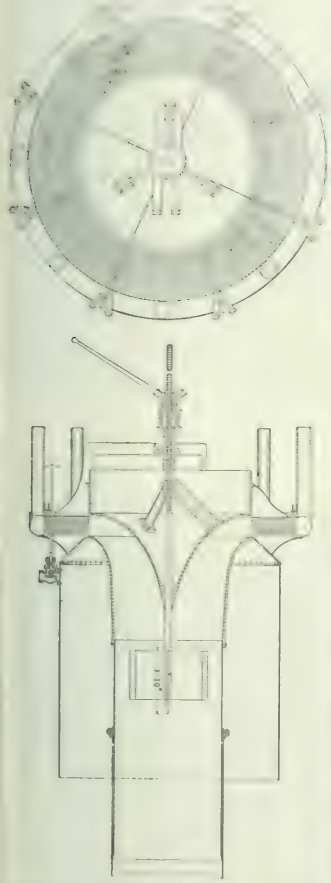


VICTORIA STAMP MILL

*Mining engineer, Duluth, Minn.

VERTICAL SECTION OF TAYLOR HYDRAULIC AIR COMPRESSOR AT VICTORIA MINE, MICHIGAN

as such for 40 ft., where an incline shaft to the surface carries the water to the river. Compression takes place in this large underground chamber, excavated in rock. From the level of the forebay to the top of the water in the air chamber is 342 ft.; the water-power head from the forebay to the tail-water line is 71 ft. and the air-pressure head is therefore 271 ft. The air capacity of the underground chamber, between its water line and roof, is 80,264 cu.ft.



PLAN AND SECTIONAL VIEW OF HEADPIECE, HYDRAULIC AIR COMPRESSOR

A tunnel at 30 deg. incline was run from the upper end of the chamber to the surface, carrying the air main which conveys the power to the mine and the mill, and also a 12-in. blow-off. The space in this tunnel not occupied by these pipes is solidly filled with concrete. The blow-off, or escape pipe, opens at the water level in the chamber 12 ft. below its roof, and terminates with an open end 5 ft. above the tail-race level. Its purpose is that of a governor.

[illegible]

On the bottom of the forebay are the upper ends of the three cylindrical shafts, each in a steel tube rising 6 ft. above the base of the forebay. In this and forming its upper movable end, is telescoped an additional length which moves freely up and down so that it may be in any depth of water or may be so high that no water can flow over it, thus shutting off the operation of the plant. Above this is an annular [illegible] which [illegible]

DISCHARGE END OF AIR CHAMBER. SUSPENDED END OF BLOW OFF PIPE

to be below water level when the plant is in operation.

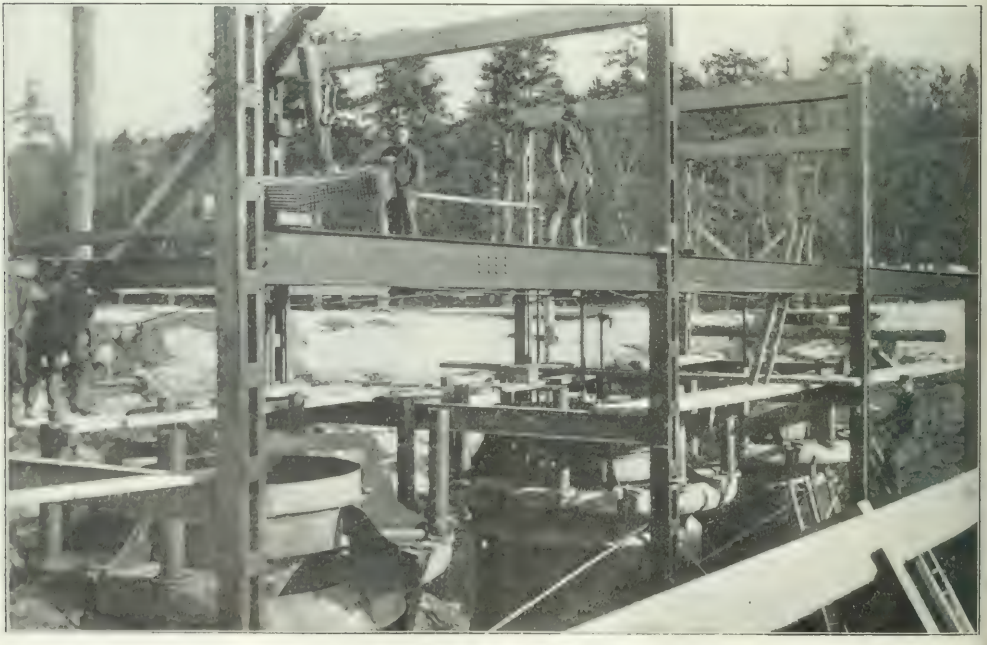
This header has an average diameter of 10 in., and is directly connected with two sets of tubes, one of which is composed of eight 7-in. verticals, the upper ends of which project above water line, and which are the atmospheric intakes. There are eighteen hundred ⅜-in. tubes projecting inward horizontally from the header. Over these, water flows downward and by its suction draws air down the atmospheric intakes, through the small tubes, and into the column of water descending the main shaft to the compression chamber.

The space between the concave and convex cylindrical castings, shown in the drawing of the headpiece, is adjusted by dropping the concave casting down a lifting screw, which is also shown. In the hub of the spider supporting this casting is set a fixed nut, which revolves with the casting on the lifting screw. This [illegible] the castings and cuts off as much of the air feed through the horizontal tubes as may be desirable. The efficient point of feed being found, the concave casting may be set more or less permanently. Each headpiece is so formed that it is an inverted tank, or float, the whole construction being suspended by the lifting screw with the capstan nut supporting it fixed in I-beams of the building.

METHOD OF CONTROL

To operate the compressor, the head-

BASES OF SHAFTS AND SPREADING PIERS IN MAIN CHAMBER.



THE HEAD PIECES DURING CONSTRUCTION

ICEBERG, 90 FT. HIGH, FORMED FROM BLOW-OFF

piece is lowered by turning the capstan nut until the lower rim of the upper conoid casting drops a few inches below the water level in the forebay; in this position the water rushes in between the mass of ⅜-in. air tubes, entering the opening between the two conoid castings on its course to the shaft. The water, on passing the end of the small air pipes, begins to drop away at an increased velocity, causing a partial vacuum to be formed, drawing the air through the ⅜-in. air tubes and inclosing small bubbles in the descending water and carrying them down the shaft, gradually compresses them, at the same time taking up the heat of compression.

At the lower end of the shaft the mixed volume of air and water is spread out in all directions by the conical cement pier, and slowly flows along the separating chamber to the outlet tunnel and shaft. The air rises through the flowing water, having sufficient time to separate and accumulate in the dome of the chamber, forcing the water down till it reaches the lower end of the 12-in. escape pipe. This it unseals and allows air to rise and mingle with the water in the pipe. The water becomes too light to resist the air pressure, and is forced out of the upper end at the surface. The surface air continues to escape, preventing the water from being forced down any lower in the chamber by the further accumulation of air. If air is drawn off through the 24-in. air main to the full capacity of the compressor, the water rises in the chamber till it seals the lower end of the escape pipe, filling it with water and preventing the air from escaping. It remains there until a further surplus is compressed, causing it to repeat its action. The water, free from air on reaching the end of the chamber and tunnel, flows up the incline shaft, discharging into the tail-race.

ing only when the compressor is overworked. In this case so large is the chamber, and so great the compressing capacity of the works (more than 36,000 ft. of free air per min.) that air may be drawn off at the rate of 72,000 cu.ft. per min. for a period of 18 min. without causing a drop in pressure of more than 5 lb., delivering double the power of the compressor during that period, and accumulating again as soon as the extra demands are withdrawn. It, therefore, has special advantages in cases of wide fluctuations of power and a limited supply of water.

AUTOMATIC REGULATION

The heads are raised and lowered automatically by means of an air connection by way of a small pipe in the side of the shafts from the chamber below. The base of this pipe is so placed that when the compression of air has proceeded sufficiently it lifts the rim of the lower conoid casting and prevents the further flow of

SETTING UP ENGINE AT THE [illegible] MINE

tanks thus utilized to lift the conaid casting leak air automatically through an adjustable valve. As soon as the pressure below is relieved, they drop the casting back into place, and the automatic flow of water down past the mouths of the minute feed pipes recommences.

There are three vertical shafts for the reason that they give greater efficiency with less water during a dry season than one, and by this arrangement a very high efficiency is secured through a range of from 1000 to 5000 h.p. As the power requirements of the Victoria plants are about three-fourths of one head there has never been occasion to operate the three. With one head running at full capacity the surplus air escapes through the blow-off, throwing streams of mixed air and water fully 500 ft. into the air, like some mammoth geyser, with a frequency and hight exceeding that of any of the famous geysers of the Yellowstone. The beauty is fully equal to that of the natural spouters.

EFFICIENCY OF THE PLANT

Air from this plant is conveyed about a mile to the mine, through a 12-in pipe. There it supplies 15 to 20 Rand drills; seven pumps of 150- to 200-gal. capacity each, raising mine water from a depth of 2200 ft.; one hoist running at a speed of 1500 ft. per min., and requiring 500 h.p.; other engines for cable lines, crushers, stamp and saw mills, shops, stamp head crushing 350 tons of rock daily, and other machinery. The mill inclosing the stamp head and mill engine is 500 ft. from the compressor. With these duties the gage pressure at the end of the air main has never varied.

Tests made by Messrs. Sperr and Hood, of the Michigan College of Mines, have shown the efficiency of the plant to be 82 per cent. when running at nearly maximum capacity. For all practical purposes it makes little difference in a plant of this sort, running on an abundant supply of free water, whether the efficiency is more or less, and perhaps if it were not for the resistance of the air bubbles descending the shafts it would be even higher than recorded.

Iron in Sweden

Production in Sweden showed a moderate increase in 1906, and there was a larger demand. Production and exports for 10 months ended Oct. 31 were as follows:

Pig iron	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	
[illegible]	[illegible]	

There was an increase in 1906 in the exports of 3600 tons in pig iron, 1900 tons in blooms, and 3000 tons in wire-rods.

The London Tin Market in 1906

SPECIAL CORRESPONDENCE

Opening at £161 12s. 6d. for spot warrants, and £161 7s. 6d. for three months', the market was momentarily depressed by realizations for bull account. The result was a small [illegible] in the three months' price. But buying orders predominated, chiefly for American consumption, and offers were readily absorbed. Eastern sellers were reluctant, and a rise in the Eastern exchange was unfavorable for importers, while stocks in the Straits seemed to be almost depleted. Thus a persistent rise culminated on Jan. 12. Thereafter a reduction in the Eastern exchange, and the approaching Dutch sale of Banka, facilitated a temporary relapse, but the American demand continued unabated, and speculation favored the rise—particularly when it was known that the Banka sale had realized the surprising equivalent of £169 2s. 6d. London prices quickly recovered, there being a particularly brisk demand for March dates. The closing days of the month brought forth a volume of demand which frustrated all bear tactics, and prices rose rapidly to £166 5s. for spot, and £165 7s. 6d. for three months', closing strong.

February revealed at the outset a reduction of 650 tons in the London stocks, notwithstanding large shipments from the Straits, and the price of spot warrants rose sharply to £167 2s. 6d. This was followed by a slackening in the American demand, with some pressure of bear sales. Advices from the East indicated shortage of labor and of material, and a renewal of American demand sufficed to absorb all parcels offered. On the other hand, the Welsh demand fell off, and confidence was disturbed by political complications, and the closing days of the month were comparatively uneventful, with spot warrants £165.10s., and three months' £163 15s.

March opened with a temporary depression, due in part to the statistics being less favorable than had been anticipated, while leading operators held aloof. Price drifted down, but this was the signal for renewed activity and an almost uninterrupted advance till the end of the month. About the middle of the month it was known that shipments from the East were on a very moderate scale, and an increasing demand for March and April dates helped to widen the back wardation on three months' warrants to £2 5s., March 16. Thenceforward it was a keen struggle between bull and bear, wherein the latter had ultimately to accept defeat. The closing prices were £169 for spot warrants and £166 for three months'.

April found abundant evidence of serious shrinkage in stocks, East and West, resulting in large dealings and a general anxiety to cover all commitments. Prices advanced rapidly from the outset, and brought out holders anxious to realize thereby, but the quantities thus offered were promptly absorbed, American buyers in particular being quite ready to pay top prices. This state of things continued throughout the month, which will be memorable for its volume of trade and for the record prices paid. Some realizations helped to ease the situation, and to encourage the bears, whose operations lowered the price to £177, whereat the month closed, the backwardation being thus widened to £6 10s.

May was destined to bring forth the most remarkable development which the market had ever known. There was at first some hesitation, due in part to uneasiness in the money market and to the shrinking values in copper and pig iron, but this was soon followed by bold buying, chiefly on behalf of consumers, whose orders had to be executed in London, Eastern sellers being reluctant to part with any large quantity. Moreover the statistics at the end of April disclosed the lowest total on record, 11,959 tons, with no prospect of early increase. Prices advanced by leaps and bounds, enormous profits were realized, and excitement was intense. The enhanced prices made bears venturesome, but the market resisted all attacks. Continental consumers who had hitherto bought cautiously, and only for immediate needs, now hastened to cover their probable requirements for the rest of the year. Tin-plates also were bought largely for American account. By the middle of the month spot warrants had advanced from £183 7s. 6d. to £215, and three months' from £177 15s. to £205, in a market scantily supplied. At this juncture there was some wavering, which was the signal for aggressive bear selling, followed by a general slump in values. By May 21 spot warrants had fallen back to £184, and three month's to £175, Eastern sellers having meanwhile put considerable quantities on the market. The situation, however, was full of risk for the bears, there being no sign of increasing supply nor of any diminution in consumption. Accordingly the more cautious bears proceeded to cover their sales, and the advent of new orders from consumers combined to initiate a recovery to £190 15s. for cash, and £188 15s. for three months'. Fluctuations continued bewildering in their breadth and frequency. The Banka sale on May 29 went at the unexpectedly low average of £181 2s. 6d., and statistics showed an increase of about 400 tons. This latter fact was perhaps due rather to accumulation of supplies than to actual increase in production as compared with consumption; but bears made the most of it to force sales, while consumers—having covered their immediate requirements—were chary of further operations. The result was that this eventful month closed with an easy tendency, £181 15s. for spot warrants, and £181 10s. for three months'.

June began under more normal conditions, excitement having subsided. Prices eased off. Eastern sellers, alarmed at the recent fall in values, had made some concessions which were now withdrawn. The next noticeable feature was the cessation of American demand, due in part to trouble in the Chicago canning industry. Bull accounts in many cases were liquidated by disappointed holders, and some parcels arriving in London had to be warehoused. A further fall was the natural result, but an improvement set in later, prompted mainly by the covering of bear accounts for August and September, and also by the firmness of Eastern sellers. The market was irregular and subject to frequent bear attacks. Further decline was arrested by the firmness of Eastern sellers, and by improved demand for August delivery. The closing days of the month brought values up to £177 5s. for prompt, £175 15s. for three months', and £177 15s. for August dates.

July was chiefly noticeable for the premium commanded by warrants for August dates throughout the month. The opening days saw a steady decline in values. Eastern holders became restless after a long period of reserve, and consumers remained generally unresponsive. Bears, who at first covered their recent sales with some eagerness, were quickly to the front with renewed attacks on the market, while bulls were no less active in liquidating their holdings. There were sharp fluctuations. Pressure of sales by Eastern holders and the liquidation of short prompts by local speculative holders brought down values £2 in two days. At this lower range the market steadied, and fluctuations were thereafter moderate, consumers being more in evidence and bulls more enterprising. The periodical Banka sale realized the equivalent of £175 for delivery in London, which price was too inflated for the London market to follow. The end of the month found the statistical position favorable for an advance, and there was some important speculative demand for French account, besides good American demand. On the other hand, some apprehension was felt in regard to 1500 to 2000 tons, said to be held in the Straits for Chinese account, and not comprised in the statistics. A notable feature of the month was the disappearance of the backwardation on three months' warrants; it reached its maximum of £3 15s., July 2, gradually dwindled until July 17, when the price was uniform for cash and for three months', revived and reached 12s. 6d., July 19, again dwindled and was wiped out on July 30, when, after a long interval, a contango was established. Closing prices were £170 12s. 6d. for cash, and £170 17s. 6d. for three months'.

August gave promise of renewed American demand for which dealers hastened to prepare themselves, while holders were correspondingly reluctant to sell. The situation was [illegible] erous orders from consumers, with the result that the first four days witnessed an advance. A sharp reaction followed, bringing down the cash price, partly induced by selling pressure on the part of Chinese dealers who had missed their opportunity and had taken alarm. Trade requirements were, however, too manifest to allow of any lengthy depression, and a gradual recovery ensued which, with few checks, lasted till the end of the month. New York orders were heavy and urgent, and a large general consumption was assured. Speculation was less active, being more absorbed in copper and iron, and prices improved mainly on the strength of consumptive demand. The contango on three months' warrants varied within £1 per ton, but had disappeared by the end of the month when the price was uniform at £184 15s.

September opened with a slight set-back in values, followed by quick recovery prompted partly by statistics, which revealed a decrease of 1207 tons during the previous month, partly by large and urgent American demand, partly also by the firmness of Eastern sellers in responding to English demand. A large business was done in English refined sorts. Toward the end of the month a steady advance ensued. The periodical Dutch sale fetched the relatively high equivalent of £188 15s., and was followed by renewed consumptive inquiry. Closing values were £191 for cash warrants and £190 7s. 6d. for three months'.

October opened with a sudden advance, both in copper and tin, the latter commanding £195 for cash warrants. This proved a temptation for bears, whose operations brought about a fall, followed by subsequent recovery. Smaller fluctuations followed with a rise to £197. By Oct. 25 the demand from America had become spasmodic, and the market was hardly prepared for the surprise which came from that quarter on Oct. 29, when brokers received instructions to sell quantities for early shipment from the United States at below current value. This was generally regarded as a crude stratagem, seeing that there were abundant indications of American stocks requiring replenishment rather than depletion. It served, however, to disturb the market with wild fluctuations. The panic was of short duration, and the month closed with a firm tendency, cash warrants commanding £192 12s. 6d. and three months' £194 5s.

November found the market ready for a sharp advance which, within three days, raised prices about £5 per ton. This, however, was too sudden to be sound. European operators held aloof in face of certain tactics adopted by American bears, while Eastern sellers showed willingness to make concessions for November and December shipment. A sudden drop of between £3 and £4 served to clear the situation. With small stocks and active consumption a gradual improvement set in. The closing day of the month found prominent support withdrawn and the market subjected to a determined bear onslaught, notwithstanding the favorable indications apparent both in consumption and supply. Final quotations were £196 15s. for prompt cash, and $197 for three months.

December opened with an initial advance, promptly followed by a determined onslaught by bears and consequent free selling from the East. This depression was generally attributed to American inspiration, and quickly gave way to a recovery. Meanwhile there was active demand for tin-plates, which was met chiefly by the Welsh makers, the American makers being too busy in other departments. Thereafter the market steadied, the speculative element being partly overshadowed by the abnormal situation in copper, and prices moved within narrow limits. The middle of the month found stocks moderate, bulls confident, and bears restrained by the optimism manifest in trade generally, while Eastern sales were but moderate, and at relatively higher prices than those ruling in London. Toward the close bear selling was again aggressive, being probably encouraged by the apathy of American consumers and by the stringency of money. Realizations of near prompts further tended to depress prices, and transformed the recent backwardation of 15s. into a contango of the same figure. The underlying strength of the market was manifested at the close, when prices stood at £196 and £196 15s., respectively, for spot and three months'.

Canda Tempered Steel Jaw Plate

The Chrome Steel Works, Chrome, N. J., is placing on the market an improved wearing plate for Blake type crushers, consisting of a combination of forged and rolled chrome steel bars (forming the corrugations) inserted into a backing of tough open-hearth cast steel. The plate is constructed by placing into the mold, side by side, the forged steel bars, forming the wearing face, and casting the soft steel back around these bars, interlocking and cast welding the entire back of the plate to the bars. The face of the plate is afterward tempered to the desired degree of hardness. The tough open-hearth steel for the backing is of such a low carbon that it does not take any temper whatever, thus a plate combining both extreme hardness and toughness is obtained. The bars are furnished in sections of several widths so that plates for any size crusher may be conveniently constructed at a moderate cost.

Leasing mines, with or without option of purchase, has been gradually growing in favor in British Columbia, particularly in the Slocan.

THE RAW MATERIALS FOR STEEL MAKING AT PUEBLO

The Colorado Fuel and Iron Co.'s Supply of Ore, Limestone and Coke—Methods of Handling—Yards, Storage Bins, and Conveying Machinery

Iron ore for the blast furnaces of the Colorado Fuel and Iron Company's Minnequa works at Pueblo, Colorado, is obtained from three sources: Orient, Colorado; Fierro, New Mexico; and Sunrise, Wyoming.

THE ORIENT IRON MINES

Orient is situated in the eastern part of Saguache county, Colorado, at an altitude of 9200 ft. It is on the Villa Grove branch (narrow gage) of the Denver & Rio Grande Railroad, 134 miles west of the Minnequa works at Pueblo. The Orient iron mine was opened in 1882, and for many years was the only source of supply for the furnaces at Pueblo. The ore is a brown hematite, and averages about 50 per cent. metallic iron. There have been five claims in the group which were worked by stopes reached through a rock tunnel 800 ft. long. This deposit has been almost entirely exhausted, and is now being cleaned up by contractors.

THE FIERRO MINES

Fierro is situated at an altitude of 7000 ft. in the north central part of Grant county, New Mexico, 690 miles south and west of the Minnequa works at Pueblo, by way of the Santa Fé Railway and the Hanover branch of the Silver City & Northern Railway. The '86 mine, since abandoned, and the Jim Fair were opened by the Colorado Fuel and Iron Company in 1899, the Union Hill in 1901. Ore from the Jim Fair is a mixture of 75 per cent. red hematite and 25 per cent. magnetite. Union Hill ore is a mixture of 75 per cent. magnetite and 25 per cent. red hematite.

The ore in both mines is very hard, requiring, as is usual in the case of even average hard ore, especially tempered drills and heavy charges of powder to dislodge it. The average percentage of pure metallic iron in the ore from both mines at Fierro runs from 57 to 60 per cent. At first very little underground work was done at the Fierro properties, where the ore stands in immense dikes, and was originally quarried out in open cuts. The ore is loaded into steel truck cars, holding 2 to 4 tons, and carried down a gravity incline 100 ft. to a tipple above the railroad tracks. From the tipple the ore is dumped into a Gates crusher, is there broken into pieces of apple size and dropped into the railroad cars below. Now, as at the Sunrise mines, most of the ore is being taken out by the milling process of underground mining. The Fierro group continue to be good producers.

THE SUNRISE MINES

The Sunrise deposit is the most extensive and important now being worked by the company, and produces the great bulk of the ore used in the furnaces at the Minnequa works. The Sunrise mine proper is situated at an altitude of 4486 ft., in the north central part of Laramie county, Wyoming, 356 miles from the steel plant at Pueblo. It is on the northern division of the Colorado & Wyoming Railway (operated by a company auxiliary to the Colorado Fuel and Iron Company), which connects with the Burlington & Missouri River Railway, at Guernsey, and the Colorado & Southern Railway, at Hartville junction.

Before the advent of white men, the Indians resorted to this district to get the red ore for war-paint. In 1899 the Colorado Fuel and Iron Company secured a lease and option on some of the properties in the group which have since been bought. The company now owns or controls all the valuable properties in the Hartville iron district.

The entire region has been systematically prospected with diamond drills, etc. The Chicago group, a short distance from the Sunrise mine proper, has been opened up during the past two years. In both the Sunrise proper and the Chicago, mil

PANORAMIC VIEW OF THE MINES AT SUNRISE, WYOMING

IRON MINES AT FIERRO, NEW MEXICO

[illegible] tons of ore have been [illegible] up." The production, although now large, is being constantly increased. When the company first began operations in the Sunrise mine proper in 1899, the open-cut system was employed exclusively. After the surface waste rock had been stripped down to the orebody the ore was loosened and broken up with black powder and dynamite, after which it was loaded by steam shovels directly into standard-gage railway cars on adjoining tracks.

Now the open-cut system has been largely replaced by the milling system of underground mining, the ore being handled through tunnels and shafts. A complete modern plant for the most economical handling of the ore has been installed. The ore is dumped from skips which discharge into bins, from which in turn the ore is drawn off into the automatic dump-cars and carried to the steel works. The ore is a red hematite, running about 60 per cent. in metallic iron, and occurs in great lens-shaped deposits.

Owing to the failure of the Burlington & Missouri River Railway to complete an extension to the new Chicago group on schedule time, and to other unforeseen delays in development and equipment, it was impossible to produce enough ore from the company's own mines, during a part of the fiscal year ended June 30, 1906, to supply the furnaces at the Minnequa works.

Accordingly 72,992 gross tons of iron ore were purchased from Lake Superior properties. Since the completion of the railroad to the new Chicago property, however, the company has been producing an ample supply of ore for present needs, and will be able in the future, as in the past, with the one exception noted, to meet from its own mines the increased demands due to the erection of the additional blast furnaces now projected.

Besides the producing iron mines mentioned, the company owns or controls iron-ore claims throughout its territory, and is carrying on prospecting at various points.

LIMESTONE AND DOLOMITE QUARRIES

All the limestone for fluxing at the steel works, was originally taken from the company's quarries, at Lime or San Carlos, six miles south of the Minnequa Works. Until 1897 this work was done under contract, but after the company began operations on its own account, more satisfactory results were obtained. The rock is torn loose from the bed by giant and black powder, and is broken with sledges to sizes convenient for loading on pit cars, in which it is hauled by mules and a gravity tram line to the Gates crusher, into which the cars automatically dump.

The rock, crushed to an average size of two inches in diameter, drops into bins from which it is drawn off into dump cars that carry it to the bins at the furnaces.

Although the quarries at Lime still furnish considerable limestone, the greater portion used at the plant now comes from Calcite quarry, about 90 miles west of the Minnequa works, on the Denver & Rio Grande Railroad. Here a very superior grade of limestone, running exceedingly low in silica, phosphorus, and other impurities, is found upon one side of a cañon, while on the other side [illegible]

omite, which is used extensively in the open-hearth furnaces. The limestone and dolomite, broken up by hammers, are loaded into pit cars, which empty into gravity cars, which in turn, carry the stone by a gravity line to a tipple, where it is dumped into standard-gage cars and conveyed to the furnaces. There is no crusher at Calcite, but the limestone is broken by sledges to a practicable size. The dolomite is ground at the works.

BINS FOR ORE [illegible] LIMESTONE AT MINNEQUA WORKS

men, coal-mining machines are little used in the properties, dependence being placed chiefly on the "diggers," armed with hand drills and picks, who work on a tonnage basis. The coal is loaded by hand into mine cars, which are hauled by mules and electric trams or gravity lines to the "tipple." There it is dumped automatically into railway cars.

The coal for coking is hauled to the washeries, where it is automatically dumped into bins from which conveyers carry it to crushers. After being crushed it goes to the "jigs," where the coal is separated from the slate, bone and rock. Later it goes to the "disintegrators," which reduce the coal to the consistency of cornmeal.

This "slack" is then loaded automatically into larry cars, which are run along the top of the bank of bee-hive coke ovens into which it is dropped. After burning for from forty-eight to seventy-two hours in the ovens, the residual coke is drawn out by men, known as coke pullers, armed with long rakes, and loaded with forks into automatic dump cars.

The coke used in the blast-furnaces at the Minnequa Works comes from the company's mines and coke ovens at Sopris, Starkville, El Moro, Tabasco, Segundo and Tercio, all in the "southern field," or Trinidad district.

When the automatic dump-cars carrying coke, limestone or ore, as the case may be, reach the steel works they are switched to a track which runs along the top of the blast-furnace bins into which they discharge their contents. Ore which requires crushing, is first passed through a crusher, with a capacity of 150 tons an hour, located in the south yard, from which it is automatically conveyed into dump-cars and carried to the bins.

A very extensive or elaborate stock-handling system has not been deemed a necessity at the Minnequa works, because the haul from the mines to the furnaces is comparatively short, because a constant and regular supply is received each day, and because the winters in Colorado are comparatively open. The present bin system consists of a single row of bins extending the entire length of the furnace plant. The bottoms of the ore and stone bins slope about 45 degrees, and the bottoms of the coke bins slope about 40 degrees to the horizontal. The bins are a massive steel structure 1760 ft. long, the sides and bottom being of heavy steel plate. The bins for each furnace consist of a series of coke bins on one side and a series of ore and stone bins on the other, divided by a number of cross partitions.

The necessity for an elaborate stock-handling system is also partly eliminated by the fact that comparatively few kinds of ore are used. Nevertheless, a considerable amount of stock is kept on hand at the works as a reserve in case of breakdowns at the mines, temporary suspension of railroad communication, or other causes of interference with the regular supply. The reserve supply of coke is usually kept stored in piles in the south yard. Parallel to the line of bins, along the old ore trestles, a large amount of ore and limestone is constantly handled.

QUARRIES AT LIME, COLORADO

[illegible] OF THE TOWN AT SUNRISE, WYOMING

A considerable amount of the ore, coke and limestone comes to the works in other than the automatic dump-cars, owing to the failure of the railroads to furnish a sufficient supply of these cars despite the fact that the company's auxiliary railroad owns a large number. All these non-dumping cars go to the trestles, where they are emptied, so far as possible, by two Dodge cranes, furnished with clam-shell buckets, after which they are cleaned out by laborers with shovels. The two Dodge cranes run along a track of 20-ft. gage, composed of rails running 150 lb. to the yard. Each crane has an extreme radius of operation of 80 ft.

The cranes are operated by 150-h.p. motors, driven by a 220-volt direct current. Each of the clamshell buckets has a capacity of three tons for each grab, and can handle approximately 96 tons of ore per hour. These cranes transfer the ore and limestone either from non-dumping cars to dump-cars, from cars to stock pile or from stock pile to dump-cars. Dump-

cars loaded in this manner from the stock piles are run along the top of the bins and dumped as in the case of the dump-cars that come direct from the mines.

Under the ore, coke and limestone bins is a standard-gage track upon which runs a trolley charging car driven by two motors and equipped with a Fairbanks 15-ton scale. The ore, coke or limestone drops from the bins into the car when the operator of the car raises the shutter of the bin with a lever. By means of a weighing attachment the operator is able to draw off into the car exactly the requisite amount of each material, thus insuring uniform charges for the furnaces. The charging car is then run to the skip pit, where the contents of the charging car are discharged into the skip car, which is hoisted with the charge along the skip bridge to the top of the furnace, where in turn the charge is dropped into the hopper about the upper bell.

COAL WASHERIES AT SEGUNDO, COLORADO

CONVEYER AT ORE CRUSHER

Coal Mining in the Indian Territory

The mines operated by the coal department of the Missouri, Kansas & Texas Railway Company are the largest producers of coal in the Indian Territory. The four mines now being worked are located near Coalgate, Indian Territory, while the main offices are at Parsons, Kansas. Of the four mines now operating, Nos. 9, 10 and 12 are producing, while mine No. 14 is still in the period of early development. The first three mines are shaft mines, while the coal seam in the last operation is reached by a slope.

In all of these mines the coal shows a thickness of from 4 to 5 ft. The pitch of the seam is variable; at mine No. 9, the bed dips 14 deg. to the south, while at mine No. 14, present prospects tend to show that the coal seam pitches 15 deg. to the north.

The Lehigh vein is the only seam worked, and produces a coal that answers fairly well for steam and domestic purposes. The deepest shaft is that at the No. 12 mine, where the coal is hoisted 650 ft. The combined size of the two hoisting compartments of the main shaft is 7½x14 ft., while the third compartment, above which is stationed a 14-ft. Crawford and McCrimmon fan, is 2x7½ ft.

Another air shaft, 7x12 ft. and 158 ft. deep, is equipped with one 22-ft. Duncan Foundry and Machine Company fan. The hoisting is accomplished by a Danville double direct-action engine, with 24x36-in. cylinders, having a drum 8 ft. in diameter. On the slope is installed a Litchfield double hoisting engine with 10x16-in. cylinders, having a 52-in. drum. The necessary steam for driving these engines is furnished by a battery of 3 steel tubular boilers, 20 ft. long and 66 in. in diameter. At the old No. 4 shaft are four 48-in. boilers which also furnish steam for operating a part of the general equipment.

PART OF 800 COKE OVENS AT SEGUNDO, COLORADO

The London Spelter Market in 1906

The opening of the year found producers sold well ahead, and only moderate quantities of the article in second hands. The galvanizing trade was very active, necessitating large purchases of spelter: and sheet zinc was in good demand. Under these conditions the market was firm at or about £29 10s. for specials, until Jan. 15. On that day there was a sensational fall in prices, due to forced sales of speculative holdings, involving a sudden drop of £1 per ton. Buyers naturally held off and awaited developments, with the result that within three days ordinary brands were offering at £27 12s. 6d., and specials at £28 2s. 6d. Jan. 22 there was a sharp recovery to £28 1s. 3d. for ordinaries, and prices strengthened during the next few days. But renewed selling pressure soon dissipated the improvement, notwithstanding producers still refused to make any concessions; and prices drifted down until the end of the month, when ordinaries were quoted £27 1s. 3d. and specials £27 7s. 6d.

February opened quietly, consumers being very reserved in face of the persistent decline, although producers remained firm in their demands. A slight improvement set in later, prompted by realizations on the part of bears; and price of ordinaries improved. This, however, was of short duration, for Feb. 13 a sensational fall in prices was caused by the operations of disappointed speculators, followed by further bear sales. Consumers' support was lacking, and the market was the sport of small holders who—toward the end of the month—depressed the price down to £25. The consuming industries, however, continued to be well employed, Galvanizers found no need to abate their selling prices, and there was considerable activity in sheet zinc. The month closed at a slight improvement from the lowest, ordinary brands being held for £25 3s. 9d. and special brands for £25 10s.

March opened with moderate buying on the part of consumers whose favorable attitude was, however, counterbalanced by persistent speculative selling; and within a week the price of ordinary brands had fallen to £24 5s. Producers, however, took a totally different view of the situation, and would make no concessions. Dealers ultimately found it difficult to obtain their supplies; and the influence of a strong buying movement on the Continent caused a sharp recovery of 10s. Consumptive demand supervening, a further advance brought the price up to £25 2s. 6d. Reports from all quarters indicated distinctly improved inquiry for sheet zinc, and it was hoped that the galvanizing trade would display similar activity. Purchases, however, were postponed; and disappointed holders thereafter accepted lower figures. The undertone, however, was sufficiently steady to inspire more confidence; and the month closed at £25 for ordinaries, and £25 12s. 6d. for specials.

April brought abundant confirmation of the recent continental reports of depleted stocks and brisk consumption. Sheet zinc in particular showed increased activity. Galvanizers were soon aroused to enterprise, and there was some anxiety shown to cover requirements for May and June, forward delivery commanding slightly better prices than the early. In sympathy with other metals, spelter advanced in value throughout the month, particularly toward the close. Ordinary brands, which were obtainable at the outset at £25, closed at £26 15s. and special brands at £27.

May opened with renewed activity in the galvanizing trade, for which substantial quantities of spelter were bought. The continental markets were also active at advancing prices. The London market suffered, however, from the forced liquidation of a few speculative purchases, causing some producers to make concessions which held back the price of ordinary brands. May 11 an improvement set in, apparently in sympathy with the rising values of other metals. By this time also galvanizers were again in the market, sheet zinc had developed increased activity at home and abroad, with consequent advance in prices, and producers of spelter had sold out for some months to come, and were quoting impracticably high prices. Trade continued thus, with steady rise in values, until the end of the month, when ordinary brands commanded £27 12s. 6d. and specials £27 15s.

June found the market rather languid, in sympathy with other metals, although with no disquieting feature in itself. The Silesian producers had already sold out for the third quarter of the year. Galvanizers were busy, and the trade in sheet zinc was unprecedentedly large. The American market, which had lately been depressed, now took a strong upward turn and so dispelled any probability of exports from that source. Consumers bought boldly, finding producers unwilling to make any concessions. Thereafter continental dealers were active in pushing second-hand lots for sale, but at a reduced price all offerings were readily absorbed, although consumers now held aloof; and the month closed with a firm market at £27 5s. for ordinary brands, and £27 7s. 6d. for specials.

July opened at the reduced price of £27, and there the price remained for a week or more, with no active demand on the part of consumers and no pressure to sell on the part of producers. Speculators next came forward to re-sell, and prices gradually fell away in the absence of any support; but after £26 10s. had been accepted demand revived, inspired by unusual activity in the sheet-zinc and galvanizing trades and the prospect of good autumn trade. At this point the market was disturbed suddenly by the pressure of second-hand sales. There was prompt response, however, and a speedy recovery, but the market lacked the genuine support of consumers, and final sales were at £26 7s. 6d. and £26 10s. for ordinary brands, and £26 15s. for specials.

August opened with business restricted in view of the holiday on the 6th and the market sensitive to the influence of small lots on offer. Influential buying soon gave it an improved tone, while producers were firm and quite willing to await events. Toward the middle of the month producers marketed large quantities on the continent; sheet zinc was in increased demand, galvanizers were booking large orders extending up to the end of the year and indicating large requirements in spelter, while speculators became less aggressive in the London market and gradually changed on to the bull tack. Toward the close some important orders from India pointed to increased consumption in yellow metal, and galvanizers shook off their reserve and bought boldly. The result was a very gradual but persistent rise in values all through the month—as was the case with metals generally—and spelter closed at £27 7s. 6d. for ordinary brands, and £27 10s. for specials.

September was a very active month in all metals, with the one exception of spelter, in which article the advance was but slow and unimportant. Continental producers were firm in their prices, having mostly sold out their production till the end of the year. The demand from galvanizers and brass manufacturers was sufficient to clear the market of all accumulations, by which time demand and supply seemed to be about evenly balanced. There was great activity in sheet zinc at frequent advances in price. The month closed quietly, but with a strong undercurrent, values being £27 15s. for ordinary brands, and £27 17s. 6d. to £28 for specials.

October opened with a steady aspect, but with little business passing, consumers having been sufficiently far-sighted to cover all early requirements. Oct. 3 dealers showed some impatience to realize on some speculative parcels in London, and prices were depressed. All weak holdings were cleared off and consumers again bought freely. Galvanized iron was in great demand, the trade being occupied to its full capacity. The market was strong, and though second-hand lots were again pressed for sale and values consequently declined, the month closed quietly, but with confident expectation of revival in demand, ordinary brands being quoted at £27 15s. to £28, and specials £28 to £28 5s.

November falsified the expectations of the previous month. The London market was listless and continental dealers became restless in consequence and made cheap offers to consumers, thereby forcing values down about 10s. Toward the middle of the month a large business developed with

home consumers, all cheap second hand lots were absorbed and sheet zinc displayed great activity. The recent loss was soon retrieved and the month closed with a strong undercurrent, due mainly to the large expansion of the galvanizing trade and the firmness of producers, most of whom held for prices much above the London parity and for distant delivery only. Final quotations were £28 for ordinary brands and £28 5s. to £28 10s. for specials.

December opened with a large business with consumers for delivery early in 1907, and at full prices. Efforts to depress prices met with little success, it being evident that little material was free for market purposes, and the trade in galvanized iron was persistently expanding. By the middle of the month dealers had sold well, and producers were holding for prices higher than those currently reported. Fluctuations were very narrow, but generally upward. Toward the close additional strength was imparted to the market by the advent of orders for yellow metal, and closing prices were £28 2s. 6d. to £28 5s. for ordinary brands, and £28 7s. 6d. to £28 10s. for specials.

Cost of Electrolytic Production of Chlorine

BY GEORGE HERBERT HARRISON

The following particulars of the work done by 16 Hargreaves Bird cells at the Piedmont, W. Va., works of the West Virginia Pulp and Paper Company, under license from the General Electrolytic Parent Company, Ltd., of Middlewich, England, during the month of May, 1906, will be of interest to the users of chlorine in the treatment of gold ores:

PERIOD, 31 DAYS.

Amperes	2,600
Volts	56.92
Volts per cell	3.56
Electric h.p. used in cell room	198.5
Total e. h.p. used by plant	270.0
Steam consumed (boiler h.p.)	24.7
Current efficiency	90.0 per cent.
Soda ash produced	120,900 lb.
Chlorine gas	81,511 lb.
Limestone used ($CaCO_3$)	247,758 lb.
Coke used	31,000 lb.

Each cell produces chlorine equivalent to 400 lb. of bleaching powder, 35 per cent., per 24 hours. The repairs on a Hargreaves-Bird plant amount to about $1.25 per ton of the "bleach" produced. The cost of each cell, including royalty in England, is about $1000.

Works on the Hargreaves Bird plan have been put up at Piedmont, W. Va.; England; France; Spain; and one is being put up in Australia.

The advantages of producing free chlorine from salt, where chlorine is used for gold extraction, are great. Engineers can calculate the costs at their own mines from the particulars here given.

In the first nine months of 1906, the kingdom of Prussia produced 95,053,110 tons of stone coal and 34,671,252 tons of brown coal.

The Lake Ore Trade in 1906

BY E. W. PARKER

The season of navigation on the chain of lakes has been one of the most peculiar that the lake region has ever seen. There have been times when lake labor unions have combined to cut down the movement of commodities, unless their demands were satisfied. At other times combinations of vessel owners have been made to affect the rates of transportation. At other times shippers have engaged in disputes which brought about serious entanglements affecting the supply of iron and its price, to the consumers. It has never before been seen that the dangers of a shortage of iron ore have arisen almost entirely from the inability of the Lake Superior region to produce the amounts which the furnaces have demanded. This has arisen from two sources. One of them is the fact that more furnaces have been placed in operation, demanding supplies from the Lake Superior region. Most of the furnaces have been active more continuously than ever in their history, and the sales of Lake Superior ore have been scattered over a wider area. The other condition, which is most striking, is that the high-grade ores are rapidly becoming more scarce, while the guaranteed content of ore is less than it has ever been, demanding that the ore shippers must increase their output to produce the same amount of iron. With the production of pig iron showing constantly new high records it is not surprising that the Lake Superior region should have difficulty in meeting the demands of consumers.

The customary difficulty with lake labor unions attended the opening of the season of navigation. This came earlier than usual and boats were soon put in operation. The lake carriers and dock managers had made the grave mistake, previously, of making contracts with lake unions which expired after the opening of navigation. When boats had been running for several weeks the demands of the mates' union, of the longshoremen, and of the tugmen who handle the boats in port, had to be met. This resulted in a tie up of navigation, after the movement was well under way. The difficulties were afterward adjusted by a two-year contract with the longshoremen, the elimination of the mates' union as a factor, and a two-year contract with the tugmen. Navigation resumed activity. Ore shippers had planned, to supply the demand, to ship 38,000,000 tons. This must be accomplished in a season cut short by labor trouble, and with an urgent demand for coal pressing upon the shippers of that commodity, and the possibility of a heavy movement of grain. These things would naturally tend to cut down the amount of tonnage in the ore trade.

Most the cooling on the [illegible] was made use of in the possibility of shipping the amount of ore that was necessary for the season. These were based upon the knowledge that coal shippers had a late start, and would have to take a larger portion of the fleet later in the year. This would come at the time when the big movement of grain was on. Although there had been an enormous increase in the carrying capacity of the lake fleet, it was apparent the supply was not equal to these demands.

It may be said therefore, without fear of contradiction, the success of the lake shippers in moving upward of 38,000,000 tons of iron ore was directly due to the discomfiture of the shippers of coal and grain, who were prevented from fulfilling contracts by the car shortage which set in during the fall. That the ore shippers were not hindered by this same cause is due directly to the fact that the railroads, seeing they were so dependent for new equipment on the continued activity of the steel trade, set everything else aside and moved the ore as rapidly as it came down the lakes.

The fear of an ore shortage, existing in mid-summer, created an early demand for iron ore for 1907 delivery and consumers began to besiege shippers to make sales. These were held off until early in November, when almost the entire output for 1907 delivery was disposed of in a single week. The amounts sold each customer depended upon his needs in previous years, and his standing as a customer had a good deal to do with the allotment. It was found even then that the supply of iron ore would not go around and some sales were subsequently made at a premium, despite the fact that the regular advance had been to the highest level since the Mesabi range was discovered. There was a horizontal advance in prices of 75c. a ton on bessemers and 50c. a ton on non-bessemers, which with a reduction in the guaranteed content, brought the price of iron ore up 92c. a ton for bessemers above the level of the preceding year. The market price of Old Range bessemer was established at $5, f.o.b. Lake Erie ports for base analysis, but the change in guaranteed content being taken into consideration, this was really equal to $5.17 on the old basis. Bessemer Mesabi was sold at $4.75; non-bessemer Old Range at $4.20, and non-bessemer Mesabi at $3.95. These prices were ultimately advanced 50c. on small sales, as a premium.

It was also apparent during the ore year that shippers have been more generally owners of their own fleets, to the exclusion, more and more, of the merchant fleets. At the end of the year they were so strongly intrenched as to be able to figure, with almost complete accuracy, on the carrying charges for next season, without taking the merchant fleets into consideration or consultation.

THE MINES OF COBALT

The Buffalo, Coniagas, La Rose, Colonial Silver, King Edward, Green-Meehan and University Mines—Open-Cut and Underground Mining

BY REGINALD MEEKS

[illegible] development of the [illegible] idea was to get silver as cheaply and as quickly as possible. The richness of the ore at the surface was a temptation to open every mine by open-cut regardless of the loss which necessarily resulted from flying fragments after blasting. As the district settled down to business it was realized that the mining methods were in need of modification and many mines began to sink and drift. But open-cuts have not been entirely abandoned and nearly every property can show veins opened by that method. Protection is afforded by placing stulls across the opening and covering with boards or timber. There is a growing tendency toward shaft sinking, however, and it will not be long before mining will be carried on under ground and cross-cuts should disclose many "blind" veins.

ORE STEALING

Nearly every camp mining high-grade ore or native metal suffers from petty thefts and Cobalt has been no exception. Ore worth $1 per lb. is found in nearly every mine and it is not surprising that many pounds never find their way to the sacks of the rightful owners. The men are not searched and it is easy for miners to slip pieces of native silver into their pockets. One man will put a rich piece of ore on the end of a car going to the dump and his partner will later find and appropriate the lump. Many thousand pounds are carried away by visitors, although strict orders are issued against this practice.

I was told that a visitor, who was in reality a man financially interested in a mine, was approached by a miner who had two or three tons of ore for sale. This was undoubtedly purloined either by this man or by a "syndicate," because the vendor had no mining property.

[illegible] Mining Company, Ltd.

This company owns 40 acres in the town of Cobalt, lying immediately over the low westerly range of hills. From the standpoint of rich ore and large nuggets of native silver the Buffalo is not a show mine. But it has steadily risen as a producer and now its tonnage is among the best. There are few mines in Cobalt which have conducted as extensive underground work, and although drifting has in many cases been through barren rock, still the veins have been followed and much ore of a satisfactory nature has been mined.

VALUE OF THE ORE

The average silver content of the ore is about 650 oz. per ton. However, the output since May, 1906, has been 1128 tons, or 161 tons per month, which compensates for the lower grade of ore. There are few, if any, mines in the district which produce as cheaply as the Buffalo.

COST OF PRODUCING

All cost of building, development, mining and everything else is directly charged to the ton of ore, and from July to September, inclusive, the average cost was $37 per ton. In October the cost for the month was increased by considerable building expense to $64, which brings the average for the four months to $44 per ton of ore loaded on cars. This is rather a low cost for mining in this district. It is estimated that of the actual mining cost one-half is charged to sorting the ore.

GRADES OF ORE

There are three grades of ore shipped from the Buffalo: The high grade contains about 2000 oz. silver, 8 per cent. cobalt, 40 per cent. arsenic, and nickel unaccounted for; the low-arsenic ore contains less than 3 per cent. of this element, and the company agrees to pay $2 per unit for all in excess of this amount. There is practically no nickel or cobalt and from 125 to 1500 oz. of silver in the form of argentite and native metal; the "cobalt special" contains 8 per cent. cobalt, 45 per cent. arsenic and from 150 to 400 oz. silver.

The ore is shipped to the American Smelting and Refining Company, at Perth Amboy, the Balbach Smelter, at Newark, or the Canadian Copper Company, at Copper Cliff, Ontario.

UNDERGROUND DEVELOPMENT

On No. 6 vein a shaft, 5x8 ft. inside dimensions, has been sunk to a depth of 130 ft. At the 70-ft. level development has progressed as rapidly as possible. There are 390 ft. of drifting and 100 ft. of crosscuts. The vein is tortuous and has been lost at times, but was found again by short cross cuts. The wall rock seemed to be much shattered. There is a 4-in. high-grade smaltite vein, and a 14-in. low-grade vein containing little arsenic. Drifting has begun at the 130-ft. level.

OPEN CUT AT BUFFALO MINES

No. 5 shaft is down 70 ft., but it is not expected to intersect No. 5 vein until it reaches the 100-ft. level. Surface openings at No. 5 show a 4.5-in. smaltite vein, and a 20-in. low-arsenical vein, which are mined together as one grade.

No. 4 shaft has been sunk 48 ft. and at the 70-ft. level a drift is to be run. There will be no showing from this shaft until the vein is cut.

No. 4 vein consists of 3 in. of smaltite carrying very low silver values. No. 3 shows 10 in. of shipping ore in places, but

not enough work has been done to determine the value of the vein.

Of the 40 acres belonging to the company only 16 have been carefully explored. There are nine known veins on the property.

EQUIPMENT

The power house contains one locomotive

SILVER NUGGET FROM LA ROSE MINE

Jenks return water-tube boiler, one Canadian-Rand 6-drill compressor operating six No. 2 drills underground, and there is also a hoist.

The usual buildings are on the property and the management is excellent. The officers are as follows: Charles L. Dennison, president; George C. Miller, secretary and treasurer, and Tom R. Jones, superintendent. The capitalization consists of 1,000,000 shares of $1 par value, of which 900,000 have been issued, and the balance retained in the treasury. So far one dividend payment, amounting to 3 per cent., has been made, which was at the rate of 1 per cent. per month for three months.

company is said to own only a small fraction of the stock having been issued to the public. The bulk is owned by three individuals.

There have been seven veins so far discovered on the 40 acres known as J. B. 6, and it is claimed that they are very rich and of good width. However, a request to go underground was refused by both the president and the superintendent. There was no disposition to decline information regarding the working, but an underground visit was not permitted.

DEVELOPMENT

The main shaft is down 80 ft. to the 1st level, and is being sunk to the 2d level. The other shaft is down 95 ft. At these depths the formation has been proved to be entirely conglomerate. Drifting has been done on the veins as follows: On A vein, 110 ft.; on No. 1, 300 ft.; on No. 2, 80 ft.; on No. 3, 140 ft.; on No. 4, 70 ft. A 168-ft. cross-cut connects Nos. 2 and 4 veins and another, 68 ft. long, connects Nos. 1 and A. All ore, except from sinking, is taken out by over-hand stoping, and very little timber is required.

GRADES OF ORE

The ore is sorted into 1st grade, 2d grade and tailings. There is practically no native silver in the ore, which consists of 8 to 10 per cent. cobalt, 1.5 to 2 per cent. nickel, 50 per cent. arsenic, and varying amounts of silver. The 1st grade carries 2000 oz. or over, the 2d grade 60 to 70 oz., while the tails run less than 30 oz. The cost to produce ore was stated to be $60 per ton, including all development and equipment charges, and to date the production has realized $600,000. Of this all but $40,000, which was the total expenditure, and a working surplus, has been paid in dividends.

ORE-HOUSE, TRESTLE AND SHAFT AT CONIAGAS MINE

Coniagas Mining Company

The name of the company spells the contents of its ore. It has combined the chemical symbols for cobalt, nickel, silver and arsenic, and has arrived at a "catchy" and unique title. This

EQUIPMENT

The power-house is equipped with one 60-h.p. boiler, one 50-h.p. hoist, and one 16-h.p. generator set. The shaft houses are 18x20 ft. and 50 ft. high; the two-compartment shafts are 8x5 ft., inside measurements, and are fitted with a cage which hoists a car, and the ore is conveyed across a trestle to the ore house. All hoisted rock is handled by gravity.

The new boiler-house will be 25x38 ft. and the engine-room 30x28 ft. At present air is supplied by the Trethewey company's compressor, but the Coniagas people are installing a new 12-drill compressor and two 80-h.p. boilers.

A VEIN AT THE LA ROSE MINE

There is also a large ore-house, an ore storehouse, blacksmith and carpenter shops, dry-house, sleeping camp, etc.

R. W. Leonard is president; A. Longwell, secretary, and J. Reddington, superintendent.

La Rose Mining Company

The deepest shaft in the Cobalt district is on the La Rose property, which consists of 40 acres known as J. S. 14. The shaft is down 320 ft., and consequently the owners are in a position to actually know more concerning the continuity of silver values at depth than anyone else in the district. But access to underground workings at this depth is denied everybody, and so it is impossible to state anything first hand. However, the management has stated that the vein shows good values in the lower workings.

NUMBER OF VEINS

There are 10 distinct veins on the property, and underground development is being carried on from two shafts. No 1 is down 100 ft., and No. 2 has been sunk to a depth of 320 ft., as was before stated. Work began in July, 1904, and has been continued steadily. Little beside the surface equipment could be learned, and that

such an important mine.

RICHNESS OF THE ORE

That the veins are exceedingly rich there is no doubt. The rock coming up [illegible] smaltite, niccolite and native silver; two pieces of vein matter weighed nearly 1000 lb. each, and would probably assay 500 to 600 lb. (av.) silver. One nugget, shown in the illustration, weighed 280 lb.; its size is shown by the 2-ft. rule alongside; the thickness was about 8 in.

EQUIPMENT

In the power-house there are one 17-drill compressor, one 4-drill compressor, one 150-h.p., and one 90-h.p. boiler, one 100-lamp generator set, one Lidgerwood and one Jenks hoist.

The shaft houses are 24x50 ft. and 25 ft. high. They are furnished with 8x12-ft., two-compartment shafts and bucket hoists. The ore dumps on a 1-in. grizzly and the rock not passing through the bars (95 per cent.) is hand-sorted and sacked according to grades.

There are 80 men employed, of whom about 37 are on underground development and mining. Of these 37, twenty are drill runners and 17 are mucking.

The usual buildings are installed at this mine; they consist of office, bunk-house, blacksmith shop, boarding house, stables, etc.

The company is closely held and no stock has been issued to the public. The officers are as follows: John McMartin, president; L. H. Timmins, vice-president; N. A. Timmins, manager. Capt. John Harris is superintendent.

COLONIAL SILVER MINING COMPANY

The vendors of this property were Messrs. McLeod and Glendenning who acquired it from a man named Hanson [illegible] it was known as the Hanson mine. The present owners are installing commodious quarters for the men and adequate machinery to operate on a considerable scale. The production at present is curtailed on account of the volume of development work and the installation of the plant and buildings. There are three shafts being sunk, one of which, on D vein, is to be the main operating shaft, the other two being more in the nature of prospecting shafts. To meet the main shaft three tunnels are being driven and these will intersect at a depth of about 200 ft. from the surface. The veins on this property are all in a hilly formation and necessitate considerably more sinking than other properties in the district.

DEVELOPMENT

A large amount of the work being done is in barren ground, sinking and driving to strike the veins showing on the surface. The veins do not show as rich material as some in the district, on account of the small amount exposed and because of the elevation of the property. However, in sinking their shafts and in the open cuts some rich ore has been taken out and the ore-house contains about 25 tons of first- and second-grade ore. No ore has so far been shipped.

NOVA SCOTIA MINE

BUILDINGS

The surface equipment consists of an office, two bunk houses accommodating 50 men each, a boarding-house 90x30 ft., a compressor house 45x55 ft. containing a 30-drill air compressor, stables, store-house, blacksmith shop, and an ore-house.

The power house now in process of construction will contain three 100-h.p. boilers, and a 200 electric light generator. All buildings are to be heated by steam and the comfort of the men is being attended to.

At present the force consists of 65 men, 40 of whom are on development work. When the power equipment is completed the force will be increased to over 100 men on mining and development work will be pushed rapidly. Two 10-hour shifts are maintained at this mine.

Seventeen veins on the property show mineral values and there are a number of seams of which nothing is known. The veins are in the diabase formation and show values of native silver in smaltite. The officers are as follows: Otto Germer, president; A. M. A. Richardson, secretary; L. D. Baldwin, treasurer.

KING EDWARD MINING COMPANY

This is a holding company, owning and operating two adjacent claims known as the Watts Mine and the King Cobalt Mine.

Watts Mine—This property was originally known as the New Ontario Cobalt and Silver Mining Company, Ltd., and is situated on lot 25, northeast quarter of the north half of section 3, concession 5, of Coleman township. It comprises 40 acres.

There are four veins on the property, three of which are being worked. A shaft 65 ft. deep has been sunk on No. 1 vein and a tunnel has been driven to within 30 ft. of the shaft. The vein is nearly 4 ft. wide and shows 14 in. of shipping ore, consisting of argentite, pyragyrite or ruby silver, native silver and a little smaltite. Six miners and two muckers are working on this vein and the work is done in three shifts of eight hours each.

No. 2 vein is being worked by open cut and the vein has been stripped for a distance of 20 ft. A shaft is now being sunk and it is expected that this will intersect the main working tunnel at a depth of 180 ft. An open cut also exposes No. 3 vein and when machinery arrives, sinking and driving will be pushed forward rapidly. The main tunnel should be intersected at about the same depth as in the case of No. 2 shaft.

King Cobalt Mine—This property consists of 40 acres and is being worked by the same management. When installed, the same equipment will operate both mines. There are three veins of the same character as those in the Watts mine, and in all cases there seems to be very little smaltite and niccolite showing.

The principal working is a tunnel which has been driven for 170 ft. A shaft has been sunk for a distance of 30 ft., but this has been abandoned, and in the future ore will be taken out through the tunnel. There are six men at work and the necessary buildings are being constructed.

The King Edward Mining Company employs at present 60 men on both properties. A bunk-house, boarding-house, blacksmith shop, ore-house, office, etc., are being built, and boilers, a 15-drill compressor, additional drills and other machinery are on the way.

University Mine

Within the past few weeks the owners of the Timmins or La Rose mine have acquired practically the entire ownership of the University mine, which is situated [illegible] far only two are being worked. No. 1 vein has been opened by a 100-ft. shaft, and drifting for about 165 ft. has been done at the 50-ft. level, and for 150 ft. at the

6-IN. VEIN AT UNIVERSITY MINE

[illegible] 1 or 100-ft. level. The shaft goes down on No. 1 vein at what is believed to be the center. No. 2 vein has been traced for nearly 400 ft. At the corner of the bunk-house there has been uncovered a vein, about 6 in. wide, showing almost solid dyscrasite, or silver-antimonide. The surface has been removed for a distance of only 10 ft., however.

SHIPMENTS

Since Aug. 1, 1906, there have been shipped 80 tons of ore and from 30 to 40 tons are ready for the smelter. Previous to the above date five cars were shipped from the property. The equipment consists of power plant, camp-house accommodating 70 men, shaft-house, ore-house, etc. A new 12-drill compressor, steam and electric-light plant are being installed. The property consists of 56 acres, 11 of which are under Giroux lake, and is capitalized for 100,000 shares of a par value of $10. H. G. Adler is superintendent.

Permission to go underground was refused.

Green-Meehan Mining Company

This property, located in the southwest quarter of the north half of lot 14, concession 1, Bucke township, is the only shipper in this township. The property lies about three miles northeast of Cobalt. So far 13 veins have been uncovered in five of the 40 acres, but active operations are confined to four veins. Of these No. 1 vein is the most important and has been stripped for a distance of from 75 to 100 ft., and open cutting has been done for 89 ft. along the strike (north-south) and to a depth of from 20 to 30 feet.

VEINS AND [illegible]

The veins lie in the Kewatin series of rocks, consisting of greenstones, schists [illegible] inch or so up to several feet. The mineralized portion will average about 6 in. in width and consists of smaltite, native silver, with some argentite in a few places. The mine has been worked since about Nov. 1 only, but 57 tons of shipping ore have been taken out so far. The men have been living in tents and log cabins, but a commodious frame building is now completed and a suitable equipment has been ordered and is on the way. This will consist of two 100-h.p. boilers, one compressor with capacity of 1000 cu.ft. free air per minute, hoists, drills, etc. At present a jib-crane hoist is in use and work is necessarily slow. The 60 men now employed will be increased to 100 by Jan. 1. The capitalization of the company consists of 2,500,000 shares of a par value of $1 each. Of these 1,500,000 shares have been issued, the balance remaining in the treasury for the purpose of acquiring other property or for the benefit of stockholders. The officers are: C. A. Foster, president; C. A. McInness, vice-president; C. C. Robinson, secretary and treasurer, and C. A. O'Connell, superintendent.

OPEN CUT AT GREEN-MEEHAN

A shortage of labor is now complained of at Broken Hill, New South Wales. Already some of the mines are offering higher wages.

Labor at Banka

According to the *Straits Times*, the coolies now imported for mining purposes in Banka seem to be mostly the offscourings of China. They give trouble the moment they land on the island. New arrivals are now at once guarded, on landing, and are kept apart before being, as soon as possible, inspected and packed off to the mines. Difficulties so beset the direct recruiting of coolies in China that they have to be engaged at Singapore. To mend matters, the Government has decided to undertake itself the sending back of coolies from Banka to China. It had been found out that time-expired miners who paid their own passages for the most part never went farther than Singapore. There they gambled away or spent their savings. On becoming destitute, they again fell into the hands of recruiters. The Government, to prevent this, has decided to see that they get back to China in [illegible] ments have also been made by the Government for money orders and remittances for the benefit of returning coolies.

Heretofore the only use of cobalt has been for coloring glass, enamels and porcelains, but it has been recently discovered that cobalt is useful in the manufacture of storage batteries.

The London Lead Market in 1906

The year opened rather hopefully for trade generally, soft foreign lead being then obtainable at £17 10s. ex-ship. The first business consisted mostly of speculative purchases, which tended to strengthen the market, but the early pressure of spot parcels checked the advance, while consumers bought moderately. Disappointed holders then pushed sales, and prices became irregular in consequence. More speculative buying set in, followed by American and Russian orders, which absorbed large quantities, and a gradual improvement was recorded. Thereafter came some selling orders, which had to be executed at best prices obtainable, with consequent reluctance on the part of buyers, and the month closed quietly with foreign at £16 5s., and English at £16 8s. 9d. per ton.

February found the available supplies rather scarce, and spot parcels in request. A fractional improvement resulted; but consumers were unwilling to cover more than their immediate requirements, and concessions had to be made by those anxious to sell for March onward. Later dealers' purchases, "bear" covering, improved demand for home consumption, and the reported outbreak of a troublesome fire in the Broken Hill mines, all combined to stiffen prices which—with occasional fluctuations—rose to £16 1s. 3d. for foreign, and £16 3s. 9d. for English, whereat the month closed with a steady market.

March found buyers rather reserved, particularly when it became known that the Broken Hill mines had resumed their normal output, although this was partly contradicted. During the first eight days prices dropped about 15s. under pressure of sales; but a recovery set in, prompted by combined speculative purchases and bear covering, and the month closed with foreign at £15 17s. 6d., and English at £16 2s. 6d.

April started with a downward tendency induced by the abstention of consumers, coupled with the pressure of large accumulations in dealers' hands. Then came a gradual recovery which—with little interruption—continued till the close. Toward the close of the month the buying—which had been rather spasmodic—became more determined, particularly for forward delivery, and was supposed to be largely for American account. English consumers, being taken unawares, followed with substantial purchases, and the closing prices were £16 5s. for foreign, and £16 7s. 6d. for English.

May found consumers encouraged by marked improvement in the building trade. Their purchases coincided with larger inquiry from the Continent, and with substantial shipping orders from America. Spot lots, which at first appeared plentiful, were thus readily absorbed. Prices advanced till inquiry slackened after the execution of large orders, and sellers predominated, and the next few days saw a decline of about 15s. in values. Thereafter the volume of business was about normal, and fluctuations were unimportant, and mostly upward. Toward the end of the month news came of serious subsidences in Broken Hill Block 10 and Central mines, with damage to mills, which pointed to curtailment of the Australian production, and caused an improvement in prices to £16 17s. 6d. for foreign, and £17 for English.

June found buyers still active under the influence of the Australian reports, consumers willingly following dealers' lead and covering requirements a good way forward. The market, however, was sufficiently supplied, and offered but little scope for speculators, and fluctuations were at no time sensational. Toward the end of the month, a good demand set in for export which, together with a good general consumption—particularly in the United States—rather stiffened prices. Closing values were £16 13s. 9d. for foreign, and £16 18s. 9d. for English.

July opened with a downward tendency, due mainly to the public marketing of various holdings, and in sympathy with other metals. Toward the middle of the month spot parcels were scarcer, and prices hardened somewhat. Home consumers bought more freely, and sellers offered reluctantly. The price improved, followed by a slight reaction; but the consumptive demand was sufficient to absorb all parcels arriving. The last two or three days of the month found demand satisfied, and sales could only be effected by making concessions, the last business recorded being £16 12s. 6d., English being held for £16 16s. 3d.

August found the market rather quiet after recent heavy buying, but without any pressure to sell, and with plentiful indication of large requirements in the near future. Consumptive demand soon asserted itself, and was followed by important orders for export, notably for Russia. This active demand was well maintained throughout the month, when foreign brands were quoted £17 10s., and English £17 12s. 6d.

September was an active month in this, as in metals generally, and a slow but steady advance was manifest throughout. Trade demand was excellent, and sufficient to absorb all incoming supplies. Bears were tempted into selling for forward delivery, but their operations were of no avail to stop the advance. Offerings were scarcer from day to day, and the general expansion of trade soon made it apparent that supply was unequal to demand. Closing prices were £18 10s. to £18 12s. 6d. for foreign brands, according to time of delivery, and £18 15s. to £18 17s. 6d. for English.

October brought evidence of growing consumption and a serious depletion of available supply. The larger consumers were quick to apprehend the situation, and they bought with more than customary boldness. Speculative purchases followed, and the price rose steadily until £20 was reached, Oct. 11. This figure tempted numerous sellers to push sales for extended delivery, and the next few days saw a relapse. Consumption, however, was too active to justify such risk, and offers were in many cases withdrawn, the result being a sharp recovery. Later the metal markets generally were adversely affected by financial trouble, and a gradual decline ensued. The month closed steadier, however, with foreign brands £19 2s. 6d. to £19 7s. 6d., and English £19 5s. to £19 10s.

November revealed a dwindling supply for early delivery, particularly in London, where an advance of about 5s. was soon established. Toward the middle of the month this scarcity was relieved by fresh arrivals, and prices eased off. Fluctuations were narrow throughout the month, and closing values were £19 5s. to £19 7s. 6d. for foreign brands, and £19 10s. to £19 12s. 6d. for English.

December revealed some scarcity of supply at the outset, but this was counteracted by early arrivals, and for about 10 days the market showed little animation. The undercurrent, however, was strong, it being evident that the consuming trades were but poorly covered, while supplies were no more than normal. Dealers now began to buy freely in anticipation of consumptive demand, and demand was stimulated by postponement of the law prohibiting the manufacture of white lead in France. The result was an advance to £20 for foreign brands, £20 7s. 6d. being asked for English, March delivery commanding 5s. premium. At these figures the market remained steady till the close.

Changes in Mexican Laws

Consul-General A. L. M. Gottschalk, writing from Mexico City, says that in the course of the coming year Mexico is to see much useful legislation of the practical sort, which will tend as well to protect certain classes of bona-fide concessionaires as to further the industrial, agricultural, and general economic well-being of the country itself. The contemplated mining legislation will show little radical change, but will have for its effect the codification of a number of decrees, circulars, and laws promulgated during the experience of fourteen years into convenient form. Petroleum and coal, it is said, will remain the property of landowners as a right inherent with their title, and will not, like the precious metals, be considered "products of the subsoil" denounceable by whoever discovers their existence.

THE ZIEGLER PROCESS FOR COKING PEAT

A New Method Now Being Successfully Used in Germany

BY OTTO K. ZWINGENBERGER

In a speech [illegible] at the opening of the Minnesota State Fair, J. J. Hill advised the people to be careful in the use of coal and iron ore, for the supply of these presents of nature might be exhausted in some decades of years. Nature at any time allows a substitute and will do so when in future ages the coal famine will menace our descendants; we see already in our day the consequences of the lavish use of wood. As considerable wood is used for the production of charcoal, the description of a successful technical process for the coking of peat, allowing us an excellent substitute for charcoal, will be of public interest.

Peat as a fuel has been used from very ancient times, especially in Germany and in the Netherlands, and it is in Germany that modern methods of manufacture have been worked out. For many years inventors have spent much time and money in various processes, but the most of them were only carried out in experimental plants and never passed this first step of development. By far the most modern, scientific and rational method of utilizing peat is that of converting it into coke with the recovery of the by-products. Martin Ziegler, a prominent chemical engineer, first established this process as a perfect industrial success.

PLANTS IN OPERATION

There are three works now in which his ideas are carried out; the first plant was built in Germany at Oldenburg, the second was erected by the Russian Government at Redkino, and the last and most modern is located at Beuerberg in south Germany. The Ziegler process consists in carbonizing air-dried peat of about 25 per cent. water in upright retorts. The preparation of the raw peat to get it ready for the coking is a work which requires a good deal of practical experience, the local conditions of the peat bog having a great influence on this work. There are several mechanical devices for digging the raw peat and other facilities in handling; but it would be too much to give here a description of all the possibilities. If a peat bog like this at Beuerberg contains many woodsticks, the peat is cut with a spade in rectangular pieces, and by a conveyer given to a peat machine (Fig. 1). This peat machine has screw knives which break up the fibrous structure of the peat, knead and mix the mass and press it forward to a mold which shapes it into bricks of about twice the volume of an ordinary building brick. These bricks are then exposed to sun and air to be dried. The waste heat of the furnaces, mixed with air, can be used advantageously in a drying chamber to finish the drying process.

*Chemical engineer, 143 W. 64th Street, New York City.

FIG. 2. TOP OF THE RETORT OVENS

FIG. 1. PEAT MACHINE. IN THE BACKGROUND ARE HEAPS OF AIR-DRIED PEAT

The air-dried peat is added at the top of the retort ovens (Fig. 2), and from time to time the peat coke is drawn off from the bottom of the retorts into cars (Fig. 3) which are covered air tight and taken outside to cool. As already mentioned, the Ziegler process saves the by-products of the destructive distillation, as paraffin, phenolates, gas oil, ammonia, acetic acid, ethyl alcohol and non-condensible gases; the latter are used to heat the retorts, therefore the only fuel required is coal or wood to heat the ovens for the first charge and when the gases become available the plant sustains itself.

ANALYSES OF THE [illegible]

The best peat is used for peat coke; the peat running a little higher in ash is used for so called "half coke." The table of resulting products is as follows:

Peat coke	[illegible] per cent.	Half coke	[illegible] per cent.
Tar	4 per cent.	Tar	[illegible] per cent.
Tar water	41 per cent.	Tar water	[illegible] per cent.
Gases	27 per cent.	Gases	[illegible] per cent.

Analysis of peat coke:

	Charcoal.
Hydrogen ... 2.0 per ct.	per ct.
	per ct.
	0.4 per ct.
	0.3 per ct.
5.2 per ct.	4.7 per ct.
	9.2 per ct.
0.0 per ct.	3.0 per ct.

The calorific effect of peat coke is 14,500 B.t.u. Peat coke is in any line like charcoal; it is tough, of fair weight and can be shoveled. It is superior to charcoal as it has the same strength as ordinary coke, and has a metallic sound when struck. It is largely used for metallurgical purposes, as for the manufacture of charcoal pig iron, machine and armature work. At Lohmalkalden, peat coke is used for blast-furnace work and at the Krupp-Gruson works it is given preference for hardening armor plates. It is used as filter carbon, as a substitute for anthracite and charcoal.

Half coke is produced as a substitute for a good coal for boilers, locomotives and other furnaces; it is very similar to peat coke, almost as firm, but burns with somewhat more flame; it is not hygroscopic and can lie for a long time in water without its surface being permeated.

Analysis of half coke:

	per cent.
Hydrogen	3.59 per cent.
	1.49 per cent.
	14.52 per cent.
Sulphur	0.20 per cent.
Ash	2.50 per cent.
	per cent.

The calorific effect of the half coke is 12,-

impregnation of wood or it is treated according to the general principles of tar distillation, turning out gas oil, paraffin, creosote oil and asphaltum. The gas oil can be separated into two kinds of about 0.835 and 0.885 specific gravity respectively; both kinds are of good value as they are used for motor cars, gas engines and lighting purposes; the heavy one is

The

tained are acetate of lime, methyl alcohol, sulphate of ammonia (by neutralizing the ammonia with sulphuric acid). The solutions of both the ammonium sulphate and the lime acetate are concentrated by the waste heat of gases from the retorts. The ammonium sulphate is well known as a fertilizer, the methyl alcohol is of the same composition as that obtained from wood

FIG. 3. AIRTIGHT CARS FOR COOLING COKE

FIG. 4. PARAFFIN HALL

BY-PRODUCTS

The tar obtained from peat by the Ziegler process approaches the brown coal tar, but generally it contains more phenolates. It is easily separated from the tar water by heating, the different specific gravities of the fluid enabling an easy separation. The tar can be used for the paraffin. (Fig. 4) is largely used for the manufacture of candles, of insulated cables and wires. Creosote oil (containing carbolic acid) is used for the impregnation of railway sleepers, for disinfection, etc.

The tar water with the due quantity of lime is treated with steam in a column apparatus and the products finally ob-

It is used in the chemical industry for the manufacture of aniline dye-stuffs and of pharmaceutical preparations. The acetate of lime is the raw material for many chemical preparations, especially for acetic acid and acetone, which is used for gunpowder. The amount of the by-products changes somewhat as to the condition of the raw material.

The following table gives a view of the output of the smallest type of a Ziegler peat-coking plant, handling per year 35,000 tons of air-dried peat in 4 retort ovens:

33.3 per cent. of peat coke = 11,655 long tons.
0.4 per cent. of ammonium sulphate = 140 long tons.
0.6 per cent. of lime acetate = 210 long tons.
0.2 per cent. of methyl alcohol = 70 long tons = 23,300 gal.
5.0 per cent. of tar = 1,750 long tons, which contain about
245,800 gal. of light oil.
80,800 gal. of heavy oil.
117 long tons of paraffin.
504 long tons of creosote and carbolic acid.
78 long tons of asphaltum, etc.

The coking of peat was already tried a long time ago in Germany, but it was generally carried out in bee-hive ovens and its disadvantages always caused the interruption of the work.

ADVANTAGES OF THE PROCESS

The advantages of the Ziegler process are: The economical utilization of the waste gases and the superior distribution of the heat; the more perfect exclusion of air from the coking chamber; the continuous work and therefore long life of the retorts by avoiding their cooling down;

the superior strength of the coke; an increase in output of coke and by-products. An enlargement of a Ziegler coking plant requires in the same ratio an increase of the unskilled labor for the production of air-dried peat, but requires only some few men more for running the coking and chemical plant, this point in the saving of by-products being of the highest importance for the economy of the process.

There were many prejudices and misunderstandings to be overcome, for the opinion of many people is that peat is a valueless material, and never would turn out a useful coke. By the request of the Prussian State Department of Commerce and Trade the first Ziegler plant at Oldenburg was investigated by a prominent German engineer and his report was favorable to the coking process and plant; some short-comings he stated regarded exclusively some parts of the architecture of the buildings.

As the fuel question is very important for some American States with immense peat bogs, pictures of the most modern Ziegler plant at Beuerberg, south Germany, are shown. They were taken in 1906. The solid structure of the buildings, a characteristic of many German industrial works, would be moderated in many countries; especially in warm climates the furnaces could stand in the open air protected by a roof against rain.

FIG. 6. GENERAL VIEW OF THE BEUERBERG PEAT COKE PLANT

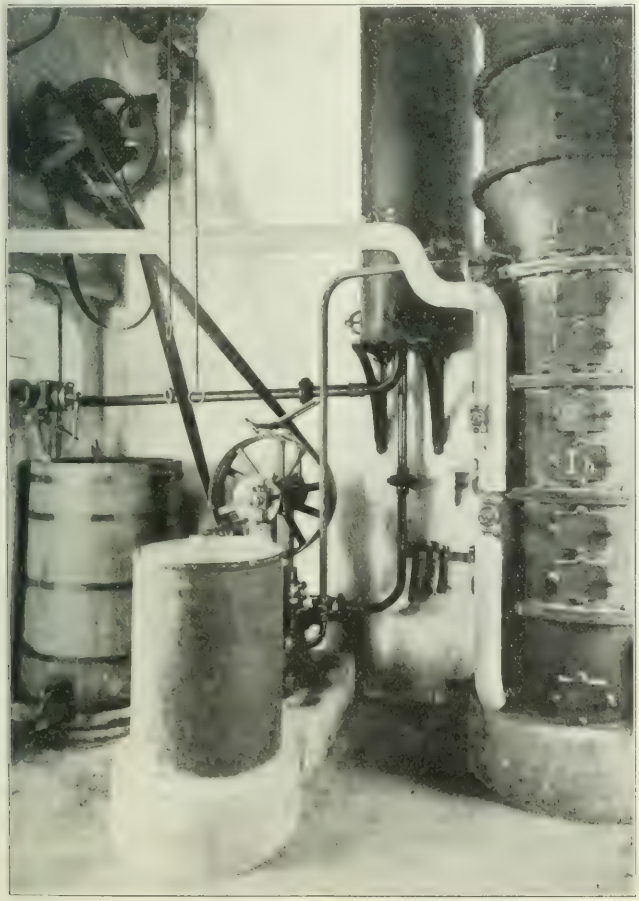


FIG. 5. COLUMN APPARATUS FOR WORKING UP TAR WATER

Increase of British Coal Exports

Consul F. W. Mahin reports from Nottingham that the sale of British coal to foreign countries has made a remarkable advance this year (1906.)

The cause may in the future be mistaken for the repeal of the export duty on coal, but the fact is that this year's foreign sales far exceeded those of previous years before that duty was removed on November 1. Prior to that, this year, the increase of British coal exports over the whole of 1905 exceeded 6,000,000 tons, and would have been still greater had not many shipments been purposely delayed till after November 1 to escape the tax. The gain in 1905 over 1904 in coal exports was only 1,250,000 tons.

The great increase of exports this year is attributed partly to Germany's decreased output, making that country unable to supply the usual demands upon its mines from Spain, France, and other countries, and partly to enlarged consumption in those countries. These now look to Great Britain. This trade with those countries is in a large part merely a return of what was lost after the imposition of the export duty of a shilling a ton in 1901. The duty has yielded about $10,000,000 a year. It is hardly probable that it caused a loss of that amount to British mines in value of exports, but there is no question that a serious loss did result.

Calculations for Mine Ventilating Fans

[illegible]

In figuring the size of a ventilating fan, it is necessary to consider the amount of air to be furnished and the pressure required to discharge the same. At a given speed a fan can maintain this pressure over a certain area only, which is called the equivalent or capacity area. This term has been introduced by Murgue, who made thorough investigations of mine ventilators, to facilitate comparisons of different fans.

The equivalent area of a fan may be described as the opening in a thin wall between two vessels holding air of different pressure, through which flows the specified volume.

The quantity V in cubic feet delivered by a fan varies directly as the velocity of flow through the equivalent area a; therefore $V = av$. Due to resistance in flowing through the opening, and due to contraction, this value has to be multiplied by a coefficient f, thus $V = fav$.

[illegible]

The velocity v in feet per second depends upon the difference of pressures on the two sides of the opening a and equals $\sqrt{2gH}$.

g = acceleration of gravity.

FIG. 7. [illegible] HOUSE, ZIEGLER PROCESS

H = hight of column of air in feet equal to difference of pressure.

Usually h is given in inches of water, thus $v = \sqrt{\frac{2gh}{12}\frac{do}{d}}$.

do = weight of cu.ft. of water.

d = weight of cu.ft. of air.

Substituting this expression for v in formula $V = fav$, we have,

No. 1. $V = fa\sqrt{\frac{2gh}{12}\frac{do}{d}}$.

The pressure of air in inches of water is proportional to the square of the peripheral velocity u (in feet per second) of the impeller.

$$h \text{ (theoretical)} = \frac{12u^2}{g}\frac{d}{do}.$$

Due to leakage, eddies, etc., this theoretical value has to be multiplied by a coefficient c, which has to be determined from actual tests.

No. 2. $$h = \frac{12cu^2}{g}\frac{d}{do}.$$

This expression may be written thus,

$$h = \frac{12c\pi^2 D^2 d}{60^2 g\, do}n^2.$$

D = diameter of impeller in feet.

n = number of revolutions per minute.

As can be seen from the formula, the pressure h varies with the square of the number of revolutions and $\frac{h}{n^2}$ = constant for a given fan.

From formula No. 1 the equivalent areas may be found.

$$a = \frac{V}{\sqrt{h}}\left(\frac{1}{f\sqrt{\frac{2g}{12}\frac{do}{d}}}\right)$$

Let

$$\frac{1}{f\sqrt{\frac{2g}{12}\frac{do}{d}}} = L,$$

then $a = \frac{LV}{\sqrt{h}}$ and for a given fan and opening a, the expression $\frac{V}{\sqrt{h}}$ = constant. From this follows $\frac{V_1^2}{V_2^2} = \frac{h}{h_2}$; that is, the squares of the volumes discharged are proportional to the pressures.

From formula No. 2 it also follows that $\frac{n_1^2}{n_2^2} = \frac{h}{h^2}$; or $\frac{h_1}{n_1^2} = \frac{h_2}{n_2^2}$ = constant; that is, for a given fan the pressure divided by the square of the number of revolutions is a constant quantity.

As found above, $\frac{V_1^2}{V_2^2} = \frac{h_1}{h_2}$, then $\frac{V_1^2}{V_2^2}$ is also equal to $\frac{n_1^2}{n_2^2}$ or $\frac{V_1}{V_2} = \frac{n_1}{n_2}$; that is, the volumes are proportional to the number of revolutions, or $\frac{V_1}{n_1} = \frac{V_2}{n_2}$ = constant.

The two coefficients c and f being determined, it is easy to calculate other sizes of fans of the same type provided the velocities of air through the fans and the shapes of blades, etc., are made proportional to those of the original fan.

A fan moves V cu.ft. of air against a pressure of h in. of water. The work it is doing is therefore $V \times h \times$ weight of cu.in. of water $\times$ 144, or $5.2\,Vh$ ft. lb.

As V varies directly as n, and h as the square of n, the foot pounds of work vary as the cube of n.

The total shipments of tin from the Stanthorpe district, Queensland, during the past quarter amounted to 65 tons 9 cwt., of the approximate value of £7500.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

Every main haulway should have refuge holes alternating on each side of the road, and not more than 40 ft. apart.

In order to properly protect electrical machines, it is important that the armature bearings should not be allowed to wear down and the armature catch the pole pieces.

Practical results in the Pennsylvania bituminous district show that on an average, each mining machine will produce about 50 tons of coal per 8 hours, cutting 65 ft. of face to a depth of 5 ft.

In the panel system of mining, the method of driving the cross entry to its limit and then working the last room first and bringing the pillars back at the same time is now being generally adopted.

Where a shunt- or compound-wound motor is used, it is generally best to have a friction clutch, so that the motor can be started with no load, and after the motor has attained full speed the load can be attached by means of the friction clutch.

In shaft sinking the pulsometer is an exceedingly useful and handy pump, and will not only force water to a hight of 80 ft., but will pump mud when not too thick. The absence of exhaust steam makes this instrument particularly useful for sinking purposes.

It is better to gain 50 per cent. of the coal seam on the advance work and then secure 45 per cent. on the retreat, than to gain 75 per cent. on the advance and to lose nearly all of the remaining tonnage, besides the evil effects of a squeeze that may result from improper development work.

About 15 per cent. of the men killed in coal mining are victims of gas or dust explosions. As an average for the past 10 years it is estimated that in 65 per cent. of the fatal accidents that have occurred in coal mining the responsibility for the disastrous results have been traced to the victims themselves.

Experiments have shown that it is easier to work in a mine where the air current has a velocity of 500 ft. per min. and the atmosphere a temperature of 100 deg. F., than where the temperature is 85 deg. and the current only 250 ft. per min. This is due to the fact that the evaporation of the perspiration on the workman's body refreshes and gives him new energy.

To install a 15-machine plant, capable of producing from 600 to 800 tons of coal in 8 hours, the cost for the power plant, mining machine, pipes and all other accessories, including the foundation, boiler setting, and complete cost of installation would be about $14,000. The total expense for maintaining and operating such a plant would amount to $5500 per year as a maximum figure.

Recently collected statistics with reference to the coal-mining industry show that for every working day in the year our coal mines produce a total of more than 1,000,000 tons of fuel. It is, however, appalling to think that for each working day we sacrifice the lives of seven men, which means that one man is killed for every 180,000 tons of coal mined. It is also true that more than twice this number of men are seriously injured each working day.

The total production of coal in the Indian Territory for the year ending June 30, 1906, was 2,966,812 tons, a decrease of 4149 tons from the production of the previous year. The total value of the coal produced was $5,446,099, and the average selling price per ton of run-of-mine coal was $1.84, an increase in the selling price of 1.7c. per ton. The production of coke for the year was 59,088 tons, as compared with 41,193 tons produced in the preceding year. The average selling price of coke for the year was $3.90 per ton.

In all cases where a miner has been overcome by the gases in a mine an emetic should be at once administered if the victim can still voluntarily swallow. To enforce this emptying of the stomach it is recommended that a solution of sulphate of zinc, containing 30 grains to the ounce, be administered in doses every 10 minutes until emesis is produced. After this treatment has been administered, it is advisable to put two teaspoonfuls of the aromatic spirits of ammonia in a cup of water and cause the patient to swallow this solution. Ammonia acts as a stimulant more satisfactorily and quickly than alcohol.

The newest innovation that has taken place in the method of operating a coal mine is the substitution of concrete for the present system of mine timbering. The experiments along this line are being made by the Reading Coal Company at Shamokin, Pennsylvania. A plant for the manufacture of these cement props will be erected at the North Franklin colliery, Trevorton, from which place the new style of timbering will be sent to all the other collieries. The Reading Company has spent considerable time and money in determining the best method for preserving mine timbers, and the present step seems to indicate that in the future cement will replace the present method of timbering with wooden props.

One cause of mine fires not generally considered is from allowing an incandescent electric lamp to lie on a heap of coal dust while lighted. Other experiments have shown that when a lamp is laid on a heap of ordinary cotton waste, the latter material will catch fire in 15 or 20 min. In the case of coal dust, a lamp has been known to fire such fine fuel in 45 min. To prevent such accidents, it is most essential that electric lamps, when not in actual use, should always be suspended and not allowed to come in contact with any material object. A further precaution is to have each bulb inclosed in a wire casing.

In our issue of September 29, 1906, under the head of Colliery Notes, there appeared a paragraph stating that an explosive should contain a small percentage of nitrate of potash, and furthermore, that if nitrate of sodium is present, the explosive is deliquescent and absorbs too much moisture from the air. Since one of these ingredients is present in many of the well known explosives now on the market, the suggestion made is consequently misleading. Coal mining differs materially from metal mining, and many explosives that act satisfactorily in hard rock are most undesirable for use in a coal mine. Explosives may be roughly divided into two classes, those which produce a shattering force, and those which act in a propulsive manner. The former are known as high explosives and their detonation is very rapid; for this reason it is not advisable in coal mining to use an explosive containing too large a percentage of nitrate of potash, since this latter element makes the compound too sensitive to shock, and consequently dangerous. Nitrate of sodium, when present in too large a proportion, causes the explosive to absorb a considerable quantity of moisture from the air. Experience has shown that in most coal mines, where the coal is not shot from the solid, a low explosive, producing a propelling or heaving effect, is best. There is really no uniformity of composition in the various explosives that are now manufactured; for instance, Atlas powders contain only 2 per cent. sodium nitrate; Giant powders contain 40 per cent and Vigorite contains 60 per cent. of this ingredient. The variation in the quantity of nitrate of potash present in explosives is likewise great: Hercules powders contain from 2 to 30 per cent.; Gelatine dynamite contains 18 per cent.; Stowite 20 per cent.; Dualine 20 per cent.; Gelignite 27 per cent.; Rendrock 40 per cent., and Brugere powder 46 per cent. nitrate of potash.

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Mine Drainage Districts

A bill for the creation of mine drainage districts, prepared by a committee appointed by the American Mining Congress and adopted at the recent session of the congress, is to be introduced at the present session of the legislature of Colorado. The legislatures of other States are to be asked to adopt the same bill. The object of this bill is to provide for united action in unwatering certain mining districts, which experience has amply proved cannot be accomplished on the principle of *laissez faire*. The advantages of a common drainage system in many mining districts are so obvious that no further argument on that point is required. The question is as to the framing of the present bill. It is to be said at once that the committee which prepared it was of superior character and enjoyed, both from its own members and from the outside, technical and legal advice of the highest class. However, the committee itself would be the last to declare that its work is free from imperfections, or is anything more than the best it could offer.

We think that the proposed bill contains some dangerous features. Its basis is valuation of mines as assessed for purposes of taxation. But the assessment of mines for direct taxation is uncertain, unscientific and often unequitable. Ten or more persons owning property to the amount of at least one-third of the total assessed valuation may secure the creation of a drainage district, and such a district upon decree becomes a municipal corporation and may issue bonds which are a lien upon all property within the boundaries of the district. Owners who may oppose the creation of a drainage district have the right of a hearing before the decree is made, but only as to the material allegations of the petitioners. Unless they can then prevent the organization of the district they run the chance of losing their property through foreclosure by bondholders; and anyway are subject to a tax of 5 per cent. on assessed valuation.

The animus of the committee and of the American Mining Congress has been unquestionably to secure the greatest good for the greatest number, but when it is proposed to effect what with human shortsightedness may be erroneously conceived to be the greatest good by means which may involve the saddling of liens upon the property of dissenters, it is easy to foresee that grave injustice may result. Mining property is different from real estate. When its ore contents are gone its value also is gone. The value of an orebody is the net yield obtainable from it, but the net yield possible varies with time. Under the proposed law the farseeing who consider that their property may increase greatly in value merely by leaving it idle may lose their natural right to do as they please because of the wishes of a spendthrift minority. Or it is conceivable that an abortive drainage tunnel might lead to the practical confiscation of a district which subsequent advance in geological, mining or metallurgical science might prove to be rich. To put it graphically, the man who locks away a block of apparently worthless mining stock with the thought that some day it may prove valuable (and occasionally that happens) might lose all chance under the operation of the proposed law.

We believe that this proposed law should receive very careful consideration before it is passed. It has been well fathered, and has received open discussion at a representative meeting of mining men, who passed a resolution advocating its passage. Nevertheless, it must be admitted that the discussion was hasty and inexhaustive. The courts are slow to uphold legislation which may work injustice to the individual where property rights are concerned. It would appear that some equitable amendment might be made which would secure the benefit of joint action without the danger of confiscation of any property.

Frauds in Mine Promotion

Everyone is aware that the gullible public has recently been, and is still being, loaded up with worthless mining stocks on which it will soon find it has lost a lot of money, that has fattened the sharks. In this, history will simply repeat itself. The words of warning which the JOURNAL and all the reputable mining men have spoken are for the most part ineffectual because they do not reach the persons upon whom the fraudulent promoters chiefly prey. What can be done to protect the unwary? The common answer is to enact more legislation. National legislation is suggested as the best means of solving the problem by Henry K. Pomroy, president of the New York Stock Exchange, and A. Chester Beatty, of the

Guggenheim Exploration Company [illegible] recent interviews published in the New York [illegible].

We agree with Mr. Pomroy and Mr. Beatty in their suggestion that our legislators may usefully study the British corporation law. We think that there ought to be a Federal corporation law. But even at present our States have laws for the punishment of fraud, which, if enforced, would make the confidence men more alive to the danger they run. Moreover, the administration of the Postoffice Department is a powerful agent in discouraging the business of these gentry.

The present trouble is not so much the absence of suitable laws as it is the difficulty of presenting proof of fraud to the proper authorities. This is the crux of the question and the swindlers know it. The small investors, to whom the fraudulent promoters appeal, are unable to investigate even if they were wise enough to do so. The inhabitants of the districts where the properties are alleged to exist often are quite ignorant of the advertisements in the East, and even if they were disposed to take the trouble, do not know how to reach the proper authorities. Anything approaching a State *visé* of company promotions would be objectionable on many grounds, and might be more dangerous than the present situation.

We fear that there is little hope of preventing a gullible public from being rankly swindled so long as it continues to be gullible; and the swindlers all know that new groups of fools are developing all the time. However, it would help if the newspapers should be more careful in accepting the advertisements of mining promotions, and the passage by the States of a law like that which the American Mining Congress is advocating would bring more closely home the danger of making false statements in such matters.

Open-hearth Steel and the Bessemer Process

The large new steel plants and the additions to existing mills now in process of construction will almost without exception make use of the open-hearth process. For making rolling-mill steel the bessemer converter seems to have lost favor. The United States Steel Corporation has during recent months authorized the construction of nearly a hundred open-hearth furnaces, and not a single converter plant has entered into its plans. The increased capacity of independent plants is to be supplied almost wholly in the same way.

The reasons given for this desertion of the process which is still supplying the bulk of our steel is the waning supply of low-phosphorus ores and the increasing difficulty of meeting the specifications of consumers. The average phosphorus content of the iron ore received at lake ports is steadily, although slowly, rising and the percentage of metallic iron is as steadily falling. Without reopening the discussion concerning the relative merits of open-hearth and bessemer steels, it may be said that the prejudice against the product of the converter has not diminished during the last few years, and the requirements of steel construction have grown more exacting. A few months ago a mill producing open-hearth steel rails had no difficulty in disposing of its entire output for the current year at an advance of $1 above the market price.

There is, however, no danger that the process which Sir Henry Bessemer gave to the world will become obsolete. Probably no year has added more converters to the total number in use than 1906. Although the picturesque vessel has lost favor in the heavy rolling mill, it has found occupation elsewhere. It offers advantages for supplying small quantities of steel at very high temperature, which renders it a valuable adjunct to the foundry. Small converters have been found especially useful in the production of light steel castings, and many were installed during 1906 for that purpose.

It seems, therefore, that the process which was at first thought impracticable except in the very largest works is now more highly esteemed in establishments where the output is relatively small.

Magnetic Separators

Since renewed attention was attracted to these machines by the great success of the invention of the late J. Price Wetherill, there has been a great development in their forms and mechanism, and in the methods of their application. Magnetic separators are now standard machines, and are in wide use. It is useful to understand the fundamental difference between the two grand types, viz., the high intensity and the low intensity. The former require much more power than the latter, but, they will make separations of minerals of low magnetic attractability, which remain unaffected by the machines of low intensity. In order to enable the latter to operate at all, the ore must be converted by roasting into a more highly magnetic form, and the cost of roasting often is more than an offset of their economy in power and lower first cost. In the case of some ores, however, such as blende-siderite, roasting and separation by low-intensity machines may give a higher grade of product than does raw separation by high-intensity machines, and the commercial result may figure out better. Consequently, if that class of ore were alone to be treated, the choice might be for a roaster and low-intensity machines.

But when it is a case of treating a variety of ores, some of which can be separated only by a high-intensity machine, the choice is determined by different considerations. The high-intensity machine will perform all of the separations of strongly magnetic material that the low-intensity machine will make, and is capable of far more delicate adjustment and of effecting separations between minerals of several different degrees of magnetic permeability.

Lake Copper Consolidations

Rumors are current of a large consolidation of Lake Superior copper companies under Amalgamated auspices. Tamarack, Osceola, Copper Range and Isle Royale have been named, together with several minor companies. It is said that the Ojibway Mining Company has been organized, with $100,000,000 capital stock, as a holding company, in which the others will be practically merged. In the excited condition of the Boston market, these rumors find ready belief. It is not possible to secure either confirmation or denial at the present time; but the probability is that there is a foundation of truth in them. The Amalgamated has long sought to secure a hold in the Lake country, and may be taking the opportunity now, though it is certainly paying a high price if rumors are correct.

THE ACTION of the Homestake company in giving its miners an eight-hour day has caused trouble for the smaller mines in the Black Hills, many of which cannot afford any increase in cost. The miners in several districts have struck, and insist upon eight hours there also.

ROUND MOUNTAIN CAMP, NEVADA

Its Location, Geology, and Mining Activities

BY GEORGE A. PACKARD*

Round Mountain camp is located on the [redacted], about half-way between Tonopah and Austin, at an altitude of from 6000 to 6400 ft., the total elevation of the mountain from which the camp is named being not more than 400 ft. above the adjacent valley. The district is reached from Tonopah via Manhattan. This latter distance, about 55 miles, I covered in an hour and 43 min. in Hofman's Winton, but the 18 miles from Manhattan to Round Mountain required over three hours in the Austin stage. The ride furnishes an excellent example of the abuse of the United States mining law, for the ground along the entire route is staked out in claims, not 10 per cent. of which show even rock in place, but all preventing the legitimate prospector from exercising his vocation unless he wishes to take chances on a row, physical or legal.

Round Mountain was discovered, or rediscovered, early in 1906. When the original discovery was made I do not know; but there is a dump good for 100 ft. on the north side of the butte, which must have been weathering some years, to say nothing of an old cabin used for a mess. The mountain itself appears to be a mass of rhyolite, the slides showing under the microscope some hornblende and biotite, with an occasional spherulite from rapid cooling, and marked flow structure. In many places, as on the Fairview and Sphinx, it is so kaolinized as to be almost white, while in other places, as in the Red Top tunnel, it is a gray brown, but always with numerous quartz phenocrysts. To the north and east of the Round Mountain proper, near the limit of the Fairview, is a light granite, almost entirely quartz and feldspar, but with a little muscovite. It has a gneissoid structure and has apparently been subjected to considerable shearing pressure.

*Mining engineer, Boston, Mass.

DEVELOPMENT OF THE PROPERTIES

The camp was still young at the time of my visit, in October, but already several tunnels and shafts had reached a depth of 100 ft. or more. The greatest development is on the property of the Round Mountain Mining Company, where several incline shafts have been sunk. The Fairview also developed its ground with inclines on the vein, while the Sphinx, with the only hoisting plant installed at that date, had a vertical shaft nearly 200 ft. deep, from which a crosscut was to be driven.

FIG. 2. DRY WASHING ON SUNNYSIDE CLAIM

[redacted] FROM THE SOUTHWEST

The ore is a silicification of the rhyolite, perhaps along shearing planes, since there is often one well defined wall. It is, however, apparently not the most silicious rock that carries the most value, since I got an assay of only $2 on one very quartzy piece; while another piece, heavily stained with iron, but less silicious, had a solid seam of gold an eighth inch thick. This was particularly interesting, as the quartz phenocrysts of the original rock could still be seen with the pure gold twined about them, plainly resisting replacement longer than the ground mass.

The fact that at two shafts on the Round Mountain vein not 200 ft. apart the strike varied 30 deg., and that the dip shows an even greater variation in the same distance, considered with the gneissoid structure of the granite and the leached and altered appearance of the rhyolite, makes the miner hope that the geological conditions are favorable to a good camp.

In October there was not sufficient work done to reach any conclusions as to the size of the orebodies and the area over

which they might be found. A small custom mill near a stream two miles away was running on ore from two leases and the Round Mountain company were laying foundations for a mill on their property. The light line along the base of the mountain in Fig. 1 is the pipe line.

METHODS OF OPERATION

To me the most interesting operation was the dry washing on the Sunnyside claim, which is illustrated in the accompanying photographs. Fig. 1 shows a view of Round mountain from the southwest and gives some idea of the area covered by this work. Fig. 2 gives a good idea of the whole operation. Large rocks, of which there are few, are picked out by hand. The gravel is then thrown against the usual type of sand screen, having 1-in. openings, and is ready to be shoveled upon the dry washers. The top of this is a screen with ¼-in. openings, from which the oversize is delivered by a piece of sheet iron 2 ft. beyond the end of the machine. The undersize is returned toward the head end and fed upon a frame covered with a coarse, heavy cotton cloth, across which are riffles about 4 in. apart. This frame forms the upper side of a bellows operated by turning a crank. The succeeding puffs of air through the cloth agitate the gravel and, aided by the slope of the frame, it is discharged at the lower end.

The man in charge of the machine turns the crank while his assistant throws 100 shovelfuls on the screen, this operation requiring about 15 min. The machine is then stopped and the frame removed and replaced by another. The gravel and gold which is retained by the riffles is brushed off into the tub, as shown in the right foreground of Fig. 2. Subsequently this accumulated concentrate is put over the machine a second time and the tailings sacked and held for shipment or further treatment. I was told that the product carries $40 to $60 per ton. The concentrate from the second handling is washed in an ordinary gold pan and the gold and black iron, of which there is a large amount, separated by a magnet. The man on the left in the illustration is preparing a sluice-box to be used when water is obtained through the pipe line.

FIG. 3. WASHING PLANT AT MANHATTAN

There are 20 men employed on the prop- [illegible] hours per day, handle about 35 tons. The daily clean-up runs from $300 to $1000, the upper edge of the area worked giving the lower value and the middle proving the best. The depth of the gravel varies from 1 to 3 ft., increasing at the pits at the lowest edge to 6 ft. or more. Here it is largely granite wash and the values are low. Fig. 3 and Fig. 4 (photographs taken at Manhattan) show another way of accomplishing the same object. Here water is hauled in barrels and dumped into a large tank. The gravel is shoveled upon a platform, shown near the bend in the sluice, and the water from the tank is then drawn off through the sluice-box, the gravel being fed in from the platform. The water from the sluice returns to a pit dug below the tank. It is then raised in a box attached to one end of the long pole which is seen in the foreground of Fig. 4. To do this a man walks up the plank, which is seen just beyond the tank in Fig. 3, and, jumping off, catches hold of the other end of the pole and, lying over it, his weight brings the box up to the level of the top of the tank and the water is then automatically discharged into the tank for further use.

The saving by the dry-washing machines is not claimed to be over 70 per cent., while the saving by the Manhattan method is undoubtedly much higher. The disadvantages of the latter method lie in decreased capacity, greater expense, and the difficulty of finding a man whose stomach will stand the pressure necessary for operating the pole for a longer time than is absolutely necessary to secure money enough to last while hunting another job.

FIG. 4. LEVER FOR LIFTING WATER

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

Depreciation of Smelting Plants

The importance of a proper allowance to be made on an industrial plant comes primarily to the attention of an engineer when he is called upon to design a plant and estimate its rentability (earning capacity). As Mr. Boggs correctly remarks, we are unable to foretell the future. Local conditions, past experience, supply and demand of the articles manufactured, possible decline in the market value of the manufactures turned out in the plant under consideration, all enter into the estimate, and require an engineer's most careful attention to forecast the life of the plant to the best of his ability. When we speak of the life of a plant, it is not so much the life of the materials that enters into its construction, but its industrial life. That methods change in course of 10 years to a remarkable extent can easily be proved in the case of smelting plants. Mechanically, the methods of working copper and lead ores have experienced great improvements in the history of both metallurgies. It is the depreciation due to the introduction of new methods which shortens the life of a plant, and is of greater importance than the actual wear and tear of the machinery, as Dr. Raymond very correctly points out.

To give an industrial plant a longer life than 10 years is hazarding on dangerous grounds. I do not know of any industrial enterprise, where too large an allowance for amortization crippled it. But I do know of many failures, which were directly due to the shortsightedness of the directors to write off sufficient for amortization.

Where the policy is prevalent to declare high dividends, draining thereby the depreciation fund, a company is very frequently put to the troublesome task of increasing its capital stock. Increasing the capital stock—not for entering an entirely new enterprise—but to *improve* the *old* works, meets rightly enough with suspicion. Germany's successful industrial growth and development can be attributed largely to the systematic carrying through of the amortization principle, which makes large sums available to apply in practice the increasing number of new inventions.

But a point not dwelt upon in any of the articles that appeared on this subject in the JOURNAL is the factor labor plays in the amortization principle. If an engineer is called upon to design a large sized smelting plant, one of the most difficult questions to decide is *how* modern a plant shall he build. In the United States this question is far less acute than in some Mexican or European industrial centers, where labor is cheap. In America, with expensive labor, and with an assured life for a plant of 10 years, it pays in most cases to put in labor-saving appliances, keep them in order, and figure their depreciation. But here in Mexico we are often confronted with the question, are we safer in building a plant using considerable labor, and meeting this expense daily, or is it more advantageous to put in the most modern labor-saving appliances and write off the increased amount of amortization, due to the higher cost of this plant. Where a plant is designed for a mine with known ore reserves, on which can be counted with almost absolute certainty, this question can be answered with but little difficulty. But when designing a custom smelter, the responsibility of building a very costly plant is great and demands circumspection. Here the life depends more on the ore supply than the life of the plant proper, and if a life of 10 years is questionable because of the possible exhaustion of the ore supply in that particular district, it may be inadvisable to curtail the profits by going to very large expenditures simply to have a modern plant. Scarcity of labor, which raises the price of labor, may of course dictate a plant with labor-saving appliances.

To cite an instance, here in Mexico in custom lead smelters, with properly arranged beds, bedding costs about 2c. per ton when the bedding is done by labor entirely, costing two *pesos* per 24 hours. This can hardly be reduced with ore bridges, conveyers, and similar mechanical means for stocking ore, where only 1000 tons or thereabout are treated daily. Such appliances are costly, and the saving of the cheap labor hardly will meet the increased rate of amortization.

I need not call attention to the fact that a 1000-ton copper or lead smelter can be built with a capacity of two tons per man per day, or 10 tons per man per day, and when we go above 1000 tons, the ratio of tonnage to men employed can be reduced to 15 tons per man per day. Here we have low amortization charges (as the plant using much labor has usually lumber buildings and less costly appliances), higher labor cost per ton of material treated, due to quantity of labor employed, the risk of labor strikes, labor inefficiency, etc., against low labor cost per ton of material treated, increased amount of amortization, smaller risks of shut-downs due to labor troubles, etc.

We often hear statements how cheaply some of these modern plants operate, but often the proportionate share per ton of material treated of the increased amortization, smaller risks of shut-downs due capital investments are not included in such statements. I make it a rule when reporting on an industrial enterprise never to allow less than 10 per cent. amortization. Where the life of machinery is known to be less than 10 years, I allow amortization accordingly. In addition, I reckon interest on the money invested at from 3 to 5 per cent.

I have at different occasions observed that engineers, figuring on the rentability of an enterprise, would not add the proportionate share of amortization and interest on the invested capital to the cost of the manufactured article. They would figure the manufacturing cost, and from the profits realized, would set aside at the end of each year a "certain" sum for amortization. This is a very dangerous policy, and often deceptive, as it gives the cost of manufacture considerably lower than it really is, and only too often this "certain" sum instead of being retained is distributed in the form of dividends. In a brick plant for instance, where the cost of manufacture per thousand brick is $3.50, exclusive of amortization and interest, I would add this quota, and carry it on the books. If the plant cost $60,000, and turns out 40,000 bricks per day, with 300 working days per year, we have to add, with 10 per cent. amortization and 5 per cent. interest, 75c. to every 1000 bricks turned out. Should the plant shut down or the company be dissolved before the expiration of 10 years, whatever moneys were not spent in reconstruction can be divided among the stockholders. In a copper-smelting plant, which cost $750,000, treating 1000 tons daily, to the cost of treating every ton should be added, using the same figures (10 per cent. and 5 per cent.), 37.5c. per ton.

Under certain conditions, lumber construction is preferable to steel and concrete, as a money investment. At the present stage of our industrial development cases like the one I am going to cite are rare, and hardly come into question with the present status of copper and lead technology, in which labor-saving appliances require strong materials to carry the usually heavy loads. I have in

mind the East Helena plant. When this smelter was rebuilt, the question arose, is it cheaper to build in lumber, or in steel and concrete. The cost of both installations was figured, their amortization and interest on the capital invested, advantages accruing from each type, the increased fire risk of the lumber buildings, and the loss of the profits during a complete shutdown in case of total destruction by fire. It was decided that the lumber construction was still the cheaper, and so the smelter was built with lumber. Such economical questions are ordinarily hard to decide, but in this case the American Smelting and Refining Company had a great deal of statistical material which assisted in the determination. Bearing such a case in mind, a lumber-built plant, apparently not "modern," is by no means a criterion to an engineer's ability.

I call to mind the thoughtful remark of a financier that most industrial enterprises when financed look well on paper, in most cases even brilliant, but that most of them have their infantile infirmities. An insufficient allowance for amortization and interest, figured into the cost of manufacture, is one of them.

HERBERT HAAS.

Torreon, Coahuila, Mexico, Dec. 12, 1906.

The Duties of an Engineer

Will you kindly define for me the duties of an engineer in charge of construction, where said construction consists chiefly of iron and steel work in metallurgical furnaces and other industrial plants? It is understood that the duties asked about are simply those of the field engineer, who is not concerned with the design and who acts neither as superintendent nor as foreman of an erecting gang. D. M.

Buffalo, N. Y., Dec. 20, 1906.

[The duties of an engineer in charge of construction are to see that the construction is properly done. He must see that the materials supplied conform to the specifications, and must see that the work of erection is done in proper manner and in conformity with the designs. If in the course of the construction it should develop that the designs are defective, he should call the attention of the designing engineer to the matter, and should give his reasons. It would be outside of his right or duty to make any alteration in the designs; but in the event of discovery of an apparent error, it would be his duty to suspend the work until a decision could be obtained from the engineer responsible.

An engineer in charge of construction is practically the superintendent of construction. The only distinction that can be made is between an engineer in charge of construction and an inspecting engineer. An inspecting engineer would have no responsibility as to the execution of work aside from questions pertaining to conformity of design, but if he should discover that the work was not being done in the most economical manner, it would be his duty to report that fact or opinion.—Editor.]

Use of Bore Holes in Mining

The recent article on this subject, by Richard Lee, reminds me of an interesting use of a bore hole in mining that I once heard of in Missouri. The case was in Washington county, where the small pipe veins of galena are worked in a very primitive manner. The veins, which lie nearly flat, are not ordinarily more than 6 or 7 ft. wide, nor more than 12 in. in thickness. The miners of the district, who always work on their own account in parties of two or three, leasing from the land owner, try to break as little ground as possible. A drift 4 ft. in hight is regarded as very commodious, and ordinarily they make a drift (it might better be called a burrow) large enough only for a man to crawl through on all fours. Sometimes they go 300 or 400 ft. away from the shaft with such a hole.

In the case I have in mind, the miners had gone something like 400 ft. away from the shaft, and finally the dragging out of the ore in candle boxes became too inconvenient even for a Missourian. There happened to be a drilling outfit in the region at the time, and the bright idea occurred to these miners to have an 8-in. hole put down from the surface to the stope where they were working. This having been done, they constructed a long bucket of light sheet iron, about 6 in. in diameter, erected a light derrick on the surface and hoisted their ore and waste through the bore hole.

MINING ENGINEER.

New York, Jan. 14, 1907.

Better Maps and Better Methods

Referring to F. W. Parson's "Colliery Surveying and Office Methods," begun in your issue of Sept. 8, it is safe to say that there is hardly a mine manager or superintendent appreciating the close connection between successful operation and thorough, comprehensive engineering, who will not say a loud Amen to all Mr. Parsons says. It has always been past my understanding why, first, operators themselves cannot all be brought to see the great advantage of properly made maps; secondly, why the great commonwealths, whose principal resource is coal, do not, through their mining bureaus, compel the operators, as a unit, to furnish the right sort of maps. If we cannot rely on the mine map to stop the frightful loss of coal due to the present system of management, it is apt to go on indefinitely; but even if adequate maps fail to stop the loss, the masses of the people, whose resource the coal really is, would at least have the means of finding out how much is lost and how much is won.

Going back to Mr. Parsons' valuable suggestions, my experience concurs very closely with them except as to numbering inside stations. The necessity for numbering outside stations is obvious and does not crowd the notes or complicate them. With inside stations, however, the writer always found it preferable to locate the stations with reference to a breakthrough, a room or chute neck or an intersecting entry and thus dispense with naming or numbering them. The paint mark in use to denote stations is placed on the rib to right and opposite the point, thus enabling the sightman or transitman to locate it, after first getting its general location from the notes. The same is true of room work where they are not driven on centers and taken up from plummet lamps.

C. H. THOMPSON.

Windrock, Tenn., Dec. 22, 1906.

New Publications

"Mica and the Mica Industry." By George W. Colles. Pp. 130; illustrated. 6x9 in.; cloth, $2. Philadelphia, 1906: Franklin Institute.

Contents: Mineralogy. Geology of the granitic micas. Geology of the pyroxenic micas. Geographical distribution. Historical. Mining and milling. Uses. Statistics. Conclusions.

This work, together with the monograph by F. Cirkel, which was recently published by the Mines Branch of the Department of the Interior, Ottawa, Canada, gives us a rather complete literature on an interesting, though comparatively unimportant, commercial mineral. While the work of Mr. Cirkel was prepared with especial reference to the mica industry of Canada, the present work is designed on comprehensive lines, it having been aimed by the author to incorporate all the previously published information of value or importance.

The material which is comprised in the volume was published originally as a series of papers in the *Journal* of the Franklin Institute. They manifest an exhaustive study of the subject, and it is useful to have them in this convenient book form. So far as we are aware, no previous writer has ever pointed out the classification of the micas into granitic and pyroxenic, nor the fundamental differences in constitution, nature and origin that go with this classification. This is perhaps the most important contribution that has been made to the literature of the subject. A highly important feature of the book is the statistical review of the industry, which, although based on previously published figures, has been recast in the light of expert study, whereby the value has been greatly increased.

Patents Relating to Mining and Metallurgy

UNITED STATES

[illegible] relating [illegible] granted [illegible] Patent [illegible] list of [illegible] INCLUDING [illegible] 25 [illegible] respond [illegible] [illegible] of the [illegible] patent ap[illegible]

Published Week Ended Dec. 11, 1906.

[illegible] FOR MANUFACTURING CE[illegible] FROM BLAST FURNACE SLAG [illegible] Berlin, Germany. No [illegible] Filed March 22, 1905.

[illegible] Edward H. Holden, [illegible] N. Y. No. 837,931. Filed [illegible]

RELEASING BLOCK OR HOOK—Angus A. McIntosh, Alexander, Ontario, Canada. No. 837,948. Filed March 28, 1906.

EXPLOSIVE CARTRIDGE AND METHOD OF MAKING SAME—Francis I. duPont, Wilmington, Del., assignor to The I. Du Pont de Nemours Powder Company, Wilmington, Del. No. 837,958. Filed Aug. [illegible]

VALVE GEAR FOR PNEUMATIC ROCK DRILLS—Carl Weidmann, Würselen, Germany, assignor of one-half to Paul Hoffmann, Rosswerke, near Siegen, Westphalia, Germany. No. 837,990. Filed June 17, 1905.

HOIST—Benjamin F. Henry, San Pedro, Cal. No. [illegible] Filed Nov. 22, 1904.

MEANS FOR DRAWING AND LOADING COKE—William M. Nixon, Chattanooga, Tenn. No. 838,049. Filed Aug. 22, 1906.

MINERS' PIT CAP—Royal E. Pitcher, Osage City, Kas., assignor of one-half to Chas. W. Swenson, Osage City, Kas. No. 838,-[illegible] Filed June 16, 1905.

ORE-CONCENTRATING TABLE — Frederic W. Sherman, Park City, Utah. No. 838,-058. Filed April 20, 1905.

CONVEYER—George W. King, Marion, O., assignor to The Marion Steam Shovel Company, Marion, O. No. 838,119. Filed June 3, 1905.

BUCKET FOR DREDGES—George W. King, Marion, O., assignor to The Marion Steam Shovel Company, Marion, O. No. 838,120. Filed June 2, 1906.

MERCURY FEEDER FOR ORE CRUSHERS—Peter Kirkegaard, Deloro, Ontario, Canada. No. 838,191. Filed Sept. 17, 1904.

PULP DISTRIBUTER—David Lonie, Fairview, British Columbia, Canada, assignor of one-half to Henry Lee, Fairview, Canada. No. 838,196. Filed Dec. 5, 1905.

HOISTING BUCKET — Almon E. Norris, Cambridge, Mass. No. 838,206. Filed June 22, 1906.

ELEVATOR BELT—Charles E. Taylor, Bremen, Ohio. No. 838,221. Filed April 6, [illegible]

PERCOLATOR—Charles E. Trewhella, Forestville Conn., assignor to American Silver Company, Bristol, Conn. No. 838,224. Filed Oct. 10, 1906.

ELECTRIC FUSE—Leonard B. Buchanan, Woburn, Mass. No. 838,235. Filed April 2, 1906.

GUIDING APPLIANCE FOR DRILLING MACHINES—Edward M. Kinsella, Bisbee, Ariz. No. 838,339. Filed Aug. 24, 1905.

HOISTING BUCKET — Almon E. Norris, Cambridge, Mass. No. 838,352. Filed [illegible]

PROCESS OF HARDENING STEEL—Shipley N. Brayshaw, Hulme, Manchester, England, assignor to George Nash, New York, N. Y. [illegible] Filed June 5, 1906.

ROTARY COMPRESSOR OR PUMP—Lebbeus H. Rogers, New York, N. Y. No. [illegible] N. Y. No. [illegible] Filed Sept. 5, 1905.

AIR COMPRESSOR—Lebbeus H. Rogers, New York, N. Y. No. 838,459. Filed Nov. [illegible]

[illegible] Lansing, Mich. No. 838,463. Filed July [illegible]

CONCENTRATOR—John P. Shumway, Los Angeles, Cal. No. 838,468. Filed April [illegible]

[illegible] MACHINERY—Louis Y. Sussman, Denver, Colo. No. 838,469 and 838,470. Nov. 23, 1903.

Published Week Ended Dec. 18, 1906.

METHOD OF PRODUCING A BLACK OXIDE ON THE SURFACE OF STEEL—Emil Jabulowsky, Pforzheim, Germany. No. 838,546. Filed Feb. 2, 1905.

SEPARATING CYLINDER FOR GOLD DREDGERS—Robert H. Postlethwaite, San Francisco, Cal., assignor to Risdon Iron and Locomotive Works, San Francisco, Cal., a corporation. No. 838,579. Filed May 15, 1905.

EARTH AUGER—George Frank, Titonka, Iowa. No. 838,614. Filed Sept. 18, 1906.

SEPARATING TANK—Edmund B. Kirby, Rossland, British Columbia, Canada. No. 838,626. Filed Dec. 17 1903.

PYROELECTRIC FURNACE—Finis E. Reach, Chicago, Ill. No. 838,647. Filed Oct. 11, 1903.

CONVEYER—Charles D. Seeberger, Yonkers, N. Y. No. 838,654. Filed May 28, 1902.

HOIST—James R. Sharp, Chicago, Ill. No. 838,655. Filed Dec. 28, 1905.

SAFETY DEVICE FOR ELEVATORS—Chas. H. Lethingwell, Cleo, Okla. No. 838,726. Filed April 20, 1906.

STONE CRUSHER—Wilhelm L. Velten, Koenthal, Germany. No. 838,921. Filed July 26, 1905.

GAS PRODUCER—William H. Bradley, Belleville, Pa., assignor of one-fourth to Alexander Gilliland, one-fourth to William C. Bradley, Bellevue, Pa., one-eighth to M. E. Webster, Chicago, Ill., and one-eighth to Sara L. Bradley, St. Louis, Mo. No. 838,-946. Filed Feb. 23, 1906.

HEAD MOTION—Abel Guionneau, Denver, Colo. No. 838,982. Filed Sept. 2, 1905.

MINER'S LAMP—Peter S. Keenan, Kemmerer, Wyo. No. 839,002. Filed July 28, 1906.

ROTARY KILN—William R. Warren, New York, N. Y. No. 839,053. Filed Jan. 19, 1906.

PROCESS OF TREATING ORES—John E. Greenawalt, Denver, Colo. No. 839,065. Filed March 27, 1905.

MINER'S CAP AND LANTERN HOLDER—Walter A. Lattimore and William V. Parmley, St. Clair, Pa., assignors to Lattimore Manufacturing Company, a firm composed of Harry B. Davis, Thomas E. Ferrebee, Charles E. Breckons, Harries L. Daddow and Walter A. Lattimore. No. 838,070. Original application filed March 18, 1905. Divided and this application filed June 30, 1905.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Dec. 8, 1906.

GOLD-EXTRACTING APPARATUS—T. E. Beaumont, London. An apparatus for extracting gold from ore by passing the pulp up through a chamber in which the heavy gold particles are collected, and afterward collecting the lighter gold particles by passing through an electrolytic depositing apparatus. No. 23,319 of 1905.

ELECTROLYSIS OF FUSED SALTS—E. A. Ashcroft, London. Improvements in the inventor's method of producing metals by the electrolysis of fused salts or ores, consisting in electrolyzing the fused ore or salts over a metal and then using the alloy so formed as an anode in another cell and so fractionally precipitating the metals of the alloy on the cathode. No. 26,813 A of 1905.

IRON OXIDE FOR PIGMENT—C. F. Wolffing, Honningen, Germany. An improved process for obtaining a black oxide of iron suitable for a base for paints, by blowing ammonia through waste solutions or pickling liquors. No. 1050 of 1906.

COAL WASHER — G. H. Rayner and the Hardy Patent Pick Co., Sheffield. Detailed improvements in coal washers of the traveling type, chiefly for the purpose of removing any muddy matters that settle. No. 1660 of 1906.

EXTRACTION OF SODIUM NITRATE—J. R. Beaver and R. Nordenflycht, Valparaiso, Chile. Improvements in the plant used for extracting nitrate of soda from caliche. No. 7178 of 1906.

WASTE-HEAT FURNACE—F. C. Knight, Salt Lake City, and H. V. Pearce, Denver, U. S. A. In metallurgical furnaces in which tortuous flues are interposed between the furnace flue and the stack, a method of construction so that the waste heat of the furnace may be utilized in heating the gases as they enter the stack and so revive the draft. No. 8071 of 1906.

COAL CUTTER—H. Baum and R. Gansen, Dudweiler, Germany. In coal cutters which swing round an upright a method of regulating the motion of the tool so that it cuts a straight and not a curved furrow. No. 11,822 of 1906.

ELECTRIC SMELTING FURNACE—H. Röchling and W. Rodenhauser, Volklingen, Germany. In electric smelting furnaces where induction currents are employed the use of two or three secondary circuits. No. 12,329 of 1906.

LINING FOR TUBE MILLS—H. P. Barray, Waihi, New Zealand. Making the lining of tube mills of honeycomb shape and using rough pieces of grinding material bedded in the cells. No. 16,395 of 1906.

UTILIZING ZINC RESIDUES—G. Stolzenwald, Roumania. A method of utilizing zinc-retort residues by mixing with zinc ore and heating in a reverberatory furnace. No. 18,134 of 1906.

Published Week Ended Dec. 15, 1906.

ZINC OXIDE EXTRACTION — R. W. E. MacIvor and M. Fradd, London. A modification in the method of extracting zinc oxide from ores by lixiviating and digesting with zinc chloride. No. 23,977 of 1905.

COAL APPARATUS—G. Smith and the Hardy Patent Pick Co., Sheffield. An automatic apparatus for extracting fine coal from a coal-washing plant. No. 25,135 of 1905.

BORE-HOLE APPARATUS—C. Erlinghagen, Nordhausen, Germany. In apparatus for measuring the deflection of bore holes, method for preventing the apparatus from turning. No. 1957 of 1906.

BORE-HOLE APPARATUS—C. Erlinghagen, Nordhausen, Germany. In apparatus for measuring the deflection of bore holes, an improved method of automatically recording the variations. No. 2781 of 1906.

CONVEYOR—J. M. Scalley, Lanark. A conveyor for carrying coal from the working face to the wagons, so obviating shoveling and breaking. No. 3953 of 1906.

COAL-CUTTING MACHINE—F. Kresl, Vienna, Austria. In undercut coal-cutting machines arranging the carriage so that the tool is always parallel to the slots already cut, and so that the motor can be brought as close to the fan as possible. No. 6016 of 1906.

IMPROVED CORE DRILL—M. Boof, Strassburg, Germany. An improved drill for bore holes, which carries up the core intact. No. 12,247 of 1906.

STACKER AND DISTRIBUTER—H. W. Blaisdell, Los Angeles, Cal., U.S.A. Apparatus for distributing and stacking tailings coming from leaching vats. No. 18,898 of 1906.

BASIC SULPHATE OF LEAD—E. Toelle, Mulheim, Germany. Producing basic sulphate of lead by adding the requisite quantity of sulphuric acid to lead oxide and stirring continuously. No. 19,718 of 1906.

Published Week Ended Dec. 22, 1906.

COAL WASHING BELT—C. Burnett, Durham. Improvements in the inventor's endless belts for washing coal, especially fine coal. No. 23,713 of 1905.

MINERS' ACETYLENE LAMP—B. Noldner, Breslau, Germany. An acetylene lamp for miners' use, the improvements relating to means of adjusting the burner and reflector. No. 24,143 of 1905.

PULVERIZER—C. W. Ogden, London. Improvements in pulverizers of the type where a number of pivoted hammers revolve at great speed. No. 1872 of 1906.

MINE CAGE GATE—H. Houghton, Wegan. Improvements in gates for mine cages, the object being to prevent interference to the passage of wagons in and out. No. 3821 of 1906.

SAFETY OIL LAMP—W. Best, Morley. Improvements in miners' safety oil lamps with the object of allowing the light to come out in a vertical direction as well as horizontally. No. 6556 of 1906.

ROLLER CRUSHER—S. R. Krom, New York, U. S. A. A crushing machine in which a series of rollers mounted on short freely-pivoted crankshafts are driven at a high speed and run against the hardened inner surface of a ring, the centrifugal force causing a very heavy crushing pressure. No. 13,389 of 1906.

COAL JIGS—I. Christ, Tamaqua, Pennsylvania, U. S. A. Improvements in jigs used for separating coal from slate. Nos. 15,-285 and 20,894 of 1906.

ROCK DRILL—B. H. Locke, New York, N. Y., U. S. A. A rock drill with a central bore for bringing water to the working face, and having a series of holes from the central bore to the outside, only that one being opened which is next to the working end; as the drill wears, so each successive hole is opened out. No. 23,078 of 1906.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

H. W. Hardinge, of New York, visited Cobalt recently.

Godfrey D. Doveton is at the Esperanza mine, El Oro, Mexico. He will be in Denver early in March.

The permanent address of Robert Peele is care School of Mines, Columbia University, New York City.

R. B. Lamb, mining engineer, is acting as manager for the Barnes King Development Company, of Kendall, Montana.

G. A. Denny, mining engineer, of London, is examining mines in Butte, Mont., in the interest of his English associates.

Wilbur E. Sanders, mining engineer, of Helena, Mont., is engaged on professional work in the Greenwater district, California.

George W. Maynard, mining and metallurgical engineer, of New York, returned recently from a prolonged visit to Mexico and Arizona.

J. F. Whiteaves, assistant director of the Canadian Geological Survey, has been awarded the Lyell medal by the British Geological Society.

C. L. Rood, who recently retired from the management of the Ontario and Daly mines, at Park City, Utah, has gone abroad for the winter with his family.

Frederick W. Denton has been appointed general manager of the mines of the Copper Range Consolidated Company, in the Lake Superior region.

James E. Chapman, of Atlantic, Michigan, spent a few days in New York recently, and has now gone to Matehuala, Mexico, where he is engaged in engineering work.

John J. Daly, president of the Daly Judge Mining Company, at Park City, Utah, and wife have sailed for Europe, where they will remain during the balance of the winter.

Juan Felix Brandes will return from Germany to the United States in January. From New York he will proceed directly to Colorado, California and Mexico, to inspect mining properties.

Edward K. Judd, for two years on the JOURNAL's editorial staff, has resigned and has become an associate of Sillwell & Gladding, assayers and engineers, 55 Fulton street, New York City.

Winthrop C. Neilson, of Philadelphia, has been chosen president of the Republic Mining and Manufacturing Company, of Georgia. He succeeds his father, lately deceased.

L. W. White and Robert Addie, of London, England, accompanied by Alexander McNab, of Scotland, all mining men, [illegible] Walter Hovey Hill, for a number of years connected with mining and railroad enterprises in the West, has become consulting engineer for the Silverman companies, at 25 Broad street, New York.

Jesse Scobey, acting for the Pride of the West Mining Company, has closed an agreement of sale of that property to the Duquesne Mining and Reduction Company. He is now in Guadalajara, Mexico.

The management of the Ontario and Daly mines, at Park City, Utah, is now under the direction of Ernest Bamberger, manager of the Daly West Mining Company, who takes the place of C. L. Rood, resigned.

Francis F. Coleman, formerly with the Westinghouse and Allis-Chalmers companies, and recently with the Traylor Engineering Company, has joined the Lidgerwood Manufacturing Company as publicity manager.

N. V. Hansell, of Hamilton & Hansell, mining engineers of New York, is at present in Sweden, where he will remain until the latter part of February. While there he will study the latest developments in the magnetic concentration of iron ore.

Edgar D. Stone, for several years mining expert for the Southern Railway, whose headquarters were established at Chattanooga, Tenn., Aug. 15 last, has resigned his position, having been appointed resident manager of the mines and washer plants of the Etna Steel and Iron Company, with headquarters at Etna, Georgia.

E. E. Olcott, Christopher R. Corning and Robert Peele, mining engineers, of New York, announce that the firm of Olcott, Corning & Peele has been dissolved by mutual consent, Robert Peele having withdrawn on account of increasing obligations of other engagements. The business will be continued by E. E. Olcott and C. R. Corning, under the firm name of Olcott & Corning, at 36 Wall street.

F. W. Sherman, who is well known as the manager of the concentrating mills of the Daly-West Mining Company, at Park City, Utah, has, together with associates, built shops in Salt Lake City, where a specialty will be made of manufacturing various kinds of concentrating machinery, especially those machines which are used in the Sherman process of wet concentration. The name of the company will be the Sherman Engineering Company.

H. J. Lamborn has been appointed superintendent of power and plant in the Yale & Towne works, to succeed F. A. Waldron, who resigned about a year ago. Since 1902 he has held the position of mechanical and electrical engineer in charge of the magnetic separating plants of Witherbee, Sherman & Co., at Mineville, N. Y. (on Lake Champlain). S. E. Dauchy, assistant superintendent, will continue under Mr. Lamborn.

Obituary

James Clayton, who died in Brooklyn, N. Y., Jan. 5, aged 85 years, was for many years engaged in the manufacture of pumps, and later of air compressors. He introduced a number of improvements in compressors. He was born in England, and came to the United States in 1849. He retired from business five years ago.

William G. Neilson, treasurer of the Keystone Drop Forge Works, of Chester, Penn., and president and treasurer of the Republic Mining and Manufacturing Company, died suddenly from heart disease, in his office in the Harrison building, Philadelphia, Dec. 29, at the age of 64. He had been identified with the iron trade from his youth, and when a young man he was for a time connected with the American Iron and Steel Association. As president of the Republic company, Mr. Neilson was interested in the development of the Georgia bauxite mines, and was an authority on the production and uses of that mineral.

Robert H. Sayre, who died, Jan. 4, at his home, in South Bethlehem, Penn., was born in Columbia county, Penn., Oct. 13, 1824. In 1840 he joined the engineer corps engaged in enlarging the Morris canal of New Jersey. His next important work was on the surveys and construction of the Back Track Railroad, between Mauch Chunk and Summit hill. In 1852, after 11 years' service with the Lehigh Coal and Navigation Company, he was elected chief engineer of the Delaware, Lehigh & Susquehanna Railroad—now the Lehigh Valley—and he supervised the extension of the system north and east. He later became second vice-president, and under his direction the extension to Buffalo and other branch lines were built. Mr. Sayre was one of the promoters of the Bethlehem Iron Company, and became general manager in 1886 and vice-president in 1891. He was well known throughout the anthracite country, from his long connection with the Lehigh Valley Company.

Societies and Technical Schools

Canadian Mining Institute—The ninth annual meeting of the Canadian Mining Institute will be held at the King Edward Hotel, Toronto, on March 6, 7 and 8. The usual single fare rate will obtain over all Canadian transportation lines. An interesting program of papers has been arranged. Members are requested to notify the secretary as early as possible of their intention to attend.

Ontario Technical Schools—An important announcement was made by Hon. Dr. Pyne, Ontario Minister of Education, in a speech at Barrie, Ont., last week. He dwelt on the necessity of technical training in connection with education, and stated that technical schools, manned by

efficient instructors, and fitted up with the [illegible], were bound to become a recognized feature of the provincial educational system.

Industrial

Furnace A, of the National Tube Company, at Benwood, W. Va., is to be overhauled and relined.

The Minneapolis Steel and Machinery Company, of Minneapolis, Minn., has recently opened an office at 1300 West Eleventh street, Kansas City, Mo., under the management of Louis Bendit, for the sale of the Munzel gas engine and suction gas producer.

During the first four days of January, this year, the Weber Gas Engine Company, Kansas City, Mo., made sales of multiple-cylinder gas engines and suction gas producers to the International Irrigation Company, Spokane, Wash.; the Fabrica de Vernado, San Luis, Potosi, Mexico; the Pekin & La Marsh Drainage Company, Peoria, Ill.; M. J. Lee & Co., Portland, Oregon; H. L. Schroeder, Chicago, Ill. The size of the plants named varies from 60 to 300 horse-power.

W. S. Barstow & Co., of New York, and Portland, Ore., have contracted to do all the electrical work for an 800,000-bbl. cement plant to be located on the outskirts of Montreal, Canada, for the Fordwick Company. The works will use about 2500 h.p. of the electric motors, and will take current from the Shawinigan power plant, 80 miles from Montreal. The property of the company is about two miles in length by 600 ft. in width, along the St. Lawrence river. Provision will be made for storing, adjacent to the works, 40,000 tons of coal.

The patents covering the Box electric drill have been bought by New York parties from Box & Sayer, of Denver, their contract with the H. D. Crippen Manufacturing Company having been terminated. Some slight changes in the drill have been made to correct certain mechanical defects and the drawings, patterns, jigs and templets have been shipped to New York, so that the drill may be manufactured under the direct supervision of the new owners. In the near future the latter will be in a position to make prompt delivery of drills, when full announcement will be made.

The Great Western Rolling Mill Company, of San Francisco, Cal., has been promoted to work up the scrap iron and steel left by the earthquake and fire. It is estimated that there is 400,000 tons of scrap in the ruins which it would not pay to ship East for re-rolling. It is proposed to cut the metal and to re-melt it in an open-hearth furnace. A mill is being built at Rodeo, Cal., near the ocean front. The plant occupies 100 acres. Emile Benjamin, purchasing agent for the company, is in Pittsburg placing orders for open-hearth furnaces, one continuous-heating furnace, muck mill and 10-, 16- and 20-in. rolling mills. It is proposed to use scrap bought along the Pacific coast, although it is believed that the metal taken from the San Francisco ruins will keep the mill in operation for years.

The Pelton Water Wheel Company, San Francisco, reports unusual activity and marked tendency toward high speed, large power units. For example, the California Gas and Electric Company is installing a Pelton wheel of 10,500 h.p. maximum capacity. The Telluride Power Company, of Colorado, is adding to its equipment one 5000-h.p. wheel operating under a head of 900 ft. and one 4000-h.p. Pelton wheel under 1800 ft. head. This company has installed a continuous lap-weld, high-pressure pipe made by the Ferrum Company, of Germany, which the Pelton Company introduced in this country. The Siskiyou Electric Power Company, of California, has ordered two Pelton wheel units, each of 2000 h.p. capacity, these being in addition to the present water-wheel equipment.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Sturtevant Mill Company, Boston, Mass. Series 96, Roll Jaw Crushers. Pp. 8, illustrated; paper, 7x10½ in.; 1906.

Scully Steel and Iron Company, Chicago, Ill. Stock List. Pp. 144, illustrated, indexed; paper, 4½x7 in.; Jan. and Feb., 1907.

The Hendrie & Bolthoff Manufacturing and Supply Company, Denver, Colo. The King Screen. Pp. 19, illustrated, paper; 5x7 in., 1907.

Western Electric Company, Chicago, Ill. Hawthorne Works for the Manufacture of Power Apparatus. Pp. 23, illustrated; paper, 8x11 in.; 1906.

Chicago Pneumatic Tool Company, Chicago, Ill. "Ideal Power," Miscellaneous Machinery, December, 1906. Pp. 32; illustrated; paper, 6x9 in.

John A. Traylor Machinery Company, Denver, Colo. Bulletin "D." Traylor Standard Jigs and Jigging Machinery. Pp. 12, illustrated; paper; 7x10 in., 1907.

The Marine Iron Works of Chicago, Chicago, Ill. Catalog No. 17. Marine Engines, Boilers and Machinery. Pp. 84, illustrated, indexed; paper, 6x9 in., 1907.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1501. Allis-Chalmers Belted Corliss Engines. Pp. 20, illustrated; paper, 8x10½ in.; September, 1906.

American Diamond Rock Drill Company, 95 Liberty street, New York City. Catalog No. 26. The Diamond Drill and Its Work. Pp. 86, illustrated; paper, 6x9 in.

Stephens-Adamson Manufacturing Company, Aurora, Ill. "Conveying and Transmission." Belt Conveyors and Conveying Machinery. Vol. 1, No. 7. Pp. 24, illustrated; paper, 6x9 in.; Dec., 1906.

American Locomotive Company, 111 Broadway, New York City. Ten Wheel Type Locomotives Weighing Less Than 150,000 lb. Pp. 54, illustrated; paper, 6x9 in., 1907.

Ingersoll-Rand Company, New York. Catalog No. 36. Ingersoll-Sergeant Air and Gas Compressors. Pp. 183, illustrated, indexed; paper, 6x9 in.; 1906. Form 45A. Ingersoll-Rand Rock Drills. Pp. 24, illustrated; paper, 6x3 in.; 1906.

St. Louis Machine and Tool Company, St. Louis, Mo. Circular A, Miscellaneous Well Drilling Machinery and Supplies. Pp. 21, illustrated; paper, 8x10 in.; 1907. Circular E, The St. Louis Center Beam Driller. Pp. 12, illustrated; paper, 8x10 in.; 1906. Circular I, Drilling Tools. Pp. 18, illustrated; paper, 8x10 in.; 1906. Circular K, Belting, Rope, Smith Tools, Hose, Etc. Pp. 8, illustrated; paper, 8x10 in.; 1906. Circular L, Steam Engines and Boilers. Pp. 6, illustrated, paper; 8x10 in.; 1906.

Construction News

Carlisle, Alabama—The Straight Mountain Coal Company is preparing to open coal mines and will need hoists and other machinery. The office is at Gadsden, Alabama.

Citrus County, Florida—The Mutual Mining Company is opening phosphate mines and will need washers and other machinery. J. R. Williams, Alachua, Florida, is manager.

Baker City, Oregon—The Virtue Mines Development Company proposes to establish a water-power electric plant on Eagle creek. J. K. Romig, Baker City, is president and manager.

Yerington, Nevada—The Nevada-Douglas Copper Company is installing some mining machinery. The company is arranging to build a mill and smelting works. Walter C. Orem, Salt Lake City, Utah, is manager.

Grand View, Tennessee—The Grand View Coal and Timber Company has started to develop coal lands, and will be in the market for hoisting, haulage and other machinery. W. C. Marshall, Chattanooga, Tenn., is the manager.

Pine Creek District, Gilpin County, Colorado—Denver and Eastern people have taken an interest in the Yellow Medicine Gold Mining Company, owning the Black Dog group in the Pine Creek district. They are arranging for the installation of machinery and heavy developments. L. J. Mountz, 315 Kittredge building, Denver, Colo., is manager.

Special Correspondence

San Francisco Jan. 10

It is expected that the Tonopah & Tidewater Railroad, known as the Borax Smith line, will be running trains into Greenwater, Inyo county, by June 15 next. The present terminus of the road is at Front, and a tri-weekly stage service is now in effect to that point. By the middle of this month it is hoped that a daily stage coach each way will be put on. A wagon road is now being built through Amargosa cañon. Freight rates have been reduced and goods are now delivered within reasonable time. The removal of Greenwater to the new town of the same name on the townsite of Ramsey will soon be an accomplished fact. The old town was up on the side of a mountain and difficult of access. That is why it was considered best to select a new location. All the frame houses of any account will be taken to the new Greenwater. Work is being prosecuted upon a number of the better known properties. Development thus far has materially improved the district, and there is every reason to believe that by spring there will have been opened up some very good showings.

The Union Oil Company's steamer "Argyll" has sailed from San Francisco with the first cargo of California oil that is to be piped across the Panama isthmus and re-shipped to the points on the Atlantic coast. This is the first vessel of the new line. The pipe line was installed by the Union Oil Company, and there will be a regular line of vessels carrying oil from this coast to the canal zone.

Two complete sections and a part of a third section of the oilfield at Coalinga, involving 1760 acres, have been purchased from 14 companies by a London syndicate, known as the Coalinga Oil-Fields, Ltd., which is headed and represented in this State by Balfour-Guthrie & Co. The transfer approximates a valuation of $2,250,000. Among the properties involved are all of section 34, three-quarters of section 26, and all of section 14. Among the companies enlisted are Forty Oyama, Westmorland, Pittsburg Coalinga, Pittsburg, McCreary, 340 Oil Company, Star Oil Company, O. Heath Company and the West interest. All these claims are in section 34. In section 26 there are the Arline, the K. W. Oil Company and 80 acres unnamed. In section 14 there are the Tavern and the Avon. The property brought values ranging from $1000 to $4500 an acre. The holdings of the Coalinga Oil-Fields Company already embrace 3600 acres and the added properties will place under its control 5360 acres. Recently the price of oil, which was down to 13 and 14c., has gone up to 25, and the Associated Oil Company will not sell now for that price.

A Los Angeles Oil Company has bought a site for an oil refinery on the Solano county shore of Carquinez straits between Vallejo and Benicia. The new corporation plans to build a wharf 500 ft. long into the bay and to build an immense oil refinery for crude oil which will be brought from the southern fields. A spur track three miles long is to be built by the Southern Pacific Company from Benicia to furnish shipping facilities for the plant. The company will build a large number of big steel tanks on the hills back of the works. The new concern has already ordered 500 tons of structural steel for the commencement of building operations.

The Wildman-Mahoney properties and other mining claims at Sutter creek in Amador county have been sold. The purchaser was the Mother Lode Gold Company, which is made up mainly of Eastern men. Mr. Overholt, of Pittsburg, is president. The Pacific Coast directors are Homer Wilson, John A. McIntyre, John Ross, Jr., and Jackson Dennis. Negotiations had been going on for a year. The Wildman-Mahoney mines have been worked since the early days of mining in California. The Wildman was discovered in 1850.

Between October and January over 5000 mining locations were filed in San Bernardino county. The locations are nearly all on the desert side of the San Bernardino range and in various spots from the mountain range to the Colorado river.

State Mineralogist Aubury has protested to the Governor of the State, the Senators and Congress on the subject of using the building stones of other States than this in the State or Federal buildings now being constructed in California. "It is unnecessary," says Aubury, "to go to Wyoming or to Arizona or to any other outside point to get sandstone for the construction of a Federal building at Los Angeles or anywhere else in this State. I believe that it is both fair and wise to give the materials produced in California a fair chance when large structures are to be erected here by the Government."

All the mines at Grass Valley still remain closed down owing to the miners' strike. The expected compromise was not carried out this week. The Mine Operators' Association and the Miners' Union has thus far been unable to agree. The mine operators formulated a communication to the Miners' Union, in which they asked the miners to return to work on the old scale, pending a settlement of the trouble, and threatening to break off negotiations unless the proposition were accepted. The operators promised definite answer to the miners' demands within 24 hours if the miners returned to work. At a special meeting the miners rejected the proposition, and said they would return to work only under an eight-hour schedule. The millmen, cyanide workers, engineers and surface workers have themselves organized a union, but have not yet become involved in the present strike trouble. The managers say that if they concede the demands which have been made upon them by the union they want a guarantee from that body that there will not be any further disturbance for a given time, say a few years. This they want in the form of a written agreement. But the officials of the union say that it is not within their power to enter into such an agreement, under the rules of the Western Federation of Miners. The operators are angry at the action of the union in calling the miners out of the North Star mine, which had already established an eight-hour day. They seem to have settled down to a period of idleness. All the mines, large and small, in the district, belong to the association and will stand together in the settlement of the conditions. The men have been peaceable and none of the mines has been troubled by the idle miners or their sympathizers.

Salt Lake City Jan. 11

An important deal has been consummated in New York affecting Park City mining properties. After negotiations covering a period of several years, Jacob E. Bamberger, president of the Daly West Mining Company, has acquired a controlling interest in the Ontario and Daly mines, together with all the water, power and other rights pertaining thereto. It is not known here what disposition is to be made of them, yet the impression prevails that they will be merged in some form with the Daly West Company.

The management of the Utah Consolidated Mining Company has decided on a location for its proposed smelting plant, to be used after the abandonment of the present plant at Murray, nine miles south of Salt Lake City. The site selected is on the west side of the Oquirrh range of mountains, near the town of Tooele, in Tooele county, and directly west of Bingham. It is planned to drive an 11,000-ft. tunnel adit, which will tap the orebodies of the company's Highland Boy mine about 1000 ft. below the present lowest workings. Pending the completion of the adit, however, it is the intention to construct and operate an aërial tramway over the mountain from the mine to the smelter site. The mouth of the proposed adit will be between one and two miles from the smelter. The company will build several miles of railroad tracks to connect with the main lines of the San Pedro, Los Angeles & Salt Lake and Western Pacific railroads.

The fuel situation, as far as the Consolidated Mercur Gold Mines Company is concerned, is very much improved. During December the battery of roasters in the mill was closed. A few days ago a portion of them were placed in commission again.

The management of the Garfield Smelting Company, one of the units of the American Smelting and Refining Company, has experienced much annoyance on

plant has not run at any time at more than one-fourth its capacity.

The Mountain Lake Consolidated Mining Company, operating in the Big Cottonwood mining district, near Alta, has completed the purchase of some additional ground near its Steamboat property. Just before the holidays the tunnel adit, through which the mine is being developed, broke into high-grade copper ore. Jesse Knight, of Provo, is the heaviest shareholder in the company.

It is likely that another low-grade gold district will be opened in Utah. Late discoveries made on the west side of Utah lake, in Utah county, indicate this. The deposits are reported to be extensive, and in character are similar to those of the Camp Floyd, or Mercur district. The Pelican Point Mining and Development Company has been organized at Provo, with Judge Warren N. Dusenbury as president; Walter Parks, vice-president; Hyrum F. Thomas, secretary, and Eugene Marcus, treasurer. Enough work has been done on the property to justify the erection of a cyanide mill and plans are now being made to install one in the near future.

The Nevada Douglas Copper Company, operating at Yerington, Nevada, but with headquarters in Salt Lake, has recently placed an order for heavy mine equipment. The company will soon begin shipments of ore, using traction engines for transportation purposes between the mine and Wabuska, a point on the Nevada & California railroad; this to continue until railroad facilities are provided. E. P. Jennings, a Salt Lake engineer, recently made an examination of the mine and estimates that it contains 10,000,000 tons of available copper ore, averaging 3½ per cent. Plans are being made to build a mill and smelter during the present year. Walter C. Orem, of Salt Lake, is manager of the company.

The Century Gold Mining Company, operating in the Park Valley, Utah, mining district, has appeared in the dividend column again, the directors having posted one for payment this month, the amount being $5000. A stock dividend of 1651 shares has also been declared. P. W. Madsen, of Salt Lake, is manager of this company. The past year has been devoted largely to development work.

During the year 1906 there were sold on the floor of the Salt Lake Stock and Mining Exchange 14,555,391 shares of stocks for which was paid $0,478,084.

Suit has been filed in the district court against the Silver Bell Mining Company, with properties at Park City. The complainant is H. E. Larson, a stockholder, who asks the court to enjoin the defendant from selling 5000 shares of stock on the ground that the late assessment of 25c. a share was illegal; that the charter of the company does not permit of an assessment of more than 10c. a share at one time.

The property of the Eureka-Swansea Mining Company, in the Tintic mining district, is now controlled by Jesse Knight, of Provo. A deal to that effect has recently been consummated.

Indianapolis Jan. 14.

The Indiana legislature is in session and only one bill relating to mines has been introduced. The bill provides that the owners and operators of mines shall provide free bath-houses and lockers for coal miners, to enable miners to wash and change clothes before returning to their homes after a day's work.

A shippers bill is being prepared by the mine operators and retail coal men, providing for a reciprocal demurrage law which will enable shippers to collect from railroad companies damages for delayed consignments and allow railroad companies a reasonable demurrage charge for cars that are not unloaded within a given time.

Governor Hanley in his message recommended the giving of greater power to the railroad commission, so as to enforce penalties against railroad companies for failure or refusal to receive coal cars from each other and transport them, also power to break up blockades and otherwise compel the roads to give more speedy transportation of coal and other freight.

It is understood that the miners will not ask for a shot-firing law. Miners from Illinois say the law in that State has proven of little or no benefit to the miners.

The eighteenth annual convention of the United Mine Workers of America will convene in this city, Jan. 15. This convention promises to be one of the quietest and most uneventful that has yet been held by the organization. It is possible, however, that some question may be sprung to arouse discussion, but there is nothing of the kind in sight. The attendance will be much less than usual, as many unions will be represented by proxy. Governor Hanley will make the address of welcome. The real work of the convention will follow the reports of the committees. Doubtless one of the chief matters to be considered is the best plan to be adopted to restore the joint conferences with the operators. It is known that the operators generally are opposed to restoring the joint conferences with the international association, and it is evident that this fact is deplored by the mine workers; hence the effort to restore it.

Scranton Jan. 14

The miners of Luzerne county in the anthracite region are asking members of the State legislature to introduce a bill at the present season to regulate the use of electricity in the mines. It is claimed that the exposed wires which carry the current underground are a menace in low places and that many lives are lost. It is proposed in the bill to provide that the current shall be reduced to 250 volts and that fewer cars be hauled on each trip. The bill also contains regulations to prevent explosion in case the wire breaks and emits sparks by coming in contact with the rail, thus igniting the gas.

One of the greatest nuisances in the anthracite region is the frequency with which holidays are observed by the foreign element. This was illustrated when the English speaking people and the foreigners celebrated Christmas in December and last week the followers of the Greek orthodox church insisted upon celebrating their Christmas, thus causing the English speaking people to be idle also. The evil is not so much that the foreigners are idle, but their absence makes it necessary to shut down the mines, thus compelling all the employees to be idle. It frequently happens that one additional day is necessary after the holiday to rest, so that two days are involved in each celebration. Each nationality has its own peculiar holiday, and all these added to Mitchell day, Labor day, eight-hour day as well as the State and national holidays means a decrease in the output.

A claim has been put forward that the sulphur water which is pumped from the mines in the anthracite region kills typhoid germs. Scranton has more than 1000 cases of typhoid, and the sewage matter is discharged into the Lackawanna river, which empties into the Susquehanna river, from which a number of small towns derive their water supply. With the serious epidemic in Scranton the State board of health issued a warning to the towns in question that their water supply was infected. The medical men in Scranton took exception to this, and pointed out that tests had been made to demonstrate that nothing whatever could live in the river after it had received the sulphur water. It is true that no life can be found in the Lackawanna river and the tests failed to reveal the presence of germs of any kind, in that portion where the mines are situated. Higher up, where the water is not contaminated, there is an abundance of trout.

Toronto, Ont. Jan. 14

Tenders for mining rights to 23 acres of the bed of Kerr lake, in the Cobalt mining area, were opened by the Ontario government, Jan. 9. The competition was very active, as six tenders were put in, the sums bid ranging from $23,000 to $178,500. The latter tender, which was accepted, was made by Charles E. Potter, Toronto, and A. G. F. Ross, Montreal, representing a syndicate of subscribers in both cities. The sale is subject to a royalty of 10 per cent. on the gross value of the output. When the property was offered a few weeks ago, without any royalty stipulation, the highest bid received was $51,500, and it was withdrawn from sale. It is

generally supposed that the absence of any offer which the government could consider at that time was due to neglect, interest being concentrated on Cobalt lake, which was offered simultaneously. The government will provide means of access to the shores of the lake, and there is also a small island which may be utilized in mining operations. The syndicate has applied for incorporation as the Kerr Lake Crown Reserve Mining Company, Ltd., with $2,000,000 capital. The names of H. M. English, E. C. Berkinshaw, E. M. Wilson, W. H. Blain, D. C. McTavish and Percy P. Dean appear as provisional directors.

A new mining camp is being formed in the Temagami forest reserve, where important discoveries have recently been made. It is situated some four miles northwest of Sucker gut, an arm of Lady Evelyn lake, and is known as New Cobalt. A line of steamers will give good water communication as soon as navigation opens. The recent find of White Brothers was in this area. Darby Brothers' location has a vein with good cobalt content from 11 to 24 in. in width. On some of the properties the veins have been stripped for several hundred feet and some trenching has been done. This camp is likely to be the scene of great activity as soon as spring opens.

Prospecting is going on actively in the Larder lake gold area, notwithstanding the season. A large syndicate, represented by J. H. Tighe and R. R. Tighe, experienced miners, are prospecting extensively with a force of men in charge of Edward Dobbin. They recently staked claims along the northeast part of the lake.

London Jan. 8

During the last few years I have from time to time referred to the Capillitas Copper Company, which was formed in 1901 for the purpose of acquiring from local owners the mines of that name together with smelters in the province of Catamarca, Argentine Republic. At the time of flotation it appeared to me that far too much money was being paid for the property and that the working capital subscribed was not sufficient. The former owners had worked the mine for a long series of years and the ores had been rich enough to pay for carriage over the Andes on mule back. When the transfer was made the richer ores were exhausted, but J. S. MacArthur reported that there were large bodies of ore in the mine that would pay, if a rope-way were built to supersede mule carriage, and if more modern smelters were erected. The present state of the company after the lapse of these five years is very disheartening. The capital subscribed on two occasions has been spent; debentures to the amount of £70,000 have been issued, this money also laid out; and the balance on current account is still on the wrong side, the security for the loan being the ore ready for shipment. The smelters have been erected, and the aerial ropeway was completed last summer. Owing to the responsibility for erecting the ropeway being divided between the company and the makers, blunders were made in the building of the standards and the necessary alterations have not yet been completed. To crown the misfortunes it has been found that the reserves of payable ore are strictly limited.

R. A. Varden, of Bainbridge Seymour & Co., went out to the mine last summer to make a general inspection of the state of things and his report was very discouraging. He found that the copper contents had shrunk to 1 per cent. and the bornite and chalcopyrite had changed to iron pyrites, while other ores, such as galena and blende, had made their appearance. A good many changes have been made in the directorate and staff, and Darcy Weatherbe is going out as general manager to try his luck.

The shares of a London company called the Arizona Consolidated Copper Mines, Ltd., are being introduced on the mining market here. This company must not be mistaken for the well known Arizona Copper Company. People who adopt names similar to those of prosperous neighbors are always open to criticism. The properties belonging to the "Consolidated" are the Chilicothe, Lowland and Sciota, at Clifton, Ariz., and they are in the midst of the copper-producing area. The promoters state that there is sufficient ore "in sight" to warrant the erection of a 40-ton furnace, some of the ores being high enough in copper to smelt direct while others will have to be concentrated. The engineers who report on the property are not known over here, nor are the directors distinguished men. It would be of interest to your readers in this country if some of your correspondents in Arizona could give information.

Johannesburg Dec. 10

Considerable discussion is going on over the eight-hour day. A few mines have adopted the eight-hour day of their own free will, but the labor organizations are beginning to demand it. There are a few mines where the eight-hour shift is workable, but conditions vary, and on the deep-level mines the introduction of an eight-hour day will cause inconvenience and add to the expense. There are mines where its introduction will come as a shock, for although the men are underground for nine to ten hours, they do not do much more than six hours' work.

If there are any people in the world that have less cause for kicking they are the artisans of the Rand. The skilled man here receives a higher wage than in most parts of the world, and he works less than in other countries. As yet the miners have not clamored for an eight-hour day.

General Mining News

United States Metals Refining Company—This company intends to add to its copper refinery, at Chrome, N. J., smelting furnaces, and two stands of converters. Construction will be begun this spring.

ALABAMA

Alabama Consolidated Coal and Iron Company—Joseph Hoadley, the new president of this company, has just made an inspection of the properties of the company in this State. He was accompanied on his trip by Col. T. G. Bush, former president, and Morris Bush, general manager. Mr. Hoadley announced plans of development by his company, stating that a locomotive works would be erected at Gate City, near Birmingham, and that he had recommended to his company the erection of a large steel plant at Lewisburg, six miles from Birmingham, besides other extensions.

Republic-Tennessee—John A. Topping, president of the Republic Iron and Steel Company and chairman of the executive board of the Tennessee Coal, Iron and Railroad Company, has been in the Birmingham district, looking over conditions and watching progress being made on improvements and developments. Directors of the Republic-Tennessee combination, including John W. Gates, are expected in the Birmingham district. There is talk of further mergers in that section, the Republic-Tennessee companies to take over properties of another coal and iron company in the State.

Straight Mountain Coal Company—This company has bought a tract of coal land on Sand mountain, near Carlisle, and has begun work on development. The managers' office is at Gadsden.

ARIZONA

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports its production for the month of December as 52 short tons of copper. The small output was due to the floods at Clifton, which stopped production nearly all the month. From Jan. 1 two furnaces have been running.

CALIFORNIA

AMADOR COUNTY

Argonaut—The controlling interest in this property, at Jackson, has been sold by W. F. Detert to W. K. Matthews, of New York, and W. A. Manson, of Chicago. The mine has been paying dividends a number of years, and is one of the famous mines of the State.

BUTTE COUNTY

Copper—Warner & Wilkes have discovered good copper ore at Sawmill Peak, near Magalia.

Platinum—At the Yuba mine, in Morris

to contain considerable platinum, and care will be taken to save this metal in the future.

Chapman—At this gravel mine, San Andreas, 11 men are at work, and the electric power line is being extended to it, when the hoist will be put in place.

Three Star—At this mine, near Angels, a body of rich ore carrying free gold and galena sulphurets has been found. The mine is under bond to San Francisco men.

EL DORADO COUNTY

Mount Pleasant—This mine, near Grizzly, Flat, Fred Beedle, superintendent, is turning out free-gold rock. The shaft is 1000 ft. down.

Lucky Marion—Litigation having ended, this mine at Greenwood is to be reopened and worked on an extensive scale.

HUMBOLDT COUNTY

Henderson Group—Sample lots of copper ore from these new mines, at Horse mountain, paid very well at the smelter, and as a result numerous other copper claims have been located in the vicinity and are being prospected.

INYO COUNTY

Darwin—The Defiance and Independence mines have been bonded to M. E. Eppinger and R. Watson. On the Lucky Jim 15 men are at work, and are steadily shipping ore. At the Giroux Verdi, a gasolene hoist has been put in.

[illegible] Copper Company—The shaft on this property at Greenwater is now 385 ft. deep, and will be sunk to water level as quickly as possible.

KERN COUNTY

Tiger Head Mining Company—This company, near Rosamond, has purchased the Ella mine at that place for $10,000.

NEVADA COUNTY

Orzalli & Shebley—At this mine, Chicago Park, the ore being taken out runs $40 per ton, and a five-stamp mill is kept busy crushing it.

California—This old mine, at Deadman's Flat, is again being worked for the first time in many years.

PLACER COUNTY

Imperial—This company has completed a 10-mile ditch and constructed a large impounding dam for the mining débris.

Hermann—A new steam plant for hoisting and milling power has been installed, and the 40-stamp mill is kept busy crushing ore.

Hidden Treasure—The air-shaft to the tunnel of this extensive drift mine at Bullion is at last finished. Timbers and material may be handled through the shaft.

SAN BERNARDINO COUNTY

Yucaipe Valley—More or less mining [illegible] years, but with little success. Of late, however, some claims have been taken up which show good promise.

Bagdad-Ludlow Mining and Milling Company—This new company, S. S. Watson, president, has bonded 30 claims near the Bagdad-Chase property, at Stedman, and will put in a hoisting and pumping plant.

Hexagon Mining Company—This company has taken over the claims of the Desert Venture Company, in the Whipple Mountain region, between Needles and Parker, and will develop them.

Bagdad Group—This group, at Camp Rochester, is now owned by the Bagdad-Chase Mining Company, the officers of which are John N. Beckley, Buffalo, N. Y., president; Edgar Van Etten, Boston, Mass., vice-president; B. E. Case, Rochester, N. Y., treasurer; John H. Stedman, Rochester, N. Y., treasurer. The group has been worked for several years. The ore is treated in the company's 50-stamp mill and cyanide plant at Barstow.

SHASTA COUNTY

Uncle Sam—This mine, at one time a large producer while owned by the Sierra Buttes Mining Company, is again being operated with 40 miners at work.

Blue Bell—E. P. Connor has discovered a small but rich ledge within a few hundred feet of the post office at Harrison Gulch. This discovery is corroborative of the contention that this townsite is mineral ground, which was the main question in the litigation at that point.

SIERRA COUNTY

Lucky Frank—This mine, in Wolf Creek, near the Nevada county line, is turning out rich specimen ore. It is owned by Mr. Bluett and F. T. Smith, of Nevada City.

SONOMA COUNTY

Copper—A vein of copper ore is reported as having been found in the western part of the county, some distance from Cazadero.

TRINITY COUNTY

Bonanza King—The new 40-stamp mill will start up as soon as the electric power line is completed. There is plenty of rich ore on the dumps to keep the mill running.

COLORADO

GILPIN COUNTY

Important Merger—Phillip Mixsell, of Idaho Springs, and J. C. Fagan, of New Jersey, have completed arrangements with English capitalists for the transfer of the Ophir-Burroughs, Gold Coin and Ivanhoe properties on Quartz hill, Nevada district, in conjunction with property situated in Clear Creek county. The first payment on the property is to be made within 30 days. It is understood that a considerable amount of new machinery will be required for the proper equipment of the property. P. Mixsell, Idaho Springs, is to be manager.

Derigo—Nashville, Tenn., people have become interested in the Derigo group at Wide Awake, have practically completed the purchase of the property, and have purchased the Douglas mill. They will arrange for the erection of a tramway for handling their ores from mine to mill next spring and will also add a concentrating plant to their amalgamation mill. G. H. Elling, Ernest & Crammer building, Denver, is manager.

Eldorado—E. S. Moulton, of Central City, Colo., has taken a lease and bond on this property, in Spring gulch, and is arranging for the installation of a steam or gasolene hoisting plant.

JEFFERSON COUNTY

Gypsum Deposit—A large body of gypsum has been encountered in the tunnel being driven for the American Cement Plaster Company, of Lawrence, Kan., the ledge at this time showing up nearly 12 ft. wide, and it is claimed that the quality is the best. The gypsum was found near Morrison. The American Company intends to erect a mill of 200 tons daily capacity near Denver as soon as the deposit is proved up.

OURAY COUNTY

Camp Bird—This company's report for December shows that the mill ran 29 days, crushing 7193 tons ore, which yielded 10,938 oz. bullion and 521 tons of concentrates. Sales of bullion amounted to $184,995. Working expenses were $42,995 and construction $1652, leaving a balance of $140,348 for the month.

SUMMIT COUNTY

Colorado Consolidated Dredging Company—This is the title of the company of New York and English capitalists which has taken over the interests of the old American Gold Dredging Company and is to operate the Swan and Blue river placer tracts. This company is going to start at once on the construction of new dredge boats and to put the two old ones in order.

Buffalo Placer Company—This company will put in a complete hydraulic plant and work its large tract of placer ground near Dillon on the hydraulic plan on a large scale. The management expects to handle about 8000 to 10,000 yards per day. This ground has been thoroughly tested and average of the wash give a general return of 25c. per yard.

Wellington Mines Company—This company is making good on its consolidation of the Wellington, Oro and Orthodox properties. Last week it was reported that a new vein of gold-bearing carbonate ore had been discovered, and further evidence of its continuity is being obtained along the line on the Oro property. In prospecting the surface, Superintendent Cummings uncovered it again this week 150 ft. from the point of original discovery. It varies in width from 26 to 4 ft.,

and within it is a streak of ore 6 to 10 in. wide that is well charged with gold. Peter L. Cummings has been appointed superintendent of this company.

[illegible] COUNTY—CRIPPLE CREEK

Penrose Tunnel—At a meeting of the committee the past week it was decided to construct the intermediate tunnel or the one known as the Gatch Park bore. Just when work is to be commenced is not definitely known, but in all probability it will be soon. It is also understood that a bill will be introduced into the present legislature for the division of the State into mining drainage districts, and an effort will be made to obtain State help in the construction of the tunnel. As it is, nearly a million dollars has been subscribed by the various mining companies for the construction of the tunnel. It has not yet been decided who is to be the superintendent of the work.

Portland—The regular quarterly dividend of this company has been declared. It amounts to 4c. per share, or $120,000. The property is in excellent condition. It is understood that the winze below the bottom level is showing very fine ore. Sinking the shaft will probably soon be commenced. F. M. Kurie, of Victor, is manager of the property.

Isabella—The annual meeting of this company will take place, Feb. 4, in Cheyenne, Wyoming. The property is situated on Bull hill, and is producing considerable ore. The mill that was recently erected is now running and making a good record. George Kilburn, of Cripple Creek, is in charge of the property.

Little Clara—The Union Leasing Company has taken a lease upon the north end of this property, and will commence sinking a shaft at once. It is hoped to find the extension of the rich ore-shoot that is now being worked by Hodges & Marsh, on the south end of the property. The Hodges lease continues to produce ore at a good rate.

FLORIDA

Mutual Mining Company—This company, organized at Savannah, Ga., to develop phosphate and timber lands in Citrus, Sewanee, Marion and other counties in Florida, will erect a modern phosphate plant to have a capacity of 25,000 tons annually. New equipment needed includes two 125-h.p. boilers, two 75-h.p. engines and two 12-in. suction 10-in. discharge pumps. Officers of the company are George F. Armstrong, Savannah, Ga., president; J. R. Williams, Alachua, Fla., vice-president and general manager.

GEORGIA

TERRELL COUNTY

John R. Irwin and associates are arranging to open limestone quarries on a large scale at Dawson.

INDIANA

[illegible]

Illinois Midland Coal Company—This company has filed articles of incorporation in Indiana. The company will invest $80,000 in coal lands and in mines and operation in Sullivan county. The headquarters will be at Sullivan and Thomas Gregory will be general manager.

INDIAN TERRITORY

CHEROKEE NATION

It is reported that iron deposits have been located 20 miles south of South McAlester, and a branch of the Missouri Pacific, which is projected from Claremore, I. T., to Paris, Texas, will touch the property. Coal and limestone can both be had with short distances.

Adamson Coal Company—This company is opening six slope mines on the Wilburton branch of the Missouri, Kansas & Texas road, west of Wilburton.

Great Western Coal and Coke Company—On Jan. 1 the following officers of this coal company assumed the duties of their departments. John C. Reid is appointed general manager. R. H. Busby is appointed purchasing agent, in place of D. C. Welch, who resigned. W. H. Crawford is appointed auditor, which place was formerly held by Mr. Welch.

McAlester Coal and Mining Company—This company resumed operations Jan. 2 in mine No. 6, in which a serious explosion occurred two months ago. S. P. Allen is general manager.

Chicago, Rock Island & Pacific Railway—Work has been begun on a branch from a point between Alderson and Bache north to the mines opened recently by the McAlester and the Indian Coal companies, on the north outcrop of the Hartshorne coal.

KENTUCKY

BOURBON COUNTY

J. F. Caldwell of Millersburg, is organizing a company to develop lead mines, near that place.

MARYLAND

GARRETT COUNTY

Beechwood-Cumberland—This company has begun work on coal property lately bought. W. M. Wharton is president, with office in the Land Title Building, Philadelphia.

MONTANA

BUTTE DISTRICT

Anaconda—After a suspension of 44 days to permit of repairs in the shaft, work was resumed in the Anaconda mine, Jan. 7, and the property is now yielding its customary output of ore. Drifting at the 2400 is progressing rapidly. This is the deepest point at which the vein has been opened in this mine or any other in Butte, although the orebody on the 2400 of the High Ore has been opened.

Red Metal (Coalition)—This company has placed its Rarus mine in shape for an increase of about 200 tons of ore a day. On Jan. 5 it finished the air-shaft connecting the surface and 1500-ft. level several hundred feet north of the main shaft, since which the lower workings have been receiving plenty of cool air. Up to the time the air opening was finished the workings were so hot that men could not work in them any length of time, and the output of the veins was curtailed. The company is driving its double-track tunnel from a point close to the new shaft on the Tramway toward the Rarus shaft with three shifts of men, and expects to finish the job early in April. The face of the opening is in 220 ft. and there is about 480 ft. of ground between it and the shaft. It will break into the latter at a depth of 210 ft. The tunnel will be the main outlet for the ore of the Rarus and will be equipped with the electric-haulage system. All timbers used in the Rarus, Tramway and Minnie Healey mines will be framed near the entrance to the tunnel and those for the Rarus will be transported through the tunnel.

Trenton—The company is cutting a station at the 2100 of the Gagnon, having finished sinking a few days ago. It is shipping about 400 tons of ore a day from the mine.

North Butte—Ore production by this company during December was about 1400 tons greater than that of any month since the company began operations. Its average was a little more than 1200 tons a day. The new vein intersected in Gem ground recently is said to be one of the best of the four from which ore is coming. It was opened by the crosscut heading for Berlin ground north of the 1600-ft. level of the Jessie.

Butte Copper Exploration—The company is installing a large pump on the south side of the shaft at a depth of 1000 ft. and expects to finish the work in a week. It is crosscutting north of the station to intersect veins, the face having reached a distance of 250 ft. from the station. Seams of good copper ore have been cut, but no large orebodies are in sight. It is supposed that the first large vein is only a short way from the face, but no attempt will be made to cut into it until the pump is in working order.

Alice—It is reported on good authority that mining will be resumed in Alice ground about Jan. 20. With the exception of work done by lessses, Alice territory has been dormant several years. Control of the property is now vested in John D. Ryan, managing director of the Amalgamated, and others, they having bought a majority of the 400,000 shares several months ago. Copper ore is known to lie

in some of the claims of the company, the Valdemere and Magna Charta especially.

Butte Central & Boston—The new hoisting engine on the Ophir mine of this company is ready for work and sinking from the 500-ft. level to the 1000 will be resumed in a few days. The upper levels are yielding silver-gold ore, and the ore of the north vein at the 500 carries some copper.

Davis-Daly—No ore has been struck in any of the properties owned by the company, but development work in the Smokehouse, Silver King, Mt. Moriah and Colorado claims is going ahead rapidly. The face of the crosscut south of the 1800-ft. station of the Original is about 1165 ft. in.

NEVADA

NYE COUNTY—TONOPAH

Extension—An important strike has been made in one of the claims. The claims are situated about six miles southwest of the Midway mine, and in a direct line running between Tonopah and Lone Mountain. While recently sinking a prospecting shaft on No. 2 claim a well defined fissure vein carrying low-grade ore was cut. This shows that the great vein systems now so successfully opened in Tonopah extend away to the southwest, and suggests the probability of their junction with the valuable Lone Mountain system. The strike has had the effect of stimulating the re-location of a large area of the adjoining ground.

Great Western—The shaft has been sunk to a depth of 350 ft. The country is dacite—a formation which overlies the lode—bearing andesite. It is proposed to carry the shaft to 500 or 600 ft. before cross-cutting, in order to be well within the vein-bearing rocks.

West End—Development operations are being carried on as usual. No ore will be broken until shipping facilities are improved. Large reserves of high-grade ore have been developed.

MacNamara—Work is being delayed by the fuel famine, which is as acute as ever. Two shifts are kept at work in the mine on development work. It is probable that ore shipping will not be resumed for several weeks.

Midway—Operations are confined to development work. A large amount of high-grade shipping ore has been developed, but it cannot be mined on account of the lack of shipping and milling facilities.

Ore Shipments—Shipments of ore over the Tonopah Railroad for the week ending Jan. 3 were: Tonopah Company, 1200 tons; Belmont, 550; Tonopah Extension, 325; Montana-Tonopah, 80; total, 2155 tons. Shipments from Goldfield were 1700 tons, making a total of 3855 tons.

Wolftone—A new power hoist has been installed and sinking has been resumed, and will be continued regularly until the water level is reached. A trial shipment of 10 tons has been melted for an average return of $200 per ton.

Stray Dog—Some rich ore is being stripped along the hanging wall of the ledge for a width of 15 in. As sacked it averages $1000 per ton. This rich ore is being mined in the 100-ft. level, and it has been decided to sink immediately to the 200-ft. level in order to open the ledge at that depth.

Esquima Copper—The shaft is down 145 ft., and a contract has been awarded to sink it to a further depth of 200 ft. From the surface to 130 ft. the lode is wide and averages 12 per cent. copper. From 130 ft. to the bottom of the shaft the assays average a little higher copper.

Manhattan Red Top—An active developing campaign has been decided upon by the management. Two veins have been cut in the prospecting shafts, which give promising assays. It is proposed to open them out in readiness for shipping to the mill, now in course of construction by the Tonopah Exploration Company.

NYE COUNTY—BULLFROG

Montgomery Consolidated—A shipment of 150 tons of high-grade ore was made last week, and it is proposed to make another similar shipment in the course of a few days. The framework of the company's mill is being rapidly constructed, and a large force of men is employed in making a roadway up to the mine.

Victor—The tunnel is in 300 ft., and the winze continues in ore. The tunnel is expected to cut the vein, which outcrops and assays well, before the end of the present month.

Montgomery Mountain—The new shaft on the Black Bull claim has been re-timbered. It is 50 ft. in depth, and is in ore the whole distance. A power hoist is on the way from California, and when it is installed sinking will be resumed.

Sunset—A ledge has been encountered in the new shaft at a depth of 50 ft. It is 6 ft. in width and assays well. Sinking will be continued to the 100-ft. level before the ledge is opened out.

Mayflower North Extension—This property was recently acquired by a new company which has decided to carry on extensive prospecting work with the view of locating the Starlight ledge, which is believed to extend through the claims.

Tramp Consolidated—It is proposed to connect the Tramp shaft with the main Tramp tunnel by running a drift south from the shaft at a depth of 100 ft. below the Empress tunnel level. It will take three months to complete the work. The Tramp shaft is in high-grade ore and shipping ore is being broken in the Hobo and Denver claims.

ESMERALDA COUNTY—GOLDFIELD

Jumbo Monnette—This famous lease on the Mohawk mine is being worked to its full capacity. Shipments of high-grade ore are being made daily. The miners' strike did not interfere with the working of this lease.

Black Cat—A well defined ledge is reported to have been cut in the shaft at a depth of 18 ft. The mine is situated near the railroad, two miles north of the township, and due west of the sandstorm mine. Should further developments prove the strike of value it will lead to the development of a large area of new ground, and extend the known gold-bearing area.

Mohawk-Daisy—Sinking has been resumed and the shaft will be carried down to the 250-ft. level before next April. A new gasolene hoist will be erected shortly to facilitate the work. The work is being rushed in order to run a crosscut to cut the rich Daisy vein.

The Oddie Lease—The shaft on the combination Fraction ground has cut a quartz vein at a depth of 400 ft. The size and value of the vein have not been ascertained.

St. Ives—A quartz vein 3 ft. in width has been cut in a north drift from the 100-ft. lvel in the Codd lease. The ore averages $100 per ton. The shaft is 150 ft. in depth, and will shortly be equipped with a gasolene hoist to enable sinking.

Miners' Strike—The threatened strike is over, the miners having voted to accept the mine-owners' offer of $5 per day, with $4.50 for laborers.

OREGON

BAKER COUNTY

Clarkville—At this old camp, near Baker City, Richard Eakman has a tunnel in 250 ft. He is drifting to find the old gravel channel believed to exist near Clark creek.

Prairie Diggings—At this mine, in the John Day district, ore has been found in a new crosscut tunnel, which looks well. Joseph Waddell is manager.

Sanger—A tunnel has been started on Eagle creek, near Baker City, which will open up this old mine at a point 1000 ft. below the mouth of the shaft.

Virtue—A new company has been organized to work this old mine, near Baker City. It is known as the Virtue Mines Development Company; J. K. Romig is president and manager. The property covers 400 acres and water rights on Eagle creek, where an electric power plant will be built. The old shafts are 500 and 800 ft. deep, respectively.

PENNSYLVANIA

ANTHRACITE COAL

Duggan & Company—The coal-stripping work on this company's property at Tresckow has been suspended, owing to the difficulty in securing labor.

Lehigh Coal and Navigation—This com-

pany has given six acres of land and $12,000 to build a miners' hospital in the Panther Creek valley.

Lehigh & Wilkes-Barre—In this company's slope No. 21, at Treskow, a 9-ft. seam of coal has been cut.

BITUMINOUS COAL

A tract of 2700 acres of coal land, at Rices Landing, in Greene county, is reported sold by J. V. Thompson, to an Eastern syndicate, for $1000 an acre. The land fronts on the Monongahela river, and a branch of the Pennsylvania Railroad is under construction through the property.

A fire, which started Jan. 9, and was caused by an explosion of gasolene in the Painter mines of the H. C. Frick Coke Company, at McClure Station, has spread to near-by shafts and is causing serious damage. Four men were carried out of the Mill mine of the United States Sheet and Tin-Plate Company, and two out of the Home pit of Stauffer & Murray, near Scottdale. All were overcome by black damp, driven into the mines by the McClure fire. T. B. Williams, mine inspector, has gone to the scene of the fire and a large force has been sent there by the Frick Company. The flames are spreading rapidly. The blaze was started by an explosion of gasolene used in a pump.

SOUTH DAKOTA

CUSTER COUNTY

Clara Belle—In running a drift in this mine, near Oreville, at a depth of 265 ft., a vein of tin ore was encountered, 4 ft. wide. It was followed for 26 ft. The discovery is considered important, as the mine is on the tin belt. The ore assays about 2.5 per cent. metallic tin, and $1 per ton in gold.

LAWRENCE COUNTY

Strike—A strike has been called by the Terry Peak Miners' Union, and as a result eight producing properties in that district have closed down, putting out of employment about 600 men, shutting down seven mills. The strike was called for the purpose of securing an eight-hour day, recently granted by the Homestake. The companies on whom this last demand was made did not feel that they could grant this. The miners and mill-men all went out at midnight, Dec. 31. The Turner and Galena men have also demanded the same hours but have not yet met with a reply.

Esmeralda—Work has been suspended until spring after a very satisfactory test run. Improvements cost over $1500 and though only 15 stamps were dropping, yet the run of 1½ months netted a clearing up of $1800 over and above expenses. In the spring the capacity will be increased.

Aurisone—The force of men working on this property will be increased, owing to the satisfactory result of the visit of the Eastern capitalists interested in the company. The property is located near Galena and the orebodies are showing up well.

PENNINGTON COUNTY

Cumberland—Owing to the present coal shortage this property is closed for the winter. An additional five stamps will be installed in the spring when work is begun. The mill has been in operation several months and the clean-ups and extraction have been satisfactory.

TENNESSEE

MARION COUNTY

Grand Pine Coal and Timber Company—This company has been incorporated at Chattanooga, Tenn., for the purpose of developing about 6000 acres of coal lands recently acquired from Messrs. O. F. James and C. E. James. It is stated that the company will develop the coal and manufacture coke, and is considering the erection of a cement plant. Incorporators of the company are Robert Marshall, Grier E. Tress, of Pittsburg, Penn.; D. M. Hertzog, Uniontown, Penn.; Charles W. Staufer, Scottdale, Penn.; W. C. Marshall, Dayton, Ohio. W. C. Marshall, it is said, will be the resident manager of the company, with offices at Chattanooga.

UTAH

BEAVER COUNTY

Talisman—This company has had its properties surveyed for patent, and has also ordered some extensive mine equipment. The property is now a regular shipper.

JUAB COUNTY

Lower Mammoth—The most important development in the history of this property has taken place at a point 90 ft. from the shaft on the 1700-ft. level. The ore is largely of shipping grade. The deposit has been proved for 300 ft. in length.

Yankee Consolidated—The management of this property and that of the Beck Tunnel Consolidated have entered into an agreement making vertical lines rule as to the boundary between their respective properties. Late developments in the Yankee Consolidated have been of a most encouraging character.

Tintic Ore Shipments—During the past week Tintic mines sent 119 carloads of ore to the Salt Lake smelters for treatment, as follows: Ajax, 2; Beck Tunnel Consolidated, 8; Bullion Beck, 7; Carisa, 2; Centennial Eureka, 38; Eagle and Blue Bell, 9; Eureka Hill, 2; Gemini, 5; Grand Central, 3; Joe Bowers, 1; Mammoth, 14; May Day, 2; Paynter, 1; Scranton, 6; Swansea, 2; Tintic Iron, 4; Uncle Sam Consolidated, 1; Victoria, 6; Yankee Consolidated, 6 cars.

IRON COUNTY

Big Fourteen—A shipment of high grade ore from this property was sold in the Salt Lake market recently, the controls showing 3.78 oz. gold, and 597 oz. in silver to the ton.

Jenny Gold Mining Company—The construction of a mill of 40 tons daily capacity has been stopped temporarily, owing to the bad condition of roads over which it is necessary to haul supplies.

SUMMIT COUNTY

Park City Shipments—The output of Park City mines last week amounted to 1,852,000 lb., the contributing mines and amounts being: Daly Judge, 556,000; Little Bell, 105,000; Ontario, 99,000; Silver King, 1,075,000 pounds.

Nelson-Queen—Free gold ore has been developed in this property, assays showing values as high as $70 to the ton.

Ontario Drain Adit—Prospects for the draining of the camp again through this adit, which has been closed for nearly two years as a result of caves, are growing brighter. Débris found in the main avenue, where it was broken into several weeks ago, was cleaned up. At a point 835 ft. from where the main adit was broken into, another cave was encountered, and is believed to be the last one of any consequence. A parallel drift will be run around it as was the case with the caves found nearer the entrance.

WEST VIRGINIA

KANAWHA COUNTY

American Coal and Fuel Company—This company is arranging to develop a tract of coal lands. It is intended to open mines to produce 1000 tons daily.

MCDOWELL COUNTY

Superior-Pocahontas—The Baltimore *Manufacturers' Record* reports that this new company is expending about $100,000 for improvements to the Davy Crockett and Helena coal properties, which were recently acquired. It can now be stated that the company will use twin tipples for making four grades of coal—smithing, egg, lump and run-of-mine—and a return conveyor line from each side of the mountain will be operated by one electric motor and clutch attachment. Other equipment which has been provided consists of electric motors for hauling, Sullivan machines for cutting coal with a capacity of from 2000 to 2500 tons per 10 hours, 600-h.p. boiler, two 200-kilowatt generators, General Electric, with Alfrey engine, 22x24 to each 200 kilowatts. All machinery has been contracted for. The company states that it has also purchased the Cletur Coal Company and the Blackstone Company, and will install electric haulage to be furnished from the above plant. Officers of the Superior Pocahontas company are: Justus Collins, Charleston, W. Va., president; C. J. Milton, Cincinnati, Ohio, vice-president; P. J. Riley, Hallsville, W. Va., manager and treasurer; J. A. Latham, Charleston, W. Va., secretary.

pecting work is in progress. On the Cop-

wide has been uncovered, carrying copper sulphides. A three-stamp mill is in use. Other prospects are the Gray Horse, where a small stamp mill and a rope tramway have been put in; the Naptung, where two tunnels, respectively 160 and 100 ft. long, have been put in. This lode, so far, carries good values in gold.

Antimok—In this district Clyde, Peterson, Reavis & Clarke have opened up several well defined veins.

Benguet Consolidation—This company is doing much work on its Minnesota claim, the ore carrying gold and pyrite. The company has lately put up a three-stamp, quadruple-discharge Hendy stamp mill, and a 60-ton cyanide plant. The mill is operated by water power and the ore is conducted to the mill in standard ore cars over tracks and trestles. In the construction of this plant arrangement has been made for future enlargement.

Bua Mining Company—This company is doing very systematic prospecting and development work on many of its claims located on a series of veins, striking approximately east and west.

In the mineral region of Mancayan-Suyoc, A. P. Wright and Mr. Chambers have been developing some copper-gold properties. Mr. Chambers, by systematic development work, has recently cut the Manyan copper lodes at considerable depth.

Foreign Mining News

CANADA

I[illegible] Coal Company—This company, at Sydney, Cape Breton, has determined upon mining its own coal, and has just concluded the purchase of extensive coal areas in the immediate neighborhood of the works. The work of development will be begun forthwith and shipping piers will be erected. The surplus output will be exported. The area secured is estimated to contain several hundred million tons of coal.

The suit of the Dominion Iron and Steel Company against the Dominion Coal Company for damages for breach of contract has been commenced in Montreal and promises to be one of the most notable civil cases ever brought in the Canadian courts. Specific damages of $68,580 are claimed for the increased price of coal bought from other companies up to Nov. [illegible] ovens and furnaces, loss of profits and increased cost of production. The Steel Company also asks that the value to it of the contract for 90 years should be assessed at $15,000,000 and the Coal Company will be held liable for that amount.

ONTARIO—COBALT DISTRICT

Ore Shipments—Official returns of shipments of ore from the Cobalt district over the Timiskaming & Northern Ontario Railway for December show an aggregate of 1,920,664 lb. The shipping mines were as follows: Nipissing, 798,656 lb.; Trethewey, 172,210; La Rose, 172,300; Coniagas, 162,405; Buffalo, 160,000; O'Brien, 128,355; Right of Way, 101,500; Drummond, 80,193; Kerr Lake, 74,300; Foster, 60,000; Silver Queen, 1000 pounds.

A considerable portion went to the smelter at Copper Cliff, Sudbury district, and several tons were brought to Toronto for experimental uses.

Abitibi & Cobalt—A camp has been established on this location at Cobalt, which lies just west of the Empress, and trenching is being carried on with the object of striking the Empress vein, which is believed to cross the property.

Cobalt Contact Mines Company—Two niccolite and smaltite veins, one of them carrying 16 in. of ore, are being worked. On a third vein of smaltite carrying free silver, 300 ft. have been stripped. Two shafts are being sunk, which are down about 40 ft. George Fillian was recently appointed superintendent.

Empress Cobalt—The shaft at this mine, Cobalt, has been sunk 28 ft. and the vein, which is 2 ft. in width at the surface, has widened. E. P. Kadleck is in charge of the work, which is being carried on by double shifts.

Foster Mine—Machinery for further development has at last been successfully installed at this mine, Cobalt, the task being one of great difficulty owing to the roughness of the roads. Modern dynamos have been received and it is expected that the drills will be at work within two weeks.

By latest news from this mine a tunnel between two shafts at a depth of 75 ft. has been nearly completed. The orebody between them will be stoped. The new equipment is expected to be in operation in about one month.

Gamey-Smith—On this location, Cobalt, a vein of native silver has been struck on the property, which has hitherto been nonproductive.

Sargeson — On this property, Portage bay, Cobalt, 10 veins have been located, and on one of them, which has been uncovered for some 2000 ft. a shaft has been sunk. Twenty feet down native silver and cobalt have been found.

Railway Reserve Mines, Ltd.—The syndicate which recently secured mining rights to sections of the Timiskaming & Northern Ontario Railway will become incorporated under this title with a capitalization of $1,000,000. A number of veins have already been located and one or more shafts will be sunk as soon as possible.

ONTARIO—PARRY SOUND DISTRICT

Consolidated Copper Company—This company, which owns valuable properties in Foley, McDougall, Hagerman and Conger townships, Parry Sound district, Ont., is about to resume development work on a large scale. Some of the locations are said to carry platinum, and from one of the Hagerman township properties an exceedingly large mica crystal, which required four drill holes to dislodge it, has been taken.

YUKON TERRITORY

The gold yield of the Yukon Territory, for the year ending June 30 last, was $6,539,402, as against $8,227,200 for the year previous. The dry season and the suspension of operations for the installation of new plants are assigned as the reasons for the decrease.

Justice Burbidge, of the Exchequer Court, will visit the Yukon during the year to try important cases arising out of the cancellation by the Canadian government of several hydraulic-mining leases for alleged failure on the part of the holders to comply with the conditions. The concessions involved are those of the Klondike Government Concessions, Ltd.; the Bonanza Creek Hydraulic Concession, Ltd.; A. B. Palmer, R. H. Palmer & D. Daig; Washburn, Ritchie & Scroggie. Should the court confirm the action of the government in forfeiting the leases, a large area of mining land will be thrown open.

Dr. Thompson, M. P. for the Yukon, will propose to the government the establishment of a mining school in Dawson. He suggests that three or four members of the Geological Survey should be located there during the winter months to take charge of the school.

MEXICO

GUERRERO

Mitchell Mining Company—This company shipped its first bullion, Dec. 17, from Acapulco via Panama to New York, approximate valuation of $50,000. In the mine the orebody has been encountered on the 500-ft. level, giving approximately 5000 ft. long by 700 ft. deep, an average of 80 ft. across. On dip of orebody there was 30 ft. gained in every 100, with the first 148 ft. vertical.

MEXICO

Zacualpam District—This district in the State of Mexico, which is held back because of the difficulties from the lack of railroad facilities, is making a good showing for the amount of work that is being done. The United States & Mexico Mining Company, made up principally of Mexico City capital, and of which H. L. Eisenhart, of that city, is president and

general manager, is operating the Coronas mines, which are showing up well. The company has practically decided on the erection of a 20-ton mill, though just what process will be applicable to the ores has not been fully decided. Near the Coronas are the mines of the Carboncillo y Anexas Company, which has just declared its first dividend of $1 each on 300,000 shares.

SONORA

A recent rainy spell will work to the advantage of the Nacozari district, which has badly demoralized transportation.

Las Chispas—This mine has had a year of good and profitable production. It is the only mine in the neighborhood of Arizpe of which this can be said. Ore stolen from this mine has been marketed as the product of other prospects in order to form a basis for the flotation of stock. Investors in the neighborhood should be careful to act solely on the advice of their own engineers. The outlook for another satisfactory year for Las Chispas is good. Many curious reports regarding the property are seen in the press of the Southwest, but all of them are misleading. J. W. Miller has succeeded R. H. Cromwell as superintendent.

Oro Maximo—This has stopped working, and was reported to be in the hands of creditors some time ago. This is a group of claims surrounding the old Picacho mine. Considerable machinery was brought in to this property, some of which has never been used.

AUSTRALIA

NEW SOUTH WALES

A flotation of considerable interest has been effected in London, that of the Nymagee Copper mine, which is one of the important producers in New South Wales. The flotation has been effected by the people who are identified with the Lloyd Copper Company, owning properties at Burraga, N. S. W.

ASIA

INDIA—MYSORE

Kolar Goldfield—The gold output for December is reported at 49,981 oz. bullion, which is 3494 oz. more than in November, but 4220 oz. less than in December, 1905. For the full year the total was 627,700 oz. bullion in 1905, and 576,287 oz. in 1906; a decrease of 51,413 oz., or 8.2 per cent. The bullion reported in 1906 was equal to 518,658 oz. fine gold, or $10,720,661 in value.

Coal Trade Review

New York, Jan. 16

The coal trade in the West continues in much the same condition as it was a week ago. Transportation was just beginning to show some improvement, when severe weather set in, with snow in the Northwest, at once increasing demand for coal and delaying its delivery. In several States attempts are being made, by organization, to secure better service from the railroads; but it will take time for these to have any effect. In the larger cities supplies are generally good, the trouble in securing coal being felt most in the small towns and villages.

In the East the coal trade has been generally quiet and unchanged. The anthracite companies have had a fair demand, as in the West. Steam coal is generally in demand along the seaboard, but domestic coal is dull, owing to the continued mild weather.

Petroleum Exports—Exports of mineral oils from the United States for the full year were, in gallons:

	1905.	1906.
Crude oil	103,304,625	118,044,864
Naphthas	26,825,426	29,111,139
Illuminating	858,829,713	827,727,219
Lubricating	110,364,506	146,715,285
Residuum	66,733,457	63,292,493
Total	1,165,557,787	1,181,614,101

Paraffin is included in lubricating oils. The total increase in 1906 was 15,056,344 gal., or 1.4 per cent.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Jan. 5 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	64,885	48,251 D.	16,634
Bituminous	573,885	523,755 D.	50,130
Coke	227,335	213,167 D.	14,178
Total	866,105	785,163 D.	80,942

The statement for 1906 covers one day more than that for the present year.

The coal and coke tonnage of the Pennsylvania Railroad lines east of Pittsburg and Erie for the full year was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	4,615,888	4,580,018 D.	35,870
Bituminous	30,686,521	32,698,081 I.	2,011,560
Coke	11,327,153	12,732,089 I.	1,404,936
Total	46,329,562	49,711,188 I.	3,381,626

This shows a decrease of 0.8 per cent. in anthracite; gains of 6.6 per cent. in bituminous, 12.4 per cent. in coke, and 7.3 per cent. in the total.

Coal tonnage originating on the line of the Southern Railway for the 10 months ending Oct. 31 was, in short tons: Tennessee district, 1,277,645; Alabama district, 1,511,235; total, 2,788,890 tons.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to Jan. 12 were 35,284 tons.

The coal and coke tonnage of the Chesapeake & Ohio Railway for the five months of its fiscal year from July 1 to Nov. 30 was as follows, in short tons:

	Coal.	Coke.	Total.
New River	2,526,018	78,818	2,604,836
Kanawha	1,442,383	35,260	1,477,643
Kentucky	66,030	.....	66,030
Connecting lines	199,740	42,742	242,482
Total	3,968,361	156,818	4,125,179
Total, 1905	3,401,795	184,163	3,585,958

The total increase was 449,221 tons, or 12.2 per cent. Deliveries of coal and coke originating on the line were: To points west of mines, 1,830,475 tons coal and 30,887 tons coke; points east, 648,683 tons coal and 4371 tons coke; tidewater, 1,283,463 tons coke.

New York Jan. 16

ANTHRACITE

There has been a marked increase in the business during the past week. Car supply showed a slight increase during the week but there was the usual falling off which has occurred during the last few weeks. Demand is not very brisk, and there is very little to report about the market in general. Small sizes are almost entirely out of the market, but coal is in better supply. Local retail dealers are not inclined to place large orders just at present, and producers are necessarily obliged either to withhold shipments or else curtail production in order to prevent flooding the market. Prices remain at $4.75 for broken, $5 for egg, stove and chestnut. Steam sizes are $3 for pea, $2.25 to $2.50 for buckwheat, $1.50 for rice, $1.40 for barley, all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade is somewhat easier in spots, and there seems to be a smaller demand for coal in New York harbor, but farther East the demand continues strong. The weakness in New York harbor is attributed to the mild weather. Car supply seems to be improved slightly in some quarters and there are better receipts of coal from West Virginia. Prices continue about the same, although mild weather would indicate a softening of prices if it continues. Good grades of soft coal may be purchased at about $2.85 f.o.b. New York harbor shipping ports, with lower grades bringing $2.05@2.75.

Trade in the far East is active and considerable coal is being absorbed. There does not seem to be as great an accumulation of tonnage as there is along the Sound. This is probably on account of better facilities for discharging and because the tonnage is better distributed.

Trade along the Sound is active and is taking large quantities of coal. Shipment to this territory is checked to some extent by accumulations awaiting discharge.

New York harbor market is soft, there being quite a little coal offered at this time and unabsorbed. All-rail trade is active and good prices are being procured at varying rates, according to quality, from $1.25@1.50 f.o.b. mines, being the price obtained for good grades of steam coal.

Transportation from mine to tide is very slow, coal taking from a week to ten days to run between New York harbor shipping ports. Car supply has improved since the first of the year to a small extent. In the coastwise trade small ves-

sels are in fairly good supply. Freight rates from Philadelphia are as follows: [illegible]; to the Sound, 85c.; all include the loading and discharging clause.

Birmingham Jan. 14

[illegible] mined in Alabama is in strong demand, with prices at a favorable point. The car situation shows a little improvement. The operators claim that the only drawback to the coal market is the transportation facilities. Almost the total output of the Alabama mines is for consumption in the State. There is some coal sent out and several carloads a day are exported to Mexico, but as a general proposition the coal is being consumed right in this district.

M. M. Kuffner, assistant State mine inspector, has tendered his resignation to the governor of the State, effective Jan. 31. His term of office does not expire until May. He has accepted a position as superintendent of mines with the Davis Creek Coal Company.

J. M. Gray, State mine inspector, is spending some time now in Montgomery with the legislature, seeking amendments to the mining laws of Alabama.

Cleveland Jan. 15

The coal market has been easier all during the week, mainly as a result of the soft weather. The slackened pace of consumption has resulted in an accumulation in the yards of the consumers. This has brought about the customary condition where some of the shippers, having to get rid of material on hand, have sacrificed it rather than pay the car charges. The market is just a little easier. Mine-run Ohio coal is selling at $1.15 at mines; No. 8 district coal at $1.10, and Pennsylvania [illegible] at mines.

The short production of domestic lump and the absence of any material production of three-quarter coal, such as is normally shipped up the lakes, has resulted in a stiffening of the demand for slack. Ohio is now worth about $1.10 at mines and Pennsylvania slack is a little higher at 90@95c. at mines.

The demand for the strictly domestic coals is easy enough to permit shippers to get ahead of their orders. The prices have not changed, general selected Massillon lump being quoted at $2.30 at mines.

The coke market is steady. Most of the sales for the year have been made, and there is only a moderate demand at $4@4.25 for the best grades of 72-hour foundry and $3.50@3.60 for furnace coke.

Indianapolis Jan. 12

The past week was perhaps the quietest midwinter week experienced in the Indiana coal industry for a number of years. The mild weather lessened demand at the mines and also aided the railroads to deliver the consignments that were overdue. As a rule there is an advance in price of coal at the mines during the first week of the year, but none has been announced so far and none will be, unless a severe cold spell should stimulate the demand.

Pittsburg Jan. 15

Coal—Some large annual contracts have been made within the past few days at prices ranging from $1.15 to $1.20 a ton for mine-run coal. These rates are from 20 to 25c. a ton higher than the prices named a year ago, before it was known that an advance in the mining rate would be enforced. For prompt shipment prices are somewhat lower than a week ago and are on the basis of $1.20 to $1.30 for mine-run. There is a better car supply and the majority of the railroad mines are in operation. The river mines are running full and energetic efforts are being made to load a large tonnage to be sent to lower ports in a few days. The rivers are at flood stage and when the waters recede will be navigable for several days. The Pittsburg district miners' convention closed on Saturday. Francis Feehan was re-elected president.

Connellsville Coke—The coke market continues strong with prices about the same as a week ago. Furnace coke for prompt and February shipment is quoted at $3.40@3.50; for the first half at $3.25@3.35 and for all year at $3@3.10. Foundry coke for the first six months is quoted at $4@4.25 and for deliveries extending through the year at $3.85@4. The *Courier* reports the production in the Connellsville region for the week at 292,189 tons and in the lower region at 118,747 tons. The shipments aggregated 14,905 cars distributed as follows: To Pittsburg, 4786 cars; to points west of Pittsburg, 8357 cars; to points east of Connellsville, 1852 cars.

Foreign Coal Trade

Jan. 16

Imports of fuel into France for the 11 months ending Nov. 30 were, in metric tons:

	1905.	1906.	Changes.
Coal	9,393,630	13,168,820	I. 3,772 190
Coke	1,460,190	2,062,200	I. 602,010
Briquets	359,420	508,580	I. 149,160
Total	11,213,240	15,736,600	I. 4,523,360

The imports were chiefly from Great Britain, Germany and Belgium. Exports from France for the 11 months were, in metric tons:

	1905.	1906.	Changes.
Coal	1,379,090	1,133,070	D. 246 020
Coke	217,890	156,740	D. 61,080
Briquets	54,870	32,680	D. 22,190
Total exports	1,651,580	1,322,490	D. 329,290
Steamer coal	127,040	187,190	I. 60,150
Total	1,778,820	1,509,680	D. 269,140

The fuel bunkered, or furnished to steamships, in 1906 included 103,150 tons of coal and 84,040 tons of briquets. The exports were largely to Switzerland and Italy.

Iron Trade Review

New York, Jan. 16

A heavy movement to buy pig iron for second-half delivery seems to have started. Consumers seem to have recovered from the slight uncertainty which marked the turn of the year, and to have made up their minds that it is safer to secure their supplies than to wait possible developments. Spot iron is practically out of the market for the time being.

In finished material new buying has not been heavy. Some contracts are being placed, but only of moderate size. A little rest is not unwelcome to most mills, giving them a chance to catch up on contracts. The structural market especially has been quiet.

Lake Iron Ore Movement—The figures compiled from the dock reports by the *Marine Review*, of Cleveland, O., show that in the season of 1906 a total of 85.5 per cent. of the iron ore shipped by water from Lake Superior mines reached the furnaces through Lake Erie ports. Receipts at those ports for the season were, in long tons:

Ports.	1905.	1906.	Changes.
Toledo	1,006,855	1,423,741	I. 416,88
Sandusky	51,202	35,847	D. 15,355
Huron	835,278	778,453	D. 46,825
Lorain	1,605,823	2,191,965	I. 586,142
Cleveland	5,854,745	6,604,661	I. 749,916
Fairport	2,008,621	1,861,498	D. 147,123
Ashtabula	6,373,779	6,833,352	I. 459,573
Conneaut	5,327,552	5,432,370	I. 104,818
Erie	2,112,476	1,986,539	D. 125,937
Buffalo	3,774,928	4,928,331	I. 1,153,403
Total	28,941.259	32,076,757	I. 3.135,498

Buffalo, which includes Tonawanda, shows the largest gain, and is now the fourth port in order of receipts. Ashtabula was the leading port, followed by Cleveland and Conneaut.

The stocks reported on docks at Lake Erie ports on Dec. 1 were, in long tons:

Ports.	1905.	1906.	Changes.
Toledo	368,024	281,000	D. 87,024
Sandusky	52,977	17,467	D. 35,510
Huron	208 023	245 499	I. 37,476
Lorain	271,695	336,321	I. 64,626
Cleveland	1,330,619	1,224,606	D. 106,013
Fairport	759,961	590,783	D. 169,178
Ashtabula	1,589,961	1,631,312	I. 41,361
Conneaut	976,976	1,057,424	I. 80 448
Erie	564 961	552,631	D. 12,330
Buffalo	315,780	315 412	D. 368
Total	6,438,967	6,252,455	D. 186,512

The stocks on docks make a fair showing. It is believed that stocks at furnaces are generally good.

The total shipments of lake ore by water for the season were 37,513,595 long tons. Receipts at Lake Erie ports, as shown above, were 32,076,757 tons. The balance of 5,436,838 tons is accounted for by deliveries at other points, such as South Chicago, Milwaukee and Detroit. The season movement to furnaces through the Lake Erie ports is figured as follows:

Stocks on docks, May 1	1,791,090
Receipts at docks	32,076,757
Total	33,867,847
Stocks on docks, Dec 1	6,252,455
Delivered to furnaces	27,615,392

This is an average of 3,945,056 tons per month delivered to furnaces through the

season. An unusual proportion of the ore received last season was loaded direct on cars, and did not go into the dock pockets at all. It is certain that the dock stocks will be drawn down to a low point by May next.

Baltimore Jan. 15

Among the exports for the week were 2480 tons steel rails to Havana and 1416 tons to Buenos Aires.

Imports included 3750 tons spiegeleisen, 772 tons ferro-manganese and 330 tons chrome iron. Arrivals of iron ore were one cargo, 5800 tons, from Cuba, and one cargo, 3850 tons, from Bone, Algeria.

Birmingham Jan. 14

Alabama manufacturers of pig iron are selling their product right along for delivery during the latter half of the year. Quotations are strong. Spot iron is very scarce, that is, for delivery during the first three months of the year. Such iron is bringing $23.50@24.50 easily, with but little to be had. Second-quarter iron is not plentiful either. This sells at $20@21 per ton, No. 2 foundry. Last-half iron is bringing $18.50@19 per ton, No. 2 foundry. The manufacturers in this district are making effort to increase production, the raw-material supplies being the condition to this end. Transportation facilities are responsible for the curtailed raw-material supply.

Much iron is being shipped out of the Birmingham district and from the Southern territory right now, that is, compared to what was sent out during November and December. The car situation is improving, as northern and western railroads are sending a number of cars this way. However, while some relief is noted, the car situation is far from being entirely satisfactory. The traffic agents of the railroads, following a meeting held in Birmingham, announced that the advance of 25c. per ton would go into effect on all shipments made after Feb. 1. The manufacturers entered a protest to the advance on iron which accumulated by reasons of the car shortage.

The Tennessee Coal, Iron and Railroad Company will blow in Little Belle furnace at Bessemer in the next few days. Two other furnaces in this section should be ready for the torch in the next three weeks.

Cleveland Jan. 15

Iron Ore—The principal interest in the iron-ore market for the week is the difficulty of the furnace interests to get the amount of iron they need out of the ore shipped down the lakes last season. Two weeks ago it was reported the iron-ore producers were paying rebates to the furnace interests, in some instances. It now proves that these payments are almost universal. It has been the case for several years that furnace interests have had to pay bonuses, because the ore exceeded the analysis, it being an exception rather than the rule, where the ore fell below the guaranteed content. The present situation seems to be a reverse of that formerly seen. The slight falling off in dock stocks indicates that there is probably less iron for use during this winter than for the winter of 1905-6, as the amounts on furnace stock-piles are no greater now than then. There is hardly any possibility, however, the stocks will be exhausted before the new supply begins to appear.

Pig Iron—Resumption of the buying movement in pig iron for second-half delivery removes all possibility of a slump in the price for the time being. There are three elements of uncertainty in the market—the crops, the money situation and the ability of users of finished material to use steel on the basis of prices indicated by the present price of raw material. Aside from these things and looking at the market from the standpoint, purely, of buying orders, the market is firmly established on the present level, or higher, for the remainder of this year. Reports of an easier tone in basic are due to the efforts of some consumers to bear prices that they might cover needs for the first half of this year. Foundry iron for spot shipment is almost out of the question. There will not be any import iron available at seaboard for another two weeks. Domestic furnaces are sold up. Small lots are selling on the basis of $25 at the furnace, with a few sales at $24.75. Southern iron is held at $23, Birmingham, but sales are difficult, owing to the congested condition of the furnaces and the scarcity of cars. For second-half delivery foundry prices have stiffened to $22@22.50 at the furnace. Basic is selling on the same basis, and some Bessemer is also being sold at the same price for delivery during the last half.

Finished Material—About the only interest in finished material is the possible influence of raw material prices upon current values and the effect upon the trade. The center of interest is consequently the billet trade, which appears to be a little easier as to deliveries if not as to price. Re-rolling billets are obtained without much difficulty, although the market is stiff. In other things specifications against contracts are heavy, amounting to anticipation of contract provisions.

Philadelphia Jan. 16

Pig Iron—The booking of a good many orders for work by mills, foundries, machine shops and establishments of all kinds accounts for the latest upheaval of orders for crude iron in the face of advancing prices. The only explanation given by some of our people who have bought within a few days is that they have the work to do, and they must have iron to do it with. The activity covers all lines of crude iron, although basic leads; but it is impossible to obtain any specific information to cover this point. The foundries are starting out with their books filled with orders and more business is coming along. The smaller shops are also well sold up. The inquiries for all kinds of material into which iron and steel enter are accumulating, and it is clear that we are going to have a more active season. For these and other reasons pig iron is now being sought for and it is believed that the maximum limit of price has not been reached. Quotations for No. 1 X foundry are $26@26.50; No. 2 X $24@24.50; No. 2 plain $23.50; gray forge $22.50; basic $24; Middlesboro No. 3, on dock, $23.

Steel Billets—There is a difficulty in obtaining prompt delivery on recent inquiries for steel billets. Some buyers have permitted their stocks to run rather low, and they are now aroused to the necessity of contracting. Some of the larger consumers who have been following the custom of ordering far ahead are also in the market for the purpose of placing orders.

Bars—A revival of demand has set in, for practically the same reasons that have put about such activity in pig iron. A great deal of work is coming to the bar mills and there is still more in sight. For this reason consumers of iron and steel bars are deeming prudence to be the better part of valor and are in the market this week.

Sheets—Practically the same conditions are developing in the sheet industry, as is indicated this week in orders for the earliest possible delivery. The sheet people say that some of the larger consumers have been asking for a reservation of mill capacity in their favor, which they will guarantee to take up just as soon as they can see a little farther ahead.

Pipes and Tubes—The demand for merchant pipe, very urgent in this territory, is fair and for tubes the consumption exceeds all records. Prices have advanced and orders are rushing in.

Plates—The smaller buyers have been very active within the past week, covering some recent business. There are inquiries from some of the older customers who buy in a large way.

Structural Material—Railroad companies have recently resolved upon further improvements in bridge work and the structural mill people say that orders will soon be forthcoming. The capacity is so oversold that manufacturers are entirely indifferent as to whether they secure any business for several weeks to come. Local building requirements are coming up and material will be wanted for these purposes for spring delivery.

Steel Rails—The rail makers say that there is an abundance of business to be had by simply indicating to buyers that they are ready to accept it. There is a

good deal of business in sight for sections suitable for lumber and mine roads.

Scrap—The scrap market is very strong in all directions and No. 1 steel scrap and wrought railroad scrap are being taken as fast as can be furnished.

Pittsburg Jan. 15

One of the unexpected features of the week,which showed the strength of the tin-plate market, developed at the bi-monthly examination of the sales sheets of the American Sheet and Tin-plate Company yesterday, under the terms of the wage scale of the Amalgamated Association. The examination showed an average of the shipments in November and December to have been at $3.50 a box, or 10c. a box above the base of the scale, and the workers employed in the union mills of the country will receive an advance in wages of 2 per cent. This is the first advance warranted by the sales for over six years and indicates that most of the low-price contracts taken early last year are filled. It was announced that another advance will be granted, and probably will be higher, when the next bi-monthly adjustment is made in March. The established price of $3.90 a box for tin-plate is being well maintained and conditions are excellent. Mills were unable to accumulate stocks during the fall and winter months, owing to the great demand, and have business on the books that will keep them going for several months. It will be necessary to increase capacity to provide for the requirements of the spring trade.

The bi-monthly examination of the sales sheets in the bar-iron and sheet branches was not as favorable for the puddlers and finishers and the sheet workers. The average for iron bars was 1.50c., due to the filling of contracts taken by the Republic Iron and Steel Company at low prices, but since the first of the year the rate of 1.80c. has been strictly maintained. The price of sheets has been advanced since the last adjustment, but the average this time was not sufficient to permit an advance. It is expected that the workers will get an increase at the next settlement.

The whole market in finished products is decidedly strong and the mills are busy, but new contracts booked are light. Specifications continue heavy in all lines, particularly wire, wire products, plates and structural material. Rail business is light, the leading producer booking only a few thousand tons during the week. The Pennsylvania and Cambria companies continue to quote $30 for standard bessemer-steel rails but are not being followed by other makers. It is believed these companies will sell at the established price of $28 for second-half delivery but expect to get $2 more for prompt deliveries. The merchant pipe mills are crowded with orders. The latest contract of importance calls for 60 miles of 16-in. pipe for a gas line.

Pig Iron—A pig-iron buying movement, that may become general in a few days, opened last week. Sales to date aggregate over 80,000 tons, the bulk of which is for second-half delivery. The leading independent interest today closed contracts for basic and malleable bessemer iron aggregating 10,000 tons, standard bessemer, 4000 tons and gray forge, 2000 tons. The forge is for first-half delivery and was at $22.25, Pittsburg, and the other was for deliveries beginning in February and extending through the year. The second-half basic and bessemer was at $21.50, Valley furnaces, and for first half the standard bessemer was at $23, and the malleable and basic at $22. Late last week sales of bessemer and basic amounted to 35,000 tons, of which 20,000 tons was bessemer. The business was divided between the leading independent producer and the Bessemer Pig Iron Association, the latter booking 11,500 tons. The iron is for second-half delivery and was at the uniform price of $21.50, Valley furnaces, the same rate at which several contracts were closed for No. 2 foundry iron. The Westinghouse Air Brake Company has closed contracts for over 25,000 tons of foundry iron for the last half, some of which is Southern iron. The Northern iron was at $22.35, delivered, and is for shipment in the last half.

Steel—Billets are still scarce and prices asked continue high. For bessemer billets $29.50@30 is quoted and for open-hearth $32.50@33. Plates remain at 1.70c. and merchant steel bars are firm at 1.60 cents.

Sheets—There is no change in the market except that the demand for galvanized sheets is stronger and, owing to the high price of spelter, an advance may be ordered. Black sheets continue at 2.60c. and galvanized at 3.65c. for No. 28 gage.

Ferro-Manganese—There is but little change in the market, and $81 to $82 is quoted for prompt and from $78 to $80 for future delivery.

Cartagena, Spain Dec. 29

Iron and Manganiferous Ores—Messrs. Barrington & Holt report that shipments for the week were nine cargoes, 28,950 tons dry ore, all to Great Britain. The Christmas holidays and wet weather have considerably interrupted business, and the mines will not be fully working until after the New Year. As shown above, shipments have been considerable, and the port is full of steamers waiting turn to load. Prices for iron and manganiferous ore are practically nominal, new business being much restricted, owing to miners and producers nearly all having sufficient orders in hand to keep them fully occupied for the next quarter or longer.

Quotations are, for iron ore, f.o.b shipping port: Ordinary 50 per cent. ore, 9s. 9d.@10s.; special low phosphorus, 10s. 3d.@10s. 6d.; specular ore, 58 per cent., 13s.; S. P. Campanil, 11s. 6d. Manganiferous ores, same terms, are 14s. 6d. for 35 per cent. iron and 12 per cent. manganese; no higher grades offered.

Pyrites—Iron pyrites, 40 per cent. iron and 43 sulphur, are quoted at 11s. 6d. per ton.

Dusseldorf, Germany Jan. 2

The German Iron and Steel Union reports the output of the German blast furnaces in November at 1,061,572 tons of pig iron. This is a decrease of 12,302 tons from October; but there was an increase in the daily average, that for October being 34,641 tons, while that for November was 35,386 tons. For the 11 months ending Nov. 30 the total output was, in metric tons:

	1905. Tons.	Per Ct.	1906. Tons.	Per Ct.
Foundry iron	1,728,835	17.3	1,928,417	16.9
Forge iron	744,522	7.5	786,752	6.9
Steel pig	636,826	6.4	862,983	7.6
Bessemer pig	386,804	3.9	439,987	3.8
Thomas pig	6,461,552	64.9	7,390,290	64.8
Total	9,958,539	100.0	11,408,429	100.0

The increases in 1906 were: Foundry iron, 199,582; forge iron, 42,230; steel pig—which includes spiegeleisen, ferro-manganese, ferro-silicon and all similar alloys—226,157; bessemer pig, 53,183; Thomas, or basic pig, 928,738; the total gain being 1,449,890 tons, or 14.6 per cent.

Metal Market

NEW YORK, Jan. 16

Gold and Silver Exports and Imports.
At all United States Ports in November and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1906	$1,963,757	$ 8,934,958	Imp. $6,971,201
" 1905	1,137,318	5,202,790	" 4,065,472
Year 1906	44,831,303	147,961,827	" 103,130,624
" 1905	44,125,935	46,264,524	" 2,138,589
Silver:			
Nov. 1906	4,411,830	2,914,157	Exp. 1,497,673
" 1905	5,361,819	4,306,838	" 1,054,981
" 1906	53,400,246	39,790,748	" 13,609,498
1905	49,816,953	31,246,389	" 18,070,564

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.
For week ending Jan. 12 and years from Jan. 1.

Period.	Gold. Exports.	Gold. Imports.	Silver. Exports.	Silver. Imports.
Week	$ 210,815	$ 40,832	$659,615	$ 80,543
1907	216,815	210,079	1,191,696	180,927
1906	534,060	60,568	4,858,053	61,810
1905	5,074,500	58,926	1,465,238	36,745

Exports of gold for the week were to the West Indies and South America; of silver to London. Imports for the week, both gold and silver, were from Mexico and Central America.

The joint statement of all the banks in the New York Clearing House for the week ending Jan. 12 shows loans, $1,048,808,700, a decrease of $858,800; deposits,

$1,008,922,400, an increase of $8,344,100, as compared with the preceding week. Reserve account shows:

	1906.	1905.
Specie	$ [illegible]	$ [illegible]
Legal tenders	[illegible]	[illegible]
Total	$ [illegible]	$ [illegible]
Surplus	$ [illegible]	$ [illegible]

The surplus over legal requirements shows an increase of $8,492,875, as compared with the previous week.

Specie holdings of the leading banks of the world on Jan. 12 are reported as below, in dollars:

	Gold.	Silver.	Total.
Asso'd New York	[illegible]	[illegible]	$177,001,000
England	$158,270,000	[illegible]	158,270,000
France	581,476,000	$195,776,800	729,252,800
Germany	135,360,000	45,180,000	180,540,000
Spain	77,140,000	120,930,000	198,070,000
Netherlands	27,080,500	28,877,000	56,254,500
Belgium	17,040,000	8,520,000	25,560,000
Italy	160,165,000	24,299,400	184,164,000
Russia	587,200,000	23,425,000	611,325,000
Aust.-Hungary	242,165,000	58,800,000	291,065,000
Sweden	19,980,000	[illegible]	19,980,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

The movement of gold and silver in France for the 11 months ending Nov. 30 was as follows:

Gold:	1905.	1906.
Imports	Fr. 742,322,000	Fr. 419,241,000
Exports	129,118,000	127,829,000
Excess, imports	Fr. 613,204,000	Fr. 291,412,000
Silver:		
Imports	92,971,000	141,164,000
Exports	64,860,000	121,825,000
Excess, imports	Fr. 28,111,000	Fr. 19,339,000

Imports of copper and nickel coins were 140,000 fr. in 1905 and 113,000 fr. in 1906. Exports were 292,000 fr. in 1905, and 200,000 fr. last year.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Jan. 3:

	1905.	1906.	Changes.
India	£ 363,000	[illegible]	D. £ 363,000
China	[illegible]	[illegible]	[illegible]
Straits	[illegible]	[illegible]	[illegible]
Total	£ 363,000	[illegible]	D. £ 363,000

Imports for the three days were £9000 in Mexican dollars from New York.

Indian exchange continues firm, and all the Council bills offered in London were taken at an average of 16.09d. per rupee. Shipments of silver to India have been light.

SILVER AND STERLING EXCHANGE.

		Silver.				Silver.	
January.	Sterling Exchange.	New York, Cents.	London, Pence.	January.	Sterling Exchange.	New York, Cents.	London, Pence.
10	4.84[illegible]	68[illegible]	31[illegible]	14	4.85	68[illegible]	31[illegible]
11	4.84[illegible]	68[illegible]	31[illegible]	15	4.85	68[illegible]	31[illegible]
12	4.84[illegible]	68[illegible]	31[illegible]	16	4.85[illegible]	68[illegible]	31[illegible]

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	[illegible]	[illegible]
Peruvian sol	[illegible]	[illegible]
Victoria sovereigns	[illegible]	[illegible]
Twenty francs	[illegible]	[illegible]
Spanish 25 pesetas	[illegible]	[illegible]

Other Metals

Daily Prices of Metals in New York.

	Copper.			Tin.	Lead.	Spelter.	
January.	Lake, Cts. per lb.	Electro-lytic, Cts. per lb.	London Std., £ per l. t.	New York, Cts. per lb.	New York, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
10	24¼	24	107½	41¼	6.00	6.70 @6.75	6.55 @6.60
11	24¼ @25	24 @24¾	108⅛	41¼	6.00	6.70 @6.75	6.55 @6.60
12	24¼ @25	24 @24	[illegible]	41⅛	6.00	6.70 @6.75	6.55 @6.60
14	24¼ @25	24¼ @24¾	108⅛	41¼	6.00	6.70 @6.75	6.55 @6.60
15	24¼ @25	24¼ @24¾	108⅛	41¼	6.00	6.70 @6.75	6.55 @6.60
16	24¼ @25	24¼ @24¾	108¾	41¼	6.00	6.70 @6.75	6.55 @6.60

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former G. M. B. New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—The market continues exceedingly quiet. The undertone remains as firm as ever, and on account of the shortage of supplies every sale that is being consummated makes an impression on prices, which are constantly advancing. The close is quoted at 24½@25c. for lake copper; 24¼@24¾c. for electrolytic in ingots, cakes and wire bars; quotations for casting are nominal at 24⅛@24⅜c.

The London standard market remains very firm and closes at £108 2s. 6d. for spot, £108 12s. 6d. for three months'.

Statistics for the first half of the current month show an increase in the visible supplies of 500 tons.

Refined and manufactured sorts we quote: English tough, £109; best selected, £114; strong sheets, £140@150.

Exports of copper from New York for the week were 2127 long tons. Our special correspondent reports the exports from Baltimore at 526 tons of copper.

Copper Sheets—The base price of copper sheets is 30c. per lb. This price is subject to change without notice.

Tin—No change in the attitude of buyers is noticeable, and transactions in this metal have not increased to any extent. Everybody seems to be waiting for a lower market before entering into larger commitments. The close is weak at 41¼.

The London market has remained steady on a lower basis, and the close is cabled as £188 15s. for spot, £189 15s. for three months'.

Lead—The quotation remains unchanged at 6c. New York.

London reports a firm market, and the close is cabled as £19 17s. 6d. for Spanish lead, £20 for English lead.

The movement of foreign lead in the United States for the 11 months ending Nov. 30 is reported as follows, in short tons:

Imports, Pig & Bullion	[illegible]
Imports, Ore & Matte	[illegible]
Total Supply	[illegible]
Exports, Pig, Bullion & Matte	[illegible]
Ex Port L, Ore	[illegible]
Total Deductions	[illegible]
Total Stock	[illegible]

This balance has, presumably, entered into consumption in the United States.

St. Louis Lead Market—The John Wahl Commission Company telegraphs under date of Jan. 16 as follows: Lead is firm at 6.07½@6.10c. for Missouri brands.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Dec. 29, that the price of pig lead has been 91.75 reales per quintal, equal, on current exchange, to £18 13s. 7d. per long ton, f.o.b. Cartagena. Silver is 14 reales per ounce; exchange 27.49 pesetas to £1. Shipments for the week were 144 tons argentiferous and 66 tons desilverized lead to Marseilles.

Spelter—Business in this metal has been very satisfactory, and the shortage of near-by supplies has become more pronounced. For this reason the market retains its firm tone and closes at 6.70@6.75 New York, 6.55@6.60 St. Louis.

In the London market spelter has been pressed for sale, and lower prices are the consequence. The market over there closes weak at £27 for good ordinaries, £27 5s. for specials.

Zinc Sheets—The base price is $8.40 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—There is no material change. Quotations are 25¾@26¼ for Cookson's; 25@25¾ for Hallett's; and 24@24½ for ordinaries. The market is from 1@1½c. below the import price, due to selling by dealers who bought considerably below the present prices and who are willing to dispose of their holdings. The market abroad is strong, and higher prices are looked for.

Platinum—Demand continues strong and prices high, with an upward tendency. Unmanufactured platinum is quoted at $38 per oz. For good scrap $31@31.50 is paid.

Nickel—For large lots, New York or

other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@05c., same delivery.

Quicksilver—There is no change. New York prices are $40.50@42 per flask of 75 lb., according to size and conditions of or- [illegible] $37.50 per flask for domestic orders, and $37@38 for export trade. The London quotation is [illegible] asked by

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 30c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Wisconsin Ore Market

[illegible] January 12.

The shut-down during the holidays curtailed the tonnage output to quite a considerable extent. Sixty per cent. ore sold at $47. A few choice lots brought as high as $50 per ton. There has been no decided improvement in the car shortage during the past week. The leading buyers showed a little more interest and a slight advance is looked for the coming week. Lead sold at $82@90 per ton. Sulphur and drybone same as last week.

The camps of the district loaded are as follows for the week ending Jan. 12, 1907:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur Lb.
Platteville	220,160	10,750	...
Cuba City	278,000	30,500	....
Bold A.	57,180	....	.....
Linwood	140,000		.....
Lancaster-Hazel Green	90,000	...	...
Galena	64,000	....	...
Linden-Calamine	54,000	....	....
Total for week	1,188,340	50,750	....
Total to date	1,880,440	140,750	....

Nothing of unusual interest occurred during the current week. Two new mills were started, but will not be in a shipping condition for several weeks.

Ore shipments from the Platteville district for the closing week in December were 1,234,785 lb. zinc ore, 95,000 lb. lead ore and 41,250 lb. sulphur ore, or pyrites. This makes the total for 1906, as specially reported to the JOURNAL, 78,703,585 lb. zinc ore, 3,756,535 lb. lead ore, and 4,130,160 lb. sulphur ore. This makes a total of 43,205 tons of all kinds.

Missouri Ore Market

[illegible] January 14.

The highest price paid for zinc was $59.50 per ton, on an assay basis ranging from $45 to $48 per ton of 60 per cent. zinc, showing an average, all grades, of $45.78 per ton.

The highest price paid for lead was $87 per ton, with medium grades selling at $83@86, and an average of $82.34, all grades.

Although both minerals show a decrease in the shipment, compared with the previous week, occasioned by the car situation, the demand was very brisk and purchases were even made ahead of the output. During the past four weeks the Caney Zinc Company has developed a desire to purchase quantities of the highest grade zinc concentrate, an innovation for this company, and its purchasing agent has been treading on the toes of the buyers for all the smelters handling the best grade concentrate. As it is not considered good policy to raise prices too high with open weather at this time of year, there is lively skirmishing to fill orders for the high-grade ores. The Matthieson & Hegeler buyers are setting the price each week, which the Caney company must pay to obtain the best grades.

Renewed activity developed during the week in lead concentrates, with the Granby Mining and Smelting Company leading in the effort for an increased tonnage, and the Picher Lead Company playing a close second. It is understood that the St. Louis company made no advances in price, accepting as its share what ore came to it at last week's quotations.

Following are the shipments of zinc and lead concentrate from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	2,072,710	494,360	$69,171
Joplin	7,435,730	260,110	98,686
Alba-Neck City	1,370,620	.....	33,580
Galena-Empire	1,139,650	98,660	30,354
Duenweg	780,280	115,620	23,192
Badger	671,890	6,110	16,707
Oronogo	529,880	51,940	14,653
Prosperity	446,390	96,600	13,583
Aurora	593,290	26,370	14,404
Spurgeon	332,140	71,820	9,340
Granby	240,000	100,000	7,300
Baxter Springs	202,580	.....	4,380
Sherwood	74,470	29,110	2,935
Curl Junction	43,060	6,030	1,243
Zincite	51,680	.....	1,240
Wentworth	27,420	.....	620
Totals	11,088,790	1,356,730	$310,688
Two weeks this year	22,259,370	2,981,230	632,850
Two weeks last year	21,091,540	2,309,840	578,425
Increase	1,167,830	671,390	54,425

Zinc value, this week, $250,823; two weeks, $508,575.
Lead value, the week, 56,895; two weeks, 124,275.

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc.

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906.
January	52.00	47.38	January	61.50	75.20
February	52.77	47.37	February	57.62	72.83
March	47.40	42.68	March	57.20	73.73
April	42.88	44.63	April	58.00	75.13
May	43.31	40.51	May	58.27	78.40
June	40.75	43.83	June	57.80	80.96
July	43.00	43.25	July	58.00	74.31
August	48.83	43.56	August	58.00	75.36
September	46.75	42.58	September	63.50	79.64
October	47.60	41.55	October	63.86	79.84
November	49.55	44.13	November	68.67	81.98
December	49.00	43.68	December	76.25	81.89
Year	44.88	43.24	Year	62.12	77.40

Chemicals

NEW YORK, Jan. 16.

Copper Sulphate—The market is firm with steady demand and no change is evident. Prices are unchanged at $7.25 per 100 lb. for carload lots, and $7.50 for smaller parcels.

Nitrate of Soda—The nitrate position for the past year is given as follows, in long tons:

	1905.	1906.	Changes.
Exports from W. Coast, S. America	1,627,000	1,720,000	I. 93,000
Deliveries	1,567,000	1,642,000	I. 75,000
Surplus	60,000	78,000	I. 18,000

The estimated deliveries are: To United States, 355,000; Great Britain, 107,000; European Continent, 1,140,000; other countries, 40,000; total 1906 deliveries, 1,642,000 tons. The combination is preparing for exports of 1,875,000 tons during the present year.

Mining Stocks

NEW YORK, Jan. 16

The general condition of the stock markets is uncertain still. The markets are being fed with huge blocks of new securities, and it begins to look as if a period of congestion, like that of a few years ago, was approaching. Speculation is halting, and depends on small fluctuations for the time being. The markets depend chiefly upon large operators.

While this is the case in the general market, there is a decided boom on in mining stocks, which is showing itself on opposite sides of the continent. The Boston exchange is wild over copper stocks; prices have risen rapidly, and there is a greater excitement than has been known for years. San Francisco is in much the same condition, the boom there being in the new southern Nevada stocks.

The New York market does not reflect this condition to any considerable extent, though there is more interest in mining stocks than for a long time past. Still, it is rather reflected than original.

The Amalgamated Copper directors will meet tomorrow, and decide on the rate of dividend for the quarter. As usual, there is much speculation about it; but it is impossible to forecast their action.

Boston Jan. 15

There has been one of the broadest and most active markets ever witnessed in this city for mining shares since the first of the year. Old standards have been put aside and new ones are stepping in. High records have been pushed away and new ones made. Stocks are being absorbed as never before and it would seem as if the end was not in sight. Combinations are the order of the day, and if one can believe all he hears, everything in the Lake Superior copper-mining district is to be

combined except the Calumet & Hecla. The advance in the market price of specialties the past week has been phenomenal and until today there seemed no limit to their flight. A moderate reaction was brought about in the late trading today, and this condition will be healthful indeed.

It is apparent that there has been steady buying of the best class of copper stocks and free selling of Amalgamated. From this it is judged that the various companies will be taken over by the Amalgamated Company and the latter's stock issued in exchange. Copper Range, Osceola, Tamarack, Allouez, Isle Royale, Centennial, Mohawk, Ahmeek, Seneca, Quincy, Arcadian, La Salle and a few others are the names conjured with at present as being parties in the combination to be taken over by the $100,000,000 Ojibway Copper Company, a holding one. Already the combination has purchased land from the Union Copper, Land and Mining Company for its future development.

Calumet & Hecla made its newest high record today at $960, being up $60 for the week. Copper Range in a great burst of speed touched $105, its best price on record, with almost a $10 setback in 24 hours. The closing a week ago was about $86. Tamarack rushed up $39 to $170, reacting $8; Osceola $7 to $166, a record, reacting $4; Quincy $12 to $126, reacting $6; Allouez $5.25 to $74.25, a record, reacting to $70; Isle Royale $6.50 to $36, reacting $2.50; Mohawk $13.25 to $97, a record, reacting $7; Ahmeek $120, a record, and Seneca $100, a record also. The last two are curb stocks, as is La Salle, the new one which has sold at from $23.62½ to $24.62½. Amalgamated went up $1.75 in the meantime to $120.62½, reacting to $118.50.

Other mining shares have risen in sympathy and the curb almost bulged out with the enormous trading there.

Trinity quieted down during the week, but began a new lease of activity Monday and today. The price today went to $35.50, reacting $1 from this, a net advance of over $2 for the week. Arcadian took a dip to $10, but is up to $14.50 today. Calumet & Arizona rose $5.50 to $184, reacting $3 today, and North Butte rose $2 to $120, with reaction to $117. Butte Coalition rose $2 to $39, losing over one-half the gain. Old Dominion spurted $3.50 to $59.50, reacting $2, and Parrot went up $3 to $35, losing $2 of it. Shannon made its price today at $22.25, being up $1.75 for the week.

Tecumseh has been stricken from the list, as a majority of its shares have been turned over for La Salle, three shares for four of the latter. Utah made its best record price Monday at $79, but yielded to $73.75 today, which is a net gain of $7.50 for the week. Bingham rose $2.50 to $37, losing all of it. Adventure sold below $5. A call for a 50c. assessment has been made, payable Feb. 5. This is the second instalment of a $1 assessment originally payable July 16, but later deferred. Michigan touched $24.25, Franklin $28.50, Boston Consolidated $33.25 and Wimona $13.62½.

On the curb Davis-Daly has been a feature, with sales above $19, and Raven has advanced to $1.75. Majestic rose to $4.62½, Keweenaw to $16 and East Butte to $18 per share.

Colorado Springs Jan. 11

In contrast with last week the market has been quite active on the local exchange. There has been a general decline in the whole market, owing to the heavy selling. Work was the feature of the market, selling from 20¼ down to 13⅝, and recovering on the call today to 18, with sales of over 71,000 shares for the week.

Elkton has also been a heavy trader, but its running mate El Paso has been less active and inclined to be weak. Acacia and Isabella were among the active traders on today's call.

San Francisco Jan. 10

There are very lively times in the mining-stock market in San Francisco these days, the volume of sales being almost unprecedented. Most of the transactions are in the stocks of the southern Nevada mines. Some days this week, after the board closed, the brokers continued trading on the sidewalks in the rain for a couple of hours. Generally speaking, the stocks have advanced of late, especially those of Goldfield. The San Francisco Stock and Exchange Board nominated officers today to serve for the year, these being the old officials without exception. The list includes A. B. Ruggles, for president; Joseph King, for chairman; F. L. Hadley, for secretary, and Charles D. Laing, for treasurer. The election will be held next Monday. A large undertaking has been decided upon by the brokers. The president, A. B. Ruggles, has been authorized to communicate with some Eastern expert, who can assist the board to organize a clearing house, through which the daily transactions of stocks can be cleared just as bank clearings are handled. The San Francisco mining-stock stockbrokers have decided that the present system of conducting business, and the perplexities that attend time sales, must be superseded by more modern methods. One effect of the change will be to stop the present running about from office to office, to get stocks that have been dealt in among the brokers. This will be a great saving of time and the economy in expense will also be considerable.

In Grass Valley, the leading gold-producing camp of California, a stock board has been organized and commenced operations. It is found that the miners there seem to have plenty of money to invest in mining securities.

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1905.	1906.	1905.	1906.
January	60.690	65.288	27.290	30.113
February	61.023	66.108	28.047	30.464
March	58.916	64.597	26.794	29.854
April	58.600	64.763	26.108	29.984
May	57.832	66.956	25.664	30.968
June	58.428	65.394	26.910	30.185
July	58.915	65.106	27.168	30.113
August	60.259	65.949	27.822	30.529
September	61.696	67.927	28.528	31.483
October	62.084	69.523	28.637	32.148
November	63.849	70.518	29.493	32.671
December	64.850	69.000	29.977	31.993
Year	60.353	67.791	27.839	31.428

The New York prices are in cents per fine ounce; the London quotations are in pence per standard ounce, 0.925 fine.

AVERAGE PRICES OF COPPER

	New York.				London.	
	Electrolytic.		Lake.			
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	15.008	18.310	15.128	18.419	68.262	78.869
Feb.	15.011	17.869	15.136	18.116	67.963	78.147
March	15.125	18.361	15.250	18.611	68.174	81.111
April	14.920	18.375	15.045	18.688	67.017	84.793
May	14.627	18.457	14.820	18.724	66.875	84.847
June	14.673	18.442	14.813	18.719	65.881	83.994
July	14.888	18.190	15.005	18.585	66.887	81.167
Aug.	15.664	18.380	15.745	18.706	69.830	83.864
Sept.	15.965	19.043	15.978	19.428	69.667	87.831
Oct.	16.279	21.203	16.332	21.722	71.406	97.269
Nov.	16.599	21.468	16.758	22.408	74.727	100.270
Dec.	18.328	22.885	18.396	23.450	78.993	105.226
Year.	15.590	19.278	15.699	19.916	69.465	87.282

New York prices are in cents per pound. Electrolytic quotations are for cakes, ingots or wire bars. The London prices are in pounds sterling, per long ton of 2240 lb., standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	29.325	36.390	July	31.760	37.275
Feb.	29.262	36.403	August	32.886	40.606
March	29.523	36.662	Sept	32.095	40.516
April	30.525	38.900	Oct.	32.481	42.852
May	30.049	43.313	Nov.	33.443	42.906
June	30.329	39.260	Dec.	35.835	42.750
			Av. year.	31.358	39.819

Prices are in cents per pound.

AVERAGE PRICE OF LEAD AT NEW YORK

Month.	1905.	1906.	Month.	1905.	1906.
Jan.	4.552	5.600	July	4.524	5.750
Feb.	4.450	5.404	Aug.	4.665	5.750
March	4.470	5.350	Sept.	4.850	5.750
April	4.500	5.404	Oct.	4.850	5.750
May	4.500	5.685	Nov.	5.200	5.750
June	4.500	5.750	Dec.	5.422	5.900
			Av., year.	4.707	5.657

Prices are in cents per pound. The London average for January, 1906, was £16.850 per long ton; February, £16.031; March, £15.922; April, £15.959; May, £16.725; June, £16.813; July, £16.525; August, £17.109; September, £18.266; October, £19.350; November, £19.281; December, £19.609; year, £17.370.

AVRAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1905.	1906.	1905.	1906.	1905.	1906.
Jan.	6.190	6.487	6.032	6.337	25.062	28.225
Feb.	6.139	6.075	5.989	5.924	24.894	25.844
Mar.	6.067	6.209	5.917	6.056	23.825	24.563
April	5.817	6.078	5.667	5.931	23.813	25.781
May	5.644	5.997	5.494	5.846	23.694	27.000
June	5.190	6.096	5.040	5.948	23.875	27.728
July	5.396	6.006	5.247	5.856	23.938	26.890
Aug.	5.706	6.027	5.556	5.878	24.675	26.938
Sept.	5.887	6.216	5.737	6.066	26.375	27.563
Oct.	6.087	6.222	5.934	6.070	28.225	28.075
Nov.	6.145	6.375	5.984	6.225	28.500	27.781
Dec.	6.522	6.288	6.374	6.443	28.719	27.938
Year.	5.822	6.198	5.730	6.048	25.433	27.020

New York and St. Louis prices are in cents per pound. The London prices are in pounds sterling per long ton (2240 lb.) good ordinary brands.

STOCK QUOTATIONS

BOSTON Jan. 12

Name of Company.	Bid.	Asked.	Sales.
Adventure	5¼	5½	2,534
Allouez	50	55	8,366
Am. Zinc	9	9¼	4,044
Arcadian	11	11½	50,800
Atlantic	16	15	1,605
Bingham	43	43¼	4,448
Boston Consolidated	31	31	2,596
Calumet & Ariz.	181	178	180¾	2,560
Calumet & Hecla	910	905	910	254
Centennial	44	40	44	5,151
Con. Mercur	50	45	47	5,955
Copper Range	89	85¾	86	51,911
Daly West	20	19	20	1,455
Franklin	26½	26	27	6,443
Granby*	14½	14	14¾	101
Greene Consolidated	35	30½	31¼	38,917
Isle Royal	35	29	35	2,613
Mass	8	8	8¼	4,648
Michigan	23	21½	23	3,461
Mohawk*	89	81¾	89	3,654
Mont. Coal & Coke new	2⅜	1⅞	1⅞	5,565
Nevada	19¾	18¾	18¾	821
North Butte	120	117	117	15,821
Old Colony	23	22¾	23¼	659
Old Dominion	57¾	54	56	3,125
Osceola*	165¾	157½	165	5,457
Parrot	34	30	33¾	3,053
Phoenix	1¼	1	1⅝	2,480
Quincy	126	114	124	14,057
Rhode Island	11	10	10⅝	11,342
Santa Fe	7¼	6⅝	7	43,493
Shannon	21¼	20	21¼	10,884
Tamarack*	164	125	162	9,273
Tecumseh	34½	31	32¾	1,590
Trinity	37	30	30½	94,113
United Copper, com.	74¼	73⅞	74	965
U. S. Oil	12½	10½	11¼	13,368
U. S. Smg. & Ref.	69	66	67½	7,608
U. S. Smg. & Ref., pfd.*	49	47	47⅞	8,066
Utah Copper*	69¾	66	69¾	18,663
Victoria	8	7¼	7⅝	4,085
Washington	2¼	2	2½	350
Winona	13	12	13	3,725
Wolverine	190	185	190	197
Wyandotte	3¼	2⅝	3	14,750

*Ex. Div. †Ex. Rights. ‡Ass. Paid.

BOSTON CURB.

Name of Company.	Bid.	Asked.	Sales.
Ahmeek	115	105	110	680
Ariz. Com'l.	36	34	35	555
Black Mt.	102⅜	97⅜	97⅜	2,990
Cananea Con.	32	30⅛	30⅛	1,863
East Butte	17	12¼	17	12,506
Hancock Con.	20⅛	17	17⅛	2,070
Keweenaw	14¾	13⅜	13⅜	4,840
Majestic	4⅞	3½	4⅛	16,319
Raven	1¾	1¼	1⅝	21,970
Shawmut	1 1/16	1	1 1/16	8,650
Superior	22	20	21	320
Superior & Pitts.	27⅞	26⅜	26⅞	16,865
Troy	3⅜	3	3¾	4,860

NEW YORK INDUSTRIALS.

Name of Company.	Bid.	Asked.	Sales.
Am. Agri. Chem.	25	24	25	400
Am. Smelting & Ref.	155	150	152½	69,000
Am. Smelt. & Ref., Pf.	117¾	115	116¾	1,200
Bethlehem Steel	39½	29½	30½	100
Colo. Fuel & Iron	57¾	54	56	76,800
Federal M. & S., Pf.	97¾	95	95½	300
Inter. Salt	20	20	20	10
National Lead	76	73	73½	3,750
National Lead, Pf.	103	102½	102⅞	600
Pittsburg Coal	16¾	16	16¾	500
Republic I. & S.	41¼	38¾	39⅜	9,550
Republic I. & S., Pf.	100	98	99	5,000
Sloss-Sheffield	77¾	74½	75	2,100
Standard Oil	540	527	540	257
Tenn. C. & I.	101⅜	101⅛	101⅜	100
U. S. Red. & Ref.	28	27⅜	27½	300
U. S. Steel	50⅜	48¾	49⅝	372 655
U. S. Steel, Pf.	108¾	106	108⅝	63,705
Va.-Car. Chem.	39½	37	37½	1,600
Va. I. Coal & Coke	85½	84½	84½	2,745

PHILADELPHIA Jan. 12

Name of Company.	High.	Low.	Clg.	Sales.
American Cement	10¾	10	10⅜	354
Cambria Steel	43⅝	43¼	43⅜	103,188
General Asphalt	47	45	47	545
Penn. Steel, pd.	106	105½	105½	155
Philadelphia Co.	48¼	47¾	47⅝	81
Tonopah Mining	19¼	18¾	18¾	2,131

PITTSBURG Jan. 12

Name of Company.	High.	Low.	Clg.	Sales.
Crucible Steel	12	11¾	11¾	823
Crucible Steel, Pf.	77½	77¼	78	1,175
Harbison-Walker Ref.	14½	13	13½	85
Oil City Gas				
Tonopah Ext.	6¾	5¾	5¾	1,295

St. Louis Jan. 12

Adams, $0.40—$0.25; American Nettie, $0.06; Century Coal, $2.50; $2.25; Central Coal and Coke, pfd., $80.00—$79.00; Consolidated Coal, $24.00; $24.25; Doe Run, $47.00; Granby, $14.00; Illinois Zinc Co., $10.00; Mammoth, $0.40; Mexican Mines, $0.40; National Lead, $73.00; $73.50; Rogers Brothers Coal, $117.00.

COLORADO SPRINGS Jan. 12

Name of Company.	High.	Low.	Clg.	Sales.
Acacia	13	12	12	5,100
C. C. Con.	6¼	6	6	1,500
Doctor Jack Pot	7	6	6	4,500
El Paso	3¾	3¾	3¾	900
Findley	61¾	61	62½	30,500
Gold Dollar	61	58½	58½	11,750
Gold Sovereign	7¼	7¼	7⅜	6,800
Independence	8¾	8	8	3,600
Jennie Sample				
Lexington	27	2	26	14,000
Portland			25	1,000
Mary McKinney			72	
Independence	6¾	6½	6¾	14,000
Isabella	1	1.34	1.34	5,500
Silver Cedar			1.00	
Work	2¼	1¾	18	71,300

NEVADA MINING STOCKS Jan. 16
(Revised by Weir Bros. & Co., New York)

Tonopah Stocks.	High.	Low.	Last.
Tonopah Mine of Nevada	18.87½	18.50	18.75
Tonopah Extension	5.62½	5.50	5.62½
Montana Tonopah	4.60	3.95	3.97
Belmont	6.62½	6.62½	6.62½
Tonopah Midway	2.28	2.25	2.27
West End Con.	1.80	1.75	1.75
Jim Butler	1.32	1.30	1.31
Goldfield Stocks.			
Sandstorm	.77	.75	.77
Kendall	.66	.64	.64
Red Top	4.50	4.37½	4.50
Jumbo	4.50	4.37½	4.50
Goldfield Mining	1.77	1.75	1.75
Diamondfield B. B. Con.	.64	.60	.61
Atlanta	.92	.91	.91
Mohawk	17.50	17.50	17.50
Silver Pick	1.55	1.54	1.54
Laguna	1.80	1.75	1.80
Bullfrog Stocks.			
Montgomery Shoshone Con.	14.00	14.00	14.00
Tramps Con.	1.92	1.86	1.86
Gold Bar	1.65	1.62	1.63
Bullfrog Mining	.44	.43	.43
Bullfrog National Bank	.60	.59	.59
Homestake Con.	1.25	1.16	1.20
Manhattan Stocks.			
Manhattan Con.	1.00	.97	.97
Manhattan Dexter	.80	.79	.80
Jumping Jack			
Stray Dog			
Indian Camp			

LONDON. *(By Cable.*)* Jan. 16.

Dolores, £1 7s. 6d.; Stratton's Independence, £0 2s. 9d.; Camp Bird, £1 8s. 0d.; Esperanza, £2 16s. 3d.; Tomboy, £2 2s. 6d., El Oro, £1 7s. 6d.; Oroville, £1 0s. 6d.; Somera, £0 5s. 7½d.; Utah Apex, £1 14s. 4½d.; Arizona Copper, pref., £3 15s. 0d.; Ariz. Copper, def., £3 12s. 6d.

*Furnished by Hayden, Stone & Co., New York.

SAN FRANCISCO Jan. 9

Name of Company.	High.	Low.	Clg.	Sales.
Comstock Stocks.				
Belcher	1.00	.77	.85	10,600
Best & Belcher	1.65	1.40	1.65	1,350
Caledonia	.69	.43	.58	3,100
Challar	.22	.18	.18	3,600
Con. Cal. & Va.	1.30	1.15	1.20	4,000
Crown Point	.38	.32	.34	5,500
Gould & Curry	.40	.36	.38	3,450
Hale & Norcross	1.00	.90	.90	1,700
Mexican	1.15	.90	1.00	5,600
Ophir	3.25	3.00	3.00	3,700
Overman	.25	.23	.25	2,600
Potosi	.25	.24	.25	1,200
Savage	1.05	.88	.90	1,100
Sierra Nevada	.85	.71	.72	1,650
Yellow Jacket	1.40	1.35	1.35	1,300
Tonopah Stocks.				
Belmont	5.87	5.50	5.77	3,900
Golden Anchor	.43	.41	.43	15,600
Jim Butler	1.32	1.25	1.30	20,075
McNamara	.70	.67	.70	9 500
Midway	2.35	2.20	2.20	4,500
North Star	.43	.38	.42	4,000
West End	1 95	1.70	1.90	3,600
Goldfield Stocks.				
Atlanta	.90	.61	.87	61,660
Columbia Mt.	1.30	1.00	1.27	42,560
Comb. Frac.	6.00	3.50	6.00	17 860
Diamondfield B.B. Con.	.65	.45	.65	55 700
Florence	4.00	4.00	4.00	100
Frances-Mohawk	.90	.90	.90	700
Goldfield Mining			1.50	
Jumbo	3.75	3.50	3.75	200
Kendall	.65	.56	.65	8,000
Laguna			1.52	
Mohawk	17.00	17.00	17.00	100
Red Top	4.25	3.80	4.25	600
Silver Pick	1.57	1.20	1.52	63,475
Sandstorm	.75	.65	.75	7,000
Bullfrog Stocks.				
Bullfrog Mining			.44	
Bullfrog Nat'l Bank	.56	.50	.56	15,600
Gold Bar	1.50	1.27	1.32	26,000
Homestake Con.	1.20	1.15	1.20	13,600
Original	.21	.19	.21	7,700
Tramps Con.	1.85	1.65	1.70	23,009
Manhattan Stocks.				
Indian Camp			1.10	
Jumping Jack	.46	.20	.20	1,500
Manhattan Con.	1.00	.93	.98	8,200
Manhattan Dexter	.79	.75	.76	9,800
Stray Dog	.65	.40	.60	1,300

New Dividends

Company.	Payable.	Rate.	Amt.
Beck Tunnel, Utah	Jan. 20	$0.04	$ 40,000
Daly Judge, Utah	Jan. 12	0.37½	112,500
Dominion Coal, pfd.	Feb. 1	3.50	105,000
Esperanza	Jan. 21	2.52	1,146,600
Grand Central, Utah	Jan. 15	0.06	15,000
International Nickel, pfd.	Feb. 1	1.50	153,639
N. Y. & Honduras Rosario	Jan. 15	0.50	15,000
Nipissing Mines	Jan. 20	0.25	300,000
Osceola, Mich.	Jan. 24	6.00	600,000
Tamarack, Mich.	Jan. 24	3.00	300,000
Tennessee C., I. & R. R.	Feb. 1	1.00	225 536
Tennessee C., I. & R. R., pfd.	Feb. 1	2.00	4,960
Tennessee Copper	Jan. 12	1.25	218,750
Tonopah of Nevada	Jan. 15	0.35	350,000
United Zinc, pfd.	Jan. 15	0.50	9 778
United Copper	Jan. 30	1.75	787,500
U. S. Cast Iron Pipe	Mar. 1	1.00	150,000
U. S. Cast Iron Pipe, pfd.	Mar. 1	1.75	262,500
U. S. Smelt., Ref. & Mg.	Apr. 1	0.87½	1,312,500
U. S. Smelt., Ref. & Mg., pfd.	Jan. 15	0.87½	1,312,500
Utah Mines Co.	Jan. 15	0.01	3,060
Utah Con., Utah	Jan. 15	3.00	900,000
Va-Carolina Chem., pf.	Jan. 15	2.00	360,000
Victoria, Utah	Jan. 15	0.04	10.000
Vulcan Detinning, pfd.	Jan. 19	1.25	18,750

Assessments

Company.	Delinq.	Sale.	Amt.
Butte Lode, Cal.	Dec. 22	Jan.	$4.50
Champ'n Mines, Cal	Jan. 21	Feb.	0.50
Golden Gate, Cal.	Jan. 7	Feb. 6	0.01
Gould & Curry, Nev.	Dec. 10	Dec. 31	0.10
Great Ironclad, Cal	Dec. 24	Jan. 15	0.03
Lyon, Utah	Dec. 10	Jan. 2	0.01
Mexican, Nev.	Jan. 10	Jan. 31	0.15
Naildriver, Utah	Dec. 24	Jan. 10	0.05
Potosi, Nev.	Jan. 7	Jan. 29	0.10
Red Cloud, Idaho	Dec. 15	Jan. 15	0.001
Star Con., Utah	Dec. 20	Jan. 9	0.03
Susannah, Utah	Dec. 21	Jan. 10	0.00½
Vicksburg, Utah	Jan. 9	Jan. 21	0.01
West'n MinesCo., Nv.	Dec. 24	Jan. 24	0.02
Yellow Jacket	Dec. 17	Jan. 27	0.15

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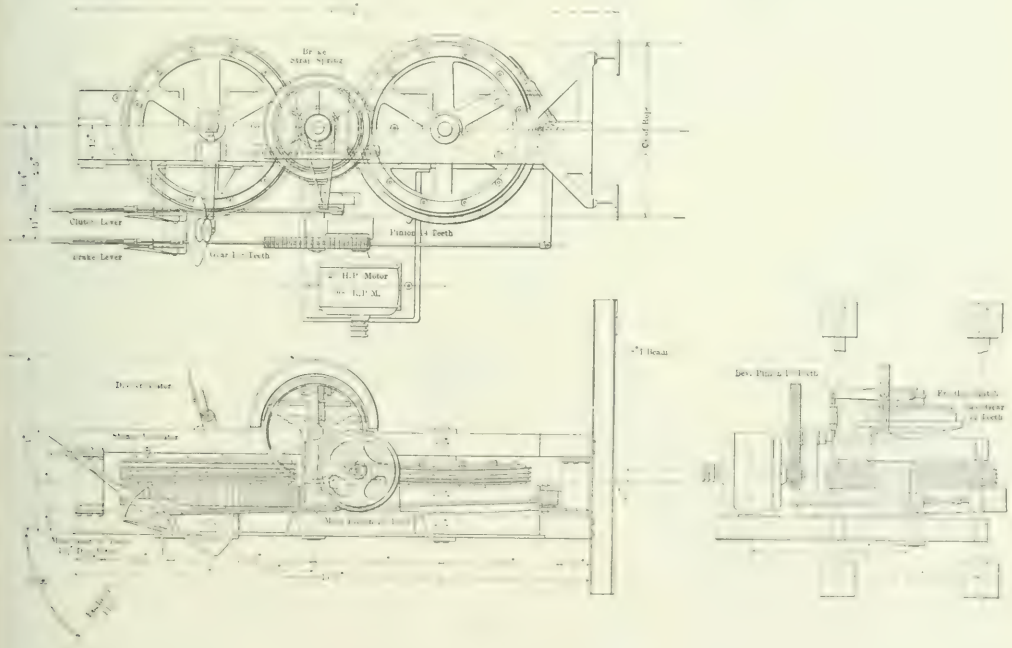
A SINGLE BALANCED SKIP FOR LOWERING IN INCLINED WORKINGS

A New Installation at the Liberty Bell Mine—Advantages and Economy

BY S. A. WORCESTER*

The Liberty Bell mine, Telluride, Colorado, has a fissure vein of very uniform thickness, with a pitch of about 53 deg. from the vertical. The vein has been worked several thousand feet horizontally on the present main working level, and about 800 to 900 ft. on its pitch above this level. The vein matter is a mixture of talcy, sticky mud and hard quartz. Water in considerable quantities is present in nearly all parts of the mine, and in the chutes it mixes with the talc, seals all openings and accumulates such hydrostatic pressure as to burst the longer chutes very frequently.

This annoyance, added to that of the jams caused by large rocks and the great wear on the chutes, involved such expensive delays and repairs that the general superintendent, Charles A. Chase, finally abandoned the principal chute, about 800 ft. in length, and installed in its place a bottom-dumping skip, with an overbalance weight for returning the empty skip. The weight, which runs on a very narrow track, balances the skip plus half of the ore-load. The skip now lowers a large portion of the mines' output with good economy and satisfaction. A new tunnel, 2600 ft. in length, has been cut at a vertical distance of 800 ft. below the present main working level of the mine. When the vein was cut it was developed perhaps 100 ft. or more in either direction, and was found to have the same pitch and general characteristics as in the upper workings. This tunnel is to become, when the necessary preliminary work and new installations are completed, the main working outlet of the mine.



GENERAL ARRANGEMENT OF ELECTRIC HOIST

The installation which was at first contemplated for lowering ore from the present working level to the new or Stillwell tunnel consisted of balanced cages, for lowering mine cars in a vertical shaft. In this case an electric motor of 40 to 50 h.p., would be necessary for hoisting an unbalanced cage, when changing levels. Later counsels, however, brought to prominence the cost of a vertical raise in the country rock with the necessary cross-cuts to the vein, also the increasing length and expense of these cross-cuts when mining is carried, as it eventually must be, below the Stillwell level. Comparison of this arrangement with a raise on the vein, in which all mining would be profitable, and the cross-cuts, with their attendant extra length of tramming, and their objectionable change of direction from tramming on the course of the vein, led to more

*Mining engineer, Victor, Colo.

careful consideration of the latter proposition. The writer was called in consultation after [illegible] preliminary layouts had been made in various forms, and had been carefully compared, the plant here illustrated was designed.

[illegible]

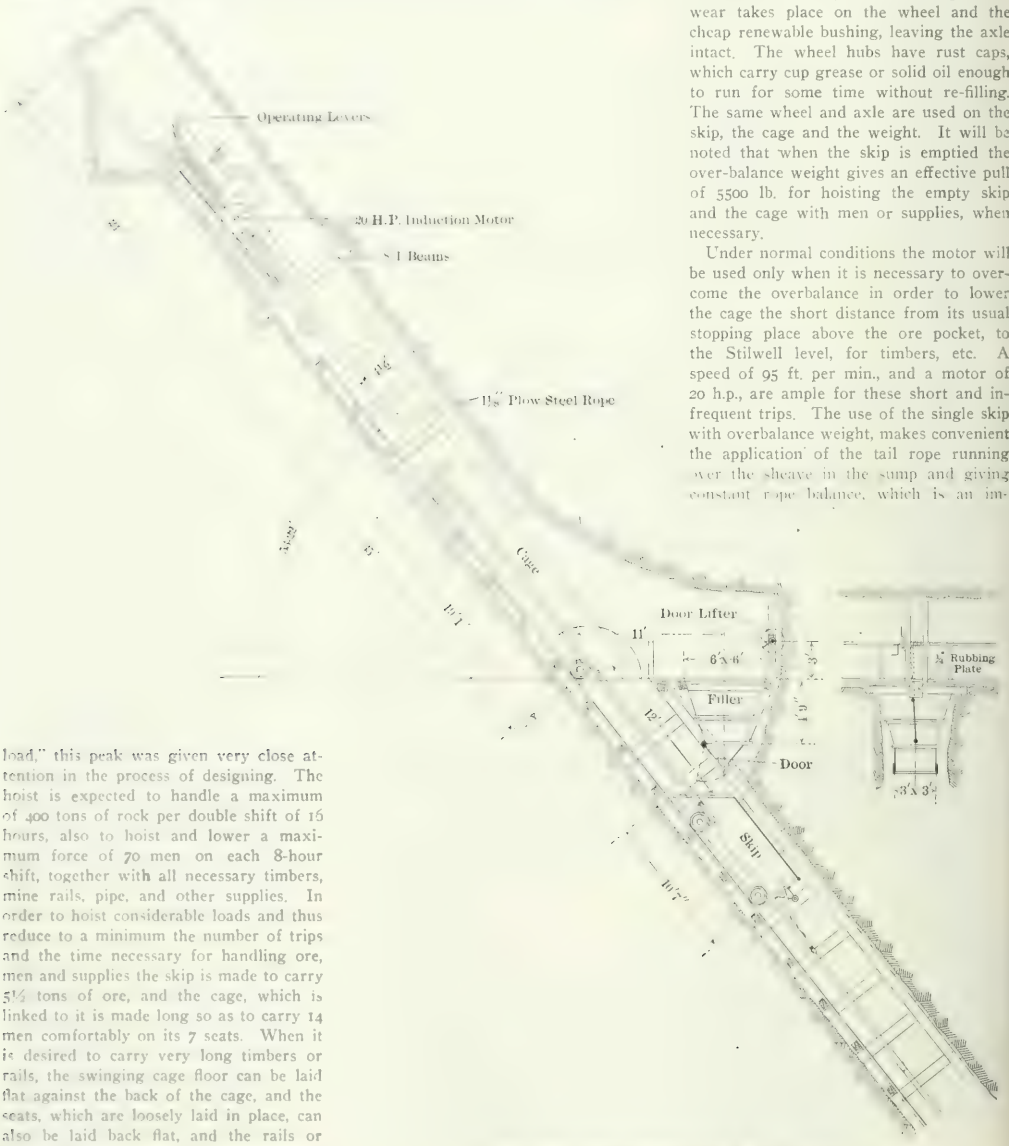
The skip is made relatively long in order to gain large capacity without involving large cross section. As a motor is necessary and current is purchased at a monthly rate governed by the "peak of load," this peak was given very close attention in the process of designing. The hoist is expected to handle a maximum of 400 tons of rock per double shift of 16 hours, also to hoist and lower a maximum force of 70 men on each 8-hour shift, together with all necessary timbers, mine rails, pipe, and other supplies. In order to hoist considerable loads and thus reduce to a minimum the number of trips and the time necessary for handling ore, men and supplies the skip is made to carry 5½ tons of ore, and the cage, which is linked to it is made long so as to carry 14 men comfortably on its 7 seats. When it is desired to carry very long timbers or rails, the swinging cage floor can be laid flat against the back of the cage, and the seats, which are loosely laid in place, can also be laid back flat, and the rails or timbers can be loaded in the skip with their upper ends in the cage.

The hoisting rope has an ample safety factor for lowering a full cage load of men and a skip-load of ore at the same time, so that very little time will be lost in hoisting and lowering men and supplies. The intention is to lower a skip load of rock, as a rule, at every downward trip.

OVERBALANCE MECHANISM.

The overbalance weight, a device which has now been in use a little over two years, in connection with a skip-hoisting plant which I designed for the Camp Bird, Ltd., Ouray, Colorado, is used with this 5½-ton skip and cage. Its 14,500 lb. balance the skip and cage, with all attached parts, plus one-half of the average ore-load. The weight is in the form of two built-up I-beams, forming with the bed-pieces a box, without top or bottom. Between the beams, and resting on their inner flanges, are placed flat cast-iron weights of about 130 lb. each. Steel bracket axles carry 16-in. wheels, which run loose on stationary steel bushings. All wear takes place on the wheel and the cheap renewable bushing, leaving the axle intact. The wheel hubs have rust caps, which carry cup grease or solid oil enough to run for some time without re-filling. The same wheel and axle are used on the skip, the cage and the weight. It will be noted that when the skip is emptied the over-balance weight gives an effective pull of 5500 lb. for hoisting the empty skip and the cage with men or supplies, when necessary.

Under normal conditions the motor will be used only when it is necessary to overcome the overbalance in order to lower the cage the short distance from its usual stopping place above the ore pocket, to the Stilwell level, for timbers, etc. A speed of 95 ft. per min., and a motor of 20 h.p., are ample for these short and infrequent trips. The use of the single skip with overbalance weight, makes convenient the application of the tail rope running over the sheave in the sump and giving constant rope balance, which is an im-



EAST AND NORTH ELEVATIONS OF SKIP FILLER

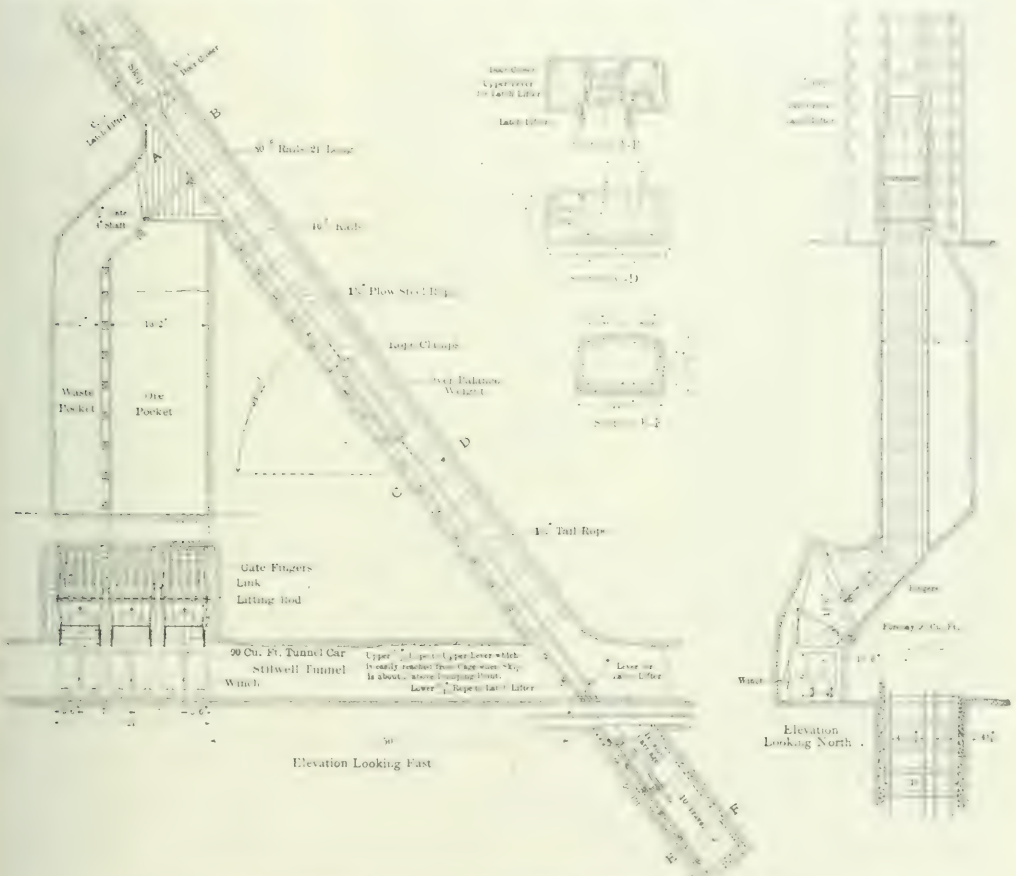
will be hauled to the station in trains of 12 to 16, and the skip tender will spend most of his time dumping cars into the "filler," while the skip is making its trips of 1100 ft., dumping, closing its door and returning. On the arrival of the skip he

by using the lever shown at the Stilwell level, or a similar lever which is easily reached from the cage when at a short distance above the ore bin.

The door is closed, when the skip ascends, by two cams, one on each side of the raise, a short distance above the dumping point. The cams encounter rollers on the door as the skip passes. These cams are strong leaf springs, and, if by accident (as for instance scraps of old mine timber catching in the skip) the door

sheaves to the cage and overbalance weight. The hoisting mechanism resembles the usual form of cable railway rope-drive or gravity-tramway headgear. It is much more compact

rope always in line with the vertical centerline of the shaft compartment, a condition which favors a long life for the rope. The dial indicator makes nearly one revolution, while the skip makes its trip. The sheave indicator is placed very near the dial in-



METHOD OF DISCHARGING FROM THE SKIP INTO THE ORE POCKET AND INTO THE CARS

drops, and the skip is quickly filled at a single operation, without danger of overfilling. The skip door of ½-in. plate, well reinforced with bars, is held by two spring latches, either of which will hold it safely if the other should be accidentally loosened. The door is so designed as to clear the shaft timbers, whether open or closed. The door latches are lifted by striking cams on the latch lifter. If it is desired to pass the dumping point without opening the door, as for instance in hoisting or lowering rails in the skip, the latch-lifter should be prevented from closing, these springs will yield and prevent damage to any of the parts. A simple indicator or tell-tale will be placed at the upper level, and will be operated by the roller on the skip door, so as to warn the skip tender if the door should fail to close.

ARRANGEMENT OF THE HOIST.

The position and arrangement of the hoist are rather unusual, and have the merit of requiring very small excavation and no deflecting sheaves for the hoisting

dicator, and almost in the same line of vision for the engineer.

The strap brake is made in halves for convenient removal, and its differential leverage is unusually powerful. The hoisting-sheave rim is bolted to the main-gear rim, and the braking-sheave rim is bolted to the brake-wheel rim, with large bolts, thus avoiding torsion on the shafts, and transverse strains on the wheel arms. The friction clutch is of very simple construction, with wooden male cone and iron female surfaces, and is ad-

justed by means of a single sleeve nut. It is so placed in the transmission that only the [illegible] not in action. The cast-iron frame, of box section, is simple and substantial.

At the lower terminal of the raise the ore is dumped, when the skip door is opened, directly into the ore bin. When waste is dumped, the door, sheathed with heavy plate and hinged on a 4-in. shaft, [illegible] its proper bin. At the bottom of the ore and waste bins are chutes or "forebays." The finger gates, of 12x12-in. and 8x8-in. timbers, are a peculiar feature. Five fingers are raised at once by using the winch, and when ore enough has passed to fill the forebay the fingers are lowered. Each finger has a weight of 100 lb. or more on its arm, and when the arm is lowered the finger prevents any more ore from passing. This form of gate has been used for some time at the present ore house at the mine with good satisfaction. It replaces the former sliding-bin gate, which gave constant trouble by the jamming of large rocks. The forebay has a capacity slightly less than that of the tunnel car, 90 cu.ft., and by lowering the apron gate the car is quickly filled without danger of running over.

[illegible]

By designing this plant before constructing the raise and adopting the arrangements described, a saving of several thousand dollars was made in original cost of raise and equipment, as compared with any other form of plant proposed. The monthly saving in cost of current over the 40-h.p. motor, which was the smallest proposed with any other arrangement, is about $120, and it is believed that the saving in labor will be several times this amount.

The single skip as here arranged and as compared with two balanced skips has, among other advantages, the following: It is always ready to move on signal without waiting for an opposite skip, and on this account has much more than half the capacity of two balanced skips of equal size. Assuming that a single overbalanced skip may be given twice the length of the ordinary type of skip, it will then have more than the capacity of two ordinary balanced skips because no time is lost by one side waiting for the other. It is free from accident because the engineer has but one hoisting compartment to watch. It is well known that fully 75 per cent. of the accidents with two-compartment hoists result from the difficulty of keeping both sides constantly in mind. In order to use the sheave hoist and tail rope with balanced skips, it would be necessary to have very cumbersome and expensive arrangements for lengthening and shortening ropes for working from different levels, but with the overweighted arrangement no such apparatus is required.

[illegible]

The tunnel cars, before noted, will be hauled in trains by an electric locomotive to the ore bins, or to the waste dump at the mouth of the tunnel. The angle station of the present aërial tramway is just below the mouth of the Stilwell tunnel, and will be made the upper terminal of the tramway when the new plant is installed, and the upper portion of the tramway will then be abandoned. The crusher plant, which was formerly at the upper terminal of the tramway, just below the present mine portal, and was carried away by a snow-slide, will be erected near the ore bins of about 6000 tons capacity which are to be placed at the new tramway terminal at the mouth of the Stilwell tunnel. The present speed governor, an automatic arrangement for regulating the speed of the tramway buckets, will be moved down to the new terminal.

The ore-handling plant, which I have described, was designed by the writer, in collaboration with C. A. Chase, to whom acknowledgment is due for a number of its original features. Since these designs were completed two other companies in this State decided to substitute skip plants for long chutes for lowering ore to tunnels.

Deposit of Lead Carbonate at Viola Mine, Idaho

BY ROBERT N. BELL.*

The Viola mine, Lemhi county, Idaho, had a great body of almost clear sand carbonate of lead 1200 ft. long, descending on a flat dip in blue limestone near a pronounced quartzite contact 200 ft., where it was cut off by a vertical fault. Back of this fault on an adjoining property a body of soft brown carbonate of iron exists that has been developed to the extent of a block 200 ft. square without reaching any limit. It is sprinkled with a little lead carbonate, has a light value in silver and gold and presents a remarkably attractive prospect to follow down.

Ten miles farther southeast on the same pronounced lime quartzite contact is a body of soft, spongy, brown gossan ore, 10 to 60 ft. wide and 2000 ft. long. At its highest crest, crossing a steep mountain ridge, it carries a streak of rich carbonate of lead on the hanging wall, a foot wide, containing 50 per cent. lead, 20 oz. silver and $5 gold, together with a 5-ft. streak of 10 per cent. concentrating ore. All the great gossan showing on this vein contains light values in silver and gold, together with a trace of copper, and it is eminently probable that the lead showing referred to in this connection will expand to important proportions with further development

*State inspector of mines, Boise, Idaho.

The Spelter Market in 1906

The spelter market during 1906 displayed a comparative degree of steadiness. Fluctuations were far less wide than in former years, although they occurred at frequent intervals. This would seem due to the tendency of smelters to sell only their current output, so that during periods of a heavy demand prices were driven up quickly, while upon the subsidence of business a decline was brought about through efforts to market the spelter as produced. The movements in either direction were, however, held in check, at times by the proximity of the European market and throughout by the fact that the domestic consumption about equaled production.

Except for the high-grade special brands produced in the East, for which there is a regular outlet in Europe, there were no exports. The increased consumption in this country was taken care of through the operation to the full capacity of all existing works during most of the year. Several of the old Kansas coal smelters were remodeled and are now being operated. At the present time there are in course of erection two smelters at different points in the Illinois coalfields and two more in the gas belt of Kansas and Indian Territory, which will contribute to the output during 1907. The active utilization of complex zinc ores in the West and a more comprehensive development of the calamine mines in the northern part of Mexico have supplied the increased requirements of raw material. As a result, the margin between the price of ore and the price of spelter has been wider than a few years ago, when its closeness worked to the great detriment of the smelting industry.

The prices at the beginning of January stood at 6¾c. St. Louis and 6.50c. New York. A surplus had been carried over from the previous year, and in an effort to market it prices were depressed, at first gradually, and then quickly, until they reached 5.90c. St. Louis, 6.05c. New York, at about which level the market remained during the whole of February. The lower level brought about a buying movement in March of very large proportions, which lifted the market to 6.20c. St. Louis, 6.35c. New York, by the middle of the month. The discussion of the possibility of a coal strike caused buyers to hold off about that time, and as a consequence the market again receded gradually until it drifted to 6c. St. Louis and 6.15c. New York toward the end of March. In April the decline made further progress, there being a desire on the part of smelters to put out some spelter against their supplies of ore, which came in freely from the West at the opening of the season. The same causes affected the market during May, until 5.80c. St. Louis and 5.95c. New York were touched about the last of that month.

A new factor made its appearance in June through a rather brisk advance in the London price to about the parity of the domestic market. This resulted in a very heavy inquiry for export. There being no surplus stocks, business for export did not result; but the aforesaid conditions stimulated buying for both speculative and consumers' account in this country, so that in the month of June prices recorded an advance to about 6.10c. St. Louis, 6.25c. New York.

With a decline in the London market, prices here again drifted back almost to the starting point, and business during July was done between 5.80 to 5.90c. St. Louis and 6 to 6.05c. New York. During the entire month of August the market remained steady at around this level, with a good business doing from day to day. The great industrial activity, which had previously had a pronounced effect on all other metals, finally made itself felt in the spelter market in September, and under a very heavy demand from all interests prices moved up to 6.15c. St. Louis, 6.30c. New York, at which figures they stood at the close of the month.

A slight reaction took place in October, but buyers only waited for some recessions to renew their purchases on a large scale, and by the beginning of November the market had again made up the decline. A steady and sustained demand resulted not only in the maintenance of prices, but brought about a further slight advance during November, which closed firm at 6.25@6.30c. St. Louis, 6.40@6.45c. New York. At the beginning of December it became apparent that all available supplies had been absorbed by the unprecedented consumption on the part of both galvanizers and brass manufacturers. In consequence of this consumers deemed it advisable to cover their requirements for the early part of the coming year, even though they were compelled to do so at advancing figures. The year closed with the market steady at 6.60c. St. Louis, 6.75c. New York.

Operations at White Knob Mine

BY ROBERT N. BELL*

The White Knob mine, at Mackay, in Custer county, Idaho, has been successfully handled during the past year by a Western company, which holds a lease of the property, and which has mined and smelted 50,000 tons of ore, containing more than 4 per cent. copper.

The ore is principally oxide and carbonate of copper, and is mined from big surface quarries near the croppings of the deposit, for the treatment of which the big smelter, with which the property is equipped, was designed by the first manager of the White Knob, Wayne Darlington. Subsequent managers, however, changed his plan, and made a matting plant of it by which method the ore is now treated, using iron sulphides shipped in from Bingham, Utah, to furnish the necessary sulphur, as the White Knob mine, although developed to a depth of 700 ft., never showed an important increase of sulphide ore.

The ore occurs in lenses and irregular masses in the quarries associated with garnet rock, a soft, gray porphyry, near a contact of pure blue limestone and eruptive granite. It is doubtful whether the underground development of the property has ever found the true vent of the mineral, and the extensive working of the great surface showing on the property may lead to important deposits at depth in a different position on the contact than it has been sought for.

The present leasers are handling the proposition in a conservative and practical manner. They have replaced the old company's electric hauling system with a Shay geared locomotive, which hauls the ore from the mountain to the smelter over a 6 per cent. grade 6 miles long, at a greatly reduced cost.

The operation would have been very profitable during 1906, but for a disastrous fire in the summer which destroyed the ore-house and machine shops at the smelter, and caused a loss of nearly $100,000, and interrupted the smelting operations for more than a month.

The smelter has two stacks with a capacity of 600 tons per day, but the ore resources have justified the operation of only one thus far.

The necessity of purchasing sulphide ore to make matte greatly increases the cost of treatment. This could be largely reduced by reconstructing the furnaces to make blister copper direct as the ore is especially adapted for that method of treatment.

*State Inspector of mines, Boise, Idaho.

The Sicilian Sulphur Situation

Emil Fog & Sons, of Messina, Sicily, write that prices of sulphur have recently advanced 5s. on all quotations, and it is announced that a further increase will be made soon. This advance in prices, together with the fact that the banks are advancing four-fifths of its value upon any quantity of brimstone that is produced, has produced a revival of the sulphur industry in all its branches.

Recently a shipment of 1500 tons of sulphur was made to New York. This shipment is contrary to what had been the previous practice of the *Consorzio*, and it is interesting to know why the custom of this company has been changed.

It is reported that an offer has been made by an American company to purchase 150,000 tons of sulphur per year. The company which offers to take this sulphur proposes to abandon pyrite burning in favor of sulphur in the process of making sulphuric acid. The price offered on this shipment was 14s. f.o.b. Sicilian ports. The offer is under consideration by the *Consorzio*, but it is generally thought that the price bid is too low. However, in order to dispose of the large stock of sulphur on hand, the *Consorzio* appears willing to grant material reduction in prices to acid factories which will engage to abandon pyrite burning, and go over to brimstone instead.

For the Prevention of Mining Frauds

The gist of the proposed law for the prevention of fraud in the promotion of mining enterprise advocated by the American Mining Congress, is found in the following section:

"Any person who knowingly makes or publishes in any way whatever, or permits to be so made or published, any book, prospectus, notice, report, statement, exhibit or other publication of or concerning the affairs, financial condition or property of any corporation, joint-stock association, co-partnership or individual, which said book, prospectus, notice, report, statement, exhibit, or other publication, shall contain any statement which is false or wilfully exaggerated, or which is intended to give, or which shall have a tendency to give, a less or greater apparent value to the shares, bonds or property of said corporation, joint-stock association, co-partnership or individual, or any part of said shares, bonds or property, than said shares, bonds or property, or any part thereof, shall really and in fact possess, shall be deemed guilty of a felony, and upon conviction thereof shall be imprisoned for not more than 10 years or fined not more than $10,000, or shall suffer both said fine and imprisonment."

Erratum

In the article by James Darroch and C. A. Meiklejohn on "A Rapid Method of Determining Molybdenum," in our issue of November 3, the calculation which read: "Standard × number of c.c. lead acetate solution required ÷ weight of ore taken × 100 = per cent. of molybdenum in ore," should have been printed as follows: "Standard × number of c.c. $Pb(C_2H_3O_2)_2$ solution required ÷ weight of ore taken, × 100 = per cent. of molybdenum in ore."

Platinum

During the first six months of 1906 the exports of platinum from Russia amounted to 156 poods, as compared to 48 poods for a similar period during 1905, and 82 poods for 1904. The price has advanced from 3000 roubles, in 1880, to 34,000 roubles in October, 1906. The advance in value during the first ten months of 1906 was 12,000 roubles per pood.

THE BLAST FURNACES AT THE MINNEQUA STEEL WORKS

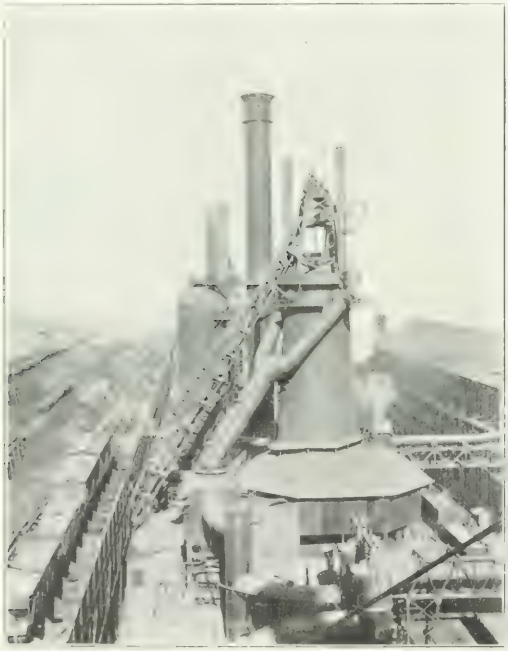
The Five Stacks of the Colorado Fuel and Iron Company at Pueblo—Equipment and Method of Operation—Details of Construction

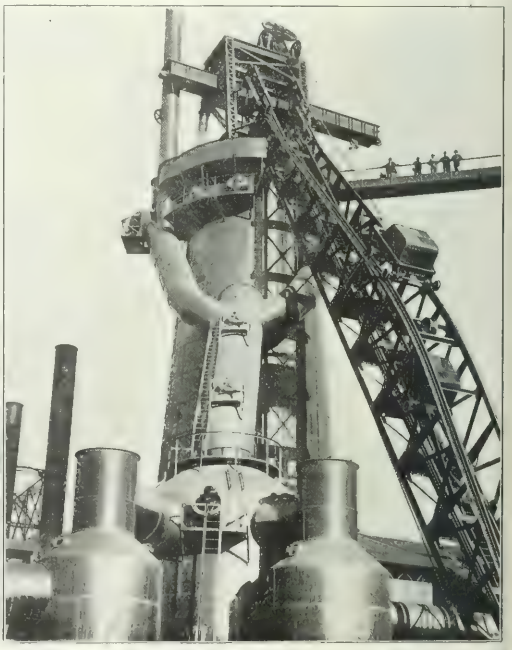
BY LAWRENCE LEWIS *

[illegible] the Colorado Fuel & Iron Company at Pueblo, the [illegible] have in [illegible] September, 1881; the second, since torn down, in November, 1889; the third, the present furnace B, in November, 1892. The two furnaces of the old plant still in use have been entirely rebuilt since 1900. Despite their small size, 75 ft. high and 17 ft. in diameter, and the disadvantage of being equipped with elevators instead of skip hoists, they are still doing satisfactory work and each produces approximately 200 tons of pig iron per 24 hours. The three new blast furnaces were first blown in as follows: A, September, 1901; D, November, 1902; E, May, 1903. The new furnaces—A, D and E—are each 20 ft. in diameter and in hight are respectively 95 ft., 95 ft. and 90 ft. Each has an average capacity of 400 tons every 24 hours. Dur-

[illegible] Minnequa works, and to other officials who kindly furnished material and assisted in [illegible]

[illegible] the first four out of the five furnaces have been in constant operation and the fifth will soon be put again into commission after relining. In order to have one furnace at all times available, in case of accident or stoppage of any one of them, contracts have been made for the completion of a sixth furnace (furnace F, 20 ft. in diameter by 85 ft. high, designed for a capacity of 400 tons). Each of the large new furnaces, with its bins, blowing engines, etc., costs approximately $1,000,000.





AUTOMATIC CHARGING APPARATUS

FURNACE EQUIPMENT

The Rust automatic hoist, an automatic charging apparatus which possesses several new features, is used for conveying stock to the top of the furnaces. The skip cars pass one over the other near the center of the bridge truss, discharging their contents at the top in such a way as to give a proper distribution of the lumps and fine material throughout the stock hopper at the top, so that the large lumps of ore, instead of being deposited on one side of the hopper, opposite the bridge, are practically uniformly distributed around the stock hopper near the center.

The bridge occupies little space laterally and is a very stiff structure for the weight of material used in its construction. The greatest depth is at the center, where the maximum bending moment occurs. Both skip cars come to rest in the pit below at exactly the same point.

The hoist is of 10 tons capacity, the capacity of the cars being 150 cu.ft. It is operated by means of an electric motor hoist furnished by the Otis Elevator Company. The cars are fitted with guards, so constructed that there is no possibility of their leaving the track when thrown off the rails by obstructions or unforeseen events. Each car is attached to a double cable by means of an equalizing device, so constructed that the tension on the two cables is always equal. The two bells at the top of the furnace are worked independently by steam cylinders, the valves for which are located in the hoist house below, where is also placed a gage showing the relative positions of the bells.

FURNACE STACK

The furnace mantle rests on 10 cast-iron columns, and the bosh is fitted with 10 tuyeres 7 in. in diameter. Bronze cooling plates with heavy steel bands support the bosh. The steel hearth jacket, which thoroughly binds the well of the furnace, is cooled by means of a system of pipes

placed just inside of the casting for the brick work.

The two dust catchers are connected almost midway of the downcomer passage by one central flue, which terminates at the top of a large dust catcher, 24 ft. in diameter. From the dust catcher are connected two vertical gas washers, from one of which the gas main leads to the boilers, while the other opens into the gas main leading to the stoves. The gas washers are so constructed that they can be run either wet or dry. The gas washers and dust catchers are so elevated that an ordinary gondola car can be placed beneath the outlet bell at the bottom and the dust or sludge discharged directly into the cars.

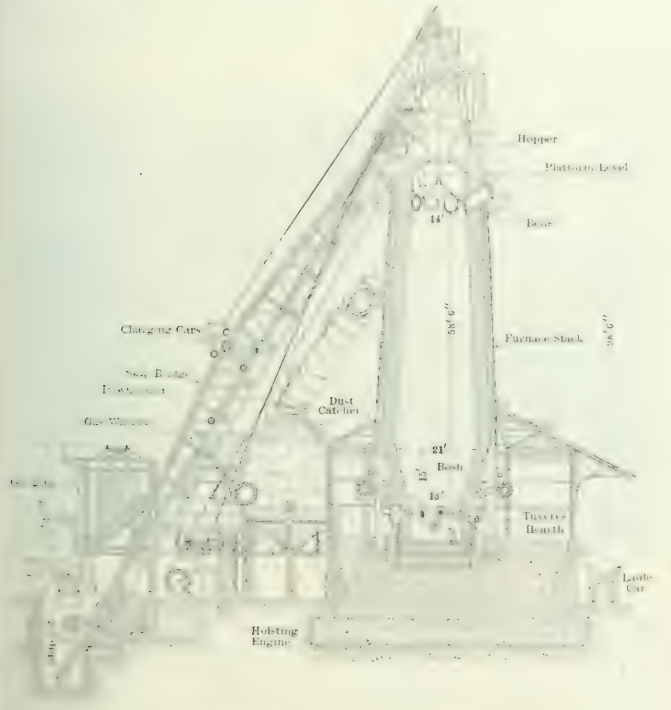
They are of the Cowper type, 21 ft. in diameter by 100 ft. high and are supplied with the necessary cleaning and air doors, the gas being admitted to the combustion chamber by means of improved Spearman hot-blast valves. The furnaces are connected up in pairs, having a single draft stack for the stoves of two furnaces, while the boilers are provided with independent stacks. The draft stack is 12 ft. 6 in. in diameter in the clear by 210 ft. high.

BOILERS AND ENGINES

Furnace A is equipped with 3600-h.p. Babcock and Wilcox water-tube boilers. In addition to this there are 14,500-h.p. Cahall vertical boilers installed to furnish steam for furnaces B, C, D, E and F and for the new bessemer department, all of which are arranged to burn furnace gas.

The blowing engines were built by the William Tod Company of Youngstown, Ohio. These engines are of the vertical cross-compound, condensing, quarter-crank, steeple type. The steam cylinders are equipped with Corliss valves, while the air cylinders are provided with positive-acting inlet and discharge valves. The engines for furnace A have open frames, while those for the other furnaces are of the "tree trunk" or bell-frame type. The steam cylinders are 44 and 90 in. in diameter, 60 in. stroke; the two air cylinders are 90 in. in diameter, 60 in. stroke. The [illegible] 1,000,000 lb. Each pair of furnaces is provided with five engines, one of which is a spare. It is noteworthy, in passing, that the low-pressure cylinders, for steam and air, measure 90 in., or 7½ ft. inside diameter, and are quite large enough for a boy on a pony to ride through with plenty of room overhead.

For the benefit of those who are not thoroughly conversant with blast-furnace practice, the following non-technical remarks about the construction and operation of the new furnaces at the Minnequa works may be of interest.



VERTICAL SECTION OF BLAST FURNACE

The gas flues to the stoves and boilers are provided with numerous down legs and pockets which serve to catch the dust before reaching the boilers or stoves.

The cast house is covered by a 20-ton electric traveling crane for handling the troughs, scrap, clay, sand, etc. The metal is tapped into ladles and conveyed direct to one or the other of the steel converting departments or to the casting machines. The hot-metal cars are of the ordinary type, without tilting gear. The cinder cars are of the Weimer make, of about 200 cu.ft. capacity.

HOT-BLAST STOVES

There are four stoves for each furnace.

Excavations for blast-furnace foundations at Pueblo were carried to a depth of about 15 ft., practically to bed rock. The foundation is built of stone, concrete and brick, a cement mortar being used throughout, so that, when finally hardened the whole has the homogeneity of solid rock.

The retaining walls, which support the cast house and the runways for the molten iron and slag, are built up about 15 ft. above the general yard level, and the interior is filled with sand. Sand is used for the reason that it is readily shaped for runways. Also, any iron which may form along the sides can easily be removed, which is necessary after each "cast," that is, every time the hot metal is withdrawn from the furnace.

THE BLAST FURNACE PROPER

The furnace proper may be divided into four parts: the hearth or crucible; the bosh; the stack; and the top or head frame and bells.

The hearth, which is directly above the foundations, is about 8 ft. high and 13 ft. in diameter, and is built of 4½ ft. of fire-brick inside a hearth jacket 21 ft. in diameter. This is where all the molten iron is collected, and the refuse slag is drawn off. The construction is so arranged that the outer surface of the hearth is constantly cooled by running water. At the same time every precaution is taken that there may be no possibility of the iron and water getting together.

The bottom of the hearth consists of tile made of the best fire-clay, and in a special form. The bottom is several feet in thickness, and extends a foot or so up into the hearth jacket. The hearth jacket, which is constructed of steel plate about 1½ in. thick, completely surrounds the hearth. This jacket has a number of holes to admit of tapping the slag and iron. The holes are called notches; the lower one is called the "iron notch," and the upper one the "cinder notch." The iron notch is at the bottom and is arranged to draw off all the molten iron in the furnace. The cinder notch is 3 to 4 ft. higher and taps the slag.

The hearth has a concentric area outside of the jacket that is always filled with

running water. On the inside of the jacket, pipes extend down 7 ft. in the brick work, and are capped at the ends. These pipes are connected with others of smaller diameter—open at the ends and nearly the same length—acting as feed pipes. The water, entering through the small pipes, passes up through the large pipe and overflows into the concentric space described. This in turn flows over a dam, and thence to the sump. This arrangement keeps the hearth from burning out, which it would otherwise do in a short time.

THE BOSH

The "bosh" is that portion of the furnace body which extends from the hearth up to a hight of about 21 ft., or as far as the mantle, a heavy annular frame which rests on top of the columns, and is attached to and supports the shell of the stack. Consequently the bosh and stack are independent of each other.

The bosh is built of the best quality of fire-brick, liberally interspersed with cooling plates, made of bronze and so arranged that water flows through inclosed channels.

Beginning at the hearth there is one row of cooling plates, and directly above come the tuyeres, 10 in number, arranged about a common center. These are the openings through which the air blast is forced into the furnace. They are well protected from the intense heat by circular cooling cones, one fitting within another, and the last or smaller one, projecting into the furnace 7 in. This is the tuyere proper.

Above the tuyeres come alternate courses of cooling plates and brick work. The brick are encircled with iron bands that bind the brick and support the enormous load of the stock or charge. These extend as far as the mantle.

THE STACK

The stack, inclosed in a shell, begins at the mantle and extends upward to the top. The shell is made of riveted boiler plate. Inside a lining is built of first-class fire-brick for about two-thirds of the distance up, and the remaining third of second-class fire-brick. Common brick is used for backing between the fire-brick and the shell. The lining extends to the hopper at the top of the furnace.

The top of the furnace is fitted with the apparatus for feeding the ore, coke and limestone. The hopper, or large receptacle, shaped like the mouth of a funnel, receives all substances that are charged into the furnace. The bottom of the hopper is closed by a cone-shaped casting called a bell. Below is a larger bell, the two forming a double seal. The bells are operated by steam cylinders and levers independently.

The method of operation is for the small bell to be lowered. After the charge has been discharged into the hopper, allowing the ore, coke and limestone to fall down around the large bell, the small bell is raised, after which the large bell is lowered, whereupon the charge drops into the interior of the furnace. The mechanism is operated from the ground and is supported by a structural steel frame called the head frame, which also supports the bridge on which run the cars carrying the charges. This bridge is called the skip bridge, the cars being called skips. Each car has a separate track, one directly over the other, the lower end of the bridge terminating in a pit, enabling the cars to pass below the ground level for convenient loading. The cars are operated by an electric hoist, so arranged that one car acts as a counterbalance to the other. The engineer who runs the hoist also operates the bells. By means of an indicator he can tell the exact position of the bells.

UTILIZATION OF GAS

Directly below the top are two openings in the walls of the furnace. These connect with a large pipe called the "downcomer." This pipe leads the gases to the dust catcher, a tank-shaped contrivance, where the dust is partly removed. The downcomer is connected with the gas washers, where the gas is washed and purified.

From the gas washers one gas main leads to the boilers, where the gas is burned to generate steam for the blowing engines. The other gas main leads to the stoves.

THE STOVES

The stoves are large cylindrical, dome-capped, brick and steel structures which stand beside a furnace stack. The stoves, of which there are four for each furnace at the Minnequa works, are completely filled with a cellular mass of fire-brick so arranged that there are numerous spaces to allow the free passage of gases and air, similar to the brick work in the regenerative chambers of an open-hearth furnace. The passages are so arranged that the gas in passing through the stoves travels to the top of the stove and then down.

The passages are supplied with valves at both ends, so that the gas can be controlled. The valve on one side is called the "chimney valve," that on the other side being known as the "hot-blast valve."

The gas passes from the gas washer to a burner, which can be thrust into the stove or withdrawn. The gas having been ignited and the flame directed into the stove, it passes up to the top and then down and out through the chimney valve, when it continues through a flue that connects with the big chimney, which furnishes draft for the stoves. At regular intervals the gas is shut off and the blast from the engines made to pass through the heated passages on its way to the furnace. The brick-work gives up to the air which is about to enter the furnace a large portion of the heat which it has absorbed from the burning gases.

TAPPING IRON

OPERATION OF THE FURNACE

From the top down to the hearth, the stock in a furnace during operation is in various states of chemical change. At the top the coke in the charge is not ignited, but as it gradually descends in the furnace, combustion takes place. At the tuyeres is the maximum temperature, due to the rapid rate of combustion of the coke at this point where the supply of air is most abundant. Without going extensively into the chemical reactions that take place in the furnace, suffice it to recall that as the coke is ignited and burned in a confined space and with what is, comparatively speaking, a limited amount of air, carbon monoxide is formed. This gas at a high temperature percolating through the ore, also at a high temperature, takes up part of the oxygen in the ore, reduc-

ing the oxide to metal converting the gas to carbon dioxide. The red-hot coke, in contact with the ore, also probably takes up from it directly a certain amount of oxygen. In either event, as a result of a series of reactions which are probably very complicated, the iron ore is reduced to metallic iron, which in turn is melted and flows down upon the hearth, together with other parts of the charge which also become liquefied by the intense heat. The iron, being the heaviest constituent, gravitates to the bottom and the slag, consisting of the waste material of the ore, flux and other foreign substances, rises to the top. This difference in the specific gravity of the iron and slag makes the process of separation comparatively easy. The slag is drawn off at the upper or "cinder notch" at frequent intervals. The iron is tapped about every four hours through the iron notch lower down.

HANDLING THE PRODUCT

When the iron notch is to be tapped a

PIG-CASTING MACHINE

considerable thickness of baked fire-clay and ganister must be drilled through before the iron will start, but when the iron begins to run it rapidly enlarges the hole. When all the iron has been drawn out the notch is closed with a mixture of clay by means of a "mud gun," which has a reciprocating piston, operated by steam, and a plunger that forces the mud into the notch where it is soon baked by the heat.

The iron is tapped into ladles or pots of 20 tons' capacity mounted on cars. These are hauled to the bessemer or to the open-hearth steel department or to the pig casting machines, by small locomotives. At the steel departments the ladles are lifted by cranes from the cars, and poured into the hot-metal storage reservoirs. There are two pig-casting machines made by Heil & Patterson, with a daily capacity of 1000 tons each. The molten metal is poured through a spout from which it flows into a series of molds, which are slowly conveyed through a water tank to a point immediately above the cars, into which the pigs are dropped automatically.

The slag or cinder from the furnaces is drawn off into pot cars, and is carried at a high rate of speed along a railroad spur, four miles long, to reservoir No. 3, along the bottom and sides of which it is dumped. By this ingenious arrangement the problem of slag disposition is solved, and the loss of water due to seepage from the reservoirs is reduced.

Proposed Law for the Creation of Mine Drainage Districts

The following are some of the more important provisions of the law proposed by the American Congress for the creation of mine drainage districts:

"Any number of persons, not less than 10, owning and operating mining claims in any mining camp or district, whose aggregate valuation for purposes of taxation within said district shall be not less than one-third of the total assessed valuation of any property situated within the boundaries of the proposed drainage districts, may at any time file with the clerk of the district court of the county in which such claims are situate, a verified petition addressed to the judge of said district court, praying for the organization of a mine drainage district."

Notice must be given to all parties interested and provision is made for the statement of objections, etc.

"In order to provide for the payment of the expenses of the drainage, or for the payment of any issue of bonds, the board shall have power to levy and cause to be collected a tax upon all mining claims and premises within the district. Such tax shall be voted only at a regular meeting of the board and shall not exceed in any one year 50 mills on every dollar of valuation as shown by the assessment roll of the county assessor.

"The board shall have power to borrow money necessary to carry out the system of drainage adopted by the issue of bonds bearing interest not to exceed 8 per cent. per annum, payable at the office of the county treasurer in even sums of not less than $500, and such bonds shall be a lien upon all property within the boundaries of the district."

The Gilmore Mine, Idaho

The Gilmore mine, Lemhi county, Idaho, in 1906 shipped something over 1500 tons of high-grade lead carbonate ore and concentrates containing an average value of 60 per cent. lead and 30 oz. silver per ton. The total milling equipment consists of four home-made jigs and a small rock breaker connected to a small steam plant. This crude equipment produces 60 per cent. concentrates, but it could hardly do less with 30 per cent. feed. The tailings run 16 per cent. lead and 8 oz. silver.

The mine is at a disadvantage by reason of poor transportation; it is situated 85 miles from the railway, to which point the ore has to stand a wagon-haul charge of $10 per ton. A subsidiary company was formed during the past year, which put on a "Best" traction engine of 100 h.p. capacity, using coal fuel and hauling four steel wagons with a total load of 40 tons. It makes a round trip from the mine to the railroad and back in four days. This train, however, was put out of commission by storms late in November, but it is believed it will be able to reduce the cost of delivering the ore to the railroad next season fully 50 per cent. There is some strong talk at the present time of building a railway branch from the Oregon Short Line into the Gilmore district.

Nodules made from pyritic cinder, concentrated magnetite and flue-dust have been used in a number of blast-furnace plants. The proportion in some cases has amounted to 50 per cent. of the ore mixture and the results have been satisfactory. The binder used consists of any adhesive hydrocarbon or carbohydrate compound, such as tar, pitch, asphalt, petroleum residuums, dextrine, molasses, glucose, etc. The adhesive binder drops or is sprayed into a stream of fine ferruginous material as it enters the upper end of a rotary kiln and coheres into masses which are broken into lumps or nodules. One per cent. or less of any adhesive binder is sufficient. As the lumps reach a zone of higher temperature in the kiln, the sulphur and the binder are volatilized and when the nodules approach the hottest end incipient fusion occurs and the nodule becomes permanent.

GOLD MINING IN WEST AFRICA

The Producing Mines in the Gold Coast Colony and Ashanti

BY W. FISCHER WILKINSON*

Colony and Ashanti, for the ten months, January to October, 1906, was 175,233 bullion oz. of an estimated value of £665,000. The production for the whole year will approximate 215,000 oz. bullion, of a value

The figures for previous years are as follows:

Gold Coast Colony and Ashanti	
1901	$ 96 880
1902	264,500
1903	578,480
1904	663,520
1905 (estimated)	817,000

The following are the leading producing mines:

		Bullion Oz.
Ashanti Gold Fields	Jan.-Nov.	34,738
Prestea Block A	Jan.-Nov.	34,878
Abosso	Jan.-Nov.	32,360
Akrokerri	Jan.-Nov.	21,430
Broomassie	Jan.-Nov.	12,758
Bibiani	Jan.-Oct.	24,821

* London, England.

The following notes are extracted from a report made by me during the year for the new Gold Coast Agency, Ltd.:

The gold mines of the Gold Coast Colony may, for convenience, be grouped into three divisions: Mines working the auriferous conglomerates (banket); quartz reefs; and alluvial deposits (dredging).

An analysis of the gold production of 1905 shows that the different districts produced gold in the following proportions: Banket mines, 32.5 per cent.; quartz mines, 61.8 per cent.; dredging companies, 5.7 per cent.

The banket mines are situated in the district of Taquah, a village which lies about 40 miles from the coast, and which is connected with the port of Sekondi, having fair facilities for landing cargo, by a railway of 3 ft. 6 in. gage.

The outcrop of the conglomerate beds, which have been extensively worked by the natives in the past, has been traced for a length of about 20 miles in a line more or less parallel with the coast. The whole length of outcrop is portioned off into blocks or concessions, of which four are being worked on a large scale at the present time. The Taquah mine has a ten-stamp mill, crushing development rock, and a new 50-stamp mill in course of erection. The Abbontiakoon, Block 1, is crushing about 5000 tons a month with a dry-crushing plant. The Abosso and Wassau mines have each a 30-stamp mill and cyanide plant.

The old workings of the natives consist of numerous small circular pits sunk close together along the outcrop. Even with this primitive method of mining, a considerable tonnage of ore has been removed. The old workings indicate the position of the best values, and it is on these old workings that the leading mines are located. Although it is not certain that the absence of old workings is conclusive proof that no payable banket occurs, it is probable that this is the case, or at all events that the reef is in such places of low grade. The results obtained from surface, adit levels and borehole samples tend to confirm this opinion.

The banket bears a close resemblance to the Transvaal ore, and is a simple ore to treat by the ordinary amalgamation and cyanide processes. The banket reef or reefs (in some cases only one reef is being developed, in others two) vary considerably in thickness, but have on an average about 3 ft. of banket. The greatest depth so far reached by the mine workings is 1000 ft. on the incline, which depth has been attained at the Abosso and Wassau mines, and the continuation is further established by boreholes. The formation inclosing the reef is sandstone, which forms fair walls, so that stoping presents no difficulties.

As to the value of the banket, the records of the crushing mines form the best index. The Abosso mine has recovered during 1905 from 31,259 tons 68.6s. per ton. During the first six months of 1906 the recovery has been 66.2s. per ton. The Wassau mine recovered in 1904 65s. per ton, and in 1905 48s. per ton milled; the Abbontiakoon has put through 47,840 tons, yielding about 42s. per long ton, or, say, 37s. per short ton. The Taquah mine has been crushing unsorted dump ore for some months, and getting recoveries of from 48s. to 68s. per ton. These figures demonstrate that high-grade ores occur. A reduction in grade may be looked for as the mines get more fully developed, and as working costs are reduced. The indications are that on the ore chutes an average recovery of from 40s. to 50s. per short ton may be maintained.

WORKING COSTS

Working costs are at present considerably above the Rand level, but they are rapidly coming down. The high cost of administration and of white labor is the main factor that makes the coast compare unfavorably with the Rand. For the purposes of comparison, working costs may be regarded as made up of three main items—supplies, native labor, and white labor. As regards supplies, there is, with the exception of fuel, no great difference between the prices paid on the West Coast and in South Africa. Coal which represents about 10 per cent. of the working costs, costs 46s. per ton, as against 14s. on the Rand. But the majority of the mines still burn native wood, which they claim is cheaper than coal.

Of native labor, the West Coast has at present a sufficient supply, and the wages paid average less than those paid on the Rand, where the average cost, including food and compound expenses, of an unskilled laborer is about 2s., while on the West Coast the average pay of a native, skilled and unskilled, is 1s. 9¾d. The average native on the West Coast is not so efficient, in my opinion, as the average native in South Africa, but on the West Coast the industry has not been so long established, nor is the labor so well organized or supervised. The material is on the whole good, and the West Coast has the advantage of being able to employ the native on skilled work, which is prohibited in South Africa. Many of the natives have been taught trades at the mission schools, and make good mechanics, carpenters, drivers, etc. This is an important point, because the country cannot support, for climatic reasons, a white industrial population as on the Rand. Indeed, the success of the field is, in my opinion, largely dependent on the trouble taken to train the native to occupy the higher positions of labor.

At the present time working costs are considerably higher than in South Africa. The lower costs, including development and London expenses, in the banket district on a 30-stamp basis are in the neighborhood of 40s. per ton. Taking into consideration the fact that the mills have been running only a short time, and that experience has had to be paid for, and also that the plants are small, a considerable reduction may be confidently looked for in the future. As regards the health of the white employee, I found that the attention paid to providing good accommodation in camps well cleared of jungle, and fresh food from the steamers has had a marked effect on the health statistics. Where attention had been paid to these points the health of the camp was good. I met several men who had had no fever, although they had been on the coast for several years.

The Gold Coast Railway is now in fair working order, but high rates continue to be charged. The railway is handicapped by the heavy cost of construction, the rates being framed to pay interest on the capital expenditure as well as the running and maintenance charges. The policy appears to be to get as much out of the mines now working as possible, and not to look for increased profits from the expansion of the industry that cheaper rates would encourage. Goods are classified into five classes and carried at the following rates: Class I., 2s. 6d.; Class II., 2s.; Class III., 1s. 3d.; Class IV., 7½d.; Class V., 5d. per ton mile. Besides these classes some goods such as patent fuel, local pro-

[illegible] Mackenzie [illegible] Rockhampton [illegible] cement at 1s. 3d. per ton mile. Patent fuel is carried at a special rate of 8s. per ton for any distance up to 50 miles, and 1d. per mile beyond that distance. Bullion travels at the rate of ½d. per £100 per mile.

THE MINES OF [illegible]

The principal quartz reef mines are the mines of the Ashanti Gold Fields Corporation, the Akrokerri, the Bibiani mine, the Prestea and the Broomassie mines. The Ashanti mines are grouped round Obuasi, a station on the Gold Coast Railway, [illegible] Prestea. There are two mills of 40 and 50 stamps respectively. The ore is mined from a number of parallel reefs. The workings have so far been principally above adit level, and development work in depth has been backward. The Ashanti group have produced [illegible] gold. From 1898 to June, 1905, there have been milled 218,160 tons, yielding gold to the value of £538,397, or 49 2s. per ton.

The Bibiani mine, in the Sefwhi district, suffers from being a long way (70 miles) from the railway. There is a 40-stamp mill, and the returns for the first six months of 1906 show 17,599 tons milled for a recovery of £58,838 or 66.8s. per ton.

The Prestea (Block A) and Broomassie workings are on one strong wide reef, which has been traced for a considerable distance. The Prestea mine is about to crush with 50 stamps, the development being well ahead, and should give good [illegible].

The Broomassie mine has a 20-stamp mill, and treated during 1905, 7124 tons with a recovery of 34.7 dwt. per ton. From January to June, 1906, 6036 tons have been milled, yielding gold to the value of £29,238. The reef is inclosed in a treacherous rock, locally known as a graphitic schist, which makes stoping dangerous.

The Akrokerri mine is situated near Obuasi. It has a 20-stamp mill. During 1905 there were 20,462 tons milled, returning an average yield of 88.4s. per ton.

Quartz mining in the colony promises to be profitable. Up to the present the mining companies have not done well, owing to the lack of railway communications and insufficient development. Now that these difficulties are being removed, the best mines ought, before long, to become dividend paying.

The dredging companies are as yet of small importance. They work on the Ankobra and Offin rivers. For the year 1905 they won gold to the value of £37,292.

The labor employed in mining in 1905 was 504 whites and 12,465 natives.

No. 3 stack of the Carrie group of the Carnegie Steel Company at Pittsburg has made a remarkable record, having been in blast continuously for six years.

South America in 1906

[illegible]

The record of South America for the past year is not one of either general success or hopeful promise for better results. General things have been predicted for this great area, almost equal as it is to that of North America. It is not difficult to account for the circumstance that, with its physiographic advantages, South America still possesses great areas which have never been investigated even in the most cursory manner. There are three particular reasons, namely: a trying climate, poor transportation facilities and unstable governments. At low elevations in the tropics these difficulties are at their worst. Good transportation and stable government are encountered in the tropics only in countries whose flagging energies are constantly stimulated by the arrival of newcomers from temperate zones.

The countries lying in the south temperate zone are, largely because of more favorable climate, ahead of their neighbors in the tropics in matters of transportation and government. There are many difficulties of transportation which are common to all extremely rough and mountainous regions, and all schemes for the building of railways in any of the countries, including either the main Cordilleras or their many ramifications, must encounter engineering problems of great magnitude and corresponding high cost of installation.

It is interesting to note the statistics of the total gold productions of some of the countries of South America. Colombia is credited with $895,000,000; Brazil, $720,000,000; Bolivia, $199,000,000; Peru, $119,000,000; and Chile with $33,000,000. (This JOURNAL, March 31, 1906.) This makes a grand total of nearly $2,000,000,000, about one-fifth of the total world's production. The figures are significant and suggest possibilities for further development and lucrative exploitation with modern economic methods.

In South America, as in all partially developed regions, the more important mines are the placers, and the major part of its gold product is from alluvial deposits. There have been no developments during the year of extensive, rich auriferous deposits, and no noteworthy new exploitation. There were a number of installations of hydraulic mining machinery, with varying success. Several dredges were built, and dismal failure is to be noted in most cases; not because the ground was poor, but by reason of faulty and unsuitable design and construction. In Tierra del Fuego successful dredging has been conducted.

Areas of platiniferous gravel, seemingly well suited for exploitation by the hydraulic and dredging methods, have been developed in Colombia. The high price of platinum makes these districts particularly attractive at present. An area of diamantiferous and auriferous alluvium has been investigated on the Jequitinhonha river in Brazil and a dredge has been shipped to exploit it. Oil of paraffin base is said to have been found southwest of Cartagena in Colombia.

There have been no noteworthy developments in vein mining, and inasmuch as this kind of mining suffers most by reason of the backward conditions generally prevailing, this industry is in a bad state. One laudable attempt to work an auriferous vein near Guaymal, in Colombia, has had an unfortunate outcome by reason of the loss of the surface plant by fire. The work at Cerro de Pasco, in Peru, is progressing favorably and investigation of areas adjacent to the copper-producing district, has shown the existence of a fair grade of bituminous coal, which is being worked.

The asphalt deposits of Venezuela, noted for the high grade of the product, are not being worked extensively. There are several good reasons for this fact. First, and most important, is the limited demand, which is largely satisfied by the more accessible, though less pure, deposits near La Brea, on the coast of Trinidad. The difficulties due to the unstable conditions of the government and the uncertainty of the rights granted under the concession by which the deposits are held and worked also prevent active exploitation. Here is an excellent example of what occurs in different parts of tropical South America. The asphalt deposits, which are said to be practically inexhaustible and are remarkably pure and well situated for working on a large scale, are because of difficulties entirely foreign to the actual work of mining lying practically idle. There are parallel cases in other countries. The metal miner, operating under the mining regulations, is not greatly disturbed even in times of uprisings.

The nitrate deposits near the boundaries of Peru, Chile and Bolivia were extensively exploited, and this valuable mineral is found in such large volume that it will probably last a century.

Iodine, a by-product of the saltpeter industry, is produced in Chile alone to the value of more than $1,500,000 per year.

*Mining engineer, 52 Broadway, New York City.

Oil for Mexico City

Consul-General A. L. M. Gottschalk reports from Mexico City that within a short time work will be begun by an American concern, which has just signed its first contract with the department of fomento (interior), upon a pipe line from the oil fields in the neighborhood of Tampico to the City of Mexico.

The touchstone of the jeweler is known as basanite, a silicious rock or jasper of a velvety black color.

WEAK POINTS OF THE FEDERAL LAW IN RELATION TO MINERAL LANDS

The Law of the Apex and Extralateral Rights—Suggestions for Preventing Abuses—The Claims in the Flagstaff Case—Location Corners

BY GEO. W. RITER

In advocating such changes in our mineral land laws as will do away with the extralateral right in future mining titles, the American Mining Congress, at its recent meeting in Denver, has again voiced the sentiments of thoughtful mining men. But the law of the apex, much as we are anxious to get rid of it, is not the only bad feature in our present mining code, and perhaps not the worst one. The feature which permits the exact boundaries and rights of a mining location to be left in a loose, indefinite state for an unlimited period of time, without any record in the United States land office, is not praiseworthy.

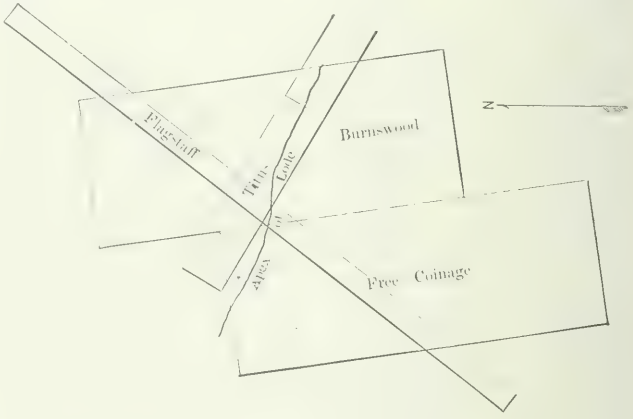
It is becoming more and more difficult, as time goes on, to find out what lands are held under a valid right; and there is no way of forcing a claimant to define his rights fully except by the expensive and doubtful process of making a location, doing the necessary development work, and then filing an application for patent in the land office, there to await a protest and adverse claim. A claimant is not even compelled to use due diligence toward maintaining his location corners. Proof of the common laxity in this matter is to be found in official notes, filed in the land office, of mining claims surveyed for patent; these notes show that in a surprisingly large number of cases, the location corners could not be found by the surveyor at all, or were not in the places contemplated by the location notices.

THE FLAGSTAFF CASE

A concrete example of the weak points of our present law is to be found in the Little Cottonwood mining district, in Utah, in two mining claims, the Flagstaff and the Titus, both of which became famous through litigation ending in the classic decision of the Supreme Court of the United States in the so called "Flagstaff case." During all of the years following its location, the Titus claim was never officially surveyed and consequently never got on the records of the United States land office. The location corners lost their identity and the development work was done through underground workings which opened to the surface on other lands. Finally there was nothing on the ground, or on the maps, to suggest any existing rights within the area once covered by the Titus. Yet the claimants were able to block an application for patent, made by parties who had located and improved what seemed to be vacant ground.

Active mining operations were at a standstill, and might have remained so indefinitely except for a consolidation of conflicting interests under which the new claims were allowed to go to patent and the historical Titus claim ceased to have a legal existence.

But note the boundary lines of the Titus and the direction of the lode in the map, both copied from the report of the Supreme Court of the United States in the Flagstaff case. Note also the boundary lines



CLAIMS INVOLVED IN THE FLAGSTAFF CASE

of the Burnswood and Free Coinage, the new claims which have superseded the Titus. What about extralateral rights now? Other conflicting and adjoining claims exist to complicate the matter still further; but inasmuch as all have passed into the hands of a common owner, the question of extralateral rights will hardly be raised again.

The point of it all is that the prudent mining man has learned how risky an extralateral right really is, and knows that by getting additional areas he can make the law harmless so far as he is concerned. He wants the law so amended, however, that he can find out promptly where any valid rights exist and what the rights consist of.

LAWS SHOULD SUIT THE NEEDS OF THE PROSPECTOR

But in trying to make mining rights more definite, there is danger of making the law too complex. We must bear in mind that the men who make the first discoveries and set up the first mining rights are not usually men of great learning. Our laws should be framed to suit the needs of the prospector, the buoyant, hopeful nomad, who disregards hardships and privations, and roams through regions where none of the rest of us care to go until attracted thence by his discoveries. The present law has always appealed strongly to men of this class, because of the very simple procedure for initiating and maintaining rights.

We have gone so far in our interpretation of the law in the matter of what constitutes a valid discovery and with reference to the time and manner of doing development work, that we have made room for a class of speculators who take up mining ground, not with the slightest intention of developing it, but hoping to get a price from the man with bona fide intentions. Since any so called "discovery" seems to satisfy the law, and since there is no limit to the number of claims one man may locate, it has become common for these persons to locate large groups of claims in the neighborhood of some promising prospect or mine, and then to wait for the ground to become valuable through the success of an industrious neighbor. These vampires seldom make preparations for development work until the last thing, and then they carry on the work only in case somebody else appears on the ground for the purpose of making a location after the close of the year. If nobody else appears, no work is done. With the new year, new names are given to the claims and new location notices are posted and recorded; and the property is held for another twenty-four months without any real development work being done at all. Some States have tried to overcome this evil by requiring a discovery

each claim as a condition for final location, but this remedy has not been wholly adequate.

CHANGES SUGGESTED

The details of the new law will need careful consideration, but it may not be out of place to suggest the following general changes:

1. Do away with the extralateral right.

2. Require the holder of a claim to apply for patent within a given number of years, and make it incumbent on him to keep his location corners up until the claim is officially surveyed.

3. Place a limit on the number of locations that one individual or association of individuals may make in the same district, within a given time.

4. Provide that the annual development work contemplated by the law shall be completed, not merely be begun, before the close of the calendar year.

Mining in Eastern Washington in 1906

BY M. H. JOSEPH

FERRY COUNTY

Eastern Washington has witnessed an awakening from its hitherto usual lethargy in mining during the past year, and several important developments have been recorded. Ferry, it is true, has not kept apace with the neighboring counties, which is partly due to a lack of a suitable method for treating the dry ores of Republic, the principal camp. Prof. William B. Potter, of the St. Louis Sampling and Testing Works, of St. Louis, Missouri, after thoroughly sampling the mines, satisfied himself that he could mine and treat the highly silicious ores of the camp having a value not exceeding $6 per ton with profit, provided that the mines could be operated and developed under joint management, on a very extensive scale. Mr. Potter has made proposals to the mine owners which are under consideration.

During 1906 the Pearl Consolidated and San Poil were worked, but both suspended operations to await the development of a milling process suitable for the home treatment of their products.

At Belcher camp, 12 miles north of Republic, considerable activity has been displayed during the year. The Belcher Mountain Railway Company has constructed a narrow-gage railway eight miles up Lambert creek, from the Washington & Great Northern Railway, to the Belcher mine, and also built commodious ore bins at the lower end of the line. The mines worked were the Belcher, the Winnipeg, the Oversight, the Copper Key, the Anonymous group, the Mineral Hill and the Meteor. New companies organized and beginning work were the Bartle Gold Copper and the Quinn. The Monitor group on La Fleur mountain, was sold to the Dominion Copper Company.

Among notable events were the discovery of wolframite in the Cascade mountains, and the organization of the Tungsten Consolidated Mining and Milling Company to work the deposits.

One of the Palmer mountain tunnels, already in 4000 ft., is to be driven 4600 ft. farther into the southeastern flank of Palmer mountain. John Boyd, the manager, has secured the capital necessary to complete it. Last year the company finished and equipped a $50,000 electric-power plant on Touts Coule creek. The company purchased the equipment for a 100-stamp mill of the Traylor Engineering Company, and has begun extending its tunnel. Other promising enterprises are the Copper World, the Copper World Extension, the Judge, and the Kimberly.

In the vicinity of Palmer lake, and northward, along the Similkameen river, mining activity has increased steadily during the past three years, and now that railway transportation will be available within a short period, every effort is being bent toward getting ready to ship ore to reduction centers at the earliest moment. The Ruby, Mountain Sheep, Q. S., Prize, Rich Bar, Security, Horn Silver and Triune mines all made progress during the year. Electric power from the Similkameen falls power plant will be available early in 1907, when mining in this section will be revolutionized through the use of machinery.

The Mountain Sheep has been accelerated by the instalment of a gasolene power plant and there is talk of establishing a commercial smelter.

In the Chesaw district new capital has been secured, and work done at several mines, including the Poland China, Mad River, Olentangy, Bimetallic, Jack Pot, Ben Harrison, Interstate, Saranac, Old Germany, Opal, Butcher Boy and Bluffton. Placer work was done by the Allen Placer Company. The completion of the Victoria, Vancouver & Eastern Railway will furnish transportation to the district.

The discovery, in 1905, of antimony at the White Stone ranch, near Loomis, opened a new field of industry, and during the latter part of 1906 Ingham & Witcher shipped from the discovery 400 tons of stibnite to San Francisco on a special order.

In the Methow district the Antimony Queen Mining Company operated the Dixie Queen mine, on Gold creek, last year and shipped several large slabs of stibnite to San Francisco, which weighed from 500 to 1000 lb. each. Since then the company has been shipping ore in carload lots. The Seattle Smelter Company has ordered machinery for a 10-ton antimony smelter, to be installed on the Gold creek antimony belt next spring, and if it proves successful, a plant will be installed to handle the entire output of the district.

In the old Ruby camp, near Conconully, last year's operations were quite extensive.

The western part of Okanogan county showed more than usual activity during 1906. In the Twisp district a number of mines were worked, with encouraging results. Among them are the Lookout, the Alder, the Gold Dollar and the Bonita.

The Chelan district has a number of excellent mineral showings, upon which considerable work is being done, and while they have not been developed into paying mines, they are a good deal more than mere prospects. The orebodies of this district are unusually large, and the values fairly good, but the lack of transportation has retarded development. Last winter J. P. Graves, of Grand Forks, B. C., took a bond on the control of the stock of the Holden Gold and Copper Mining Company, which is showing excellent values in copper.

STEVENS COUNTY

All of that part of the Colville reservation in Stevens county tributary to Orient, a town in Ferry county, on the line of the Washington & Great Northern Railway, has experienced unprecedented mining activity during the past year. Under competent management several mines in this section, including Kettle river and Pierre lake districts, demonstrated their worth in 1906. Among them are the First Thought, Napoleon, Easter Sunday, Orient, Pomeroy, Chief and Butte, Minorca, Swamp King, Abe Lincoln, Globe, Regina, Copper Butte, American Flag, Trojan, Tenderfoot, Big Iron, Defender, Golden Crown and several others, which are under development.

The Metaline district became prominent last year through several mines with large deposits of silver-lead ore, the principal being the Morning and Mammoth. Several other companies are operating in the district, and a large amount of work was done, chiefly in tunneling.

Cedar cañon district the past year has experienced prosperity, mainly through the purchase of a group of claims, on which a good quality of tungsten ore was discovered, and the introduction of capital by the Krupp Steel Company, of Essen, Germany, which purchased the claims last fall and have since been industriously blocking out ore. This company has ordered a concentrating plant.

In the Chewelah district, which was discovered 20 years ago, some discoveries of copper ore were made last year, and the development of silver ore in some of the mines was reported. The United Copper Mining Company purchased three claims and a fraction, and owns five others on which development is in progress. The Jay Gould mine became a shipper of silver-lead ore to the Tacoma smelter last fall.

THE MINES OF COBALT

The Kerr Lake or Jacobs, Right of Way and Trethewey Mines—Leasing by the Railway Commission—A Claim Four Miles Long

BY REGINALD MEEKS

[illegible] for their similarity in some respects and for their wide variance in other ways. Some of the mines seem to run to but one class of ore, while in others there is found a varied assortment. While argentiferous smaltite is the rule, still there will be found heavy showings of niccolite in other sections. Native bismuth and the antimonide of silver (dyscrasite) will appear in some mines and be foreign to others.

The general character of the fissures is similar, but in certain sections the wall-rock is more shattered than in others, and in some cases portions of the walls themselves are sufficiently rich for one or two feet to warrant breaking down and sorting. Pieces of wall at the Trethewey were shown which were covered with thin leaves of silver. There have been 39 different minerals found in the district, some of which have not yet been classified.

Kerr Lake Mining Company

This property is better known, locally, as the Jacobs mine, and consists of 52 acres in the north half of lot 3, concession 4, on the shores of Kerr lake. The discovery was made in 1904 by M. T. Wright, and the land was acquired in 1905 by the present owners. Considerable development has been done and the ground has been found to be well mineralized.

[illegible] Extent of Veins

There have been discovered to date 15 veins, 5 of which are considered to be of most importance. They have no uniform direction, but strike in all positions of the compass, but with a general trend to the north and south.

No. 1 vein strikes east and west, and has been worked by a 100-ft. open cut for a depth of 50 ft.; it averages 1.5 in. of argentiferous smaltite and ruby silver.

No. 3 is considered the main working and is shown in the sketch. A tunnel has been driven into the base of a low hill for a distance of 225 ft., and the ore stoped out for a hight of 50 ft. for the entire distance. At the entrance of this tunnel a shaft was sunk to a depth of 130 ft., and levels were driven north and south at the 60- and 120-ft. stations. Drifting to the south disclosed highly mineralized rock, and the ground is being stoped at a distance of about 30 ft. from the shaft. Within the past few weeks a crosscut was driven 12 ft. to the west at the 60-ft. level and encountered a 12-in. vein of ore which is claimed to be 25 per cent. silver.

The shaft is substantially lined with square-set timber, and is equipped with a bucket hoist which it is proposed to change to one employing a cage and car. The shaft-house and ore-house are well built, and sheathed with tar-paper. None of the shaft-houses of Cobalt seems to be built to handle a heavy tonnage or to withstand a long siege.

No. 6 vein strikes north and south and is entered by a 140-ft. tunnel. The vein shows from 2 to 3 in. of cobalt and native silver. No. 7 strikes in the same direction as No. 6, and is worked by a 60-ft. shaft. Stoping has been done for a length of 30 ft., and for a hight of 10 ft. The vein has been traced for 250 ft., and averages from 4 to 6 in. of smaltite and native silver.

No. 9 vein shows 8 in. of rich silver ore, and has been traced for 500 ft. It enters a swamp on one side and the lake on the other. A cut has been made for 160 ft. and the stoped area is 60 ft. long by 10 ft. high. The other veins run from 0.5 to 6 in. in width, and have not been worked except in the case of Nos. 8 and 12.

Of these No. 8 has been opened by a cut, 30 ft. long and 10 ft. high, which shows a 2-in. vein of smaltite and silver. No. 12 strikes east and west, and shows a small rich vein of silver. It has been opened by a cut 70 ft. long by 6 ft. deep. The vein crosses No. 7 at right angles.

Equipment

The mine is furnished with one 60-h.p. boiler; one 4-drill compressor; one 6x8 hoist; feed pumps, etc.; office; two bunkhouses; one boarding house; power, ore, pump, store and dwelling houses, and is in good shape to meet present requirements. The management is pushing development as rapidly as possible.

There were formerly 30,000 shares of a par value of $100 each. Recently these have been changed to 600,000 shares of $5 each. The stock is quite closely held, and is not actively dealt in.

About 200 tons of high grade ore have been shipped from this mine.

The officers are as follows: Edward Steindler, president; W. J. White, vice-president; J. A. Jacobs, secretary-treasurer; I. R. Jacobs, manager, and S. W. Cohen, superintendent.

Right of Way Mining Company

This mine is an example of what may be done in this extraordinary camp. Ordinarily a tract of land 4 miles long by 99 ft. wide would be considered a rather venturesome mining risk, but in the case of this property the results so far have more than realized the expectations of the promoters. It is essentially the "freak" mine of the camp, and is laughingly referred to as the mine whose equipment consists of "seven men, three planks and a wheelbarrow, to which has been added a couple of candles for the night-shift." Nevertheless, the management has taken out of a cut, 50 ft. long, 10 ft. wide and 10 ft. deep, 30 tons of first-grade and 25 tons of second-grade ore. The former was shipped in December, and was expected to return nearly enough to clear the entire purchase price of the property.

The facts relative to the acquisition of

KERR LAKE OR JACOBS MINE

the property are also interesting. The Ontario government built the railroad now known as the Temiskaming & Northern Ontario Railway, and placed all details in the hands of a commission consisting of Cecil B. Smith, Dennis Murphy and J. L. Englehart. These men were granted, as a bonus, the surface and mineral rights along the right of way, and in all townsites along the line of the railroad.

The commission advertised for bids or, as they are called in Canada, tenders, and the following properties were leased for the term of 999 years: Right of Way Mining Company, Cobalt Townsite, Wright Mining Company, Nancy Helen, and the City of Cobalt Mining Company. The terms were a cash bonus, and a royalty of 10, 15 or 25 per cent. of the smelter returns, depending upon the value of the ore. In the case of the Right of Way the rate was 25 per cent. independent of the value and a cash bonus of $50,000. It is a peculiar coincidence that only one bid was received for this property, which was granted to five business men of Ottawa.

EXTENT OF THE CLAIM

The grant extends from the 101st to the 105th mile-post, and the width consists of 49.5 ft. on each side of the center line of the track. The station grounds are excluded, and a 3-acre tract at the northern end was included. This makes the total area very close to 43 acres, but it had the great disadvantage of being a long, narrow strip of ground.

The owners had considered selling a controlling interest to outsiders, but when discoveries of what later proved to be remarkably rich ore were made, they decided to work the veins themselves.

With an expenditure of less than $5000 they have won ore which is expected to return close to $60,000, less 25 per cent. royalty.

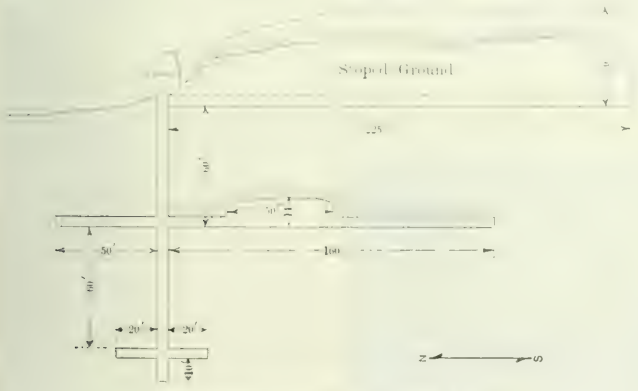
CHARACTER OF ORE

The vein is calcite, carrying considerable smaltite, niccolite and native silver, and, in the small space which has been opened, shows a width of better than 12 in. Five men are drilling by hand and [illegible] sunk at the north end of the cut, close to the La Rose boundary. It is proposed to sink this shaft and then drift to the south along the vein. At the lower or south end of the property they have two leads running from the Townsite, and a supposed extension of the Silver Queen vein. Besides this a man has offered to show the owners a discovery he claims to have made, on condition that they pay him $150 for each inch in width, and states that the vein is about 6 in. wide.

EQUIPMENT PLANS

Operations began in October, 1906, and with the equipment and force mentioned. Now the management has ordered machinery which will place them in a better position to extend development. Orders have been placed for one 25-h.p. boiler, one 6x8 steam hoist, one No. 3 Canadian-Rand steam drill, a bucket and an ore-car. At present 15 men are employed.

The company is capitalized at $500,000, the par value of the shares being $1. Five parties own the entire issue, with the exception of 100,000 shares, which remain in the treasury, and 25,000 shares, which have been issued to the public. The officers are as follows: T. A. Beamont, president; Edward Seybold, vice-president; E. A. Larmonth, secretary-treasurer; E. McMurtry, superintendent.



DEVELOPMENT ON VEIN NO. 3, JACOBS MINE

The O'Brien Mining Company

Litigation has been the cause of much trouble to more than one mine owner and M. J. O'Brien and J. B. O'Brian have from this cause been forced to keep idle for a long period a mine which should have long ago taken its place among the active shipping mines of Cobalt. Owing to a dispute about the title the owners have been obliged to keep a small force on the property pending the settlement of the suit brought against them by the attorney general on petition by the owners of the La Rose, the adjoining mine. The Canadian Government has finally [illegible] right to resume operations, with the stipulation that 25 per cent. royalty on all smelter returns must be paid to the Government.

Previous to the enforced idleness one 25-ton carload of ore was shipped, but between that time and December, 1906, there have been no shipments. In December the management was granted permission to ship one car, and a 50-ton car was thereupon ordered.

[illegible]

The O'Brien mine is a close corporation, owned by the men already named. It consists of 154 acres, but so far operations have been confined to lot R. L. 403, situated east of and adjoining the La Rose mine. The mine is located on the summit of the low range of hills rising from Cobalt lake, and the elevation is about 75 ft. higher than the La Rose mine.

There are six veins lying in all directions, besides many fissures; the ore is smaltite and native silver, with a good showing of argentite. Two shafts have been sunk. No. 1 shaft is down 320 ft. and, it is claimed, is in good ore at that depth. The levels are 50 ft. apart, but no drifting has been done below 150 ft. This shaft, which has one compartment, is equipped with a bucket hoist, which is to be changed to a cage in the near future. The shaft house is 30x50 ft. and 45 ft. high; it is sheathed with corrugated sheet steel. The second shaft is down 50 ft. The underground operations comprise 700 ft. of drifting, 100 ft. of cross-cutting and a 50-ft. raise to the surface.

EQUIPMENT

The power-house is 40x20 ft., and contains two 50-h.p. Ames locomotive-type boilers; one 6-drill Ingersoll & Sargent straight-line compressor, and one 8x10 Lidgerwood hoist. Since the settlement of the title difficulty it has been decided to maintain a force of 30 men underground and 50 on the surface, and to increase the equipment accordingly. The company has built a substantial camp on the property, and active mining operations should add greatly to the information concerning continuity of silver values at depth.

M. T. Culbert is superintendent of the mine.

Trethewey Mining Company

The properties formerly known as Trethewey J. B. 6 and J. B. 7 were at one time owned and operated by the same parties. The lot known as J. B. 7, consisting of 40 acres, was acquired late in the year. On Nov. 8, 1906, the officers were elected and work was begun two days later. Previous to the present régime, ore to the value of $325,000 was shipped, and the present owners have received $105,000 for their ore, including $60,000 received for shipments in transit, when negotiations for the property were concluded. Since Nov. 8, 1906, there have been shipped 50

grade running from 150 to 200 oz. per ton.

There are a number of clearly defined

ly worked. Along the line of contact and 100 ft. west of the shaft, there is a 12-in. vein of smaltite (not shown in the sketch) carrying 15 to 25 per cent. cobalt, and probably not more than 50 oz. silver. This vein has been opened by an open-cut for 80 ft. at a maximum depth of about 20 ft.

I am informed that Thomas A. Edison has offered 40c. per lb. for the cobalt contents of this ore to use in the manufacture of storage batteries, and is also willing to pay for all but 19 oz. of the silver which it contains. This amount, it is claimed, is lost in the extraction process.

The principal vein is opened by a shaft which has been sunk to a depth of 120 ft. Levels have been driven at depths of 50 and 100 ft., and ore has been stoped at the upper level for a distance 40 ft. east of the shaft and to the surface.

The ore exposed is in a vein 5 or 6 ft. wide which is streaky. There are probably 2 ft. of second-class, and 4 in. of first-class ore. Recent assays of the former ran 250 and 230 oz. silver to the ton. The high-grade ore runs from 900 to 4000 oz., depending upon the native silver contents.

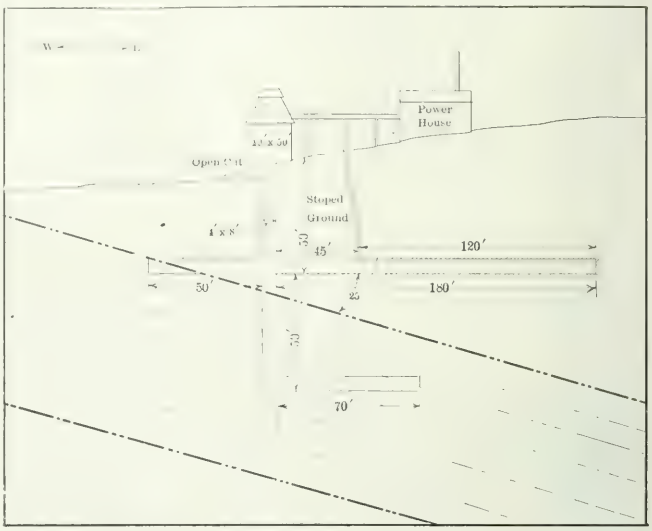
At the first level drifting has progressed 180 ft. to the east and 50 ft. to the west. At the lower level drifting has been confined to the east and 120 ft. has been done. The ore seems to be of the same character in both levels. A stratum of what is

to the south it is expected that vein A of the Coniagas mine will be intersected. This vein strikes directly toward the Trethewey property.

In all the underground operations overhand stoping methods are used and the policy is to push development as much as possible. Wherever there is a fracture, and they exist in all directions, cobalt ore and native silver are found. This results

most completed and soon sorting will be done under far better conditions. At present 90 men are employed but the normal force consists of 40 men underground and 30 on the surface.

The stock issued amounts to 1,000,000 shares of a par value of $1. The officers are as follows: A. M. Hay, president; S. A. Wickett, vice-president; Frank C. Loring, consulting engineer.



UNDERGROUND DEVELOPMENT AT TRETHEWEY MINE

probably the Kewatin formation traverses the property, dipping at an angle of about 25 deg. Wherever this has been encountered silver values have been found to be less. The rock formation has been located at two points and its direction estimated. Its position is shown in the sketch. Cross-cuts are being driven to the north and south and have progressed 15 and 44 ft. respectively. By cross-cutting in a large quantity of low-grade ore running 100 oz. silver per ton and upward.

EQUIPMENT

The power house contains one 12-drill compressor which furnishes air for both the Trethewey and the Coniagas mines; one 180-h.p. boiler and a hoist.

The ore-sorting house has been very inadequate but a much larger building is al-

Manganese Ore Lands in Caucasus Leased

Consul Alexander Heingartner, reporting from Riga, states that an English company has leased manganese ore lands in the district of Tschiatury, in the Russian South Caucasian Government of Kutais, which district has at times supplied nine-tenths of the world's demand of this ore. In 1902 there were mined 415,000 tons out of a total Russian production of 536,558 tons.

The quantity of land leased is reported to be about 50,000 dessiatines (134,985 acres), at a yearly rental of 25,000 rubles ($12,875). To further transportation facilities the branch line starting from the station on Kwirilly, on the Transcaucasian Railway, is to be extended northeastward to Satscheri, then eastward to the village of Dschaba. A stock company with a capital stock of 3,000,000 rubles ($1,545,600) has been organized, divided into 16,000 shares of 187.50 rubles each.

In December the five Carrie furnaces of the Carnegie Steel Company at Pittsburg turned out 68,167 gross tons of pig iron, beating the best previous record in March of 66,250 tons. This is an average of 440 tons per stack per day.

British Columbia

BY E. JACOBS*

A considerable increase in value of the mineral production of British Columbia in 1906, as compared with that of 1905, appears to be the gratifying result of the year's mining operations. The estimated total of $25,129,875 for 1906 gives a net increase of $2,668,550 over that of 1905, which was $22,461,325—the previous record year for the Province. It is interesting to note that 10 years ago—in 1897—the total production was but $10,455,268, so that within a decade the mines of British Columbia have more than doubled their output in point of value.

By far the greater part of the increase for the year just closed was made by copper, which not only had the assistance of an advance in average price of about 4c., but was produced to the extent of nearly 7,500,000 lb. more than in 1905. Lead, lode gold, building materials, etc., also show increases, but placer gold, silver, coal and coke are estimated to have decreased during the year. There were special—but temporary—reasons for the falling off in production of these minerals, as will be stated presently.

As to districts, the Boundary made the biggest increase, being the chief copper-producing district in Canada. East Kootenay came next, occupying a similar position in the Dominion in regard to lead. While in several other districts production showed little or no increase, important developments took place which may be expected to add considerably to the output of mineral from those districts in the near future.

Following the method of calculation used last year, the average prices for the year of silver, lead and electrolytic copper in the New York metal market have been used as a basis, less deductions of 5 per cent. off silver and 10 per cent. off lead. No other deductions have been made. Placer gold has been calculated at $20 and lode gold at $20.67 per oz. Coal at $3 per long ton and coke at $5 are fair values for the Province.

The estimated value of the production, with the changes as compared with 1905, is shown in the following table:

	1906.	Changes.
Gold, placer	$ 900,000	D. $ 49,500
Gold, lode	5,167,500	I. 234,498
Total gold	$6,067,500	I. $185,098
Silver	1,902,375	D. 69,443
Lead	3,060,000	I. 660,978
Copper	8,550,000	I. 2,678,778
Total metalliferous	$19,579,875	I. $3,450,411
Coal	$3,400,000	D. $ 852,936
Coke	1,250,000	D. 108,925
Building materials, etc	1,900,000	I. 200,000
Total non-metalliferous	$5,550,000	D. $ 761,861
Total production	$25,129,875	I. $2,668,550

The following comparative table shows the quantities of minerals produced in 1905 and, approximately, those in 1906:

		1905.	1906.	Changes.	
Gold, placer	oz.	45,625	45,000	D.	625
Gold, lode	oz.	255,000	261,000	I.	6,000
Total gold	oz.	300,625	306,000	I.	5,375
Silver	oz.	3,439,417	3,300,000	D.	139,417
Lead	lb.	56,580,703	60,000,000	I.	3,419,297
Copper	lb.	37,092,251	45,000,000	I.	7,907,749
Coal	long tons	1,954,312	1,850,000	D.	104,312
Coke	long tons	241,285	200,000	D.	41,285

Gold, copper and lead, as stated above, furnished the increase in production.

GOLD

The further falling off in placer—1905 production having previously been the lowest since 1898—is due to causes which are matters for congratulation rather than the reverse. In both the Cariboo and Atlin districts—the two chief placer gold sections of the Province—financially strong companies are engaged in preparations for extensive operations next year or the following. The Guggenheim enterprises in both districts named are on such a scale as should add largely to the quantity of placer gold recovered after works now in course of construction shall have been completed. In the Atlin individual miners are rapidly giving place to companies, and steam shovels are superseding smaller appliances, where large quantities of gravel are to be handled. The increase of nearly a quarter of million tons of ore treated in the Boundary has added to the lode-gold output, there being a little gold associated with the copper ore. Rossland's production has well kept up. The Ymir mine has again been a disappointment. The Nickel Plate, in lower Similkameen, was not worked to full capacity of its mill, pending the outcome of negotiations for sale of the property, which was not made.

SILVER AND LEAD

The St. Eugene increased its output of lead-silver ore and consequently its silver production, and the Sullivan mine, also in East Kootenay, added its quota of silver from its low-grade ore. Boundary and Rossland helped a little, but the Slocan output was again much below expectations. The closing of the silver-lead smelters for several weeks during the strike at the Crow's Nest coal mines was in part responsible for the decrease in this metal.

The St. Eugene again maintained its very considerable advantage in lead production, and the Sullivan was also an important producer. On the other hand Slocan is believed to have fallen short heavily. The Blue Bell mine in Ainsworth division will likely produce a considerable quantity of lead when arrangements for treating its big body of lead-zinc ore shall have been completed.

COPPER

It is estimated that fully three-fourths of the copper produced came from Boundary mines which in 1905, according to the "Annual Report of the Minister of Mines" for that year, gave an average assay, based upon copper recovered, of 1.52 per cent. With an output exceeding 1,100,000 tons [illegible] 000,000 lb. of copper as the district's production should be well within the mark. Rossland, with an output of about 280,000 tons of ore having an average copper content of rather less than 1 per cent., contributed between 5,000,000 and 6,000,000 lb. The coast mines, chiefly the Tyee on Vancouver island and the Britannia on Howe sound, made up practically all the remainder of the year's total of this metal. The Iron Mask at Kamloops did not work all the year, so its output was less than was anticipated it would be.

ZINC

The production of zinc received a setback by the charging of duty on zinc ore and concentrate entering the United States from British Columbia, and the non-completion of the Canadian Metal Company's zinc smelter at Frank, Alberta. Additional plant is being installed at these works, with the object of making them suitable for the economic production of zinc.

COAL AND COKE

First the destruction early in the year of a large part of San Francisco, which cut off from the Vancouver island collieries what had long been their chief market for coal, and next the recent labor troubles at the Crow's Nest Pass Coal Company's collieries, which were closed for two months and not operating to their former full capacity the following month, prevented the production of these fuels from showing an increase. During the latter part of the year there has been, though, a distinct improvement in the demand for coal and coke, but the island collieries could not get sufficient men to allow them to keep pace with it. Coal and coke from western Alberta in large measure kept West Kootenay and Boundary mines and smelters supplied during the strike, so that the stoppage of supply from Southeast Kootenay coal mines was not felt to so great an extent as would otherwise have been the case. Preparations are being made to mine coal in the Nicola district, which has lately been given railway communication.

IMPROVEMENTS AND PROSPECTS

Taking the mining districts of the Province in the order usually followed in official publications, the following comments are made:

In Cariboo the Cariboo Gold Mining Company, with J. B. Hobson as resident manager, is constructing 17 miles of ditch for water supply and doing other important work preliminary to the extensive working of its enormous gold-gravel beds. The Bear Hydraulic, also in Cariboo, is at length about ready for producing gold. The Consolidated Cariboo deep-drift mine appears to be approaching a self-supporting and probably dividend-paying period.

Atlin, in the Cassiar, has been in a tran-

*Editor *British Columbia Mining Record.*

[illegible] operations will be larger. Dredge-mining in this district has proved a loss thus far. The introduction of a big steam shovel by the Guggenheim company promises to work a transformation in results of work with big gravel-handling appliances. The Berry Creek Mining Company is now in position to work its Thibert creek hydraulic gold mine profitably, having completed its water-supply system.

East Kootenay is making considerable progress in both lead-silver and coal mining. The St. Eugene mine has had its plant and machinery enlarged, and the Sullivan mine and smelter have been brought to a condition of steady production. The Crow's Nest Pass Coal Company is steadily increasing its coal and coke output.

In West Kootenay the old Ainsworth camp is again active, the purchase of the Krao mine by Butte capitalists having been the chief feature of the year. The Blue Bell in the same mining division is being extensively opened up. Developments at several Slocan properties are encouraging. Deep-level mining in the Rambler-Cariboo was the most important development of the year. On Slocan lake the successful working of the Hewitt, Vancouver group, Standard, Ottawa and other silver properties has given that section a fresh start. Nelson district has the successful development of the La Plata and the considerable improvement of the Hall Mining and Smelting Company's smelting works to credit for the year. Rossland's mines—Le Roi, Le Roi No. 2, Centre Star and War Eagle—have all been extensively developed with gratifying results, each now having more ore in sight than at any previous time. The Trail smelter and silver-lead refinery have been enlarged and improved.

The Boundary copper mines in Yale district and the smelters have made the most progress of any in the Province. The Granby, British Columbia Copper and Dominion Copper companies have, respectively, enlarged their mining and smelting operations and have been making large profits. The construction of railways to the Similkameen is having a beneficial effect on mining in that section.

On the coast the Howe Sound Copper Company has mined a considerable quantity of ore at its Britannia mines and had it smelted at its smelter at Crofton. The Tyee Copper Company has continued production and smelting at its mine and works. The Tyee orebody has been met with in the adjoining Richard III mine. The coal mines on Vancouver island are now producing to the utmost capacity practicable until more labor shall be available.

Generally the mining and smelting industries of the Province are in a better condition now than ever before, production being larger and several companies able to divide part of their profits among the stockholders.

A Notable Exhibit of Rare Minerals.

At the meeting of the New York Academy of Sciences and the Geological Society of America, held in New York, Dec. 29, 1906, to Jan. 1, 1907, Dr. George F. Kunz exhibited the great mass of true jade (nephrite), weighing 4715 pounds, which he discovered and obtained at Jordan's Muhl, Silesia, in the year 1899, and which now belongs to the Heber R. Bishop collection, being loaned to the American Museum of Natural History through the courtesy of the Metropolitan Museum of Art. With this specimen is a series of photographs of the quarry and the features connected with it, which shows how the specimen of jade was found, made by George H. Kunz, a son of Dr. Kunz; also, a specimen that was obtained at the same time and polished, showing the beauty of the material, as well as a hand fragment unpolished. This find of jade in Silesia is of special interest, as it was believed by many that the jade implements found in the lake dwellings of Switzerland, Italy and Austria had all been obtained from material of Asiatic origin and brought westward in the pre-Christian migrations. In this one mass there is enough jade, however, to make five times the number of implements that exist in the combined European museums, and there is no necessity of attributing an Asiatic origin, although some of the implements may have had such an origin.

Dr. George F. Kunz exhibited in connection with his paper before the Geographical Society of America, American diamonds from six distinct localities: three in Wisconsin, one in California, one in Alabama, and one in Indiana. With this is a series of Jasper rock, iron ore, horn-blende, corundum, and other typical minerals and rocks, which were found associated with gold in the gold washings of Brown and Morgan counties of Indiana. These are of especial interest, because a number of these rocks have been identified and also verified by Canadian geologists as being of Canadian origin, and as having been transported during the ice period from the northern shores of Lake Superior and Ontario, and probably some from as far as Ungava district, in British Columbia. Naturally, the fact that a series of minerals, varying in specific gravity from quartz to native gold six times the weight of quartz, would lead to the plausible theory that these had been transported by ice and not by river action, or they would not have been transported but would rather have been separated according to their varying densities. The subject is one of unusual interest, as diamonds have also been found in other parts of Wisconsin, Ohio and Indiana, and it is believed they all have a common origin, having been transported either in the first or second ice periods. With this collection is also shown a collection of concentrates from the gold washings of Brown and Morgan counties of Indiana, containing zircon, garnet, kyanite, feldspar, smoky quartz, gold, and notably corundum in crystals and jasper conglomerate from the province of Ontario, and a variety of other minerals.

In the archæological exhibition there was also shown with the Heber R. Bishop collection of jade, the two great volumes of the monumental catalogue, probably the most magnificent ever published for elegance of paper, variety and richness of type, and for the extensive scientific investigation connected with it. Descriptions of the book were also shown, written by Dr. George F. Kunz, who had the scientific investigation of the Bishop collection of jade in charge.

American Development of Mines in India

Consul-General William H. Michael, of Calcutta, writes that Americans are paying some attention to the mineral deposits of India, and that it is altogether probable that this will lead to the use of American capital in the development of Indian mineral deposits on the most modern lines. Under the present governmental policy this interest by the Americans is invited and encouraged, and it is to be hoped that they will not be backward in entering the field with a full equipment of American mining machinery.

In 1905 the total value of minerals taken out in India is estimated at $27,539,780. The most notable increase was in manganese ore, which went up from $648,160 in 1894, to $1,241,545 in 1905. This places India well-nigh the head of all countries in the production of this ore. The total output of manganese ore in India last year was 253,896 tons, nearly double the output for the previous year, 1904. The tons exported in 1905 amounted to 282,334, which was an increase of 127,504 tons over the export of 1904.

Barytes Mine near Platteville Camp

James Parish, of Platteville, claims to have discovered a body of barytes located about 4½ miles west of the Platteville camp. It is said that the vein has been proved laterally for more than 300 ft., and varies from 2 to 18 in. in thickness. The samples exhibited are of an unusually clean white color, and most of the ore on the dumps seems to be pure. The average depth at which the ore is found is about 35 ft.

A report states that a rich discovery has been made in the Phœnix mine, in New South Wales. A lead vein has been struck, which yields 17½ dwt. of gold, 19 oz. silver, and from 60 to 70 per cent. of lead. The seam is running in a northerly direction for 200 yards.

VENTILATION IN FLAT COAL SEAMS

A Technical Consideration of Modern Mine Ventilation with Reference to Economy and Efficiency in Non-gaseous, Low Seams

BY A.H. STOW *

It is not that there is anything distinctive or peculiar to the ventilation of a flat coal seam, but merely that this implies, within wide limits, certain conditions and volumes to be dealt with.

Non-gaseous is not a hard and fast distinction; often mines that have been free from gas for years, in time will show small traces of gas, then gradually increasing quantities will appear, until the mines in question may be clearly classed as gaseous or fiery.

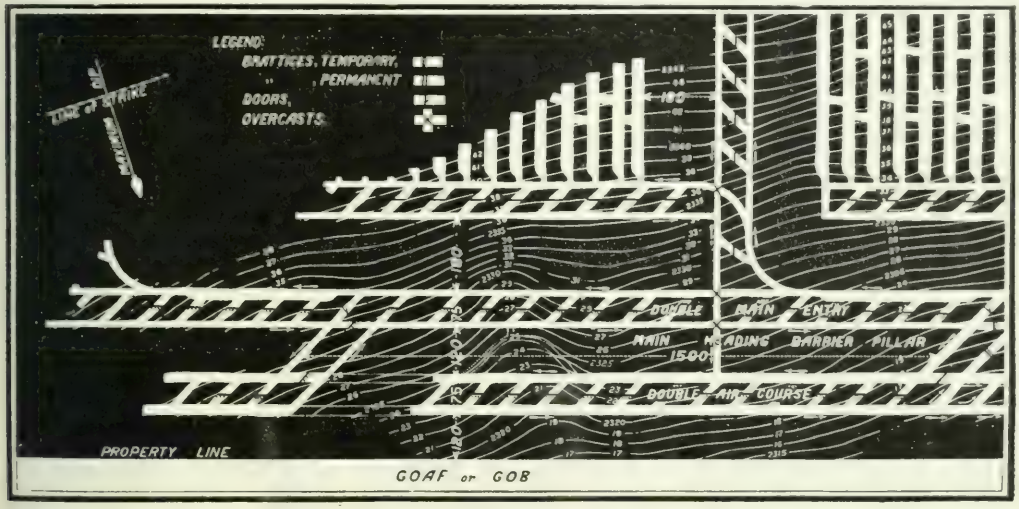
able outcrop, where the entries have no great distance to drive.

EVIL PRACTICES THAT EXIST

Where a large property is to be worked out, and the main entry has a long drive ahead of it, away from the crop, the case is different. Such mines, however, having a fan or furnace of moderate capacity, can readily run two or three years—often do run much longer—without any serious inconvenience being felt or danger noticed.

date that the ventilation must be improved sooner or later, however, as need to make and the repair of [illegible] is delayed indefinitely.

When the point is finally reached where there is little or no real ventilation, the moving trips of cars will result in a sort of false ventilation, and in a closely gobbed low-coal haulway, such trips form quite a good piston, as it were; which form of ventilation serves admirably to distribute the dust resulting from haulage throughout the adjacent workings, until everything becomes coated with fine coal in a delicate state of balance, so that a windy shot, or the accidental discharge of a keg of powder serves again to place the dust in a state of suspension ready to propagate an explosion; still there are quite a few yet who do not at heart believe in dust explosions, while they



GENERAL METHOD FOR VENTILATING A FLAT COAL SEAM

A possible improvement in methods of ventilation, that might be quickly adopted for a gaseous mine, quite likely would be promptly turned down for a non-gaseous proposition, if there were any additional costs attached. Low coal often has to compete with adjacent high coal having much lower mining costs, so that any improvement that may involve increased costs, must be closely looked into and carefully considered.

To one accustomed to the rigid necessities of a gaseous district, the attempt to enforce the same precautions with the incidental expense, no doubt seems unwarranted, and to some extent and under some circumstances, this would seem good judgment, as in the case of a small drift property, with light cover, and consider-

Brattices that would be inexcusably leaky under considerable pressure, answer well enough as long as the entries are only in a short distance, with practically no friction to overcome, so that the brattices are under no pressure to speak of; these brattices, seemingly good enough, are gobbed up, as the entries are driven.

As the workings advance, the friction to be overcome increases, and the pressure on the brattices becomes greater, until what was only an insignificant leak at the start, becomes a serious loss of air. New brattices are put up in the same style as the old, which seemed good enough, it is only a question of time until no air reaches the face of the main, while the fan continues to show ample capacity for the property in question. In a non-gaseous mine, there is no particular time or may not care to dispute that they are a reality.

Quite likely, by this time, the mine has reached such a depth that gas has already made its first appearance, when this mine may be said to be in a critical state, with possibly everyone off their guard. The fact that explosions continue, even in non-gaseous districts, is proof enough that there is room for improvement in methods of ventilation.

CONCENTRATION OF WORKINGS

The quick drawing of pillars as soon as the rooms are driven up simplifies the problem and reduces the cost, but one of the most common mistakes in low coal, and where it does the most damage, is in allowing workings to become badly scattered. Stone brattices have long been used, along main entries, to obviate many of these difficulties; and properly put in

*Mining engineer, Mayberry, West Virginia.

under good top that will stand from over them, they answer well.

Stone brattices, however, are an appreciable item of cost, and to be properly put in, they require a class of workmen not always obtainable, especially in new districts. Assuming that the labor available is incompetent, it will be difficult and expensive to get good ventilation at the working faces. One way of overcoming this trouble is to develop a four-entry system with long and practically unbroken pillars between the two pairs of entries.

In cases where the main heading is being driven as close to the line of strike as advisable, two entries may be driven parallel to the main heading and its air course. This additional pair of headings, driven room width where the top will admit of it to avoid yardage for narrow work, will, for present purposes, be called the double air course, the main entry and its air course being called the double main entry. This system leaves a solid pillar of coal, which may be anywhere from 60 to 180 ft. in width, between the double air course and the double main entry.

This main-heading barrier pillar must be broken as often as the partings are moved up, to insure economical mule haulage; while 1000 ft. is no doubt more economical, 1500 ft. is a more common figure.

On a basis of one crosscut every 500 ft., one brattice may be said to replace at least six such stoppings under the old system. On this basis of replacing six brattices by one, the leakage will be reduced to one-sixth; also if the ventilating cross section has been doubled, and the pressure thus reduced one half, the leakage will be cut down to one-twelfth, figuring this leakage as only proportional to the pressure. In the case of an explosion, the air can be placed at the face of the main in one-sixth of the time and at one-sixth of the expense. In the case of serious leakage in the permanent brattices, or accident to some of them, the trouble may be located in one-sixth of the time, which is an item in these days of close competition when foremen are pushed to their limit.

AN AID TO DRAINAGE

In the case of a heavy dip or swag across the main heading, the double air course, which should generally be driven on the dip side, may serve as a ditch to the main. Where the lowest air course is say 270 ft. from the haulage way, and 220 ft. down, the maximum dip averaging 3 per cent., the double air course will serve as a ditch 6 ft. deep, without any cut or excavation being made for this purpose whatever. A special or extra air course may be driven around the swag if it may occur, in order to enable the air to pass around the water that may be roofed in the double-air course.

The crosscuts in the main heading barrier pillar may usually be driven at such an angle that the coal coming from the double air course may be gotten out on a fair grade; where such is not the case, a special motor parting can be put in.

One of the objections that will be urged against this system is to the effect that it leaves too much coal for the last man to get, although not necessarily expressed in these words. This, however, is a point in its favor, that sufficient solid coal, preferably in the shape of large barrier pillars, should be left along the main haulway, more particularly to enable the working of a sufficient number of miners to make it profitable to finally pull back the main entry.

Where the general line of advance is up the pitch, instead of close to the line of strike, the double air course can be placed in the center, with barrier pillars on either side, between the double air course and the right and left double mains, which may properly be considered a six-entry system, although at least two of the six places, if not four, are preferably room width, if the top will admit of it.

With practically the full force of an adequate fan within 500 ft. of the face, the last 500 ft. of brattices, in non-gaseous sections, may properly enough be only temporary affairs; even brattice cloth should answer.

Where there are large barrier pillars on either side of the main entry, to enable the final economical drawing back of the main entry pillars, the addition of the double air course will serve to place the main-heading mule haulage on a more economical basis.

Six places, four headings and two break-throughs, at four cars apiece, will require 24 cars, which is a day's work for one mule in low coal, or more particularly for a string team, which is necessarily slower. Where the double air course may be driven room width, and the coal is not so low that it is necessary to shoot top, this four entry system of ventilation may be adopted, not only without any additional costs, but at an actual saving on brattices, sufficient to cover the cost of two extra motor switches at say $35 to $40 apiece, or to cover the cost of good stone brattices in the crosscuts.

It is thought that the importance of a large number of small leaks is not appreciated, or, at least, acted upon as it should be.

A PRACTICAL EXAMPLE

For the purpose of comparing costs, a low-coal proposition having an output of 20 cars of 30-ton capacity, or 600 tons per day for 300 working days, giving 180,000 tons per year, will be taken as an example.

While the figures may vary between wide limits, depending upon the management, conditions, etc., this mine will be assumed to have 15,000 ft., or say 2¾ miles, of cross entries, with 160 brattices, and 8000 ft., or about 1½ miles, of main entry with 90 brattices, the main entry and each of the five cross entries being assumed to advance at the rate of 900 ft. per year; figuring the break-throughs at 90 ft. centers, will make 60 new brattices per year, 10 on the main, and 50 on the cross entries.

An ordinary wooden brattice, single thickness, may be figured as follows:

1-in. plank, ½-in. strips and waste, 100 ft. b. m. @ $20 per thousand	$2.00
Labor, $1.75, 3 props and caps, $0.15	1.90
Daubing, $0.35, nails, etc., $0.25	0.60
	$4.50

The life of this brattice will ordinarily be from 4 to 5 years, so that $1 per year per brattice may be taken as the cost of maintenance. Where top is shot, or where there is much draw slate, it will usually be found, particularly in low coal, that there is considerable cleaning out to do to get at the old brattices; which work may readily cost as much as the brattice itself, thus making the cost of maintenance $2 per year, instead of $1.

Doors will cost:

Lumber, say 120 ft. b. m. @ $20, $2.40, nails $0.10	$2.50
Labor $3.75, hinges, $0.75	4.50
	$7.00

Door boys are thought more properly chargeable to haulage than ventilation, for even if there were no doors they would still be necessary, in the majority of places, to flag drivers ahead, and for this reason will not be considered.

There are, however, in most mines, at least one or two places where a door boy at $0.75 per day, or say $200 per year, could be replaced by an overcast at $50 first cost, good for 5 years, and thus costing only $10 per year, making a net saving of $190 per year for each door boy replaced.

The cost of the usual method of ventilation per year may then be figured:

Main, 90 old brattices, maintenance @ $1.00	$ 90.00
Main 10 new brattices @ $4.50	45.00
Crosses, 160 old brattices, maintenance @ $1.00	160.00
Crosses, 50 new brattices @ $4.50	225.00
Doors, 5 new @ $7.00	35.00
Equivalent to 0.308c. per ton, for 180,000 tons, per year	$555.00

Where the old brattices have to be dug out before they can be replaced, this work may readily amount to $1 per year for each old brattice, or $90 additional. Where the mine workings are so arranged that the brattices on the cross entries will not be on service longer than the life of the first brattices put in, the $160 for maintenance may be dropped. It often occurs that shorter new lines are driven, but this is objectionable, as it leaves no suitable air current along the haulways to carry off the dust from haulage, the class of dust most to be dreaded.

In the example taken, where all the brattices have to be repaired at one time, the approximate cost will be:

Main, brattices, 90 old, replaced @ $4.50.	$ 405.00
Crosses, brattices, 160 old, replaced @ $4.50	720.00
Equivalent to 0.625 c. per ton, for 180,000 tons	$1,125.00

Where the brattices have to be kept up the total cost may be $2250, or 1.25c. per ton, for a year's output.

Stone brattices are preferably from 1½ to 2 ft. thick, depending upon thickness of coal, top, etc., and should be well hitched or cut into the rib, particularly in the case of soft coals that spall off readily. Where the coal is low and hard, with good roof and bottom, a 1-ft. wall would seem ample. The following table shows the contents in cubic yards of different sizes of brattices:

TABLE 1.

4 FT. COAL.

Width Crosscuts or Breakthroughs in Feet.	1 ft. Thick.	1.5 ft. Thick.	2 ft. Thick.
	cu. yd.	cu. yd.	cu. yd.
10.0	1.48	2.22	2.96
12.0	1.78	2.67	3.56
14.0	2.08	3.11	4.15
16.0	2.37	3.56	4.74
18.0	2.67	4.00	5.33
20.0	2.96	4.44	5.92
22.0	4.89	6.52	8.15
24.0	3.56	5.33	7.11

6 FT. COAL.

Width Crosscuts in Feet.	1 ft. Thick.	1.5 ft. Thick.	2 ft. Thick.
	cu. yd.	cu. yd.	cu. yd.
10.0	2.22	3.33	4.44
12.0	2.67	4.00	5.33
14.0	3.11	4.67	6.22
16.0	3.56	5.33	7.11
18.0	4.00	6.00	8.00
20.0	4.44	6.67	8.89
22.0	4.89	7.33	9.78
24.0	5.33	8.00	10.67

THE COST OF BUILDING BRATTICES

Where the draw slate forms a durable building stone, double-stone brattices, filled with muck, may be built for $10 to $15, part of the actual cost being properly chargeable to "slate," or entry cleaning. Where stone must be quarried and brought in from the outside, a good brattice, single thickness, may cost anywhere from $15 to $35. Where coke cinder is available, cinder concrete may be used for brattices and overcasts.

Disregarding the cross entries, which may be assumed to be the same in either case, and taking $25 as the cost of a stone brattice, which, particularly for low coal, may be considered a liberal estimate, the costs of wooden and stone brattices may be figured as follows:

Stone brattices:		
Main, 10 brattices @ $25.00 per year....		$250 00
Wood brattices:		
Main, 90 old brattices, maintenance @ $1.00.....	$90 00	
Main, 10 new brattices @ $4.50	45 00	
		135 00
		$115.00

The balance of $115 in favor of wood brattices is equivalent to 0.064c. per ton, for 180,000 tons.

Figuring the cost of maintenance of wooden brattices at $2, instead of $1, the balance in favor of wood brattices is only $25, or equivalent to 0.014c. per ton for 180,000 tons.

Figuring stone brattices at $25, and the maintenance of wooden at $1, a stone brattice will need to be in service 25 years to be as cheap as a wood brattice; but figuring the maintenance at $2, will only need to be in service 12½ years.

Double wood brattices filled with muck may be figured at $10 to $11 each, with say $2 to $2.25 per year, for maintenance. Compared with this a stone brattice will only need to be in service 12½ years, or allowing $1 per year for digging, say 8 years, to be as cheap as a wooden brattice. Stone brattices cost somewhat more than the double air-course arrangement, where the latter does not involve shooting considerable top, or equivalent yardage for narrow work, but cost less where yardage must be paid.

Where the coal is so low that a small mule cannot be worked in the double air course, and the miners will not shore the cars, it is then necessary to shoot top, in order to have the crosscuts in the main-entry barrier pillar the proper distance apart.

TABLE 2. COST OF DOUBLE AIR COURSE WHERE TOP IS SHOT, IN CENTS PER TON, PER YEAR, PER ADVANCE OF MAIN ENTRY OF 900 FEET.

Thickness of Coal in Feet.	Price Per Yd. Shooting Top.	Advance of Main Entry Per Year Before Double Air Course.	Total Yardage Cost Double Air Course.	Tonnage For Year.	Cents Per Ton, Total Shipment.
3.00	$2.50	900 Ft.	$750.00	135,000	0.56
3.25	2.25	"	675.00	146,250	0.46
3.50	2.00	"	600.00	157,500	0.38
3.75	1.75	"	525.00	168,750	0.31
4.00	1.50	"	450.00	180,000	0.25
4.25	1.25	"	375.00	191,250	0.20
4.50	1.00	"	300.00	202,500	0.15
4.75	0.75	"	225.00	213,750	0.11
5.00	0.60	"	150.00	225,000	0.70

The last 200 or 250 ft. of the double air course, before it holes into the next crosscut, may be left unshot. This 250 ft. will about balance the extra top shooting in the crosscut, so that the yardage may be figured the same as on the entry.

While the disadvantage of unshot sections in one of the double air courses is fully understood, still in the case of a gob entry, the gob occupies a larger volume than the original top in place, and that thus reducing the ventilating cross section it is believed the unshot entry will offer less resistance than the airway shot.

Where the top is so bad that the double air course must be driven narrow, the additional narrow work in the crosscuts may be estimated at 200 ft. for each of three places, or 600 ft. for the entire 900 ft. of entry driven, depending upon the distance apart of crosscuts, thickness of barrier pillar, and angle on which crosscuts are driven.

YARDAGE COSTS

The accompanying tables, Nos. 2, 3 and 4, showing yardage costs, etc., have been computed on the basis heretofore given, except that the yearly tonnage has been made proportional to the thickness of coal, on the basis of 180,000 tons for a 4-ft. seam, in order to avoid changing the rate of advance in proportion to the thickness, which would have been necessary had the yearly output been kept at 180,000 tons:

The yardage for narrow work, figured in cents per ton, is generally less in proportion, as the thickness of coal increases; so that, to a certain extent, the extra cost of the double air course may be said to keep within certain limits; but the rate of advance, in the example given, will usually correspond to a larger output per year in high coal than in low coal, so that the additional cost in cents per ton will be correspondingly reduced, while the general mining costs in high coal are also usually lower in proportion.

TABLE 3. COST OF DOUBLE AIR COURSE, EACH 10 FT. WIDE, FOR AN ADVANCE IN THE MAIN ENTRY OF 900 FT., WHICH REQUIRES THAT THE DOUBLE AIR COURSE SHALL BE DRIVEN 1100 FT., GIVING 600 FT. OF YARDAGE.

Thickness of Coal in Feet	Yardage For Single Place	Equivalent Yardage for 3 Places	Cents Per Ton Double Air Course Coal Only	Total Per Year	Cents Per Ton Total Proportional Thickness Shipment	Proportional Shipment in Tons Per Year
3.5	$1.00	$3.00	18.37	$1,100	0.70	157,500
4.0	"	"	16.05	"	0.61	180,000
4.5			14.29		0.54	202,500
5.0			12.86		0.49	225,000
5.5	"		11.69		0.44	247,500
6.0	"		10.71		0.41	270,000
6.5	"		9.89		0.38	292,500
7.0	"		9.18		0.35	315,000
7.5	"		8.56		0.33	337,500
8.0	"		8.03		0.31	360,000

TABLE 4. APPROXIMATE CORRECTIONS FOR TABLE 3, SHOWING CENTS PER TON, FOR DIFFERENT YEARLY SHIPMENTS, AND FOR DIFFERENT TOTAL COSTS.

Thickness of Coal in Feet.	Total Yearly Shipments	Total Yearly Costs. $1,000.00	$900.00	$800.00	$700.00	$600.00
3.5	157,500	0.64	0.51	0.38	0.25	0.13
4.0	180,000	0.56	0.44	0.33	0.22	0.11
4.5	202,500	0.49	0.39	0.30	0.20	0.10
5.0	225,000	0.44	0.36	0.27	0.18	0.09
5.5	247,500	0.40	0.32	0.24	0.16	0.08
6.0	270,000	0.37	0.30	0.22	0.15	0.07
6.5	292,500	0.34	0.27	0.21	0.14	0.07
7.0	315,000	0.32	0.25	0.19	0.14	0.06
7.5	337,500	0.30	0.24	0.18	0.12	0.06
8.0	360,000	0.28	0.22	0.17	0.11	0.06

In low coal, where the double air course necessitates yardage as high as $2 per yard advance of entry, for either shooting top or narrow work, stone brattices are unquestionably cheaper; whether the double air course is worth the difference is a problem for each management to decide.

ing repairs, will run higher than the figures given, in proportion as the hight increases, while the cost of the double air course in cents per ton becomes less. Doubling the thickness may be said to double the output and halve the cost.

Good air at the face of the main, however, does not necessarily mean good ventilation; as to doors compared with overcasts, there is the same objection to doors as to brattices every 60, 75 or 90 ft. along several miles of main entry. Doors are well enough where they can be kept shut, but their efficiency depends too much on the constant attention of a large number of employees, some of whom are certain to be negligent. It is not merely a question of smoke, but also of the resultant accumulations of dust.

Where the mine cars are in good repair, much of the dust resulting from haulage may be avoided by the simple and inexpensive expedient of filling the cracks between the boards with black strap.

Where the double air course does not involve yardage, the five overcasts likely to be needed per year, at $50 each, will require $250. Deducting from this, say $90 credit on the score of brattices, will make the total cost $160 per year, from which should be deducted the repairs to wrecked doors.

A large property is quite likely to require at least one relay fan inside, as the workings advance; while the relay fan is unquestionably a move in the right direction, still the leakage between the two fans may be sufficient to cause much of the fresh air from the outside fan to leak through the brattices, leaving the inside ventilator to merely churn the air without any beneficial result.

PRATTICE LEAKS

In the example taken, 100,000 cu.ft. of air per minute delivered at the working faces, and properly distributed, would seem ample; there are, however, 90 old and 10 new brattices, or 100 in all, so that it will only require an average leak of 1000 cu.ft. per minute per brattice to leave the remote faces without any ventilation whatever. If there are just two leaky cracks in every brattice, the cracks do not have to be large to cause a loss of one-third the air.

While both mud daubing and cement seem to act satisfactorily as a stopping for the cracks between the boards, neither one seems to answer quite as well for the joint between the boards and the coal, particularly if the coal has become smoked. Some form of calking, such as oakum, or mineral wool, after the brattice has become seasoned and the cement hardened, would seem preferable.

Instances have been seen in which enough coal has been lost, owing to lack of any way of getting air to pillars, to pay for several years' narrow work or top shooting. The cost of the double air course is a distributed cost, and cannot become an accumulated back cost.

In the case of narrow work, even where the roof is bad, it is possible to drive merely the upper air course narrow, the lower air course and the break-throughs being driven wide, the break-throughs, however, being necked, thus reducing the cost to one-third; while the lower air course would doubtless be closed by falls, still the leakage from the brattices should be reduced, say to one-sixth. This arrangement of double air course driven in two sections will not delay the general rate of advance.

Where there are no yardage charges, for a large property, the ideal arrangement would be a quadruple air course near the fan, dropping off to a triple, and finally to a double air course, near the limits of the property.

A mine of such extent as to require years to work out, is always liable to have to go through an explosion; counting the delay, possible loss of orders, damage suits, etc., the cost may easily be $10,000 to $25,000, and in some instances much more; the entire cost of double air courses and overcasts is hardly 5 per cent. of $25,000, and in a sense, might be looked upon as a sort of premium paid on insurance. Not that these will by any means guarantee freedom from explosions, but the increased cost, where there is such, should be considered as partly offset by the lessened chances of an explosion.

It is not wished to leave the impression that it is thought that good work in the right direction has not, or is not, being done; there are, however, wide variations, and those mines that have been run, often for years, without any attention to ventilation, and without bad results, seem to prove in a practical sort of a way that is hard to get around, and often to the very man who some years later may be called upon to look after mines of considerable size, that more or less smoke does not make any difference anyway; and quite likely will result in the lack of that hearty coöperation which is necessary to the entire success of any plan.

Old mines that have been accumulating dust for years would seem to require more careful treatment than those that have always had good ventilation; dust that has once settled will not be carried out by the same quantity and velocity of air as that in suspension.

While honest efforts resulting in improved conditions should certainly be looked upon with satisfaction, still at the same time they should not be considered good enough, merely because better than heretofore, or adjacent mines, or than State laws require. The stand should rather be taken that the best that can be done is not good enough, if one may so express it; this will doubtless seem an extreme view to many, and unwarranted particularly in non-gaseous districts, yet on the other hand it would seem justified from the recurrence of explosions, often in up-to-date districts, some times without well explained or understood causes.

Owing to the unfortunate disaster that has just occurred in this district, it is necessary to state that I am only recently in the employ of the Pocahontas Consolidated Company, and have no connection with the Pocahontas division of the company. It might also be well to say that I have never been inside the Pocahontas mine where the disaster occurred, and no statements made by others in connection with this explosion have had any bearing on the above subject matter, which was practically complete at the time of the disaster referred to.

Anthracite in Russian Territory

Consul Alexander Heingartner, of Riga, reports that large deposits of anthracite coal have been discovered in the Russian territory of the Orenburg Cossacks.

The depth is only 56 in. and the vein extends about 133 miles north to south, and at about the same distance in a southerly direction from the great Siberian railroad. The great value of this discovery lies in the following facts:

(1) The proximity of the coal fields to the Ural iron and steel industry, which is at present mainly dependent upon wood and charcoal for fuel, and therefore otherwise incapable of a further expansion. (2) In view of the probable early exhaustion of the south Russian iron-ore mines, estimated to take place in about twenty to thirty years, the Ural district is destined to become the largest producer of iron and steel in the Russian Empire. (3) The discovery in the neighborhood of the coal fields of deposits of brown hematite.

Scarcity of Labor in Chile

Consul Alfred A. Winslow, of Valparaiso, reports that the labor question in Chile is becoming a very serious matter, and one that is keeping back the development of the country along all lines.

There is a great lack of laborers, both in the city and in the interior, and because of this workmen demand very high wages and are so independent that in many cases they are of little service. There are no labor organizations, but workmen are so scarce that anyone who wishes to work can demand and obtain almost any price. Common laborers have been paid 8 and 10 pesos per day, which means from $2.40 to $3 United States gold. The usual wage is from 5 to 6 pesos ($1.50 to $1.80) per day, and skilled labor in proportion. Even at these prices it is impossible to get enough men.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

As a general rule, mine superintendents prefer not to use a portland cement which begins to set in less than 30 min., or which sets hard in less than three hours.

In calculating brick work, it is well to remember that an ordinary brick will weigh 4½ lb. In a general manner, it may also be considered that 1 cu.ft. of common brick work will weigh 125 lb.

The addition of one or two per cent. of sulphate of lime to any Portland cement is sufficient to change the time of setting from a few minutes to several hours. When a cement has been made slow setting by the addition of sulphate of lime, it will become quick setting if mixed with a solution of carbonate of soda.

It is generally believed that the end of the pipe connecting to a water-gage gives the best results when it is placed at right angles to the air current. Some authorities advocate covering the end of the pipe loosely with a roll of felt, and inserting a wooden plug at the top; this causes the air to pass through the cloth, and enables the observer to secure better results.

In developing a mine, many engineers neglect to use proper care in turning off their cross entries. It is probable that eight out of every ten mine engineers will place their centers for driving the cross entry at right angles to the main haulway. This necessitates shaving the rib, and even then too sharp a curve is made for the trip to successfully travel. Most satisfactory results will be obtained if a specified curve with a 63-ft. radius is used in turning off each of these cross entries.

Experiment has shown that where coke is made in a bee-hive oven, and the smoke and gases given off during the burning pass from the oven into a main flue and are drawn under boilers to generate steam, the heat given off from these ovens will evaporate about 20 gal. of water per hour. The number of ovens necessary to feed one boiler is largely dependent on the quality of the coal and other local conditions; however, it may be generally taken that from 18 to 35 ovens will provide for one boiler.

Three-throw pumps have met with considerable favor and are now largely used in mine work. They consist of three ram pumps placed side by side on one bed and driven by connecting rods from three cranks, which are arranged on one shaft and set at an angle of 120 deg. with each other. Among the advantages claimed for this style of pump, it may be stated that the strain on the driving shaft is kept almost uniform, and the delivery of the water nearly constant. It is also possible to drive these pumps either by electricity or by wire rope.

As a general statement it may be said that 1 cu.yd. of rock, when broken, occupies 1.8 cu.yd. of space; also, 1 cu.yd. of earth, when broken, occupies 1.2 cu.yd. of space. Rock would therefore require 50 per cent. more loads to haul a given volume, measured in place, than the same amount of earth. At the present rate of pay it costs from 7 to 12c. to load 1 cu.yd. of rock into a cart. Similar experience has shown that the cost of loading earth into a cart varies from 5 to 7c. per cubic yard.

Blown-out shots are a source of great danger to coal miners, and numerous precautions should be observed to eliminate the possibility of such an accident. It is advisable, wherever possible, to see that the drill hole does not exceed the depth of under-cut. It is also best to have the hole pointed slightly upward, because all charges when fired have a tendency to rise, and a hole drilled in this matter will not require as much tamping. It is also advisable when shots are fired to have the room or entry in the vicinity thoroughly wet so that dry dust will not be raised and ignited.

It is sometimes impossible to investigate a coal seam by any other method than drilling. In such a case, the bore holes will accurately show the depth of the seam and furnish a core from which the quality of the coal may be determined. One difficulty, however, presents itself when such prospecting is carried on; this consists in finding the true thickness of the seam when the bed is inclined. The angle of dip must be first ascertained, and this often necessitates the drilling of several holes. When the pitch of the vein is known, the thickness is determined by multiplying the distance bored through by the cosine of the angle of dip.

In supporting the roof of an inclined seam, the props should neither be set vertically, nor at right angles to the dip of the vein; but rather at an angle slightly less than at right angles to the dip of the seam. This method is preferable because the tendency of the roof is to slide down hill, and if the prop is set as here suggested, the slipping of the roof will tend to drive the support into a line at right angles to the dip, which causes the timber to tighten and afford greater support.

In a mine where considerable timber is used, the economical gain resulting from the systematic drawing of props after the coal has been mined, not only results from the fact that such timber can be used again, but has the further advantage of causing the roof of the seam to settle more steadily and regularly on the gob. The practice of carelessly neglecting to withdraw timber may cause a sudden settling which sometimes results in a squeeze, or has some other disastrous effect.

There is a special art in sharpening and tempering miners' tools. In sharpening any piece of steel, the tool should not be heated to more than a blood color, and no further along its length than is absolutely necessary; it should then be hammered lightly and quickly until quite black. After this process of sharpening has been completed, the tool should be allowed to cool down before it is tempered. In hardening a pick or other similar instrument, the tool should not be heated farther up than 1 in. from the point, and should then be dipped into cold water for about ¾ in., leaving ¼ in. still at red heat. After filing the edges of the tool so the metal will be exposed to the atmosphere, the heat remaining in the top part gradually passes toward the edge, causing various colors to successively appear, varying from a faint yellow through brown and purple to a full blue color. If the article is plunged into water when the first color appears, the hardest temper will be secured; if it is plunged into water when the blue color appears, the metal will be softer and will permit a little bending before any fracture takes place.

In a mine or other operation where it is necessary to deposit concrete under water, there are many difficulties encountered in performing such work. Under no circumstances should the superintendent ever allow the concrete to fall through the water; even a drop of a few feet causes the material to rearrange itself and settle with the heaviest part, such as the gravel or broken stones, at the bottom. In lowering concrete through water, a V shaped box is often used; this apparatus is so built that by a lever or rope arrangement, one side of the box will swing loose and permit the concrete to deposit on the bottom. Another method, where the water is not too deep, is to have a long box or tube which is filled with concrete, then lowered in the water, and the bottom caused to open by means of a mechanical arrangement, allowing the concrete to gradually run out, while at the same time, a new supply is shoveled into the top of the tube. Other popular methods for building concrete in water is to place the mixture in paper bags which break and allow the material to run together; also cloth bags are used with much success, the cement oozing through the cloth and forming a solid mass.

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The Santo Domingo Gold and Copper Company

It is unusual to hear of a promoter who publicly admits that he was mistaken as to an enterprise to which he had invited and accepted subscriptions; and on top of that offers to refund the money. Consequently the course of A. O. Brown & Co., a New York Stock Exchange house, in doing those things in connection with the Santo Domingo Gold and Copper Company, has received great applause, mingled with some astonishment. We should be the last to decry the merit of their action, but may be permitted to point out that they would have displayed a finer sense of honor by causing an adequate expert examination of the property to be made before they undertook its promotion.

The affair is a fine example of opera bouffe in mining. The promoters were gulled into the belief that several square miles of territory contained payable dirt, uniformly all over. No engineer was sent out to verify that idea. This was deemed unnecessary in view of the fact that Tom, Dick or Harry could dig at random and pan out the gold. The preliminary investigations were apparently of that character. After the company had been organized its sponsors smelled a rat and caused a competent investigation to be made, in consequence of which the directors decided to suspend development, and A. O. Brown & Co. sent out a circular letter to their subscribers of the purport stated above. Probably it was a job of "salting" that caused the mischief.

It is a pity that the honest promoting firm, even in its inexperience, cannot acquire the rudimentary precept that the time to employ an engineer is before, not after. We have no special admiration for the blunderer, who repairs, if he is able, the damage for which he is responsible. Even the clear-sightedness which avoids obvious blunders is no cause for admiration. In promotions of mines, or anything else, the highest moral obligation is fulfilled in making the most thorough investigation that common-sense requires before asking the public to come in. This is partly what the promoter's profit is supposed to stand for. The firm of A. O. Brown & Co. has learned this lesson at the cost of profound humiliation and doubtless of considerable money. But how many will profit from it? It was only last summer that the Fresno Copper Company was duped through the same failure to employ an engineer to advise before parting with its money, as was extensively commented upon in the JOURNAL. However, having failed to profit from that recent experience, not to speak of many previous ones, A. O. Brown & Co. certainly did the next best thing.

Coal Dust as a Factor in Mine Explosions

Although there has been a general discussion concerning the action of coal dust in many of the recent explosions, the investigations so far made have failed to give a clear understanding of this subject. That coal dust has been the main explosive force in many disasters is no longer doubted; nor do we now believe that gas must be present to propagate such an explosion.

The most difficult part of the coal-dust problem is to discover what elements must necessarily be present in a coal to make the dust dangerous. Some experiments have been carred on with this end in view, but the results obtained have not been particularly enlightening.

We know, of course, that a dust, to be dangerous, must be dry, finely powdered and present in a considerable quantity. Coal-dust explosions are more likely to occur in winter than in summer. This is due in part to the fact that the temperature in the mine is then higher than the outside temperature, and the mine air, when it enters the workings, becomes warmer, and, as a consequence, its capacity for holding moisture in suspension increases as the temperature rises. This causes the air currents to absorb the moisture found along the entries and dries the coal dust that is present.

A discouraging feature that has attended all investigations of coal dust is the inability to form any general fixed rules that can be relied upon to determine the characteristics that make a dust dangerous. It would naturally be supposed that the chemical composition of a coal would lead to a satisfactory solution; it has been found, however, that the composition of a coal will not determine its degree of inflammability or the extent to which it will aid an explosion.

Hard, compact coal will give less dust than crumbling friable coal, and as a result more dust will usually be found in a

...where the coal is of the latter class. It is also sometimes stated that coal must be high in fixed carbon to form a dust that will enter seriously into an explosion. This theory has not been generally proved, and according to the investigations so far made the results tend to show that in some instances a coal dust with a less carbon content has exploded more readily than where the coal was high in carbon.

The subject is of such importance that it deserves special attention from those who have the opportunity to carry on investigations. The fact that physical characteristics, rather than chemical composition, is the essential point, makes the problem rather uncertain and invites the serious attention of technical men.

Mining Stocks on the New York Stock Exchange

The movement to list mining stocks on the Produce Exchange has stimulated the New York Stock Exchange to action. We understand that a committee has been appointed by the latter, or will be appointed, to consider the creation of a mining department. Apparently being determined to forbid any relations between its members and other exchanges, and recognizing the extensive interests of its own members in the curb market, the leading exchange could hardly do less than make this tardy admission that good mining stocks are a meritorious class of security. The wonder is that it has not awakened to that fact long before this, especially inasmuch as it has had on its own list for a long time such stocks as Anaconda, Federal, Homestake and Ontario.

If the plan now under consideration is consummated, it will doubtless include these features: The submission of reports by reputable engineers as to the property for which application to list may be made; the right to make independent examinations by engineers of its own appointment; and the filing of quarterly financial reports and monthly reports of operations. If carried out on the above basis, which other exchanges like the Boston and the Produce would be sure to adopt, mining securities would increase greatly in the public estimation and the public would gain a powerful protection in learning to discriminate between the companies that could pass inspection, and those of a different character. Some companies might under these circumstances be forced to change from the unlisted to the listed class.

The Price and Production of Copper

The reason for the present extraordinary price for copper is easily determined. The production of North America in 1906 was only 3.2 per cent. in excess of the production in 1905, while consumption increased at a considerably greater rate (just how much it is not yet possible to say), and at the beginning of 1906 the American market was bare of stock of refined metal, except the comparatively insignificant quantity that is always necessarily on hand.

The present outlook is for a prolonged continuance of the high level of price. Consumption shows no diminution, so far as can be judged from trade reports, and there is no great prospective increase in production. Arizona and Michigan both produced in 1906 to their full limit. Montana cannot do much more until the new smelting capacity, now under construction, is completed. Utah is troubled by the smelter-smoke question, and the new dressing works will hardly be completed before midsummer. The Balaklala, of California, will scarcely be producing before that time. Ely, Nev., will not begin to produce until 1908. Alaska will probably show a considerable increase in production, and Idaho will forge further ahead. At present there is no good ground for forecasting a larger percentage of increase in 1907 than there was in 1906.

In 1908, when the disseminated ores of Bingham, Utah, and Ely, Nev., will be yielding copper, when Shasta county, Cal., will be producing at its maximum, when the smelting capacity on the Pacific coast will be greatly increased and larger supplies of ore will be coming from Alaska, we may expect an important gain in the production; but who can say what the consumption will be then?

We believe that during the next ten years the copper of Alaska is going to be a great factor in the production. The reports of reliable engineers on its deposits, with which we are conversant, are strongly optimistic. According to the statistics which we published Jan. 5, the production of Alaska increased from 4,703,600 lb. in 1905 to 6,250,000 lb. in 1906. However, its full credit, inasmuch as much of its ore goes to Vancouver Island smelters and appears in the Canadian production. Making [illegible] Alaska in 1906 was about 8,000,000 lb.

Dr. Charles D. Walcott

Dr. Charles D. Walcott, director of the United States Geological Survey since 1894, was chosen secretary of the Smithsonian Institution on Jan. 23, at the annual meeting of the regents. The election of Professor Osborn to the position was announced some time ago, but he was unable to accept it. Dr. Walcott has had charge of the Geological Survey for some twelve years, and leaves it in excellent condition. During his term the work of the Survey has been greatly extended by the addition of the irrigation and water investigations, but it has met the increase promptly and creditably. His administration has been thoroughly successful from the beginning.

In Connection with the smelter smoke problem, it is interesting to note that the Steptoe Valley Smelting and Mining Company, which is now building an immense plant at McGill, Nevada, 14 miles from Ely, to smelt the ore from the latter camp, has acquired eight square miles of territory, together with the water right of the entire section, the object of securing this large area being to prevent the possibility of any damage claims arising from a smoke nuisance or the pollution of water. This certainly is a wise plan, especially where land can be secured so cheaply as in that section of Nevada. The Steptoe Valley company is jointly owned by the Cumberland-Ely and Nevada Consolidated companies.

All of the readers of the Journal will congratulate Lewis E. Aubury upon his reappointment as State mineralogist of California. He was originally appointed for the term of four years in 1901, but has held over nearly two years. He has now been named to serve the remainder of the unexpired term. Under Mr. Aubury's administration the excellent State mining bureau of California has been made an active and useful agent in promoting the best interests of the mining industry of that State to a greater extent than ever before. It is pleasant to know that he will be able to continue the good work which he has inaugurated.

THE PRODUCTION OF COPPER IN ARIZONA DURING 1906

Operations in the Various Districts—Output of the Chief Producers

BY JAMES DOUGLAS

The production of Arizona during 1906 has, if anything, exceeded anticipation. The increase has been attributable to legitimate expansion of operations, rather than to illegitimate pressure upon the mines to meet the extraordinary demand for copper. The surplus has come mainly from the Warren district, and from miscellaneous sources. The Copper Queen mine production, treated at the large Douglas smelter, or shipped to Globe as sulphur ores to aid in matting the oxidized ores of the Globe district, exceeded last year's production by approximately 18,000,000 lb. The production of the Calumet & Arizona smelter was also approximately 12,000,000 lb. in excess of that of 1905. This excess was contributed in part by other mines than the Calumet & Arizona, controlled by the same group of owners, and which became active producers during last year. Their output—with that of still other mines of the same group—will during the coming year contribute to increase the output of the Bonanza properties. While the Copper Queen mine may not increase its own production during the coming year, not only will the Calumet & Arizona group yield more copper, but some other companies in the district will enter the active list, and continue to make the Warren district lead during 1907, as it has done during 1906, though probably not quite to the same extent.

The Clifton district would during the past year have exceeded its actual production had it not been for the serious floods in early December which disabled all the works in the district for a time. As it is, however, the district produced about 5,000,000 lb. more of copper than it did in 1905. The United Verde likewise increased its production, and the Globe smelter has turned out 8,500,000 lb. of copper in excess of the previous year. Of the Globe [illegible] was from Mexican ores or mattes, secured primarily for their sulphur contents. The quantity of sulphur, however, derived from the ores of the Globe district is increasing so rapidly that the prospects are that within a twelvemonth Globe will be independent of imports for its supply. One of the large veins under the Buffalo hill has recently been struck, in drifting from the Gray shaft of the United Globe mines, which [illegible] a notable amount of the precious metals. The Continental group of the Old Dominion Company is producing more copper and [illegible] lower levels of the Old Dominion mine likewise are also producing sulphur ores in such quantity as to warrant the prediction that, with ore coming from the Arizona Commercial and other local mines, the coming year will relieve the district of the necessity of looking to foreign sources for any ingredients of its furnace mixture.

In addition to these old standard sources of supply the Helvetia Company has been producing; the old San Carlos Copper Company, now reorganized as the Saddle Mountain Mining Company, has been running intermittently and producing a considerable amount of matte, and the smaller mines of Yavapai county, stimulated by the facilities offered by the Humbolt smelter, have yielded more copper than the county ever before supplied from these secondary sources.

Adding together the increased production from the old and these contributions from new mines, the territory has helped to meet the excessive demand of the world for copper by increasing her output from 223,000,000 lb., in 1905, to approximately 265,000,000 lb. in 1906.

The furnace capacity of the Southwest has undergone increase during the past year, and plans are suggested for further augmentation during the coming year. The Copper Queen smelter at the present time consists of ten furnaces, and an increase is contemplated of one additional furnace 54 ft. long. The Calumet & Arizona smelter, it is understood, intends adding two new furnaces to its present plant of five, and the Old Dominion has or will add two additional furnaces. The Detroit Copper Company is remodeling its converting plant. The new concentrator of the Arizona Copper Company was put into commission in July last, and the Detroit Copper Company's enlarged concentrator has been in full operation for several months. The Saddle Mountain Mining Company, as already stated, has become an independent producer, but the most important addition to the metallurgical equipment of the territory is the new Humbolt smelter on the Agua Fria, provided with both reverberatory and cupola furnaces.

A reverberatory furnace has been running steadily at the Detroit Copper Company's works, at Morenci, receiving the slag continuously from the cupola settler and melting the flue-dust. The results have been, from both a technical and an economical point of view, very satisfactory, reducing the copper in the slags approximately one-tenth of one per cent., while the total cost of operations has been somewhat less than would have been the cost of briquetting and smelting the 6000 tons of flue dust which have been treated. The fuel employed has been crude oil, and the experiments have been directed to the best method of adding the flue dust to the stream of liquid slag as it enters the furnace from the settlers. If inserted by the barrow or carload, though it is rapidly melted down, it creates a superficial layer of slag, which, though liquid enough to flow, is more silicious and higher in copper than the lower strata, with which it can be mixed only by violent agitation. The method involving least labor and the most perfect mixture is by allowing a stream of flue dust to strike the jet of incandescent gas; but the corrosive effect on the roof of the furnace of the dust thus created increases the cost of repairs. Experiments looking to the treatment of fine concentrates by throwing them upon this bed of liquid slag indicate that a very rapid process of liquation proceeds, the sulphides in the concentrates melting immediately, and desending through the liquid slag, leaving infusible silicious shells upon the surface which tend to form accretions on the walls of the furnace, as well as a stratum of highly silicious slag. Where, however, it is desirable to save the sulphur contents of the concentrates, no better method could probably be adopted of reducing to a minimum by volatilization the sulphur contents, while making a low-grade matte for subsequent treatment in the cupola. The percentage of costs chargeable to reversibility during the year has been as follows:

	Per Cent.
Fuel oil	73.11
Labor	17.35
Repairs	8.85
Shop expense	.42
Water	.21
Light	.16
	100.00

The furnace is 50 ft. long; the heat of the gases in the combustion chamber is 1400 deg. F., and at the flue end 1210 deg. F. A boiler to generate steam is being erected, and the economy which will result from the utilization of the escaping gases has therefore not yet been determined, but will notably decrease the cost of furnace treatment.

No radical changes have been made in mining. The Arizona Copper Company has introduced underground electrical traction, and the Copper Queen is planning to concentrate all its ores at the new Sacramento shaft, to use a skip, and then by a belt conveyer to distribute to a train of cars the ores from every section of the mine, thereby securing a more perfect smelting mixture than is now obtained. But at the Cananea

mine the caving system so successfully used in the lake iron mines has been adopted.

The mining and smelting operations during the latter months of the year have had to struggle with the same conditions that have beset nearly all the industries of the country—scarcity of fuel, scarcity of labor, and frightful congestion on all the railroads serving the territory. The cessation of the fuel-oil supply from both Texas and California necessitated a sudden return to coal, and strained the only accessible coalfields to the utmost in meeting the exigency. The increased demand nearer home for Colorado and other Western cokes has obliged the smelters of the Southwest to rely largely for their coke supply on Eastern sources, which, under existing railroad conditions, were only able to forward it with precarious uncertainty. But all the interests, appreciating the adverse conditions arising from excessive prosperity, have borne with commendable patience and resignation the slight evils to which they have been exposed in consideration of the benefits which prevailing high price of their product has conferred.

The Tin Market in 1906

More than ever before in its history, tin was used as a football by speculators in the London market, as well as in New York, during 1906. It was comparatively easy to create a bull or bear position as the available supplies were closely concentrated in a few hands. As the production, at least so far as the East Indies were concerned, did not increase, while the consumption showed remarkable expansion, no stocks of consequence were accumulated during any part of the year. This fact assisted materially in making manipulations of the article at the different exchanges an easy one. The consequence was an excited and exaggeratedly high market when the bulls had the upper hand, and a rapid decline in prices when the bears were victorious.

On going in detail into the market situations as the year developed them, we find that at the beginning of 1906 spot tin was selling at 36c. per lb. It fluctuated between this and 37c. per lb. until toward the end of March, following closely quotations received from London. In April a shortage of spot supplies became acute and a corner instituted in the same proved so effective that toward the middle of May owners of small available stocks were able to drive prices up to 48c. and 50c. per lb. During that time a large quantity of Chinese tin was brought into this market and consumers who had never before dared to use anything but prime Straits or Malacca tin were only too glad to have an opportunity to replenish their supplies by acquiring some of this lower-grade Chinese tin.

Fortunately, this corner did not last very long, but was followed during the last week of May by a slump which brought prices down by about £30@35 in London and from 6@8c. in this market. The market held steady at this level during the month of June and the beginning of July, at which time spot tin was selling for from 39@39¼c. per lb. July again witnessed a rather bad break in London and simultaneously in this market prices touched 36c. Prices righted themselves during the month of August and retained a level of 40½@41½c. per lb. until the end of September. During October the bull party in the London market had everything its own way and prices held around 43@43½c. When, notwithstanding the firm and high market, large orders from American consumers failed to materialize, and it was even found that one of the largest consumers of tin in this country was re-selling some of its purchases in the London market, the influence on that market was rather depressing. Prices settled gradually into a lower level and closed the end of the year at 42c.

Developments in the different producing centers of tin during 1906 showed that no increase need be expected in the Straits Settlements. While some of the mines there are petering out entirely, a great many others are running on leaner ore and prospecting work in new directions is not being done by the Chinese. Production in the Dutch colonies is continuing at the regular rate. There should be a large increase in the output of Bolivian tin, and as soon as the necessary railroads have been built in that country an increased tonnage ought to be available for export. The high prices for tin have also had a stimulating effect on tin mining in Wales and also in some parts of Saxony, Germany, where, however, the production at best is not large.

So long as the output of this important metal is, comparatively speaking, limited and handled to a large extent through London brokers, the disturbing element of wild speculation cannot be eliminated.

Ores of the Cripple Creek District

The characteristic feature of Cripple Creek ores is the occurrence of the gold in combination with tellurium and chiefly as calaverite. This peculiarity is pointed out by Messrs. Lindgren and Ransome in their report on the Cripple Creek district which the United States Geological Survey has published recently as Professional Paper No. 54, "Geology and Gold Deposits of the Cripple Creek District, Colo."

Native gold is present at Cripple Creek in the unoxidized ores only as a rarity. Pyrite is widely distributed in the country rock and also occurs in the veins with tellurides. Galena, sphalerite, tetrahedrite, stibnite, and molybdenite are sparingly present. Among the gangue minerals quartz, fluorite, and dolomite prevail; celestite is also often present, but is frequently changed into quartz. The ore occurs chiefly as filling of narrow fissures and consequently the ores as mined have the approximate composition of the country rock. The average tenor of gold in the ores is about $30, or 1.5 oz. per ton, and at various mines ranges from 1 oz. up to 3 or 4 oz. Ore with less than $12 per ton is rarely mined. Small amounts of ore with up to 2500 oz. of gold per ton have been mined. The pyrite is rarely auriferous except when admixed with tellurides. The ores contain on an average only about 1 oz. of silver to 10 oz. of gold. In some mines the proportion is very much less. Small shipments have been made of tetrahedrite ore rich in silver.

The tenor of the ore as mined has decreased somewhat in the last 10 years, but this is probably mostly due to lowered operating and reduction expenses.

A Great Smelter Stack

SPECIAL CORRESPONDENCE

The Boston & Montana Mining Company has let a contract for the erection of a stack at its smelter, 506 ft. high, 500 of which will be above ground. The Alphonse Custodis Chimney Construction Company, of New York, will do the work, and must finish it by Nov. 1 of this year. The cost will be about $200,000. The stack will be circular in cross section, and will have an inside diameter of 50 ft. at the top and 75 ft. outside diameter at the bottom. Its weight will be 16,600 tons. It will be made of perforated brick, which will be manufactured on the ground and designed to fit the curvature of the circle. The stack at the great Washoe plant is only 300 ft. high and 2,200,000 common brick were used in its construction. If this class were used in the new chimney, 5,700,000 would be required. The top of the stack will be 742 ft. above the blast-furnace charging floor, and 320 ft. above the top of the present stack. A flue 1800 ft. long will connect the furnaces and stack, 1450 ft. of which will be 48 ft. wide and 20 ft. high, while about 350 ft. will be 175 ft. wide and 20 ft. high. The latter section will be the dust chamber. The stack will have 2¾ times the capacity of the Washoe chimney. The object in making it so large is to be prepared for any increases that may hereafter be made in the capacity of the smelter, which was designed originally for 1000 tons a day, but is now treating 3000 with another addition of 1000 tons authorized.

A syndicate is in course of formation with the object of continuing operations in connection with a discovery of petroleum in the district of Hope Town, Cape Colony.

New Publications

Madison. Fourth Edition (1906-7). Pp. 770, with maps and plans. 5x8 in.; cloth, [illegible]

"Geological Survey of Canada, Section [illegible]" By Drew. Ingall, Chief of Section. Pp. 162. 6½x10 in.; paper. Ottawa, Canada: Pub-[illegible]

"Thirty-first Annual Report of the Chief Inspector of Mines of the State of Ohio; [illegible] Chief Inspector of Mines. Pp. 440. 6x9 in.; paper. Columbus, O.: State Printers.

"Geographical Dictionary of Alaska." Second edition, 1906. By Marcus Baker. Being Bulletin 299, United States Geological Survey. Pp. 688, 6x9 in.; paper. Washington: Government Printing Office.

"The Area of the United States, the States and the Territories." By Henry Gannett. U. S. Geological Survey, Bulletin No. 302. Pp. 9 and 1 map. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Report of the Mine Inspector for Indian Territory to the Secretary of the Interior for the Year Ended June 30, 1906." By William Cameron. Pp. 58. 5½x9 in.; paper. Washington, 1906: Government Printing Office.

"Report of the Chief Inspector of Mines in India, Under the Indian Mines Act (VIII. of 1901) for the Year Ending Dec. 31, 1905." By W. H. Pickering, Chief Inspector of Mines. Pp. 67. 8½x13 in.; board covers, 12 annas or 1s. 2d. Calcutta, 1906: Office of the Superintendent of Government Printing.

"Third Report on the Geological Features and Mineral Resources of the Pilbara Goldfield, Western Australia." By A. Gibb Maitland, Government Geologist. Western Australia Geological Survey, Bulletin No. 23. Pp. 92, with 7 geological maps and 13 figures. 5½x8½ in.; paper. Perth, 1906: Fred W. Simpson, Government Printer.

"Combustion and Smokeless Furnaces." By Jos. W. Hays. Pp. 104; illustrated. 6x9 in.; cloth, $1.50. New York, 1906: Hill Publishing Co.

Contents: Heat and combustion. Combustion and boiler furnace. Combustion and steam boiler. The chimney evil. Smokeless furnaces in general. Mechanical stokers. Hand-fired furnaces. Some conclusions.

"Hints to Practical Users of Tool Steel." By Arthur Balfour. Pp. 60. 4½ x7 in.; paper; Sheffield, England; Seebohm & Dieckstahl, Ltd. New York and Chicago: George Nash & Co.

Though issued in the interest of a steel firm, this little book is more than a trade catalog. It contains practical rules and directions for the working and use of tool steel, which ought to be of service to toolmakers and others, including users of drills.

"Mortars, Plasters, Stuccos, Artificial Marbles, Concretes, Portland Cements and Compositions." By Fred T. Hodgson. Pp. 520; illustrated. 5x7½ in.; cloth. Chicago: Frederick J. Drake & Co. Price, $2.

The title of this book is comprehensive enough to indicate its contents. It is a compilation intended as a handbook on the use of plasters and cements in building of all kinds. After a general treatise on cement materials and the composition of the various plasters and concretes, it treats of their uses and the methods employed with them in building and decoration. A great deal of space is given to concrete, and its various uses, and to reinforced concrete construction. It is condensed, but comprehensive, and is intended for the use of practical men, who will find it of much service in their work.

"Mining and Engineering and Miners' Guide." By Henry A. Gordon. Pp. 615; illustrated. 6x9½ in.; cloth; 10s. Wellington, N. Z., 1906: John Mackay, Government printer. London: Eyre & Spottiswood.

This work, which was originally published as the "Miner's Guide," has proved so useful that it has been expanded into a general treatise on mining engineering, especially in connection with gold mining, lode and placer. The author was formerly inspecting engineer of the Mines Department of New Zealand, and is a past-president of the Australasian Institute of Mining Engineers. Everyone who is familiar with the excellent "Miners' Guide" will be glad to have the present work. The fact that it is the third edition manifests the general appreciation that it has met with. Many new chapters have been added and the old ones have been considerably amplified. American engineers will find much that is of service in this work, which has achieved such great popularity in Australia and New Zealand, where it is best known.

"Producer Gas." By J. Emerson Dowson and A. T. Larter. Pp. 295; illustrated. 6x8½ in.; cloth, $3. New York, 1906: Longmans, Green & Co.

Contents. Theory of producer gas. Furnace work. Heating work. Engine work. Suction plants. Gas from bituminous coal for engine work. Stand-by losses. Comparison of gas and steam power. Fuel. Analysis of fuel and of producer gas. Calorific power of solid and gaseous fuels. Practical notes. Appendices.

Dowson is one of the famous names in the history of gas-firing, and consequently this book will be heartily welcomed. The joint authorship gives it a certain peculiarity of appearance. The preface is signed by Mr. Dowson alone, and in it he states that he could not have undertaken the preparation of the book without the help of his assistant, Mr. Larter. In the text the first person singular, first person plural, and the third person "Mr. Dowson" are severally used. However, this is an immaterial matter.

The book is distinctly the treatise of an engineer, rather than of the pedagogue, and therein differs from much of the work in the literature of gas-firing. Yet for that very reason it has certain disappointments, especially because it fails to go into the question of costs, as is the case with all the other works on this subject that we know. The great economy of gas-firing in respect to coal consumption is well known, but as in the comparison between the steam engine and the gas engine, that is only part of the story. The comparison to be complete must start with the first cost of plant and must include operating costs other than fuel consumption. Everyone is well aware that there are conditions wherein it is more profitable to waste coal than to install gas-fired regenerative furnaces, in spite of the great fuel economy of the latter. An exhaustive analysis of that phase of the subject remains to be presented.

However, there are many furnaces in connection with which gas-firing and the principles of heat recuperation can be applied at only a small increase in first cost and with unquestionably great advantage. Mr. Dowson's descriptions of some of these are particularly useful. We regret that he did not see fit to go further into the details respecting them. In this connection we read with some surprise that the system of counter-current recuperation, originally introduced by Gaillard and Haillot is followed in nearly all modern recuperative gas-heated furnaces. Mr. Dowson remarks: "This not only simplifies the working of the furnace and materially reduces the risk of explosions, but lessens also the cost of construction and the ground space required." We agree with the first part of this, but should qualify the latter part. Moreover, we should add that, at its best, counter-current recuperation is not quite so efficient as reversing in respect to utilization of heat units, and it involves serious structural difficulties in keeping the joints of the flues tight under the severe expansive conditions of a high-temperature furnace.

But it is not our purpose to be captious. We consider the present work to be one of the most practically useful in its subject of any heretofore published, and have pleasure in recommending it to the attention of engineers and metallurgists. It goes extensively into the use of producer gas in internal-combustion engines, which indeed occupies a large part of the book. The printing of the latter is good, but the engraving might have been better. A good index concludes this valuable addition to engineering literature.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

The Carmichael-Bradford Process

Referring to your editorial in a recent issue, and to the letter from R. Anstee, I take it that, though he does not explicitly say so, Mr. Anstee intends to refer to the "direct decomposition of the gypsum" (or rather of the anhydrous $CaSO_4$ which has resulted from it) by the silica and silicates present in the charge. It has seemed to me also that in your editorial you had missed, or at all events had failed to emphasize this point.

In discussing the reactions and final results of the three processes in the "lime roasting of galena," it is necessary to keep in view the cardinal point that none of them can obtain the desired final product without the presence of a certain amount of silica in the charge. Whatever may be the course of the reactions during the earlier roasting periods of the processes, the final stage consists in the more or less complete slagging of the materials with the decomposition of sulphate brought about by the formation of silicates. During this stage calcium sulphate undergoes this decomposition equally with lead sulphate, giving its share of sulphur dioxide to the gases, and this has nothing whatever to do with any reactions which may or may not have occurred earlier between PbS and $CaSO_4$.

The Huntington-Heberlein process in the preliminary separate calcination produces $CaSO_4$ by means of part of the sulphur in the ore, another part of the sulphur passing away in the calciner gases. When the calcined charge comes into the converters there is thus, of course, less sulphur present than there was in the original ore. In the Carmichael process the $CaSO_4$ is added ready-made, and there is also no loss of sulphur from the ore due to preliminary calcination; so that all the original sulphur, plus all the sulphur of the gypsum used, will be theoretically available in the converter gases for the making of sulphuric acid, and hence the great advantage of this process wherever gypsum is economically available, in addition to the economy in original outlay on plant and in costs of preliminary calcination.

Regarding the discussion of the reactions which may take place in roasting (without fusion) when PbS and $PbSO_4$ are together, it seems to be quite certain that no decomposition of $CaSO_4$ alone takes place at any temperature with which these processes are concerned in practice. Also we know that $CaSO_4$ is easily reduced to CaS when heated even to a moderate temperature in contact with any carbonaceous material; and that CaS again is very easily and rapidly oxidized to $CaSO_4$ at a low temperature.

My own view is that when $CaSO_4$ and a sulphide mineral, say PbS, are heated together, the sulphide acts on the $CaSO_4$ at the point of contact in a manner similar to that of the action of the carbonaceous material, giving oxidation of the PbS, with local reduction of the $CaSO_4$ to CaS. In a current of air the CaS is re-oxidized, and this reduction and re-oxidation goes on continuously. Call this action catalytic or what you will, the result is that galena so treated oxidizes far more rapidly and at a lower temperature than when treated alone.

It is quite true that ferric oxide has the same action, but it is not so vigorous. In roasting rich, fine-grained galenas in long calciners I have found the use of a certain proportion of Fe_2O_3 so advantageous that in the treatment of many thousands of tons "blue billy" was purchased for the purpose and well repaid the cost; and I expect that many other metallurgists have had the same experience.

W. MAYNARD HUTCHINGS.

Newcastle-on-Tyne, Dec. 12, 1906.

Estimation of Zinc in Ores Containing Iron

The method for the estimation of zinc in ores containing iron described by your correspondent is 17 years old and has been used by the chemists of the Broken Hill Proprietary Company, Australia, for more than 10 years, as I know from experience. It seems odd that it should not be widely known in this country.

It is a good method for rapid work, but for buying and selling zinc ore it requires to be checked by the Schulz & Low method, using auranium salt as indicator.

It may interest your correspondent to know that the originator of the method was Voight, who described it in the *Zeitschrift fuer Angewandte Chemie*, year 1889, pages 307-308. It is also in Sutton's "Volumetric Analysis," not only in the new editions, but in the 1890 edition, in which it is given as follows:

"The solution of the substance in hydrochloric acid is oxidized with nitric acid and diluted to about 100 c.c. Sufficient potassic tartrate to keep the iron in solution is added and then ammonia *to feeble alkalinity*, and the liquid is further diluted to about 250 c.c. Standard solution of potassium ferrocyanide is then run in until a drop of the mixture brought into contact with strong acetic acid develops a permanent blue. The ferrocyanide is of suitable strength if 1 c.c. is equal to 0.01 gram of zinc. About 46 grams of the salt are dissolved and made up to 1 liter and the solution is standardized against one of zinc made by dissolving 12.461 grams of zinc oxide in hydrochloric acid and diluting in 1 liter. Ten c.c. of this solution mixed with 5 grams of potassic tartrate, a few drops of ferric chloride, ammonia and water to 250 c.c. should require 10 c.c. of the ferrocyanide. An essential condition is that the excess of ammonia should be as small as possible."

HENRY WATSON

Chicago, Jan. 9, 1907.

Tapping Water in Mines

The spirit of cooperation manifested in the article, "Tapping Water in a Mine," in your issue of Oct. 13, 1906, is to be commended. The man in charge was confronted with the risk of property loss and perhaps also of life. He frankly admitted that he desired the opinion of others. Such cases are rare and are apt to be dangerous because of errors in surveying or in working after surveying. To avoid these risks no company should be allowed to abandon any mine in which much development work has been done, without surveying and recording the last work done, and correcting all maps, etc. In tunnels passing under rivers, in hard ground, test holes should be kept ahead of the workings in order to prevent such disasters as we have heard of in holing into abandoned mines.

Two experiences of mine with cases of this kind may be of interest to someone who may be unfortunate enough to encounter similar difficulties. We had a shaft down 400 ft. at an angle of 70 deg., and from this we ran a drift on the vein 375 ft. Above was a shaft on a hill 240 ft. deep, and to connect with the drift we had to drive a crosscut 70 ft. into the hanging wall, then sink for a sump, and then to raise up to strike the shaft and unwater the old workings. It seemed risky and I had forebodings enough, especially after getting letters from the company admonishing me to be careful and to take no chances.

In order to perform the operation safely I built a bulkhead, first making a wall of

brick midway in the crosscut, and then [illegible] with concrete. A 4-in. pipe and valve were placed in the bottom to release the water in such quantities as the pumps below could dispose of.

When the raise was up to the desired hight, a dozen holes of different lengths, varying from 5 to 11 ft., were drilled and loaded, and the bulkhead was securely closed. The valve was shut off and everything put in readiness to press the battery. The only thing I feared was the concussion of the blast, which I thought might injure the bulkhead, drown our pump and fill the mine to an unknown depth. I knew that would be the result if we failed to knock through. Why did we not drill through and tap it that way? Because the character of the rock did not warrant that course.

The foreman left me to set off the blast. There were exciting minutes before a muffled sound announced success, to my great relief. Everything held intact, and I received the congratulations of my superiors. We drained the working above without any mishap whatever.

My other experience was not of so exciting a character. It was not unlike the case mentioned in your paper. I merely took what was near at hand, an 8-in. pipe (a 6-in. would have been quite as satisfactory), and attached flanges, a gate valve, and a clack of the ordinary form on the inside of pipe. The outer end was reduced by means of reducers to nearly the size of a drill rod. Inside of the pipe, between the clack and the reducer, we placed a mass of waste, so that if we were caught with the drill in the hole, it would act as packing. If we had time to withdraw the drill, we would plug up the reducer and let the clack act. This plan can be rigged so as to withstand any pressure.

T. S.

Patents Relating to Mining and Metallurgy

UNITED STATES

[illegible] following is a list of patents relating to mining and metallurgy and kindred subjects issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Dec. 25, 1906.

CRUSHING MACHINE—Morton G. Bunnell, Chicago, Ill., assignor to Western Wheeled Scraper Co., Aurora, Ill. Continuation of application filed March 28, 1900. No. 829,-100. This application filed Oct. 24, 1906.

PROCESS OF SMELTING IRON ORES—Gilbert Love Wheeler, Buffalo, N. Y. No. 840,126. Filed Dec. 26, 1905.

ZINC SMELTING FURNACE—William Langan, Iola, Kans. No. 839,160. Filed July 30, 1906.

APPARATUS FOR IGNITING PRIMERS IN METALS—Francis I. du Pont, Wilmington, Del., assignor to Du P. du Pont de Nemours Powder Company, Wilmington, Del. No. 839,194. Filed Nov. 8, 1906.

GRINDING-MILL—John C. Woodcock, Chillicothe, Ohio. No. 839,248. Filed June 11, 1904. Renewed Sept. 19, 1906.

APPARATUS FOR SEPARATING METALS FROM ORES—William Snee, West Elizabeth, Pa., assignor to John A. Snee, West Elizabeth, Pa. No. 839,329. Filed Apr. 3, 1906.

APPARATUS FOR DRYING AIR FOR METALLURGICAL PURPOSES—Giuseppe Cattaneo, Charlottenburg, and Julius Schlesinger, Berlin, Germany. No. 839,362. Filed Jan. 9, 1905.

GRAVITY SEPARATOR—William Hughes and James Thomas, Ravenrun, Pa. No. 839,387. Filed Dec. 5, 1905.

THEODOLITE—Peter J. J. R. Sorensen and Alfred C. B. Sorensen, Green Bay, Wis. No. 839,433. Filed Mar. 20, 1906.

TREATMENT OF PYRITIC ORES—William Blackmore and Alfred Howard, London, England, assignors to the T. R. Refractory Ore Syndicate, Ltd., London, England. No. 839,451. Filed Mar. 27, 1906.

PROCESS OF MAKING GAS—Hugo Dicke, Frankfort-on-the-Main, Germany, assignor to Jacob Eduard Goldschmid, Frankfort-on-the-Main, Germany. No. 839,459. Filed Sept. 27, 1901.

APPARATUS FOR WASHING BARYTES—William R. Macklind, Mineral Point, Mo. No. 839,493. Filed Sept. 8, 1906.

FURNACE—Martin V. B. Smith, New York, N. Y. No. 839,520. Filed Feb. 28, 1906.

IODINE PREPARATION—Emil Fischer, Berlin, Germany, assignor to Farbenfabriken of Elberfeld Co., New York, N. Y. No. 839,569. Filed Dec. 16, 1905.

ROCK-DRILL—Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. No. 839,-586. Filed May 31, 1904.

Published Week Ended Jan. 1, 1907.

ELECTROCHEMICAL APPARATUS—Frank A. Decker, Philadelphia, Pa., assignor, by mesne assignments, to Decker Electrical Manufacturing Company, Wilmington, Del. No. 839,816. Filed Mar. 9, 1905.

MAGNESIA CEMENT COMPOSITION—William L. Dudley, Nashville, Tenn. No. 839,820. Filed Aug. 17, 1906.

DRILL—George E. Eaton, Corning, N. Y. No. 839,824. Filed May 23, 1906.

DRILL-BIT FOR WELLS—Charles W. Guttzeit, High Bridge, N. J., assignor to Taylor Iron & Steel Company, High Bridge, N. J. No. 839,837. Filed Apr. 2, 1906.

AUTOMATIC DUMPING AND RIGHTING HOISTING-BUCKET—Walter T. Krausch, La Grange, Ill. No. 839,858. Filed Feb. 26, 1906.

INGOT-CASTING MACHINE—Nils H. O. Lilienberg, Philadelphia, Pa., assignor of one-half to Bradley Stoughton, New Haven, Conn. No. 839,861. Filed Mar. 14.

DUMPING-CAR—Alvin C. McCord, Chicago, Ill. No. 839,870. Filed Sept. 1, 1904.

GYRATORY CRUSHER—Jay B. Rhodes, Chicago, Ill., assignor to Austin Manufacturing Company, Chicago, Ill. No. 839,891. Filed Mar. 11, 1905.

GYRATORY CRUSHER—William A. Spring, Harvey, Ill., assignor to Austin Manufacturing Company, Chicago, Ill. No. 839,901. Filed Mar. 11, 1905.

DREDGE—George W. King, Marion, Ohio, assignor to The Marion Steam Shovel Company, Marion, Ohio. No. 839,934. Filed June 2, 1906.

APPARATUS FOR MAKING GAS AND COKING—Leon P. Lowe, San Francisco, Cal. No. 839,939. Filed May 3, 1904.

APPARATUS FOR RECOVERING FROM OIL ITS TARRY OR ASPHALTIC CONSTITUENTS, WITH GAS AS A BY-PRODUCT—Leon P. Lowe, San Francisco, Cal. No. 839,940. Filed July 6, 1904.

ELECTRIC FURNACE—William H. Bristol, New York, N. Y. No. 839,983. Filed Aug. 6, 1906.

APPARATUS FOR ERECTING AERIAL CABLES—Ralph S. Pierce, Chicago, Ill. No. 840,009. Filed Feb. 27, 1905.

CLUTCH FOR AERIAL ROPEWAYS—Giulio Ceretti, Milan, Italy. No. 840,109. Filed Dec. 13, 1905.

MEANS FOR SURVEYING BORE-HOLES—Hugh F. Marriott, Parktown, Transvaal. No. 840,148. Original application filed Aug. 30, 1904, Serial No. 222,776. Divided and this application filed Feb. 21, 1905.

PULLEY FOR PULVERIZING-MILLS—Geo. E. Rudnick, Iola, Kans. No. 840,162. Filed Aug. 13, 1906.

BOSH-PLATE—William D. Berry, New Brighton, Pa. No. 840,195. Filed May 25, 1906.

COAL-TIPPLE—James S. Pates, Monongahela, Pa. No. 840,248. Filed Oct. 11, 1906.

ROASTING OF PYRITOUS MINERALS—Giovanni Rambaldini, Miniera di Boccheggiano, Italy. No. 840,253. Filed Jan. 28, 1902.

SEPARATOR—Walter M. Cook, Ludlow, Vt., assignor of one-half to Christian M. Lauritzen, Chicago, Ill. No. 840,301. Filed Dec. 13, 1905.

METHOD FOR TUNNELING THROUGH ROCKS—Patrick Ford, Chicago, Ill. No. 840,307. Filed Dec. 26, 1905.

MINER'S GOLD-PAN—Thomas Hussey, Hollywood, Cal. No. 840,333. Filed Apr. 30, 1906.

ORE-SEPARATOR—Matthew R. Lyle, Oakland, Cal. No. 840,354. Filed Nov. 10, 1905.

CHEMICAL APPARATUS—Horace B. Snell, Jacksonville, Fla. No. 840,391. Filed Jan. 8, 1906.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Dec. 29, 1906.

ZINC OXIDE PROCESS—N. M. Ogle, London. Producing zinc oxide from ores by leaching out with sulphuric acid obtained by roasting the ores and roasting the sulphate of zinc so obtained with carbon. No. 24,238 of 1905.

HARDENING TOOL STEEL—S. N. Brayshaw, Manchester. In hardening high-speed steels, first heating in a bath to a temperature considerably above hardening point, then reducing the temperature in a bath to about hardening point, and afterward quenching in a cold bath. No. 25,004 of 1905.

PULP SIZING APPARATUS—J. M. Callow, Salt Lake City, U. S. A. Improvements in the structure of sizing machines for fine pulp, consisting of traveling belts of sizing cloth. No. 26,566 of 1905.

MINE CARS—J. H. Hollings, Sheffield. Improved locking device for coupling mine cars. No. 26,653 of 1905.

DRY AIR APPARATUS—A. S. Haslam, Derby. Improvements in the inventor's system of removing moisture from air used in metallurgical operations, consisting of preliminary cooling the air by passing it through ammonia refrigerating apparatus before passing it over chloride of calcium. No. 1665 of 1906.

ELECTRIC FURNACE—O. Frick, Saltzjobaden, Sweden. In electric smelting furnaces, dividing the operation into two parts, the melting being done in a preliminary chamber with a different type of current. No. 10,097 of 1906.

ELECTRIC DEPOSITION OF METALS—A. Ramen, Helsingborg, Sweden. In the electric deposition of metals, improved methods of making depolarizing solutions, so as to reduce the amount of current employed. No. 18,080 of 1906.

Published week ended Jan. 5, 1907.

CONCENTRATING TABLE—J. S. and P. Roddn, Redruth. A concentrating table formed in two sections with separate water supplies; the lighter sands being removed with first section and closer separation effected in the second section. No. 25,120 of 1905.

MAGNETIC SEPARATOR—W. Simpkin and J. B. Ballantine, London. Improvements in magnetic separators for concentrating iron ores, in which the revolving drum is of non-magnetic material, and the two poles are inside and outside the drum respectively. No. 25,748 of 1905.

PULP GRINDER—J. H. and J. M. Holman, Camborne. An improved grinding machine for wet pulp in which the grinding is effected between the muller and the vertical sides of the machine as well as between the muller and the bottom. No. 1406 of 1906.

TEMPERATURE INDEX—F. and H. F. Huntsman, Sheffield. For the purpose of ascertaining the temperatures of steels during the hardening process, arranging a series of different colored silks in sealed tubes colored to represent the various temperatures. No. 1969 of 1906.

COAL CUTTER—J. Elfert, Mulheim, Germany. Arranging coal cutting teeth in a wire cable, by means of which coal can be cut in large blocks. No. 7079 of 1906.

PROTECTING STEEL ARTICLES—C. S. A. Tatlock, Glasgow. For the purpose of coating steel articles with a protective coating of magnetic oxide, plunging the articles into molten nitrate of soda. No. 7757 of 1906.

METALLURGICAL PROCESS—Societe Electro Metallurgique Francaise, Froges, France. A process for manufacturing an iron with a minimum of carbon contents that may be cast without the occurrence of bubbling. No. 13,189 of 1906.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

H. W. Hardinge, New York, has gone to Chicago on professional business.

S. A. Worcester, of Victor, Colo., is engaged in professional work at Bellevue, Idaho.

T. R. Miller, of Denver, is in the Black Hills of South Dakota on professional business.

David H. Lawrance, of Denver, has been making examinations in the upper Clear Creek district in Colorado.

Edwin E. Chase arrived in Denver from California and Nevada last week and left again for Mexico on professional business.

Dr. F. M. Simonds, of the firm of Simonds & Burns, New York, left last week for a trip to Arizona on professional business.

Chas. Pfeihl, of Denver, has just returned home after making some examinations of zinc mines in southwestern Missouri.

Chas. S. Walter, vice-president of the Security Investment and Mines Company, of Denver, Colo., is visiting Eastern cities on business.

Carl Scholz, of Chicago, president of the Rock Island Coal Company, spent Jan. 10 and 11 at the Indian Territory mines of his company.

Edward L. Dufourcq is making examinations of mining property in Shasta county, Cal. He expects to return to New York about the end of February.

Col. L. Kingsbury, general manager of the Summit Banner Placer Mining Company, and also of the Buffalo Placer Company, is in Denver on his way south.

Hermann A. Keller, mining engineer, of New York, is now at Planet, Arizona, where he will be engaged on professional business until about the end of March.

Charles R. Keyes, who has been president of the New Mexico School of Mines, Socorro, New Mexico, closed his connection with that school at the end of the year 1905-6.

W. E. Wilson, of Boulder, Colo., has been elected president of the Lost Bullion Spanish Mines Company, of Silver City, N. M., and is now on a visit of inspection at the property.

A. D. Benton has taken a position with the Paymaster Consolidated Mines Company as manager, from Jan. 1. The mines are 24 miles south of Tucson; address, Tucson, Arizona.

Herbert S. Dyer, geologist, of Portland, Me., has been for several years engaged in securing mineral rights to deposits of mica, feldspar, graphite and molybdenite in Maine.

Prof. A. L. Parson, who has held the chair of mineralogy at the University of Minnesota for the last four years, has been appointed lecturer in mineralogy at Toronto University.

Peter L. Cummings, of Breckenridge, Colo., has been appointed superintendent of the Wellington Mines Company, operating in Mineral hill and French gulch in the Breckenridge district.

John Duer Irving, who has been professor of economic geology at Lehigh University, has been appointed to the same chair at Yale. Professor Irving is the editor of *Economic Geology*.

Thomas F. E. Fitzgerald has resigned his position as manager of the Federal Lead Company, at Flat River, Mo., to take effect Feb. 1. He is succeeded by Edmund S. Kirby, as manager.

W. W. Keefer has retired from his position as general superintendent of the Pittsburg Coal Company and the Monongahela Consolidated Coal and Coke Company, after four years of service.

A. A. Talmage has moved his office from the Union Trust building to the Chamber of Commerce building, Los Angeles, Cal., where he is associated with the Pittsburg-Salt Lake Oil Company.

E. G. Spilsbury, mining engineer, of New York, recently suffered a serious accident, while in Arizona, and is now in a hospital at Nogales. He made a misstep from a porch and fell, breaking a leg and an arm.

Franklin Bache, of Fort Smith, Arkansas, president of the Kah-Inla Coal Company, the Bache & Denman Coal Company, the American Smokeless Coal Company, and the Mammoth Vein Coal Company, spent Jan. 10 and 11 at McAllister, Indian Territory.

Obituary

J. M. Hower, general manager of the Dorcas Mining and Milling Company, died recently at Florence, Colo. Mr. Hower was 60 years of age. The Dorcas mill, which he operated for a number of years, was destroyed by fire about a year ago.

The body of W. A. Walter, a pioneer mining man of the San Juan, was found recently at the bottom of a shaft on a prospect he was developing near Silverton, Colo. His death was evidently the result of an accident, which probably occurred a number of weeks before the discovery of the body. Mr. Walter's son, E. N. Walter, is superintendent of the Ross mill at Silverton.

John R. Wilson died suddenly of apoplexy, at Deadwood, S. Dak., Jan. 5. He settled in the Black Hills when that section was new. Having a thorough law training, he rapidly rose to the front rank at the bar, and followed that profession for 20 years. During the past five years his time was largely devoted to the Gilt Edge-Maid Mining Company, of which he was secretary and general manager. Mr. Wilson was instrumental in forming and financing this company, and had invested largely in it, faith in the Black Hills being one of his strongest traits.

Capt. Samuel T. Curtis died at the hospital in Goldfield, Nev., Jan. 6. He was superintendent of the Hale & Norcross, Ophir and Andes mines at Virginia City at different intervals and his last positions in that capacity were at the Iowa and Keyes. He was one of the most prominent mining men in the early history of the Comstock, where he resided until the late seventies, returning to the lode in 1886 from Mexico, where he also was manager of a mine. At one time his opinion on mining properties was considered on the Comstock infallible and he made several fortunes during his career, which were lost in speculation and unprofitable investments. He drifted into Goldfield about a year ago where he died penniless. Before entering the mining field he was a sea captain. He leaves a family in San Francisco and was aged about 85 years.

Societies and Technical Schools

University of Wyoming—The catalog of this institution, at Laramie, Wyo., calls special attention to the School of Mines, which is now well equipped for instruction in its department.

Engineers' Society of Western Pennsylvania—At the annual meeting recently held in Pittsburg, S. M. Kinter was elected president; George T. Barnsley, vice-president; A. E. Frost, treasurer; Edmund Yardley, secretary; R. A. Cummings and Walter Riddle, directors for two years; F. Z. Schellenberg and J. O. Handy, directors for three years.

Industrial

Aetna furnace, at Aetna, Tenn., has been sold to J. J. Gray, Jr., of Mt. Pleasant, Tenn. The sale includes 2000 acres of land containing brown hematite iron ore. Mr. Gray is president of the Rockdale Iron Company.

The Traylor Engineering Company, New York, has secured the services of Edward J. Smith, late of Portland, Me., as manager of its works at Allentown, Penn. Theron H. Tracy has been made general manager of sales, with headquarters at the New York office.

The Texas Fullers' Earth Company, Dallas, Texas, has recently awarded a contract for the complete equipment of its plant for dryers, crushers, pulverizers, etc., the J. R. Alsing Company, of 136 Liberty street, New York. The first shipment of machinery will go forward the latter part of this month.

gan Company, Cleveland, Ohio, by the United States Steel Corporation; it calls for 64 Hughes mechanical gas producers for the Duquesne Steel Works. These producers are to be driven by electric motors, and are equal in gas producing capacity to 100 hand-poked producers.

The Vulcan Iron Works Company, Toledo, Ohio, has, during the past year, materially increased the capacity of its plant. New machines, of the latest and most improved types, have been installed, such as heavy steam hammers, lathes, boring, turning, milling, punching, and shearing machines, besides two large water-tube boilers with a capacity of 200 h.p. each, and a new Ingersoll-Rand air compressor, with a capacity of 750 ft. of air. An important feature is the completion of a new and separate shop for taking care of repair work. These conditions were brought about by the increasing demand for heavy duty shovels.

The Compania Minera Borda Antigua y Anexas, whose mines are located close to the Dos Estrellas mines, near Tlalpujahua, Mexico, has recently placed an order with G. & O. Braniff & Co. for an electrical installation for the mines. The motors, transformers, etc., will come from the works of the Westinghouse Electric and Manufacturing Company, Pittsburg, and the pumps from the Byron Jackson Machine Works, of Oakland, Cal. There is already on the ground, being erected, a 250-h.p. Lidgerwood steam hoist, purchased before electric power entered the camp. The Westinghouse people will attach to this hoist a standard 150-h.p. alternating-current hoist motor, the only necessary change in the hoist being the adding of gear and pinion to adapt the drive. There will be four horizontal centrifugal pumps, direct coupled to alternating current motors; also, two motors for driving blower for ventilating the mines. Three 50-kw. transformers will be used to change the voltage of the Mexican Light and Power Company's circuits from 3000 volts to 400 volts, for motor and lighting work.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Clinton Wire Cloth Company, Clinton, Mass. Clinton Wire Lath. Pp. 52; illustrated; boards, 6x9 in.; 1907.

Jenkins Brothers, New York. Jenkins Brothers Valves and Packing. Pp. 128, illustrated, indexed; paper, 6x9 in.; 1907.

Wonham-Magor Car Works, New York. Industrial Cars and Track. Pp. 160, illustrated; indexed; paper; 6x9 in.; 1907.

Arthur Koppel Company, Koppel, Pa. Album, 1907. Illustrations of Industrial Railway Material. Pp. 26, paper, 4½x6 in.

Seebohm & Dieckstahl, Ltd., Sheffield, England. Hints to Practical Users of Tool Steel. Pp. 58, illustrated, indexed, paper, 4½x7½ in.

Ingersoll-Rand Company, 11 Broadway, New York. Catalog No. 91. Davis Calyx Diamondless Core Drills. Pp. 62, illustrated; paper; 6x9 in.; 1907.

Sullivan Machinery Company, Railway Exchange Building, Chicago, Ill. Catalog No. 55. Sullivan Diamond Core Drills. Pp. 157; illustrated; paper; 6x9 in.

Atlas Engine Works, Indianapolis, Ind. Bulletin No. 134. General Bulletin of Illustrations and Specifications. Pp. 23, illustrated; paper, 8x10½ in.; Nov., 1906.

H. W. Johns-Manville Company, 100 William street, New York City. "Reasons Why." "J.-M." Giant Strain Insulators. Four-page folder, illustrated; 3½x6 in.; 1907.

W. Harold Tomlinson, 44 E. Walnut Lane, Germantown, Philadelphia, Pa. Catalog of Rock and Mineral Sections and Sets. Pp. 24, illustrated; paper, 6x9 in.; 1906.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1045. Allis-Chalmers Rotary Converters. Pp. 15, illustrated; paper 8x10½ in.; October, 1906. Bulletin No. 1040. Allis-Chalmers Polyphase Induction Motors. Pp. 20; illustrated; paper; 8x10½ in.; November, 1906.

Construction News

Keystone, South Dakota — The Holy Terror-Egyptian Company is preparing to enlarge its present mill to 40 stamps.

Bingham, Utah—The Bingham-New Haven Company is considering the question of putting up a smelter. Charles H. Doolittle, Salt Lake City, Utah, is manager.

Bartow, Florida—The Bartow Cement Stone Company is putting up a plant to make cement and concrete building blocks. John Bishop, Bartow, Fla., is superintendent.

Somerville, Texas—Work has been begun on a plant preparing fullers' earth for market; also for mining and handling the substance. N. W. Dunham, Somerville, Texas, is general manager.

Mount Pleasant, Tennessee—The Blue Grass Phosphate Company and the Jackson Phosphate Company are both preparing to put in drying plants for phosphate. Address of both at Mount Pleasant, Tennessee.

Eagle Pass, Texas—The Olmos Coal Company has purchased or leased several tracts in Maverick county, and will open coal mines. Machinery will be needed. L. M. Lamar, Eagle Pass, Texas, is managing the enterprise.

Special Correspondence

San Francisco Jan. 17

It is gratifying news to the San Francisco people who still have faith in the Comstock mines to learn that the Ward shaft has been drained and that the bottom of it has been reached at a depth of 2481 ft., where work was suspended 23 years ago, when the great mines of the Comstock declined. It is now the intention of the company to sink the shaft to the 300-ft. level, and to work the mine and develop the lower workings to a considerable extent.

The recent storms have brought exceptionally heavy snowfalls in the mountain regions, and rainfall in the foothills, causing high water in all the streams. The miners are happy in being insured a long water season for the coming summer. Judging from the amount of snow already fallen, there is little chance of the mills having to close down early in the fall, as has been the case the past few years, when the water supply gave out some time before the rain commenced.

A dredge-mining company has bought about 1700 acres of the famous Natoma vineyard, near Folsom, Sacramento county. It is provided in the deed that all of the personal property belonging to the Natoma Vineyard Company, shall pass into the hands of the mining company. This will include live-stock, tools and implements, grape boxes, stills, boilers, winery, machinery in distillery, cooperage, houses and barns. It also takes in all of the canal and water rights, water ditches and dams. It is understood that six new gold dredges of the largest capacity, will be built this year to work in the gravel beds, near Folsom.

Butte creek, Butte county, is to be dredged. The machine will not be put in a floating basin, but will be used on tracks laid on the surface. The numerous tunnels already in the bank where the dredge is to begin its work, would necessitate a supply of water larger than Butte creek could supply, if the boat type of dredge were used.

The acting commissioner of the general land office has announced the withdrawal from entry of all the lands in the Del Norte mining district, California, which has recently been recommended as an addition to the national forest reserve by the miners of the district. The district in question, which will soon be known as a part of the Klamath forest reserve, comprises some 155,580 acres lying in Del Norte county and bounded on the north by the Oregon State line. These lands will be inspected as soon as conditions will permit, and they will undoubtedly soon be added to the Klamath reserve. The action of the miners in this matter is without precedent, and goes to show that they are awakening to the fact that their

only safety against the assaults of the timber grabbers lies in the protection of the United States forest service.

Lewis E. Aubury, who has been State mineralogist of California for the past six years, has been reappointed to the position by the governor, and will hold the office for two years more. Mr Aubury has been an active and energetic official and this reappointment was to have been expected as a recognition of services. At the end of his first term there were several prominent aspirants for the position, but the governor declined to appoint any of them and finally gave the office again to Mr. Aubury. Many valuable bulletins, maps, registers, and other publications have been published by the State mining bureau since Mr. Aubury took charge. He has taken an active part in preventing timber men from acquiring mineral lands in the mining regions; also in prosecuting men who have been selling mining stocks on a fraudulent basis. He was mainly instrumental in having the law passed which punishes by fine and imprisonment those who publish misrepresenting and exaggerated statements concerning mining properties in California. Altogether Mr. Aubury may be said to have made a very satisfactory State mineralogist, and will now be able to carry out further plans for advancement of the mineral industry of the State.

Interest still centers in the mining developments in and around Greenwater district, in Inyo county, although as yet none of the camps in that region has become productive. The long talked of merger of extensive Greenwater interests has taken place. The combination takes in the Greenwater & Death Valley Company, which is controlled by the Schwab interests, the United Greenwater Company, controlled by the Nevada Smelting and Mines Corporation, and the interests controlled by Brock and the Philadelphia capitalists, which have not been organized. The basis of the distribution of stock on which the consolidated company was formed is as follows: Greenwater & Death Valley, 68 per cent.; United Greenwater, 18; Brock Syndicate, 14 per cent. It will be seen that the Schwab interests are in control. The smelter will be located at Ash Meadows, Nevada, about 30 miles northeast of Greenwater. This is 42 miles from Rhyolite, 115 miles from Goldfield, and 143 from Tonopah. On the property of the company are extensive deposits of lime and iron. Fuel will be brought from the petroleum fields of California over the Borax Smith road.

An important factor in the advancement of these new camps is that of water supply. B. C. Brockington states that he has located a flow of water carrying 1,600,000 gal. each 24 hours of pure, cold water, 600,000 gal. of which will flow across the Funeral mountain to Greenwater by gravity. One million gallons of this flow has an altitude of 4000 ft., and it can be utilized for generating electrical power, to be used for operating mines, furnishing electric lights for the towns of the desert, which are growing up and will continue to grow. This 4000-ft. elevation occurs in a distance of six miles from Death valley. The water is located on Telescope peak, in the Panamint range, which is 10,984 ft. high. The location is about 20 miles in an air line from Greenwater, and a pipe line 25 miles long will bring it to town. At the point where the pipe line would cross Death valley it is 34 ft. below sea level. This would be at Bennetts Well.

The newest town in the desert region of Inyo county is called Skidoo, after Robert Montgomery's mine of that name. It is 40 miles north of Ballarat, 45 miles west of Rhyolite, and about the same distance northeast of Keeler, at an elevation of 5500 ft. The long haul prevents shipment of ores, and a mill is being built to treat ores on the spot, not only for the Skidoo mine, but for lessees or custom men. The mill will be operated by electricity generated by water power.

The prospects for an early settlement in the miners' strike at Grass Valley do not appear favorable. The men insist on an eight-hour day, and that the companies begin to hoist the men at 3:30, and guarantee to have them all out of the mine by 4 p.m. each day. The pumps on the mines are kept running, but the union held a meeting and decided to call the pump men out unless the operators granted them an eight-hour day. This, of course, had to be conceded at once to avoid flooding the properties. The business men of Grass Valley have petitioned Mayor Clinch to intervene and settle the strike. He has accepted the task and will endeavor to get the operators and miners together and, through concessions on both sides, settle the strike. About 150 miners have left the district since the strike started.

By the terms of a decision rendered by G. F. Potter, assistant land commissioner at Washington, D. C., an area of about 4000 acres on the Forest Hill divide, in Placer county, is mineral land. The tract is close to the Hidden Treasure, Turkey Hill, Bullion, Damascus, Eureka and Pioneer mines, above Michigan Bluff. The decision confirms the miners' rights.

For the first time in 20 years hydraulic mining on a large scale is to be carried on in the district near Alleghany, Sierra county, as soon as the rains convert the heavy snows now lying on the hills into water. An extensive hydraulic plant has been installed by the Alleghany Mining Company, operating at Balsam Flat, 1½ miles south of Alleghany, to work the placer gravel deposit formerly known as the McNulty claim. A débris dam has been built at Whiskey Point, and has been accepted by the California Débris Commission. W. W. Tiner is superintendent of the company.

C. D. Hitchcock, the mechanical engineer of the Balaklala Consolidated Copper Company, has arrived from Salt Lake to take charge of the operations of installing the big smelter plant, which the company has in the course of erection at Coram, Shasta county. The steel frames for the McDougall furnaces are already in place, and the huge cement foundations for the smelter proper have been laid.

There is quite a little excitement over the discovery of gold and copper ores in the desert region of Ibex district, near Java station, on the Santa Fé line, San Bernardino county. Ledges were discovered in that vicinity in 1892, but little was done with them. Now a great number of location notices are being recorded, and many men are prospecting the region.

Oakland, California, men, headed by F. J. Swears, of Goldfield, have organized the Goldfield Diamond and Drilling Company. They have purchased three plants and now have them en route to Goldfield. On their arrival, one or more of the drills will be installed on the Corinth claims, in the eastern part of the district, near the Rochester goldfield, and holes will be bored to a depth of 1000 ft., and an endeavor made to locate some of the pay shoots.

The Stanislaus Electric Power Company has just contracted for a new equipment, which will generate a larger horsepower than that generated by any plant or station in the State. The new power plant is located at Stanislaus, about 12 miles northeast of Sonora, in Tuolumne county. It will have a capacity of over 36,000 h.p. A narrow-gage railroad 12 miles in length is being constructed, to be used in transporting material and supplies. An immense dam will be erected in Relief valley.

Salt Lake City Jan. 19

Quite a revival in mining activity is noted in Beaver county, particularly in that portion of it near the town of Milford. Recent developments in the Star district have revealed the presence of lead-silver ore in quantity. Around Frisco and Newhouse developments in some of the copper properties have been of a satisfactory character, while down in the extreme southeastern portion of the county, in the Pine Grove district, the Revenue Mining Company, of which L. G. Burton, of Salt Lake, is manager, shows developments of gold ore. The ores found in the Pine Grove district carry values principally in gold. It is understood an effort is being made to re-open the old Lincoln mine, which includes the first claim patented in Utah.

The Federal grand jury has resumed its investigation of the alleged coal-land frauds, and has ordered a civil suit brought against the estate of the late Stanley B. Milner, who, it is claimed, secured title to coal lands in Emery, Carbon and Iron counties not exactly in accordance to law.

The management of the Bingham-New

tant strike on the lower or tunnel level of that property. A vein of ore was encountered 870 ft. in from the portal of the tunnel, and has been crossent for 128 ft. In character, the ore is similar to that produced in the Highland Boy mine of the Utah Consolidated Mining Company. The matter of building a smelter is receiving consideration. Charles H. Doolittle, of Salt Lake, is manager.

The Alice Consolidated Mining Company has been formed in Salt Lake to operate in the Dugway section of the Deep Creek district. The basis is six claims favorably situated in that camp. The incorporators are: W. R. Hutchinson, president; W. F. Calloway, vice-president; C. C. Dailey, secretary and treasurer, who, with B. L. Cutler and R. E. Miller, are directors.

The Bingham Consolidated Mining and Smelting Company has secured a 60-day option on the Iosepa farm, which for several years has been occupied by a colony of Hawaiian converts to the Mormon church. The land is situated about 50 miles west of Salt Lake, on the line of the Western Pacific Railroad. If the railroad companies will consent to making the place a Utah common point, it is probable that the option will be executed and the future smelting operations of the Bingham company conducted there.

The business interests of Bingham Junction and Murray have been so thoroughly aroused over the removal of the copper smelters out of the Salt Lake valley, as a consequence of the late decision and injunction of the Federal court, that they are making an organized effort to bring about their retention. No matter what happens, however, the Utah Consolidated and Bingham Consolidated companies have decided to abandon their present plants and build elsewhere. There is little doubt about the Utah Consolidated going to a point about four miles above the town of Tooele, and on the opposite side of the Oquirrh range of mountains from the mine. The latter will be connected with the smelter by means of a tunnel. Employees will be permitted to make their homes in the town of Tooele and will be conveyed to and from their work by electric cars.

A settlement has been effected between the Magnolia-St. Louis Mining Company and the Silver King Mining Company, of Park City. The former brought suit to recover $900,000, the value of ore alleged to have been extracted from the domains of the plaintiff. The Silver King Company has acquired the property of its opponent, but the terms of the agreement have not been released. The Silver King Company has suspended dividend payments temporarily.

The Frisco Contact Company has started its new compressor plant and is now developing by means of machine drills.

Toronto, Ont. Jan. 21

In order to aid the development of the mining industry, the Timiskaming & Northern Ontario Railway commission is taking preliminary steps toward the construction of two more branch lines. One of these will open up the Larder Lake gold area, running east from Englehart for 12 miles or more. The other will run for five or six miles either from Cobalt town or Gillies Station, to tap the Portage Bay area. Inspections of the proposed routes preliminary to surveys are now being made.

The summary report of the Geological Survey of Canada for 1906 has been published. It anticipates that when the figures of the mining production for the year are available they will show a large increase over those for 1905, in which year the output was $68,574,000. Director Low paid a three-day visit to Cobalt camp, looking over a number of the more prominent mines and claims, during which enough was seen to pronounce upon the phenomenal richness of the numerous veins and to make a rough estimate that millions of dollars in silver show on the surface, and in the shallow workings of the claims. "The question of the depth to which the silver will be found," says Dr. Low, "is an important one, but it is one upon which no opinion can or should be given with the data at present available." He goes on to say that while there is no doubt that great values will be extracted from the properties about Cobalt, it might be wise for the investing public to consider the very large capitalizations and abnormal prices of stock of many of these properties, and the large sum required from production to pay a fair profit on these small veins. Attention is also called to the limited area covered by the silver-bearing veins and the impulse to consider properties situated in the vicinity of bonanza claims, as being themselves of great value when the reverse is often the case. "Cobalt is now in the throes of the inevitable great speculative boom, and prices are being advanced in many instances beyond the bounds of prudence and reason."

London Jan. 12

A few weeks ago I mentioned that the Nerchinsk Gold Company, one of the pioneers of Siberian development, had floated a subsidiary company to work the Kluchi mine. This week a further flotation has been effected. In this case the property in question is not a developed mine, but a tract of territory on which only a little prospecting has been done. The new company is called the Nerchinsk Options, Ltd. According to Pearse, Kingston & Browne, the consulting engineers, the prospecting thus far done has proved the outcrop of gold-bearing veins, which fully warrant systematic development. While [illegible] matters, I may say that although promoters are inclining to look to Siberia for a new hunting ground, there is no boom in Siberians, and it is well to point out that the Russian laws as to ownership by aliens are sufficiently severe to prevent any extensive acquisition of properties by English syndicates. There is, in fact, a small storm raging in financial circles in London as to whether certain leases, etc., in Russia, worked by English companies are all in order or not, and it is practically impossible to obtain any authoritative information, even from Russian officials themselves, as to the exact requirements of Russian laws on this question. In the near future it is probable that a good deal will be heard of this tenure difficulty.

A further issue of 30,000 shares at £7 5s. each has this week been made by the Otavi Mines and Railway Company, which owns property in German Southwest Africa. Operations were commenced in this territory some 15 years ago, and in 1900 the late Christopher James, the well known mining engineer and metallurgist from South Wales, spent a year investigating the country. The district is a copper-bearing one, and the copper ore occurs concurrently with galena. The developments done by Mr. James and other engineers have opened up large bodies of ore, and during the past six months arrangements have been made for erecting smelters. The properties are 350 miles northeast of the port of Swakopmund, and the company has built a railway between these two points. There is already a government railway between this port and Windhoek, the capital of German West Africa, and for the first hundred miles it might have been possible to use the same track for both railways, but for some reason the two railways have been built quite independently. It should be mentioned that the Otavi company is incorporated under German colonial laws, and is not a British registration; the promoters are all German firms. A good deal of the capital, however, has been subscribed in England.

Public interest in the Cornish mines will be increased considerably within a short time, owing to a scheme nearly completed for buying up the lord's rights in the Camborne district by a London syndicate. Hitherto, the owners of the land in Cornwall have jealously guarded their rights to a percentage of the gross output of the mines, and, as in many cases the amount paid in this way has been the bare margin between profit and loss in working, it has been supposed, rightly or wrongly, that the landlords' dues were a stumbling block in the way of mining enterprise. As I have already mentioned in these columns, the Cornish Consolidated Syndicate, which is headed by Francis Allen, a London lawyer, and Messrs. Meyerstein the stock brokers, has introduced considerable sums of London money into Cornwall during the last year or so. In order to enable them to extend still further their

operations without the necessity of consulting the landlords, they have made a bargain with Mr. Basset, the principal landlord, to buy out the whole of his mining rights. Mr. Basset's estate includes such big producers at Dolcoath, East Pool, South Crofty and Basset, and the income he draws from these is estimated at £15,000 a year. It is probable that he will require £250,000 for his rights. At the time of writing, the matter is not definitely settled, though within a week or two the complete details will be arranged. This deal is a big one, and the Cornish Consolidated has secured the co-operation of several other important groups, such as the Venture Corporation, for the purpose of underwriting the issue of shares in the company to be formed to take over these rights. How the new company will deal with the rights remains to be seen, but it will probably take large lumps of net profits instead of proportions of gross outputs. In the case of Dolcoath, the change of landlordship may lead to important events, for in March next the present low rate of dues accepted by Mr. Basset a few years ago in order to encourage the company to spend more capital comes to an end. The relations between the new landlords and the Dolcoath company will be watched with interest. In the meantime Cornishmen are pleased at the prospects of more money flowing into their county.

Johannesburg Dec. 24

The Boers have received the new constitution given to the Transvaal by the Liberal government, with keen satisfaction, for everything is in their favor. The British here are not at all pleased with the document, and they complain bitterly of the policy of the Liberals.

To the mining community the articles dealing with the natives and with Chinese labor are of most importance. From the first reading one would judge that the question of Chinese labor is definitely settled, for it is stated that the Chinese must leave one year after the first parliament meets. Should the first parliament so desire, they can send the Celestials away before the year is over.

There is one ray of hope. Provision is made for changes in the constitution, and if there is a majority of the first parliament in favor of the retention of the coolies, no doubt the yellow men will remain on the Rand. The pro-Chinese party is known as progressive. Realizing that the whole Chinese question depends upon their success at the polls, the Progressives are making a strenuous fight, and are now in a much stronger position than they were a few months ago. In spite of everything, the leading men here still maintain that the Chinese will not leave the country. It is expected that the elections will be held some time in February, and parliament will meet in Pretoria about July next.

During the past fortnight there have been very welcome announcements by many companies of dividends payable for the year. There is a big variation in the amounts paid out, from 15 per cent. in the case of the Ferreira mine, to 5 per cent. in the case of the New Modderfontein and the French Rand. The last named mines make their debuts as dividend payers. For a long time they have been paying off debentures, but now by the help of Chinese labor they are able to enter the lists of the dividend mines. The rate paid is small, but it is at least a beginning, and no doubt these two mines will make steady declarations of dividends provided the Chinese remain.

Tube-mills are doing well. At present there are 58 tube-mills in working order along the Rand, and several other mines are expecting to erect one or more of these grinding machines. With tube-mills the crushing capacity of the larger mines on the Rand has been greatly increased. The largest gold-milling plant under one roof in the world is on the Rand, that is the joint plant of the Knight's Deep and Simmer East, with 400 stamps. This plant cost £549,563.

The following list shows the 13 batteries, each containing 200 stamps or over:

	Stamps.	Tube Mills
Knights Deep-Simmer East	400	3
Simmer & Jack Proprietary	320	..
Crown Deep-Robinson Central Deep	300	5
Robinson Deep	300	2
Angelo	200	2
Cason	220	2
Dreifontein	220	2
Knights	220	..
Robinson	210	3
New Kleinfontein	200	..
Geldenhuis Deep	200	3
Rose Deep	200	3
Witwatersrand Deep	200	..

In spite of the hard times and the scarcity of labor, there are any amount of flotations going on. Diamond companies seem to be the favorites. An alluvial gold proposition, about 25 miles west of Pretoria, has come in for a lot of notice. If boom times ever come around again there will be a plethora of mines of all kinds floated. At the present time deep levels are out of favor. Only highly speculative propositions seem to be wanted just now.

Although it is some months yet before the election, the different factions are getting ready for the fray. As a rule the Rand is distinctly lethargic as far as politics are concerned, but the amount of interest being shown now is worthy of America in a presidential election. The British women have formed themselves into a federation, for the purpose of promulgating British ideals in South Africa. The Boer women have formed a society of their own. Altogether we can expect lively times early next year when the elections come off.

General Mining News

CALIFORNIA

Kennedy—The east ledge of this famous property at Jackson has been struck at the depth of 3000 ft., the rock being of fair milling grade.

Argonaut—The new purchasers of this mine at Jackson will assume charge next month, with Mr. Matthews as manager.

BUTTE COUNTY

Steiffer—This mine near Magalia has struck pay gravel. The mine is adjacent to the old Perschbacker, which yielded handsomely for years. It has been under development for two years past.

INYO COUNTY

Great Western Ore Purchasing and Reduction Company—At a meeting of this company, whose property is at Keeler, Chas. M. Schwab was given an option on the mine for 30 days.

Mining District—At Big Pine a district has been formed, and Nevada laws adopted, to take in Saline and Eureka valleys, Little Cow Horn, Big Cow Horn, Fish Lake valley and Deep Springs. Copper, gold and silver are found in the district, which needs only development and railroad connections to come to the front.

Southern Belle—The main shaft in the Bullion mine of this company, A. E. Vandercook superintendent, is nearing the 400 level. The orebody is quite wide and carries fine gold.

Keane Wonder—A 20-stamp mill is being constructed and an aërial tram will carry the ore from mine to mill. The company owns 22 claims on the Death Valley slope of the Funeral Range. One ledge is 30 ft. wide and shows well in gold.

Ubehebe—In this district are several promising claims, wire-gold and native copper have been found in close proximity. The Salsberry claim has a good force of men at work, with J. V. McConnell as superintendent. Two shafts have been sunk, and one is to be sunk to 500 ft. depth. Both carbonate and native copper are in the ore.

KERN COUNTY

California Rich Gulch Mining Company—This company has now 15 claims, having recently acquired five more. In the New Hampshire, particularly, good ore is exposed carrying gold, silver and copper.

Kern River Gold Mining Company—This company owns two claims on the Kern river at the point where the stream is to be diverted for two miles by the power tunnel of the Edison Electric Company, and will begin operations as soon as the water is out of the bed. The river bed will then be mined. Meantime pipe borings have been made through the

gravel and the returns are satisfactory. In addition to the gold there is considerable platinum in the gravel at this point.

Devil's Gulch—At this place near Hites Cove, Heaton & Branson have discovered a 3-ft. quartz vein carrying free gold, and the mine has been bonded to Mr. Richards, of Hites Cove.

MONO COUNTY

Masonic District—James T. Shaw is arranging for an electric power plant for this district and has ordered the necessary machinery. Both the Calivada and Pittsburg Extension companies have good ore in their claims.

NEVADA COUNTY

Lincoln—San Francisco men have this mine under bond and are sinking a shaft, at the bottom of which is a small vein of high-grade ore.

[illegible] Valley district are at present closed down owing to the strike of the miners employed in them, who demand an eight-hour day. The matter has not yet been settled.

PLACER COUNTY

Invincible Mining Company—This company has bought, from George McAulay, eight mining properties on the Middle Fork of the American river, five miles from Forest Hill. These properties are bar-gravel mining propositions, situated on Arkansas Bar, Eureka Bar, Horseshoe Bar, Boston Bar, Pleasant Bar, Winifred-Shirley Bar, American Bar and Willow Bar. The last three were Mr. McAulay's claims and the others belonged to the Horseshoe Bar Consolidated Mining Company. The Invincible company is composed of San Francisco and Oakland capitalists and they intend to commence work on the mines at once and will spend a great deal of money in their development.

Barton—At this mine 25 men are at work, and a new steam hoisting plant has been installed.

Big Dipper—In this old drift mine, Iowa Hill divide, the lessees found rich gravel in some of the pillars, taking out in places as high as $80 to the pan.

Arcadia—At this mine, near Greenville, owned by D. McIntyre, a contract has been let for 100 ft. of tunnel, by which it is expected to tap the rich chute of ore which was worked near the surface some years since.

Florence Mack — At this quicksilver mine considerable ore is being taken out, and the output will shortly be increased.

SAN BERNARDINO COUNTY

Salt—G. A. Davidson, W. H. Brewer and B. F. Levet, of the Santa Fe Railroad Company, are opening beds of pure salt near Daggett and will soon place the material on the market. The closing down of the Liverpool Salt Company's works by the overflow of the Salton sea has made this new property of considerable value.

Silver Lake and Lava Point—Some 50 locations have already been recorded in these new districts, and about 100 prospectors are at work in the vicinity.

Owl Mountain—In this region, 16 miles south of Daggett, a number of copper claims are being opened.

SHASTA COUNTY

Reid—James Salle, owner of this mine, at Old Diggings, is building a railroad 1½ miles long from the mine to the Sacramento river, to take the place of the aërial cable now in use.

SIERRA COUNTY

Rainbow Extension—This mine has been bonded by H. H. Noble and James Clinton to White & Giles, representing men from Wilkes-Barre, Pennsylvania.

SISKIYOU COUNTY

Dredge—A new Bucyrus dredge is to be set up on Scott river, near Callahan.

Helena Mining Company—The property of this company, James McKean, superintendent, is being reopened and a number of men are at work. There is a fine cyanide plant at the mine.

Helena Development Company—This company, lately organized, has bonded the McKeen mine, near Callahan, from the Helena Gold Mining Company. The mine has produced largely from the upper levels. The intention is to open up the lower levels, where a large orebody is believed to exist. The company is composed of San Francisco men, with A. Sydney Additon as general manager.

TEHAMA COUNTY

Tom Head—On these copper claims a new tunnel has been driven and a good orebody developed.

TUOLUMNE COUNTY

Big Creek—This Bangor, Maine, company has changed its name to Big Creek Electric Power and Water Company. It has refused offers to sell its Golden Rock ditch, water rights, etc.

YUBA COUNTY

A. Steinberger has applied to the California Débris Commission for a permit to hydraulic the Brandy City mine, near Camptonville, the drainage of which is into Cherokee creek.

Bonded — Charles D. Lane and associates, owners of the famous Utica mine, Calaveras county, have taken a bond on the Pennsylvania, Dannenbrog and Hawkeye mine at Browns Valley, and commenced development work. All these mines were producers years ago, but have been closed down some time.

COLORADO

LAKE COUNTY—LEADVILLE

New Monarch—The Cleveland shaft, now 500 ft. deep, will be sunk another lift of 100 ft., and during the week the work was started. Heavier machinery has been installed in the way of extra boilers and pumps and although a heavy flow of water is not anticipated, the management is prepared to meet one if opened in the course of sinking. The Cleveland shaft is to the north of the Winnie, and when the 500-ft. mark was reached a body of gold quartz was opened that ran $6 per ton. It is to develop this orebody that the shaft is being sunk deeper and also to catch the extension of the streak of ore opened in the Winnie last summer. Development work has been steadily kept ahead on this streak and from it a carload and a half has been shipped monthly to the smelter yielding the mine a net profit of $10,000 per car. The work of development has been carried over 1000 ft. on the streak. In addition to the rich ore shipped from the Winnie about 1500 tons monthly of medium-grade ore is being shipped to the smelter.

President, Breece Hill—The first important strike in the district for the new year was made in this property in one of the lower levels at a depth of 500 ft. The property has had rather an eventful history; 28 years ago it was located by Thomas O'Rourke, who is still the owner; he put his own money in to develop it and when this was gone lessees took hold of it. In the upper contact several rich streaks of ore were found, running from 12 to 15 oz. gold per ton and when worked out development was continued to find the main ore-shoot, but it was never located in the upper contact. O'Rourke then sunk the shaft to the lower zone and when his money was gone he again leased the claim. This time, in the northeast drift a splendid body of sulphide has just been opened and the initial shipment has been sent out; the lessees state that it will run $30 per ton. Work is now being pushed on the orebody and sufficient has already been done to prove that the ore is in place and the main channel cut.

Breece Hill—The driving of the Yak tunnel into this section of the district has stimulated mining to a great extent, as water is eliminated and the owners of property are now able to carry on work in the lower levels at greatly reduced cost. Among the mines on the shippers' list are the Vinnie, Big Four, Big Six, Fanny Rawlins, St. Louis tunnel, Highland Chief and Penn, and all are shipping from 30 to 50 tons daily of silicious and sulphide ores. To be added to this list is the work that is being carried on at the four shafts of the Ibex, let out to 225 sets of lessees and employing 450 men. The monthly tonnage is in the neighborhood of 7000 tons of silicious, sulphide and zinc ores, and the average value is close to $100 per

ton. A number of lessees are fortunate every now and again in opening a pocket, from which will be taken from 500 to 1000 lb., adding materially to their bank balance. The lowest work in the property is being done at the 1500-ft. level where the lessees have opened a 5-ft. body of sulphide ore that is just on the edge of being pay; upraising on the orebody will bring the desired values.

Carbonate Hill—This old section is one of the busiest in the camp and the amount of ore that is being shipped daily from the different properties is a little better than 500 tons. At the crest of the hill the Little Nell is shipping about 150 tons a month of ore that will average $100 per ton; all of the shafts belonging to the Morning and Evening Stars are busy shipping iron and from the Catalpa and Crescent shipments are going out steadily, and the same applies to the Wolftone, Maid of Erin and Big Chief.

Dinero Tunnel—The starting of this enterprise in the Sugar Loaf district has been the means of bringing capital to the district in search of investment as it is known to the mining world that the claims in the district carry large bodies of low-grade ore that in the past could not be worked on account of the expense attached to lifting water. This will be done away with as the tunnel cuts into the hill and will drain the section. Another point that favors the district is the reduction made in the treatment charge by the Arkansas Valley smelter for low-grade ores. By early summer it is expected that 500 tons a day of ore will be shipped to the smelter from the different claims.

Lackawanna Gulch—To the south of Sugar Loaf is another section of the district that will receive a great deal of attention next summer on account of the rich ore opened in the Miller group of claims last fall. The main shaft is down 85 ft., the vein 4 ft. wide and the values run from 10 to 15 oz. gold per ton. A five-stamp mill was erected last summer and the run in the fall was highly satisfactory.

SUMMIT COUNTY

Swastika—This is the title of a new incorporation filed to operate properties in Summit and Park counties and capitalized for $2,000,000. Elgin Mawhinney and Joseph H. Chandler, of Chicago, Andrew W. Gillette, of Denver, and C. F. Hazelton, of Breckenridge, are the incorporators.

Col. Sellers—This well known property in Kokomo has changed hands, having been sold by Joseph A. Lamping to Horace B. Hawkins for a consideration of $12,000. This will be worked under the style of the Delaware Gold Mining and Milling Company.

Mice—This is the name of a new organization formed to operate claims in Montana in the Wilkinson district. This company has secured possession of the Winifred, Ruth, Marie, Dorothy and Magnet properties.

Vidler Tunnel Company—It is reported that this company has acquired title to the Wilcox tunnel and railroad properties. It is proposed to extend the Denver, Lakewood & Golden Railroad over Lookout mountain and to traverse the Vidler tunnel, thus making connection with Montezuma and Rathbone. The line will then join the Denver & Rio Grande at Dillon.

Wellington Mines Company—This company has started on its ore-delivery contract and is now shipping the ore at a rate of 75 tons per day. Pike & McClellan have the hauling contract to railroad. Peter L. Cummings has been appointed superintendent of the company.

GEORGIA

LUMPKIN COUNTY

Barlow—At this mine, near Dahlonega, the new shaft is now down 150 ft. below water level. At that point the vein is about 6 ft. wide, running from $4 to $7 per ton in gold. The mill is being repaired and put in order.

IDAHO

BLAINE COUNTY

Croesus—This mine, three miles from Hailey, has resumed after being idle for over two years, on account of certain dissatisfaction among the stockholders. Since commencing operations the company has developed some high-grade galena ore on the lower workings; 20 in. of this ore will average about 2000 oz. silver per ton, besides some gold and 55 to 60 per cent. lead. The main vein is approximately 20 ft. in width and is good concentrating ore; pyrrhotite is the main gold-bearing sulphide, and is the most prominent, while galena and chalcopyrite are disseminated throughout the vein in smaller quantities. The company is working 24 men and running the 10-stamp mill steadily, producing regular shipments of good-grade concentrates.

Nay Aug—This mine, situated on Deer creek some 15 miles northwest from Hailey, is shipping good-grade galena from a 15-in. streak, which seems to be continuous for some distance. The company is driving a long tunnel which will give approximately 200 ft. additional backs from the lowest workings.

Minnie Moore—This mine will resume active work shortly, and the deep shaft now under way will facilitate working the property.

Wood River—This district is feeling the activity in mining and many new discoveries are looked for during the coming spring and summer. Developments at Bullion are progressing rapidly but nothing important has been encountered at this date. Bullion was once famous for its large bodies of high-grade silver-lead ore, but unsystematic developments revealed but little. The companies now operating are working on more substantial lines, and will make good.

CUSTER COUNTY

Custer county will be the center of attraction for gold mining during the coming season. Last year several good discoveries were made and not a few old properties were started up, under modern methods of mining, and the results have been gratifying.

Idaho-Montgomery—Important discoveries have been made by this company, which lately acquired some good property in Washington Basin. The company has opened up large ore reserves and is pushing work; but owing to a late start last fall it is unable to place machine drills and necessary equipment. The company is shaping everything so that an early start can be made for placing the 500-ton reduction plant next summer. The plans have all been formulated. The ore carries well in gold, silver and bismuth. Deeper developments during the winter have shown the continuation of the orebodies with increase in gold and bismuth values in many instances. Out of the five veins there are two carrying values that will justify the erection of the plant spoken of. Nevada capital is behind the enterprise.

INDIAN TERRITORY

CHOCTAW NATION

Degnan-McConnell Coal and Coke Company—This company is opening another shaft mine near Wilburton. This will probably ship over both the Missouri, Kansas & Texas and the Chicago, Rock Island & Pacific Railway. This is one of the largest coal companies in the territory.

KENTUCKY

HOPKINS COUNTY

Daniel Boone Coal Company—The property of this company at Boone, near Madisonville, has been sold to Andrew Hogg, of Madisonville, and associates. The property covers 3000 acres of land, on which a mine has been opened.

MARYLAND

Consolidation Coal Company—This company's statement for the year 1906 shows net earnings over fixed charges, $1,332,844; dividends received, $180,000; total, $1,512,844. The charges for depreciation on plant, etc., were $77,977, leaving a surplus of $1,434,867. The board declared an extra dividend of 2 per cent, in addition to the regular quarterly payment, making 3½ per cent. in all.

MICHIGAN

[illegible]

Wyandot—It is reported that the Winona lode has been intersected by a crosscut at the 1000-ft. level and drifts have been started both north and south on the vein.

interfered with operations of the large companies, especially the Boston & Montana, the ore of which is transported 183 miles for reduction. With a few exceptions, all of the heavy producers were closed down Jan. 11, and kept closed until Jan. 15, the weather having moderated sufficiently to permit of resumption. All of the wet ore, when exposed to the cold, became a solid mass of rock and could not be drawn from the bins. Where it was possible, mining was conducted in the upper levels in which the ore is dry. In addition to congealing moisture in the ore from the lower levels, another shortage of cars occurred and the companies had difficulty in shipping their dry ore. Boston & Montana suffered more than any in this line, and was compelled to close two of its five furnaces in the smelter. It has not yet placed them in commission, and may have to close one or two of the others. It is short of coal at both its mines and plant, and its supply of coke at the latter is about exhausted. It has 100 tons en route from Duluth, and 75 from Fernie, B. C., but the Great Northern Railroad Company has given notice that it is impossible to move trains under existing conditions. Washoe is receiving only two-thirds of the usual ore supply.

Bullwhacker—Patrick Clark, head of this company, announces that the workings of the property abandoned by lessees recently on account of the expiration of the lease contain at least $500,000 worth of ore, and that the company will build a 500-ton leaching plant during the coming summer to treat it. The vein at a depth of 50 ft., he says, is 90 ft. wide, 16 ft. of which carries 6 and 7 per cent. copper, while the remainder averages 4 per cent. A cross-cut has been driven from the 200-ft. station of the main shaft in the direction of this body of ore, and while the southeast end of the opening is in ore, the vein is not the one opened by the lessees 135 ft. east of the main shaft. The ore of Bullwhacker is silicate of copper and cannot be concentrated. The property is directly east of the main workings of the Pittsburg & Montana, about 1200 ft. separating the main workings of both.

Butte & Summit Valley—This company, financed by Boston men, is exploring its ground with a diamond drill, which is working from a depth of 250 ft. in the Saratoga. The work is going on under the direction of H. H. Taft, of Denver.

Reins Copper—The company will drive an opening into Ella ground, which it bought recently, from the 1200-ft. workings of its old possessions and tap the body of water in the 600-ft. shaft on the Ella with a diamond drill. After the old shaft drains, the 600 ft. between the bottom of the Ella shaft and the 1200-ft. opening will be raised out, thus affording an outlet for the men working in the lower levels of the Reins in case of accident. There are two veins in Ella ground. Both will be cross-cut and explored after the other work is finished.

East Butte—Shaft No. 1 is 650 ft. deep and the one on No. 11 is 330. The former is going 800 ft., but at 400 the two will be connected by a cross-cut. F. M. Sullivan, president of the company, reports an 8-ft. vein of first-class ore on the 400-ft. level of No. 1, adding that the present showing in the property is better than it has been at any time since the company began operations. The vein has an east and west course, and is better in the west drift than in the east. The company is still receiving revenue from various sets of lessees, who are working in all of the openings outside of the two main shafts.

NEVADA

ESMERALDA COUNTY—GOLDFIELD

Hayes-Monnette—This famous lease on the Mohawk mine expired at noon on Jan. 11. The miners continued at work until the last moment. During the 24 hours before the ending of the lease 300 tons of ore were hoisted from the bonanza, which averaged $250 per ton. During the previous fortnight over $800,000 worth of ore was taken from the ground and forwarded to San Francisco for treatment.

Waverly—A body of high-grade ore has been opened up in the Gold Coin claim in a crosscut from the 50-ft. level. The shaft will be sunk to the 300-ft. level with all speed. The company also owns a lease on the C. O. D. claim and has commenced sinking on it.

Simmerone—Several small quartz veins have been cut in the shaft at a depth of 100 ft. Assay values up to $15 per ton have been obtained. In the surface workings some rich shoots were profitably worked and the new find is most encouraging. The quartz carries sulphides and the ore resembles the Mohawk ore. A valuable find may be expected at any time as the lower workings progress.

St. Ives—The Codd Leasing Company has re-started its operations on the St. Ives and is working three shifts. Before the mine was closed through the miners' strike a vein assaying $100 per ton was cut. This will be developed vigorously. Work will also be undertaken by the company on the 350-ft. level.

Esmeralda—The four new shafts on this property are being sunk in record time under the management of M. T. Monnette. There are persistent rumors of a find in the deepest shaft. The shafts are being sunk with the view of developing the famous Mohawk vein which is believed to traverse the Esmeralda leases.

Tule Cañon—A group of copper claims is being developed by the Venture Corporation, of London and New York. About a dozen men are employed. There appears to be some difficulty about the title to the claims and legal proceedings are threatened by some Goldfield prospectors, who claim to have located and secured title to the ground in the early part of last year.

NYE COUNTY—BULLFROG

Midas—The new hoist has been started and will greatly facilitate sinking. Two shifts will be employed in sinking the shaft to the 500-ft. level. It is on the vein, which is mineralized throughout.

Venture—This mine has been developed to a depth of 65 ft., and the vein has been proved by trenching for a length of 3000 ft. on the surface. In a number of places good values have been found. It is expected to develop into a large moderate-grade milling property.

Ziegler—A tunnel is being run in the Pearl Hart claim. On the Ziegler claim a quartz vein 15 ft. in width assaying up to $30 per ton is being sunk on.

Original—Active sinking operations are in progress and the shaft has now reached a depth of 370 ft. It will be continued to the 400-ft. level before crosscutting is undertaken.

Steinway—The northeast drift is in 260 ft. and the southwest 280 ft. Numerous quartz and talc streaks have been met with in the northeast drift and Superintendent Wilson is of opinion that the workings are rapidly approaching an orebody. The southwest drift is being run to intercept the Pilot vein. It will require to be run 40 to 50 ft. farther before getting into the line of strike.

Tramp Extension — A promising vein over 4 ft. in width, having all the characteristics of the Tramp vein, has been cut in the main workings. This has encouraged the owners to more vigorously push development work, and it is proposed to continue the sinking of the shaft on the Anglo-American claim and to drift for the Hobo vein, which is also believed to traverse the leases.

Alliance—The vein at the bottom of the shaft at a depth of 200 ft. is looking well. A new hoist has arrived and will be erected as soon as possible, so that the shaft can be sunk to the 500-ft. level to enable drifting to be undertaken on the vein.

NYE COUNTY—MANHATTAN

Zanzibar—The driving of the main tunnel is being continued and the Consolidated vein, which was tapped therein several weeks ago, is opening up well. Gold values average about $25 per ton, but the vein in places is seamed with high-grade ore.

NYE COUNTY—KLONDYKE

New Klondyke—At a depth of 50 ft. in the incline shaft a 6½-ft. ledge has been cut which assays high. Ore is being sacked for shipment. The mine is situated

5 miles southeast of Tonopah and is attracting a considerable amount of attention on account of the excellent showings in the workings. The company has been operating for several years and has obtained several shipments of rich ore from the mine, but the shoots were small. The new find comprises well defined quartz vein, giving promise of permanency. Many locations have been made in the vicinity of the company's buildings, and the find will result in the development of much new ground.

Manhattan Combination—The ledge is being thoroughly exploited with satisfactory results. A large tonnage of high-grade ore has been developed and the mine promises to become one of the greatest producers in the field. When milling facilities are provided, the management promises to furnish some ore that will yield sensational returns.

Paymaster—This mine, situated in the western end of the field, is developing well. Several veins have been opened up and all carry ore of milling grade, while in parts of the workings some very rich shoots have been cut. Some quartz has recently been sacked that averages over $400 per ton.

NYE COUNTY—TONOPAH

Montana-Midway Extension—The shaft has been sunk to a depth of 630 ft. and crosscuts have been run east and west for a distance of 50 ft. in each direction. The formation has changed and numerous quartz stringers have been cut, indicating the proximity of a large quartz body. The crosscuts will be continued farther with the view of intersecting one of the Midway ledges.

Cash Boy—A station is being cut at the 500-ft. level and preparations are being made to start a long crosscut. The workings are making over 12,000 gal. of water per day, and steps are being taken to improve the pumping capacity before continuing to sink the shaft to the 600-ft. level.

MacNamara—Two shifts are employed and development work is being pursued in all parts of the mine, preparatory to producing a large output when milling and transportation facilities are improved. The ledge is opening up remarkably well.

Ore Shipments—Shipments of ore from Tonopah for the week ending Jan. 10 were: Tonopah Company, 500 tons; Tonopah Extension, 325; total, 825 tons. In addition 1770 tons were shipped from Goldfield, making 2595 tons in all. The light shipments were due to the closing down of plants on account of scarcity of fuel.

NEW MEXICO

GRANT COUNTY

Silver City has just had a significant visit from some of the most important copper-mining men of the United States, including W. C. Greene, Sonora, Mexico, Dr. James Douglas, and others who are well known.

Several big deals have been consummated, and there are others now under consideration. The Tyrone Development Company, in which Col. Greene and Mr Cole are largely interested, has purchased a group of 10 claims about a mile north of the Robinson group and adjoining the Top mine for $125,000 cash. The Robinson is a property owned by Judge W. C. Porterfield and associates, and some strikes of high-grade copper ore have lately been made in the workings. The Austin group is also under Judge Porterfield's control.

Lost Bullion Spanish Mine—An old shaft which was sunk by a prospector in 1875 and is now included in the holdings of the company has a vein from 6 to 8 ft. wide averaging in value from $30 to $40 per ton. This shaft is 75 ft. deep and a drift of 50 ft. along the vein shows good values all the way. A large dump has been found on another portion of the old property. It indicates the location of one of the main workings of the property in ancient times and is now entirely overgrown with trees and brushes. The bulk of the dump is now being systematically sampled by cuts and shafts. In the western part of the workings of the old mine a new ledge of highly ferruginous quartz has been struck which assays high in gold and silver. The company is now consulting with an engineer for the erection of a modern treatment plant of a daily capacity of 500 tons, and W. E. Wilson, president of the company, has just finished a visit to the property.

Chloride Flat—A deal of importance has been consummated in this district. An old property which has lain dormant since 1893 has been purchased by Eastern parties, who are now actively engaged in shipping ore which nets $10 per ton above shipment and treatment charges.

SOCORRO COUNTY

Mogollon District—Both Cooney and Mogollon camps are short of machine men. In the Cooney mine important new orebodies are being opened, and the force at both mine and mill is being augmented by Manager T. J. Curran of the owning company, the Mogollan Gold and Copper.

Rosedale—The gold mine and mill here, 26 miles west of Magdalena in the San Matias range, is now closed, pending a sale. The mine is opened with 50-ft. levels, from a shaft, to a depth of 700 ft. on a nearly vertical shoot of quartz, some 10 ft. thick by 180 ft. long. Another blind shoot has been found by drifting south on the 500-ft. level, that appears to be of the same size and quality and will probably join the discovery shoot in depth. The ore is gold, with a little hematite in quartz and runs about $9 a ton, of which half can be caught on the plates. There is a 10-stamp mill of 18 tons daily capacity. The cyanide plant, erected to treat the tailings, made an imperfect saving, owing probably to lack of fine sliming.

Magdalena District—The Graphic Company, after drifting, without result, for some 500 ft. north and south from the intersection of the Waldo adit with the Silver Pipe limestone, has at last been rewarded. The body struck is 40 ft. thick and, it is hoped, will prove to be on development the largest zinc deposit yet found in the camp. Much of it assays 42 per cent. zinc with scarcely any lead.

J. A. Traylor (of the Traylor Engineering Company), with New York associates, has bought control of the Tribullion company (owner of the Kelly mine) and has placed $350,000 cash in the treasury for extensions. The new three-compartment shaft on the Silver Peg claim is now down over 200 ft. and the first station is cut. The 15-drill air compressor and first-motion steam hoist ordered for this shaft will inaugurate a new era for Kelly mining practice, when they are installed.

It is planned to locate the new Tribullion smelter at Albuquerque on a site donated by real-estate men there. Competitive rates can be secured that will enable slack coal to be delivered at $1 a ton, as the town is centrally located to the Gallup, Cerrillos and Carthage coal districts. The smelter will comprise an oxide department and a spelter department; also lead and copper smelting furnaces.

The Kelly mine has been shipping recently two classes of sulphides, A and B. The A class runs 20 to 25 zinc and 8 to 12 per cent. lead, while B class has only 2 of lead but 35 per cent. zinc. The contract for the extraction of this ore has been held by A. O. Jacobsen & Co., but it expired Jan. 1.

Superintendent Davis has now taken a lease and bond on four adjoining patented claims to utilize the organization and machinery equipment of the Jacobsens, now existing in Kelly. Of these the Juanita has been worked steadily on a small scale for 20 years, and the Juanita Extension has a 150-ft. shaft in which one small but rich orebody was found. The other two claims, however, the Companion and the North Companion, have as yet shown no ore and their systematic exploration will be watched with interest.

NEW YORK

ST. LAWRENCE COUNTY

Benson Mines Company—This new company has leased the property of the Magnetic Iron Ore Company, at Benson Mines, which includes about 2800 acres of land with a concentrating plant. It has also acquired mineral rights on adjoining lands. The Benson ore is a magnetite ranging from 35 to 45 per cent. iron and low in phosphorus. When the Magnetic

Ore Company was working, several years ago, concentrates were made, carrying 60 [illegible] and 05 sulphur. The lessee will begin operations at once. The Benson Mines Company has a paid-in capital of $200,000 with John C. Eden as president and Wayne Wills, vice-president. The directors are Alexis W. Thompson, John C. Eden, Wayne Wills, E. N. Ohl and Henry Cassel, several of them being connected with the Inland Steel Company. The post office address of the company is Benson Mines, St. Lawrence county, New York.

OREGON

BAKER COUNTY

Bourne Camp—It is understood that negotiations are in progress for the consolidation of the Columbia, the Eureka & Excelsior, the Golconda and the North Pole mines. H. G. Hendryx, of Portland, Oregon, is managing the deal. Bourne is eight miles from Sumpter and 30 miles west of Baker City.

Hecla Gold Mines Company—A conference was held recently in Baker City between representatives of the stockholders and Receiver Otto Herlocker. It is understood that a plan for settling the debts of the company was arranged.

PENNSYLVANIA

BITUMINOUS COAL

Consolidated Connellsville Coke Company—This company has been organized to take over all the properties of the Southern Connellsville Coke Company, the Sterling Coal and Coke Company and the Masontown Coal and Coke Company. The new company will control about 2000 acres of Connellsville coking coal, 500 acres of surface and more than 1000 ovens. The new organization is composed of men from Fayette county, Pittsburg, Boston and Cleveland. The paid up capital is stated at $1,000,000. The properties of the new company are already in active operation. The officers are: President, W. C. Magee, Pittsburg; vice-president and general manager, George Whyel, Uniontown; secretary and treasurer, I. W. Semans, Uniontown.

Monongahela River Consolidated Coal and Coke Company—This company's statement for the year ended Oct. 31, 1906, shows net earnings of $2,286,336. The charges were: Royalty on coal mined, $442,932; interest and taxes, $683,842; maintenance and depreciation of river craft, $706,962; total, $1,833,736, leaving a balance of $452,600; from this dividends of $450,000, or 4½ per cent. on the preferred stock, were paid, leaving a surplus of $2600. The net reduction in floating debt was $952,031. The production of coal for the year was 6,509,737 tons, an increase of 1,578,674 tons, or 31 per cent., over 1905. [illegible] Ohio Valley Company mined 127,399 tons. The company has sold the stock which it held in the Corona Coal Company, finding the properties in Alabama could not be operated to advantage in connection with the properties in Pennsylvania.

SOUTH DAKOTA

CUSTER COUNTY

St. Elmo—While doing assessment work a rich streak of quartz was found, and, the stringer being followed, a 5-ft. ledge carrying panning values on the surface was uncovered. It was stripped for a distance of 100 ft., maintaining its values for that length. A force of men will be put to work to develop this new find.

LAWRENCE COUNTY

Hercules—Preparations are being made to resume work soon on this property in Ruby gulch. A compartment shaft, now 200 ft. deep, will be sunk to the greater depth for the purpose of encountering the ore deposits which lie below.

Cleopatra—R. B. Hughes, superintendent, is working a force of men in an old tunnel already 1200 ft. in length. The vein has been followed for a distance of 50 ft., and work is being carried on to locate the orebody lost a few years ago by reason of a fault in the formation.

Gilt Edge Maid—R. N. Ogden, a Deadwood attorney, has been appointed secretary and general manager to succeed John R. Wilson, who died suddenly a week ago. Mr. Ogden is a large stockholder in the company, has been identified with mining interests in the hills for a number of years, and is thoroughly familiar with all conditions.

Golden Placer—This company granted the eight-hour day to all of its employees the first of the year, and is consequently pushing work rapidly on its new mill. The two buildings are approaching completion, and will be in condition to operate within a few weeks.

Cobalt—Cobalt ore is said to have been discovered on the Boswald property, a mile east of Portland in the Bald Mountain district. Some samples of ore were taken from the dump, supposed to contain lead ore, but on being assayed at the Homestake office they showed a percentage of cobalt. Larger samples will be taken and further analysis made.

TEXAS

BOWIE COUNTY

Carbondale Coal Company—This company, which owns coal property near Simms, has, according to a report in the *Manufacturers' Record*, of Baltimore, expended about $150,000 for improvements and is at present mining at the rate of three cars per day. Leases on more than 3000 acres of land are said to have been secured, from which it is expected about 30,000,000 tons of coal can be produced, the product being a hard cannel coal with good power-producing qualities. The vein is said to be about 150 ft. underground, covered with a layer of slate, then a vein of soft coal, beneath which the cannel coal exists in a vein from 13 to 15 ft. in thickness. The company has constructed a standard-gage railroad four miles in length from the mines to Carbondale. It is also said to be arranging for the installation of a briquetting plant with a view to manufacturing coal briquettes. Officers of the company are J. B. Schmidtz, Denton, Texas, president; J. W. Ripy, of Fort Worth, Tex., first vice-president; I. B. Walker, Dallas, Tex., second vice-president; C. T. Ramsdale, Denton, Tex., secretary-treasurer.

UTAH

BEAVER COUNTY

Cedar Mining Company—Recently, on the 250-ft. level of this company's property a new vein containing rich gold ore was encountered. For some time shipments of high-grade lead-silver ore have been made.

Newhouse Mines and Smelters—The mill belonging to this property at Newhouse is turning out concentrates at the rate of two carloads a day. The work of enlarging the mill is in progress. The plant is to be doubled in size.

Talisman—Two new veins have recently been developed in this company's property. On the 200-ft. level 2½ ft. of lead-silver-copper ore has been exposed, 18 in. of which shows high-grade values. The other find was on the 80-ft. level in the southern part of the property.

JUAB COUNTY

Lower Mammoth—Connections between the workings on the 1700 level of this property have been effected, exposing ore of shipping grade for a distance of 240 ft. The vein shows from 15 to 30 ft. in width.

Emerald—This company is sinking its shaft to 1000 ft. depth. It is now over 800 ft. down.

Eureka-Swansea—Jesse Knight, of Provo, has secured an option on the property of this company near Silver City. It is said it will be used as a site for the proposed smelter to be built by the Tintic Smelting Company.

Centennial Eureka—Equipment for the new 50-drill compressor to be installed at this property is being assembled.

Tintic Ore Shipments—Ajax, 4 cars; Beck Tunnel, 10; Bullion Beck, 4; Carisa, 7; Centennial Eureka, 4; Eagle & Blue Bell, 7; Eureka Hill, 1; Gemini, 10; May Day, 4; Ridge & Valley, 2; Scranton, 5; South Swansea, 1; Swansea, 5; Tintic Iron, 10; Uncle Sam, 4; Yankee Consolidated, 2 cars

WASHINGTON

WHATCOM COUNTY

Whatcom County Miners' Association—At a meeting held in Bellingham, Jan. 9, the officers elected were: President, Wil-

ham Cox; vice-president, F. M. Lewis; secretary, Phil Bardon; treasurer, John M. Schurr. These officers and the following members comprise the board of trustees: John Siegfried, R. L. Kline, J. J. Noethe and A. T. Raycraft. A committee was appointed to arrange for affiliation with the State association.

WEST VIRGINIA

Fairmont Coal Company—This company's statement for 1906 shows net earnings over fixed charges, $1,017,708; dividends received, $94,500; total, $1,112,208. Depreciation amounted to $40,628, leaving a surplus of $1,071,580. From this a dividend of 3 per cent. was declared on the stock.

Foreign Mining News

CANADA

BRITISH COLUMBIA

British Columbia Copper Company—A plan for an increase in the capital stock of this company from $2,000,000 to $3,000,000 has been sent to the stockholders by President F. L. Underwood, with the announcement that the directors have already given approval to the measure, which has as its chief object the refunding of the large expenditures already made for extensions and improvements at the mines and smelter of the company and to supply additional working capital called for by the increased business.

The increase recommended is of 200,000 shares of a par value of $5 each, and of this amount 116,160 shares, or $580,800, will be offered to stockholders at par. The directors have agreed to take all of the stock not subscribed by the shareholders. The new stock, if approved, will be offered to stockholders of record Feb. 20 for subscription to the amount of 30 per cent. of their holdings, of which $2.50, or one-half, will be payable March 11 and the balance May 10 next.

ONTARIO—COBALT DISTRICT

Gamey—This Cobalt claim of 40 acres, lying north of the Buffalo, in which E. E. Dennis of Grand Rapids has the controlling interest, is to be extensively developed under the direction of Albert C. Houghton, consulting engineer. Machinery, including a 60-h.p. boiler, four-drill air compressor and hoist, will be installed and a force of about 45 men engaged. It is proposed to continue the shaft to the 100-ft. level and drift both ways at 50 and 100 ft. down and run a cross-cut at the latter depth.

AFRICA

TRANSVAAL

The actual production of gold reported in December was 550,167 oz., being 16,794 oz. more than in November, and 118,573 oz. more than in December, 1905. For the full year the total was: Witwatersrand, 5,550,534 oz. fine gold: outside districts, 227,083; total, 5,780,617 oz., or $119,609,373. This is an increase of 889,396 oz., or 18.2 per cent., over 1905. Of this gain 853,101 oz. was from the Witwatersrand, and 36,295 oz. from the outside districts.

Coal Trade Review

NEW YORK, Jan. 23

The coal trade in the West has been enlivened by cold weather, causing an increase in demand. The complaints of car shortage still continue, but it is to be noted that the supply at all the large consuming centers has been quite sufficient to meet the extra demands of the past week. The chief effect of the weather has been to make prices firm; it has not advanced them.

In the East both anthracite and bituminous trades remain quiet. A cold spell this week was too brief to have any serious effect on trade. The demand for steam coals continues large.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Jan. 12 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	170,088	163,302 D.	6,786
Bituminous	1,276,748	1,302,127 I.	25,379
Coke	471,975	478,526 I.	6,551
Total	1,918,811	1,943,955 I.	25,144

The daily average was 147,601 tons in 1906, and 161,996 tons in 1907; an increase of 14,395 tons.

New York Jan. 23

ANTHRACITE

Hard-coal dealers are still averse to placing any orders while the weather continues mild, and the dullness which has characterized the anthracite market for several weeks continues unabated. Last year at this time, although the weather was similar, there was considerable activity during January, February and March owing to the fact that a strike was imminent; but this year no such contingency has to be met, and dealers, who ordinarily would think nothing of giving an order for several thousand tons, are content to order 900 or 1000 tons. Unless a decided cold spell occurs, there is little prospect of activity. Cars are in fair supply, and the number could probably be readily increased, should the demand warrant it. The production at the mines is naturally curtailed, and the first sizes to be affected as to quantity are the small steam sizes, and these are very scarce in the local market. Prices remain at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are $3 for pea, $2.25@2.50 for buckwheat; $1.50 for rice; $1.40 for barley; all f.o.b. New York harbor shipping points.

The Atlantic Seaboard soft-coal trade shows little change, and the demand is generally good, though here and there trade is quiet. This has been brought about by the comparatively good weather, which has permitted regular shipments from the mines to come forward to consumers. Car supply to individual operators has continued good since the beginning of the year, which was also a helpful feature in the market.

Trade in the far East is good, and this territory has absorbed its full quota. Trade along the Sound is better to a small degree, and discharging has been facilitated, which has permitted more coal to go forward to that territory. New York harbor trade is quiet, with coal of various qualities being offered. This has not changed prices to any extent, though it has produced more or less weakness, which cold weather will probably correct. Fair grades of steam coal are bringing about $2.75 f.o.b. New York harbor shipping points.

All-rail trade is easier, although consumers are taking on considerable coal, as they do not care to let their stocks fall behind to any extent. Transportation from mines to tide has improved, coal running through in a little less than schedule time. In the coastwise vessel market vessels are in fair supply, and freight rates continue the same. We quote from Philadelphia to Boston, Salem and Portland, 95c.@$1, and discharge, on large vessels; the loading and discharging clause is included.

Birmingham Jan. 21

Coal operations in Alabama show some improvement, as the railroads begin to supply more cars. There is no hold-up in the demand, and strong prices still prevail. State Mine Inspector J. M. Gray has not received enough figures as yet to give out positive information as to the coal production in this State for the past year.

G. B. Crowe and associates have purchased the coal properties and coke ovens of the Connellsville Coal and Coke Company, in the lower part of Jefferson county, paying $50,000 for 2300 acres of land. The property will be developed at once, more coke ovens constructed and coke manufactured. Dr. Crowe and associates now operate the mines at Yolande, in Tuskaloosa county, not far from the Connellsville property.

Edward Flynn, president of the Alabama district organization of the United Mine Workers of America, has been appointed assistant State mine inspector, to take office Feb. 1, *vice* M. M. Kuffner, resigned to take a position with the Davis Creek Coal Company. Mr. Flynn is a practical coal miner. He will resign his position with the mine workers as soon as his commission comes from the governor.

Chicago Jan. 22

greatly. The cold weather that began Sunday may aid the trade greatly; but the indications are not favorable to continued cold weather over Chicago territory, and the present over-supply and light demand will probably continue. Nearly all grades of coal are lower in quotation, while the amount of coal received continues, through favorable transportation and increased facilities at the mines, to increase.

Illinois and Indiana, as constituting the great bulk of the local market, determine the quotations. Prepared sizes from the mines of these two States are decidedly easier; the operators, preparing for a mild winter, have caused an over-supply of lump and egg, so that the product is disposed of with difficulty. Lump and egg from Illinois and Indiana mines sell for $1.85@3; run-of-mine for $1.80@2.50 and screenings for $1.25@1.50. In general it may be said that these coals are off 10 to 50c., on account of the weather chiefly.

Eastern coals are likewise depressed. Smokeless, the steadiest, brings 20 to 30c. less than the standard quotations of $3.40 for run-of-mine and $4.30 for lump. Hocking is in over-supply and brings 40 to 65c. less than the standard quotation of $3.65. Youghiogheny is selling at about $3, with the supply large.

Cleveland . Jan. 22

The coal trade improved when the cold wave settled over this territory on Sunday and Monday. Stocks on hand are so liberal, however, there has been little need for anyone to worry about supply, and it will take several days for the market to get rid of the surplus, and for the colder weather to have any influence on prices. The only result, therefore, from a trade standpoint, was the elimination of sales in the nature of sacrifice to avoid car-service charges. The market has strengthened in tone without any real change in prices.

The best grades of mine-run coal are selling on the basis of $1.15 at mines for Ohio; $1.10 for No. 8, and $1.10@1.15 for Pennsylvania. The supply of slack has been so short some of the users of stoking devices have been forced to use mine-run coal, breaking it up with hammers and crushers to the size needed. Ohio slack is selling on the basis of $1.10 at mines, and Pennsylvania slack 85@90c. at the mines. The colder weather has also stiffened the demand for strictly domestic coal, especially since the pressure of natural gas has not been strong enough to satisfy the demands. The prices in that market have not changed, being based on $2.30 at mines, for Massillon.

The coke market is stronger and the blizzard is giving further improvement to the tone of the market. The best grades of 72-hour foundry coke are selling on the basis of $4.25 at ovens, and furnace coke $3.50@3.60 at ovens.

Hartshorne, Ind. Ter. Jan. 19

The car shortage in the Southwest still continues, but the warm weather prevailing for the past two weeks, together with the extra efforts put forth by the railroads, has made the situation a little easier and prevented any actual suffering. The demand for coal, however, has not abated.

Pittsburg Jan. 22

There was a slump in coal prices last week, caused by cutting on the part of small operators. The mild weather of the past few weeks was responsible for a falling off in orders, and besides there was an unusually good supply of railroad cars. The leading interest, although it had enough cars to serve its mines to capacity, did not operate to more than 80 per cent. The severe cold weather which opened the week is expected to increase the demand and restore former prices. Sales have been made on the basis of $1.10 @1.20 for mine-run coal at the mine. The mines of the Monongahela River Consolidated Coal and Coke Company have been prevented from operating full on account of the high water in the river, it being impossible to handle empty craft. When the waters recede a good boating stage will enable shippers to send several large tows to lower ports.

Connellsville Coke—The coke market continues strong, but there is no change in prices. Furnace coke for January and February shipment is quoted at $3.40@3.50 and foundry remains at $4@4.25. According to the *Courier* the production for the week amounted to 292,673 tons. The shipments aggregated 15,252 cars, distributed as follows: To Pittsburg, 4575 cars; to points west of Pittsburg, 8792 cars; to points east of Connellsville, 1885 cars.

Foreign Coal Trade

Jan. 23

The quantity of coal bunkered, or furnished as fuel, to steamships engaged in foreign trade at United States ports for the 11 months ending Nov. 30, 1906, was 4,712,087 tons. Adding this to the exports, previously reported, makes a total of 13,826,758 tons sent beyond the limits of the United States.

Exports of fuel from Great Britain, with coal sent abroad for the use of steamers engaged in foreign trade, were as follows for the year ended Dec. 31, in long tons:

	1905.	1906.	Changes.
Coal	47,476,707	55,599,771	I. 8,123,064
Coke	774,110	815,224	I. 41,114
Briquets	1,108,455	1,377,209	I. 268,754
Total exports	49,359,272	57,792,204	I. 8,432,932
Steamer coal	17,396,146	18,590,213	I. 1,194,067
Total	66,755,418	76,382,417	I. 9,626,999

This shows a total increase of 14.4 per cent. in coal sent beyond the limits of the United Kingdom. Exports to the United States, included above, were:

	1905.	1906.	Changes.
Atlantic ports	56,609	25,438	D. 31,171
Pacific ports	75,160	30,741	D. 44,419
Total	131,769	56,179	D. 75,590

The larger exports in 1906 were 9,444,528 tons to France; 7,810,024 tons to Italy; 7,629,653 tons to Germany; 3,573,505 tons to Sweden.

Exports of coal from Germany for the 11 months ended Nov. 30 were, in metric tons:

	1905.	1906.	Changes.
Coal	16,446,517	17,975,884	I. 1,529,367
Brown coal	18,423	16,837	D. 1,586
Total	16,464,940	17,992,721	I. 1,527,781

Exports of coke for the nine months March—November, 1906, were 2,596,106 tons. Included in these were 15,529 tons to the United States.

Imports of coal into Germany for the 11 months were, in metric tons:

	1905.	1906.	Changes.
Coal	8,614,287	8,355,056	D. 259,231
Brown coal	7,176,868	7,764,865	I. 587,997
Total	15,791,155	16,119,921	I. 328,766

Imports of coke for the nine months March—November, 1906, were 417,135 tons; of briquets, 127,104 tons.

Dusseldorf, Germany Jan. 12

The coal production of the German Empire for the 11 months ending Nov. 30 is reported as below, in metric tons:

	1905.	1906.	Changes.
Coal	110,672,797	125,693,158	I. 15,020,361
Brown coal	47,256,651	51,329,874	I. 4,073,223
Total mined	157,929,448	177,023,032	I. 19,093,584
Coke made	13,878,482	18,475,721	I. 4,597,239
Briquets made	11,748,721	13,345,283	I. 1,596,562

The total increase in coal mined was 12.1 per cent. The briquets made are largely from brown coal, or lignite.

Iron Trade Review

New York, Jan. 23

Strong buying of pig iron is still in evidence, and the movement started last week has not yet subsided. Consumers seem to have made up their minds to secure their supplies by contract, and so guard themselves against any possible difficulty in getting supplies when needed.

In finished material there has been comparative quiet, with few new orders. The mills are being pressed for deliveries on contracts, and are all busy. Some structural business is still coming forward, but more is held back, on account of the difficulty in getting early deliveries. Steel billets are not as active as they have been, but are still in strong demand, as are sheet-bars. Bars, both iron and steel, are strong, with little spot material. Lake ship builders and steel-car builders are responsible for sold-up conditions in plates and shapes.

Car shortage worries mills and furnaces.

...and coal mines do not seem to be improving to any great extent. The Southern furnaces are suffering most, and cannot move their iron as fast as they make it.

Ore sales are practically completed for the season, though a little is being bought from the Lake Erie dock stocks.

Baltimore Jan. 22

Imports for the week included 310 tons spiegeleisen and 456 tons ferro-manganese. Receipts of iron ore were two cargoes, 9350 tons, from Cuba.

Included in the exports were 749 tons steel billets; also 29,317 lb. zinc dross.

Birmingham Jan. 21

The improvement in transportation has not been at such a rate as to bring a great amount of satisfaction. The shipments this month are somewhat better than they were in December, but not much. The accumulated stocks of iron will not show as big a reduction at the end of the month as was hoped. Manufacturers or consumers will have to pay the 25c. advance in freight rates, which goes into effect Feb. 1, on a large tonnage of iron. The sale of iron for delivery during the last half of the year is still steady and inquiries that are coming this way indicate that much iron is yet needed. The quotations remain firm. No. 2 foundry, for delivery during the last half of the year, is bringing $18.50@19. Iron for the first quarter is very hard to find. Second-quarter pig is not so plentiful, though some is to be had. The price for second-quarter iron is still above $20. No. 2 foundry.

The Shelby Iron Company is making preparations to blow in one of its furnaces about the first of the coming month; charcoal is being collected now.

The Tennessee Coal, Iron and Railroad Company has sold its probable make in steel rails for the entire year. There is a good inquiry being received for steel and steel products, with all plants in full operation. Cast-iron pipe, soil pipe and other products are in strong demand, and good prices obtain. Labor is still scarce.

Chicago Jan. 21

The last week has been one of strong trading and advancing quotations for Northern pig iron, with Southern fully holding its own. Melters seem to be coming to the point where they are willing to contract heavily for future demands, and the spot iron clamor is becoming fainter. The great demand now is for iron on contracts for the third and fourth quarters of the year.

Everybody in this market expects a January lull, but this is past, for 1907, to all appearances. The year opened with the usual diffidence of buyers. They thought there were possibilities of a lower market and of business disturbances that would cause the unexpected to happen. The unexpected did not happen. Prices remained firm and need has steadily increased. In consequence, the market is the strongest that has been known for many Januaries, and bids fair to grow stronger.

Quotations are variable, but the following represent a fair average and presentation of the market as it stands today, for deliveries in the last half of 1907: Lake Superior charcoal, $25.50@26.50; Northern No. 2, $25@26; Southern No. 2, $25.35@26.35 ($21@22 Birmingham). On deliveries in the second quarter prices are $1@2 lower.

All indications are for a greater year than 1906, so far as the consumption of iron locally is concerned. The sale of finished materials is very strong and increasing.

Coke is active with increasing demand, and Connellsville bringing $6.65 Chicago, or $4 at ovens.

Cleveland Jan. 22

Iron Ore—An estimate has been made that the shippers of iron ore own or have under charter enough boats to bring down the lakes 36,000,000 tons of iron ore during the coming season. It is estimated that the fleets owned by the producers will move 20,000,000 tons, and that the merchant fleets chartered have a carrying capacity of 16,000,000 tons. Provided the movement by lake is 40,000,000 tons there will be, for carriage in wild boats, about 4,000,000 tons. It is anticipated the movement will not be less than the figure outlined and possibilities are it will be much larger. Sales of ore are light, sales off stock piles being almost nil. This may be heavier, this year, than for a number of years, however, owing to the desire of some consumers to get a portion of the high-grade ores remaining on the stock piles here for years.

Pig Iron—Producers of foundry iron are compelled to cut down shipments because production is reduced, first by low-grade ores, and second by necessity to make repairs to furnaces. The demand is still strong, the surplus being cared for by imports. A good deal of foreign iron is coming into this territory, and most of it is sold before it reaches this market. The price is $26 delivered. On future delivery the demand is still good. Consumers are trying to hammer prices, and this gives rise to many reports of weakness. The market is really strong, with $22 at furnace the minimum, and some of the furnaces selling their output as high as $24 at furnace. Bessemer has been stiffened just a little by sales at $21.50 for large amounts. Basic is holding firm on the same basis. Southern furnaces are not able to sell in this territory for first half, owing partly to congested conditions at the furnaces and partly to lack of transportation facilities. Their spot price is $23 Birmingham for No. 2, while $18@19 is asked for second-half delivery.

Finished Material—Interest continues to center in the supply of semi-finished material. It may be said both billets and sheet-bars are easier. This is particularly true of re-rolling billets. Forging quality is still hard to obtain. The demand for sheets is strong; also for bars, especially bar iron, which is selling on the basis of 1.80@1.85c. Pittsburg. The demand for structural shapes and plates is still strong, most of the specifications being in the nature of anticipation of contract requirements.

Philadelphia Jan. 23

Pig Iron—People in this territory who are taking new business calling for pig iron feel that they must buy, notwithstanding prices are higher than they think the iron is worth, or is likely to sell at later on. At least this is an expression that has been made by quite a number of consumers who have contracted for iron since last report. They see that there is nothing else to do but to make themselves safe, and they are unwilling to take any chances. Every influence at work points to still higher prices and they take very little encouragement from the intimations thrown out in some quarters that we have reached the high-water mark. Foreign iron costs almost as much as American to deliver, and there is not much relief offered at Southern furnaces. Our Pennsylvania pig-iron makers are not seeking buyers, and what little capacity they have available for the next three or four months they are conscientiously taking care of to benefit their customers. Basic iron is exceptionally strong and the only reason why big business cannot be announced this week is that the makers are not in a position to accept orders. Bessemer pig is very strong and is pointing upward. Some little business has been done in malleable iron and considerable malleable is due to consumers here, which was contracted for some little time ago. The barmill people are resting quietly so far as forge iron is concerned, as they have contracts which will protect them in most instances. Quotations for No. 1 X foundry may be given at about $26.50; No. 2 X, $24.50; No. 2 plain, $23.50; standard forge, $23; malleable, $26.50; basic is nominally $24; Middlesboro on dock is quoted at $23@23.50, and Scotch in the neighborhood of $25.

Steel Billets—It remains with the mill people to determine whether much business in billets will be done this week or next. The users of billets are in about the same fix as the users of pig iron and are forced to follow the same policy of buying in order to take care of the business which is coming along. Rolling billets are about $34, forging $36.

Bars—Best refined iron is moving quite freely from stores in small lots at high prices, 1.93½c., and steel bars are selling

on the card at that figure.

Sheets—While the card rate is from 2.80 to 3.20c., the actual selling price on the business that is being done this week

very strong and high. Conditions point to further advances in tubes.

Plates—The only quotations which have over the supposed card rates, as the material is wanted promptly.

Structural Material—There will be a heavy demand within the next two weeks for structural material for a number of big buildings that are to be erected in this territory. There are also rumors of large transactions for railroad purposes and terminal requirements. Premium quotations are the rule and further advances are regarded as inevitable.

Steel Rails—The business for the past week has been made up altogether of small lots and light sections are being ordered more freely than for some months.

Scrap—The outcome of the frantic endeavors of the scrap-iron people to gather in material has been that there is a temporary surplus of certain kinds, but this surplus would soon be swept out of the way if the scrap men would take a little less money. They have been riding the high horse so long that they feel they can keep up these high quotations, but the indications are that they will have to change their minds.

Pittsburg Jan. 22

The iron and steel markets are decidedly dull, so far as new business is concerned, but specifications on old contracts in all finished lines continue heavy. An active pig-iron buying movement for second half had been expected when several important sales were made two weeks ago, but since that time there have been few transactions, and last week no sales of any grade of pig iron for late delivery were

All the mills in the Pittsburg district are busy, and despite the high water during the past week, little inconvenience was caused to the mills along the rivers, compared with former years. The two rivers were at a flood stage several times, but to the mills was slight, and did not interfere seriously with operations. While production is not at the highest point the output for December, Structural material seems to be a dull line, and the Carnegie Steel Company has taken advantage of it to put new engines in its 35-in. mill at the Homestead works. This mill will be running again early next week. There are inquiries for over 100,000 tons of steel rails, but so far the business has not been placed. The Carnegie company has not booked any new rail orders lately, but is operating

and plates, the Edgar Thomson, at Braddock, and the Ohio works, at Youngstown, to capacity, and both will be kept busy until late in the year on contracts taken to date.

The tin-plate market is firm, and the standard price of $3.90 a box for coke plates, 14x20, is being strictly observed by both the American Sheet and Tin-Plate Company, and the independent interests. Production is heavy and stocks are light. If the packers conform to the standard established by the committee of the Department of Agriculture the manufacture of tin-plate may be affected. It calls for a minimum coating of 1.8 grains on each piece 2 in. square, equal to 2 lb. 1¼ oz. a box. At present 2 lb. of tin is used in coating a box of plates. Uniform coating, however, cannot be guaranteed by the manufacturer, and to insure the coating required under the standard of the committee it would be necessary to use more tin, which would increase the price of tin-plate to the packers.

All the pipe mills are crowded with business, and new inquiries are being received that may result in contracts shortly. The Adrian Gas Company is in the market for a large tonnage of various sizes of pipe, and the order may be placed with the National Tube Company. The plate mills are booked up to the third quarter, and considerable new business is in sight. Inquiries are in for 40,000 steel cars, and if the contracts are placed will mean fully 400,000 tons of plates.

Pig Iron—The only business of importance booked this week was for delivery in the first quarter. One sale was of 500 tons of bessemer for January and February delivery at $23.85, Pittsburg, and the other, 1500 tons of gray forge for first quarter at $22.50, Pittsburg. Small lots of No. 2 foundry sold at $25, Valley furnaces. Producers are not willing to make any concessions on prices established for the second half, and consumers do not seem to be ready to buy. There is a small spread between the leading grades, with foundry the highest at $21.75, bessemer, $21.50 and basic, $21.25, all f.o.b. Valley furnaces. All the Westinghouse interests, except the Westinghouse Electric and Manufacturing Company, have covered for their second-half requirements, and it may delay buying in expectation of a lower rate.

Steel—Deliveries of billets are improving, but there is no new business. Prices remain unchanged, with bessemer billets quoted at $29.50, and open-hearth at $32@33. Plates are firm at 1.70c., and merchant steel bars at 1.60c.

Sheets—Mills cannot guarantee deliveries on new business inside of two months. Prices continue strong, black sheets being quoted at 2.60c., and galvanized at 3.65c. for No. 28 gage.

Wire—The market is lower, sales having been made today at $79 a ton.

London Jan. 17

Iron and Steel Exports—Exports of iron and steel; and of machinery, from Great Britain for the full year are valued by the Board of Trade returns as below:

	1905.	1906.	Changes.
Iron and Steel..	£31,826,438	£39,880,563	I. £8,054,125
Machinery.....	23,260,326	28,732,693	I. 5,472,367
New Ships.....	5,131,298	8,685,240	I. 3,553,942
Total.....	£60,218,062	£77,298,496	I. £17,080,434

The increase in the total last year was 28.4 per cent. The larger items of the iron and steel exports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	982,876	1,664,442	I. 681,566
Wrought iron.....	183,376	200,316	I. 16,940
Rails	546,569	463,240	D. 83,329
Plates.....	204,568	275,058	I. 70,490
Sheets.....	406,815	443,131	I. 36,316
Steel shapes, etc.....	213,747	275,143	I. 61,396
Tin-plates.....	354,564	375,414	I. 20,550
All other kinds.....	828,567	992,102	I. 163,535

The total increase in quantities was 967,464 tons, or 26 per cent. Exports of pig iron to the United States in 1906 were 310,699 tons, an increase of 136,810 tons; of tin-plates, 61,518 tons, a decrease of 1532 tons.

Iron and Steel Imports—Imports of iron and steel into Great Britain for the full year are valued as follows:

	1905.	1906.	Changes.
Iron and steel...	£8,589,405	£8,360,135	D. £229,270
Machinery.....	4,537,871	5,127,187	I. 589,316
Total.....	£13,127,276	£13,487,322	I. £ 360,046

The total increase was 2.7 per cent. The chief items of the iron and steel imports were, in long tons:

	1905.	1906.	Changes.
Pig iron.....	126,164	89,246	D. 36,918
Wrought iron.....	105,960	107,713	I. 1,753
Steel billets, etc.....	603,949	486,029	D. 117,920
Bars and shapes	50,227	55,025	I. 4,798
Structural steel	122,998	138,660	I. 15,662
All other kinds.....	346,700	340,043	D. 6 657

There was a total decrease in quantities of 140,282 tons, or 10.3 per cent., last year.

Iron Ore Imports—Imports of iron ore into Great Britain for the full year were, in long tons:

	1905.	1906.	Changes.
Manganiferous ores.	285,563	309,071	I. 23,508
Iron ores.....	7,059,223	7,514,015	I. 454,792
Total.	7,344,786	7,823,086	I. 478,300

Of the imports in 1906, Spain furnished 203,303 tons of manganiferous ores and 5,746,058 tons of iron ores.

Cartagena, Spain Jan. 5

Iron and Manganiferous Ores—Messrs. Barrington & Holt report for the week: Shipments were one cargo, 4000 tons dry ore, to New York; one cargo, 4450 tons, to Philadelphia; two cargoes, 6100 tons dry ore, to Great Britain; 14,550 tons in all. Since our last report there has been very little business passing, miners in most cases not having yet resumed work after their holidays. The position, however, continues highly satisfactory from the miners' point of view, the demand for every class of ore being far in excess of the production. The amount of iron ore shipped from Cartagena during 1906 was

780,439 tons, as against 530,029 tons for the previous year, while the other producing ports in the province, Puerto Matarredona, Mazarelos and Aguilas—all show increased shipments.

We are unable to quote any prices, owing to their being apparently no ore disposable. Freight rates are a trifle easier, but tonnage still continues scarce, there being a considerable number of orders in the market for prompt boats.

Metal Market

NEW YORK, Jan. 23

Gold and Silver Exports and Imports.

At all United States Ports in December and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1906...	$1,729,194	$ 7,588,624	Imp. $5,859,429
" 1905..	2,668,589	1,028,881	" 1,360,349
Year 1906..	46,564,097	155,350,766	" 108,990,369
" 1905..	46,794,467	50,293,405	" 3,498,938
Silver:			
Dec. 1906...	5,486,094	4,122,324	Exp. 1,363,770
" 1905..	8,196,149	4,692,746	" 3,503,403
" 1906..	59,036,340	44,350,896	" 14,685,444
1905..	57,513,102	35,939,135	" 21,573,967

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Jan. 19 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 256,800	$ 94,036	$244,863	$ 31,189
1907.....	473,615	304,115	1,435,459	212,116
1906.....	536,000	118,926	6,385,082	185,382
1905.....	8,016,432	111,885	2,294,318	61,740

Gold exports for the week were chiefly to Argentina; silver to London. Imports, both gold and silver, for the week, were from Mexico and South America.

The foreign trade of the United States for the full year is valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1905.	1906.
Exports	$1,626,980,795	$1,798,107,955
Imports.....	1,179,144,550	1,321,064 694
Excess, exports....	$447,846,245	$477,043,261
Add excess of exports, silver.....		14,685,444
Total		$491 728,705
Deduct excess of imports, gold.....		108.990 369
Net export balance.....		$382,738,336

The gold and silver movement in detail will be found in the table at the head of this column.

The joint statement of all the banks in the New York Clearing House for the week ending Jan. 12 shows loans, $1,063,957,200, an increase of $15,148,000; deposits, $1,042,434,400, an increase of $33,512,000, as compared with the preceding week. Reserve account shows:

	1906.	1907.
Specie	$189,968,300	$192,610 600
Legal tenders.....	84,138,600	86,458,700
Total.....	$274,106,900	$279,069,300
Surplus.....	$49,561 50	$48,109,750

The surplus over legal requirements shows an increase of $0,820,000, as compared with the previous week.

Specie holdings of the leading banks of the world on Jan. 19 are reported as below, in dollars:

	Gold.	Silver.	Total.
Asst'd New York	.....	.....	$[illegible]
England..	$160,814,120	.....	[illegible]
France	529,877 800	$198,165 800	[illegible]
Germany	151,001,500	[illegible]	[illegible]
Spain	76,935,000	121,005,000	197,940,000
Netherlands....	27,[illegible]	[illegible]	[illegible]
Belgium.....	[illegible]	[illegible]	[illegible]
Italy.....	160,980,000	23,[illegible]	[illegible]
Russia	590,265,000	23,675,000	613,930,000
Aust.-Hungary.	232,165,000	58,900,000	291,065,000
Sweden	19,980,000	.....	19,980,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

The movement of gold and silver in Great Britain for the full year is reported as below:

Gold:	1905.	1906.
Imports	£38,567,895	£46,042,090
Exports	30,829,842	42,617,267
Excess, imports.....	£7,738,053	£ 3,424,823
Silver:		
Imports	£12,292,014	£17,288 063
Exports	14,561,677	18,865,285
Excess, exports.....	£1,569,663	£1,577,222

Of the silver imported last year £14,890,946, or 86.1 per cent. of the total, came from the United States.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Jan. 10:

	1905.	1906.	Changes.
India.....	£ 747,200	£33,480	D. £ 713,720
China.....	.....	.....	.....
Straits..	.....	.....	.....
Total.....	£ 747,200	£33,480	D £ 713,720

Receipts for the week were £5000 from New Zealand, £11,000 from Chile, £17,000 from the West Indies, £362,000 in coin from the Straits, £203,000 in bars and £15,700 in Mexican dollars from New York; a total of £673,700. Exports were £26,780 in bars and £6700 in Mexican dollars; £33,480, all to India.

Indian exchange is strong, and the Council bills offered in London were taken at 16.09d. per rupee. Shipments of gold from Australia to India have been small so far this year.

Prices of Foreign Coins

	Bid.	Asked
Mexican dollars.....	$0.53	$0.55
Peruvian soles and Chilean.....	0.47⅛	0.49
Victoria sovereigns..	4.85⅛	4.87⅛
Twenty francs.	3.86	3.89
Spanish 25 pesetas...	4.78	4.80

SILVER AND STERLING EXCHANGE.

	Silver.				Silver.			
January.	Sterling Exchange.	New York, Cents.	London, Pence.	January.	Sterling Exchange.	New York, Cents.	London, Pence.
17	4 85⅛	67⅛	31¼	21	4 85⅛	68⅛	31⅛
18	4.85⅛	67⅛	31	..	4.85⅛	68	31⅛
19	4.86	67⅛	31⅛	23	4.85⅛	68⅛	31⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York

	Copper.			Tin.	Lead.	Spelter.	
January.	Lake. Cts. per lb.	Electrolytic. Cts. per lb.	London. Cts. per lb.	Cts. per lb.	Cts. per lb.	New York. Cts. per lb.	London. Cts. per lb.
17	24¾ @25	24¼ @24¾	107⅛	41¼	6.00	6.70 @6.75	6.55 @6.60
18	24¾ @25	24¼ @24¾	106½	41¼	6.00	6.70 @6.75	6.55 @6.60
19	24¾ @25	24¼ @24¾	. . .	41⅜	6.00	6.70 @6.75	6.55 @6.60
21	24¾ @25	24½ @24¾	106½	41¼	6.00	6.70 @6.75	6.55 @6.60
22	24¾ @25	24 @24¾	106⅞	42	6.00	6.70 @6.75	6.55 @6.60
23	24¾ @25	24½ @24¾	106⅝	42	6.00	6.70 @6.75	6.55 @6.60

London quotations are per long ton (2240 lbs.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper apply to cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—Transactions have been light. Conditions in the market still remain unchanged. Prices, due to the oft reported shortage of supplies, still continue to harden, and close firm at 24¾@25c. for Lake; 24½@24¾ for electrolytic ingots, cakes and wirebars. Casting copper is nominally 24¼@24½c.

Some bear selling took place in London, and while these sales were not able to depress the standard market very much, they nevertheless had the effect of unsettling it, especially as far as spot supplies are concerned. It closes steady at £106 16s. 3d. for spot, £108 1s. 3d. for three months.

Refined and manufactured sorts we quote: English tough, £109; best selected, £114; strong sheets, £123@124.

Exports of copper from New York for the week were 2019 long tons. Our special correspondent reports the exports from Baltimore at 1126 tons of copper.

Imports of copper and copper material into Great Britain, with exports of copper, were as follows for the full year; the total imports given being the copper contents of all material, in long tons:

	1905.	1906.	Changes.
Copper ore.....	93,689	96,249	I. 3,560
Matte and precipitate...	69,129	74,875	I. 5,746
Fine copper.....	70,876	74,298	I. 3 422
Total, copper.....	114,710	121,361	I. 6,651
Reexports	14,291	11,954	I. 6...
Exports.....	52,482	42,443	D. 10,039
Total exports..	66,683	57,107	D. 9,576
Balance, imp.	48,027	64,254	I. 16,227

Of the imports the United States furnished last year 6388 tons of matte an increase of 1499 tons; and 26,895 tons of fine copper, a decrease of 1318 tons. Imports of matte and precipitate from Spain in 1906 were 20,328 tons, an increase of 2100 tons. Imports from Chile were 4895 tons matte and 11,742 tons copper, show-

lb.; subject to change without notice.

per sheets is 30c. per lb.; subject to change without notice.

Tin—Notwithstanding the fact that the London market has become a good deal firmer and higher, buyers in this market are still holding back and business was done in retail lots only. At the close 42c. is quoted for spot tin in this market, while London closes firm at £192 for spot, £192 5s. for three months.

Tin shipments from the Straits for the first half of January are cabled as follows: United States, 634 long tons; Great Britain, 1246; European Continent, 250; total, 2130 tons. This is a decrease of 951 tons from the corresponding period last year.

Imports and exports of tin in Great Britain for the full year were as follows, in long tons:

	1905.	1906.	Changes.
Straits	33,446	35,635	I. 2,189
Australia	4,074	5,114	I. 1,040
Other Countries	2,246	2,859	I. 614
Total imports	39,766	43,608	I. 3,843
Re-exports	29,155	32,271	I. 3,116
Exports	7,623	8,495	I. 872
Total exports	36,778	40,766	I. 3,988
Balance, exp.	2,987	2,842	D. 145

The re-exports are largely of Straits tin to the United States.

Lead—The quotation remains unchanged at 6c. New York.

London, which had reported toward the end of last week a weaker market, has become a good deal stronger since the beginning of this week, and closes firm at £19 18s. 9d. for Spanish lead, £20 1s. 3d. for English lead.

Imports and exports of lead in Great Britain for the full year are reported as below, in long tons:

	1905.	1906.	Changes.
United States	24,690	18,894	D. 6,294
Spain	106,614	111,914	I. 5,300
Australia	70,504	54,252	D. 16,252
Germany	24,721	16,640	D. 7,081
Other countries	4,013	7,033	I. 3,021
Total imports	229,542	208,253	D. 21,292
Exports	61,411	44,594	I. 3,453
Balance, imports	168,054	163,659	D. 24,645

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

St. Louis Lead Market—The John Wahl Commission Company telegraphs under date of Jan. 16 as follows: Lead is quiet, with sales at 6.07½c. for ordinary Missouri brands, and 6.15c. for corroding lead.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 5, that the price of pig lead has been 91.75 reales per quintal, equal, on current exchange, to £18 4s. 4d. per long ton, f.o.b. Cartagena. Silver is 14 reales per ounce; exchange, 27.44 pesetas to £1. Exports for the week were 192 tons argentiferous lead to Marseilles.

Spelter—Consumption in this metal continues at a very satisfactory rate, in consequence of which a good business has been done. Spot and near by shipments are still at a premium over more distant deliveries. The market closes firm at 6.70 @6.75 New York, 6.55@6.60 St. Louis.

Imports and exports of spelter in Great Britain for the full year were as follows, in long tons:

	1905.	1906.	Changes.
Spelter	90,808	93,704	I. 2,896
Zinc sheets, etc.	21,167	19,354	D. 1,813
Total imports	111,975	113,058	I. 1,083
Exports	7,322	7,837	I. 515
Balance, imports	104,653	105,221	I. 568

Imports of zinc ores are not reported separately.

The London market, which was very weak and had declined to £26 10s., closes somewhat firmer and reports quotations as steady at £27 for good ordinaries, £27 5s. for specials.

Zinc Sheets—The base price is $8.40 per 100 lb. (less discount of 8 per cent.) f.o.b cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—Quotations are unchanged. Cookson's, 25¾@26¼c.; Hallett's, 25@25¾c.; ordinary brands, 24@24½c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum — Demand continues strong and prices high, with an upward tendency. Unmanufactured platinum is quoted at $38 per oz. For good scrap $31.50@32 is paid.

Quicksilver—There is no change. New York prices are $40.50@42 per flask of 75 lb., according to size and conditions of order. San Francisco prices are $39@40 per flask for domestic orders, and $37@38 for export trade. The London quotation is £7 per flask, with £6 18s. 9d. asked by jobbers.

Imports of quicksilver into Great Britain for the full year were 2,552,586 lb. in 1905, and 2,911,742 lb. in 1906; an increase of 359,156 lb. Re-exports of imported metal were 1,599,826 lb. in 1905, and 2,078,449 lb. in 1906; an increase of 478,623 lb. last year.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Dating from Jan. 1, 1907, the name of the Pittsburg Reduction Company has been changed to the Aluminum Company of America. The change is solely one of name and is made to indicate the character of the business.

Wisconsin Ore Market

PLATTEVILLE, Jan. 19

Indications the first part of the week pointed to increased strength and activity in the zinc ore market, but no material excitement resulted. Nearly all of the operators resumed work, and the buyers were all back in the field. Two of the new plants have had their try-out runs, but no turn-in has been reported from them so far. The new roaster at the Black Hawk is ready to start. It is estimated that there are several hundred tons in their bins ready to be treated in the roaster. Interest is being shown in the output of the different camps, and it is expected that this coming spring will see a change in the shipments from some of the smaller producers, owing to the starting up of new mills. Platteville camp is bound to hold first place as the old-time producers have as bright an outlook as they ever had, and this summer will see at least three new producers in operation, the foundations being in for two plants already.

Prices remained, in general, as they were last week.

The camps of the district loaded ore as follows for the week ending Jan. 19:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur Lb.
Platteville	253,250	.....	...
Highland	447,160	.....	.....
Linden	441,785	.....	.....
Benton	210,800	.....	.....
Mineral Point	170,550	36,600	.....
Galena	164,000	.....	.....
Cuba City	152,140	.....	.....
Total for week	1,839,685	36,600	.....
Year to Jan. 19	3,820,625	173,350	.....

A portion of the tonnage reported this week really belongs in last week's report. The figures from one or two camps were not received in time for this week's issue, but will appear next week.

Missouri Ore Market

JOPLIN, Jan. 19

The highest price reported paid for zinc was $50 per ton, on an assay basis of $46 to $48.50 per ton of 60 per cent. zinc. Average price, all grades, $45.86. The highest price paid for lead was $87.50, medium grades bringing $84 to $86, and an average, all grades, of $83.98 per ton. The corresponding week last year zinc sold at $54 and lead at $76 per ton.

Considering that 9000 tons of zinc ore

are piled up in bins throughout the district, the demand is exceptionally strong, because the ore in the bins is sold and money advanced on most of it. The smelters have thousands of dollars tied up in this ore and cannot move it on account of the inability of the transportation companies to provide enough cars. The week's shipment was reduced through this cause, at some points, and at others rain and mud made impassable roads. No cold weather has visited this district this winter, except a light freeze in the latter part of November, and the output has been large. This week, however, broken gas mains caused a loss of two days at many mines.

Following are the shipments of zinc and lead concentrate from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,608,980	845,860	$86 837
Joplin	2,192,080	228,100	61,108
Galena-Empire	1,127,640	103,090	30,266
Badger	923,100	3,040	22,743
Alba-Neck City	587,020	.....	14,381
Duenweg	356,930	91,260	12,219
Aurora	432,350	.....	8,990
Granby	430,000	72,000	8,800
Carthage	274,240	.....	6,718
Spurgeon	242,540	42,120	6,471
Prosperity	69,590	102,950	5,960
Springfield	.....	62,240	2,614
Sherwood	59,680	27,010	2,536
Lawton	57,670	.....	1,355
Totals	9,362,420	1,577,720	$280,998
Three weeks	31,621,790	4,558,950	$913,848

Zinc value, the week, $214,746; three weeks, 723,321
Lead value, the week, 66,252; three weeks, 190,527

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1905.	1906.	Month.	1905.	1906
January	52.00	47.38	January	61.50	75.20
February	52.77	47.37	February	57.62	72.83
March	47.40	43.68	March	53.20	77.73
April	42.88	44.63	April	58.00	75.13
May	43.31	40.51	May	58.27	78.40
June	40.75	43.83	June	57.80	80.96
July	43.00	43.25	July	58.00	74.31
August	48.83	43.56	August	58.00	75.36
September	46.75	42.58	September	63.60	79.64
October	47.60	41.55	October	63.86	79.84
November	49.55	44.13	November	68.67	81.98
December	49.00	43.68	December	76.25	81.89
Year	44.88	43.24	Year	62.12	77.40

Chemicals

NEW YORK, Jan. 23

Copper Sulphate—The market remains firm and steady, with a fair demand. Prices are unchanged at $7.25 per 100 lb. for carload or larger quantities, and $7.50 per 100 lb. for smaller slots.

Phosphates—Exports of phosphate rock through the port of Savannah for the month of December are reported by J. M. Lang & Co. as follows: Italy, 597 tons; Holland, 956 tons; Germany, 4427; total, 5980 tons.

Sulphur—Messrs. Emil Fog & Sons report from Messina, Sicily, under date of Jan. 1, that exports and stocks of sulphur in Sicily were as follows, up to Nov. 30, in tons of 1030 kg. each.

	1905.	1906.	Changes.
Exports Nov.	24,501	18,764	D. 5,737
" 11 mos.	415,547	363,898	D. 51,649
Stocks, Nov. 30	451,355	520,257	I. 68,902

The November exports included 4047 tons to the United States in 1905, and 1717 tons in 1906; a decrease of 2330 tons.

British Chemical Trade — Exports of chemicals from Great Britain for the full year were as follows, in cwt. of 112 lb. each:

	1905.	1906.	Changes.
Bleaching powder	937,000	1,003,537	I. 66,537
Muriate of ammonia	99,269	130,585	I. 31,316
Soda ash	1,491,646	1,901,488	I. 409,842
Bicarbonate of soda	426,481	404,740	D. 21,741
Caustic soda	1,508,955	1,592,465	I. 83,490
Soda crystals	201,129	189,970	D. 11,159
Soda sulphate	742,332	980,099	I. 237,767
Sulphuric acid	85,866	98,029	I. 12,163

Exports of copper sulphate were 55,881 tons in 1905, and 42,982 tons in 1906; a decrease of 12,899 tons last year.

Imports of chemicals and raw materials into Great Britain for the year were, in long tons:

	1905.	1906.	Changes.
Nitrate of potash	9,103	11,166	I. 2,063
Nitrate of soda	104,436	108,486	I. 4,050
Phosphates	420,988	422,970	I. 21,982
Sulphur	20,016	25,033	I. 5,017
Pyrites	698,746	759,324	I. 60,578

Estimating sulphur contents of pyrites at the usual figure, the total imports of sulphur were 299,514 tons in 1905, and 338,763 tons in 1906; an increase of 39,249 tons last year.

Mining Stocks

NEW YORK, Jan. 23

The general tone of the stock markets remains uncertain. Conditions are about the same as last week, and there is no perceptible improvement. The impression is that the period of liquidation is not yet over. Some people had anticipated a boosting of the market in the hope of making room for new securities, but such a movement has not been apparent.

Amalgamated declared the same dividend—2 per cent.—as for the previous quarter. Some people were disappointed, though it is hard to say why, since this company's dividend policy is always a mystery to outsiders.

The mining stocks on the New York curb were more active, though no special excitement has been visible. The Boston market continues active though less excited.

All sorts of rumors of copper consolidations are still heard, but nothing definite or final can be said about the matter.

Boston Jan. 22

The reaction which started a week ago in copper shares continued the greater part of the week. It was accelerated by reports that a hitch had occurred in the pending combination of certain companies and these were the stocks that had the greatest setback. Saturday last saw the lowest prices, and since then there has been some recovery. Speculation has tamed down, and the volume of business is nearing normal. In the meantime another new record has been established, being that of Boston Stock Exchange memberships. One seat sold last week for $38,500, which is the best price they ever brought, and $1000 above the last previous sale. As indicating the interest that mining shares have created it is noted that stock exchanges are being established in various Western centers, and preparations are said to be making to take some of the New York curb stocks on the Stock Exchange there, regardless of their par value.

Wolverine established a new price record by selling up to $200 per share. It is thought that the next dividend will be $10, semi-annually. There was some disappointment felt because the Amalgamated dividend was not increased, and the stock dropped $7 to $111.62½, but it recovered to above $116 today. Copper Range broke $2 to $93.50, but has recovered the loss, and North Butte tumbled $6 to $111.50, recovering to $115. Osceola fell $7.50 to $157, but went back to $166 today. Tamarack fell $14 to $148, recovering to $162. Calumet & Arizona went off $5 to $177, but touched $184 today. Isle Royale, which stiffened $2.25 to $36, went off to $31, recovering to $33.75. Quincy fell $6 to $114, but is back to $121 today. Utah Consolidated slumped $3.50 to $70.25, with recovery to $74. United States Coal and Oil spurted $2.25 to $13.25, reacting slightly. United States Smelting fell $2 to $66, with partial recovery.

Trinity fell from $39 to $34.75, but recovered to $38.87½ today. Lawson is pursuing a vigorous newspaper advertising campaign, which accounts for the popular interest in this stock. Shannon went to above $24, which is its highest record. This company has increased the number of stockholders the past few months, and now has about 2300 owners. Winona advanced from $12.50 to $13.75, and Wyandot has been an active feature, selling up to $3.50. The latter has struck the Winona lode, which brought buying orders. American Zinc rose sharply to $53, reacting to $50.50 tonight, against the close a week back at $45. Calumet, after touching $960, fell to $935, but is back to $950. Greene Consolidated slipped off $2 to $29.50, but recovered $1. Allouez slipped back $6 to $63, recovering one-half the decline, and Centennial fell $3.50 to $38.50, rallying to above $41.

Butte Central has been a curb feature, the common advancing from $7.50 to $8.50 and the preferred from $11.50 to $14. Davis-Daly has been active, settling to $17.12½, with recovery to $18.37½. Superior & Pittsburg rose from $26 to $28.75 on reports of a rich strike at the property, but yielded to $27.50 on profit-taking. Nipissing has been quiet. It has been found necessary to have a transfer agency in this city for this company's stock.

Colorado Springs Jan. 18

The local stock market has been dull and featureless. The most active traders this week were Isabella with 28,000 shares to her credit and Work with 25,500. There seems to be an Ethiopian in the C. K. & N. woodpile as a sale was recorded at 15 on Tuesday, with no bids at over 6½ since, until to-day, when a sale of 5000 was recorded at 6⅞. It has been bolstered up for some time and has seemingly sold as high as 18c. It is generally conceded that this stock is now selling for all it is worth, considering its high capitalization. The balance of the list has held firm, some of the stocks advancing slightly. The predicted after-holiday activity has failed to arrive.

STOCK QUOTATIONS

NEW YORK Jan. ..

Name of Comp.	Clg.
[illegible]	1⅜
[illegible]	.6
[illegible]	11⅜
[illegible]	25¢
[illegible]	1⅜
[illegible]	1⅜
[illegible]	33
[illegible]	36
Butte Coalition...	37½
[illegible]	⅞
[illegible]	⅞
Colonial Silver ...	3⅝
Cum. Ely Mining.	13
[illegible]	18⅝
[illegible]	6⅜
[illegible]	..
[illegible]	2
[illegible]	2
[illegible]	2
[illegible]	5
[illegible]	250
[illegible]	2
[illegible]	2
McKinley Dar....	2⅛
[illegible]	6¾
Mines Co. of Am .	2⅝
Mitchell Mining..	5½
[illegible]	12½
[illegible]	4⅝
[illegible]	24
Nipissing Mines..	14⅜
[illegible]	4
[illegible]	2
[illegible]	2
[illegible]	51⅜
[illegible]	1
[illegible]	1
[illegible]	148⅝
[illegible]	116
Bethlehem Steel .	..
Colo. Fuel & Iron.	37
[illegible]	37
Inter. Salt	31
[illegible]	74
[illegible]	1
[illegible]	17⅝
Republic I. & S...	28⅝
[illegible]	4
Sloss-Sheffield....	57
[illegible]	..
Tenn. C. & I.....	44
U. S. Steel, pf....	99⅝

BOSTON Jan. ..

Name of Comp.	Clg.
Adventure	5
Allouez	.6
Arcadian	30⅜
Arcadian	14½
Atlantic	17½
Bingham	33
Boston Con	30
Calumet & Ariz.	184
Calumet & Hecla.	950
Centennial	41
Con. Mercur	52
Copper Range	95
Daly-West	19½
Franklin	25¼
Granby*, New	130
Greene Con	30⅜
Isle Royal	33½
Mass	8½
Michigan	22
Mohawk*	92
Mont. C. & C.(new)	1¾
Nevada	18¾
North Butte	114¼
Old Colony	1¾
Old Dominion	57
Osceola*	68¼
Parrot	32½
Phoenix	1⅛
Quincy	120
Rhode Island	11⅜
Santa Fe	6½
Shannon	24
Tamarack*	160
Trimountain	..
Trinity	38¼
United Cop., com.	75
U. S. Oil	12
U. S. Smg. & Ref.	66
U.S.Sm.& Re.,pd.*	47⅝
Utah Copper*	74
Victoria	8
Washington	2½
Winona	14¾
Wolverine	..
Wyandotte	3½

BOSTON CURB

Ariz. Com	110
Black Mt.	3⅛
[illegible]	31
[illegible]	1
[illegible]	17⅜
[illegible]	14½
[illegible]	4⅝
Raven	1⅝
[illegible]	1½
Superior & Pitts.	27
[illegible]	1

Name of Com	Clg.
Camp Bird	1
[illegible]	1
[illegible]	1
[illegible]

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MINING CONDITIONS IN THE MOUNTAINS OF CHIHUAHUA*

The Difficulties of Operation in the Sierra Madre—The Dolores Mine and Mill

BY JOHN B. FARISH†

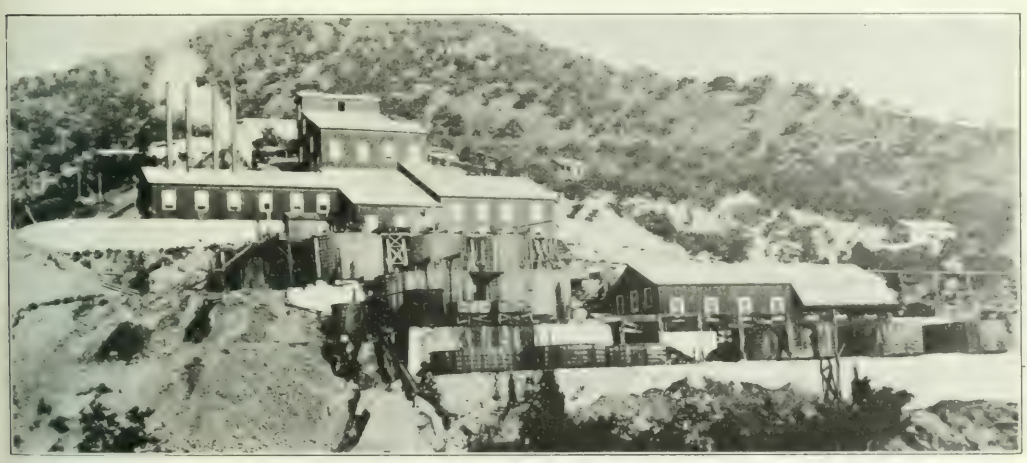
The properties owned by the Dolores Mines Company are situated in an isolated section of the Sierra Madre, in the western part of Chihuahua, Mexico. The nearest mining camps, which are from one to two days' mule-back travel from the mine, are Soyopa, Ocampo, and Pinos Altos. The property is reached by the Mexican Central Railroad from El Paso to Chihuahua, thence via the Chihuahua al Pacifico Railroad to La Junta, thence over the branch to San Isidro. From San Isidro a mule trail leads over the mountains in a general direction a little south of west, an estimated distance of about 100 miles to the Dolores mine. This trail is exceedingly rough in places; good riding time from San Isidro being 33 hours in the saddle. Owing to the roughness of the trail this requires, under ordinary conditions, from three and one-half to four days.

Careful observations were made on my trip of the riding time between points and barometric readings of elevations. From these I prepared a profile based horizontally on riding time and vertically on altitude. This, of course, gives only an approximate idea of the character of the country, for it is readily understood that the riding time on steep hillsides is not nearly so fast as on level mesas. Still the observations are of sufficient interest, as indicating the character of the country. The elevations vary from 3510 ft. at the pumping station on the Tutuaca river to 8500 ft. on the summit of the Cebadilla mesa. The variations in altitude present a range of vegetable growth from the palm trees of the upper tropicals to the pine trees of the temperate zones. At the pumping station at the Tutuaca river can be seen some few scattering palms, sycamores, aloes, willows, maguey, and a scant growth of small scrub oaks. At an altitude of 4500 ft. junipers appear with a scant growth of scrub cedars. Here the oaks have materially increased in size. At something over 5000 feet manzanitas and scrub madrones appear. At an altitude of 5250 ft. the madrones have increased in size, and the first scrub pines appear in the sheltered ravines. At 6000 ft. the oaks reach their maximum growth and development. At an altitude 500 ft. higher the pines produce good mine poles with some fair saw-logs. The best saw-logs, and in fact the only ones that can be considered good, were seen at altitudes above 7000 ft.

TRANSPORTATION

Over the trail described, all freight, supplies, laborers, and in fact everything going to Dolores, must be transported on mule back. Supplies and machinery must be broken in packages of from 150 to 300 lb. each, as an average load for a mule is about 250 lb., while that for a burro is about 200 lb. Packages weighing in excess of 300 lb., or those of unhandy bulk or shape call for extra freight rates, which are greatly in excess of the regular rates for packing more convenient parcels. During the construction of the mill $25 was paid for packing a cam-shaft weighing 485 lb., while $37.50 was paid on a piece of a Cameron pump weighing 630 lb.

At the time of the organization of the company there seemed to be an abundance of freight animals, both mules and burros, to handle all material and supplies for the mine. The advent of the Greene interests in the Sierra Madre, the building of railroads and the opening of other new



THE DOLORES MILL FROM THE EAST

*This article is drawn from a report made to the Dolores Mines Company, as the result of a visit to the property in June and July, 1906. Some photographs that accompanied but were not published in the original report have been added.

†Consulting mining engineer, Denver and New York.

uation. Animals are very scarce, and transportation has advanced in consequence from $3.50 and $4 per carga (300 lb. avoirdupois) at which rate most of our machinery was transported from the railroad, to the present ruling rate of $6 per cargo from San Isidro. The probabilities are that the rate will be further increased, owing to the general activity and sharp competition that now exists throughout the State of Chihuahua.

The average time for a freight train from San Isidro to the mine is, in favorable weather, from 10 to 12 days. The average return trip from the mine to the railroad—the animals being without loads—is from five to six days. Both mules and burros then require a considerable rest on pasture. Two round trips for animals under Mexican control in three months is a good average under present freighting conditions. During rainy or stormy weather the regular trip to the mine takes never less than 15 days, and from that up to several weeks, depending upon the severity of the rains or

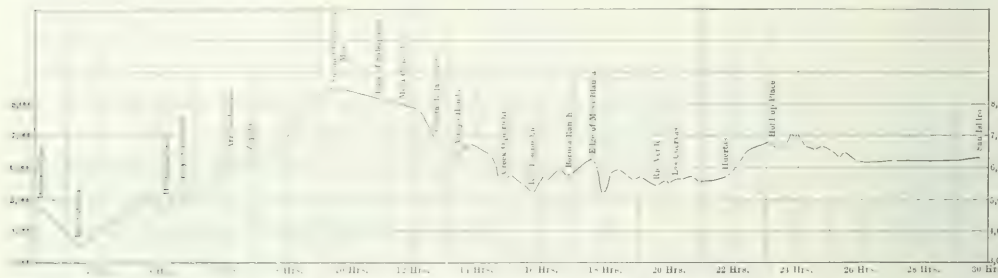
WATER SUPPLY

Unless the season is very dry, sufficient water flows in the San Francisco and Dolores arroyos to supply domestic wants. During the past two rainy seasons and parts of the winters following the streams have been large enough to even furnish water for milling. During the remainder of the year it is necessary to resort to the Tutuaca river, 16,000 ft. distant, where a pump has been installed. This pump is the finest piece of sectionalized machinery of the sort that I have ever seen. It has a capacity of 100,000 gal. daily, pumping through 6000 ft. of pipe against a head of 1450 ft. Such conditions impose a severe test on the pumping plant, but this has been met by a Riedler pumping engine. The plunger of this pump is differential, being 2 3/16 and 3 1/16 in. in bore by 28 in. stroke, actuated by a Corliss condensing engine. The ease with which it works and the fact that it is a sectionalized machine surprise all who see it. The tank into which the water is thrown by the pump through

ly all of which is oak. There remains approximately 6¼ cords per acre, of which 2¾ cords are oak and 3½ cords are pine, consisting of small trees, and tops of saw-log trees. The larger part of this is in the higher and more rugged mountains. The fuel now being delivered is costing about $3 per cord delivered at the mill.

Two relatively small portions of the company's acreage carried pines of sufficient size for saw-logs. Nearly all the saw-logs were snaked from the places at which they were cut, along rough roads for distances up to as much as two miles, to a point where a rough hoist was improvised from the machinery left in the old mill erected at Dolores some 20 years ago. The logs were drawn up a slide 1200 ft. to the top of the ridge, from which point they were again snaked for a distance of nearly a mile to the top of a log chute, down which they were slid 1500 ft., and again snaked a further distance of nearly a mile and a half to a log chute, down which they were slid 250 ft. to a point near the mill.

The saw-logs cut on a small section to



PROFILE OF DOLORES TRAIL, CHIHUAHUA, MEXICO

the snow storms, and the condition of the rivers and trail. Often the freighters will stop with cargas at ranches in the valley, or lay off where the pasture is good in the mountains, for a week or more in order to rest their mules before proceeding. When the rivers are up the freight is often delayed for weeks.

In this connection, it will be recalled that the rainy seasons of the summers of 1904 and 1905, and the following winters, were two of the most severe that have ever been known in northern Mexico. During the past winter snow fell to a depth of 4 ft. on the Cebradilla mesa, and lay for a period of three months—a thing unheard of before. During the first summer of our operations the rainy season was so mild that the springs and arroyos surrounding the mine dried up, and water for domestic purposes had to be packed on burros from the Tutuaca river. The following winter was equally mild and only two slight flurries of snow fell upon the trail, neither of which exceeded an inch or two nor remained on the ground more than a week.

3000 ft. of 3-in. and 3000 ft. of 3½-in. pipe, is of solid masonry. From this intermediate tank it flows by gravity through 10,000 ft. of 4-in. pipe to a second tank, also of solid masonry, located on a hill above the mill, and having a capacity of 200,000 gal. The building of these tanks in a country where there is practically no lime was an expensive item. All of the lime for this and other construction was gathered at scattered points, where mineral springs had made small deposits of carbonate of lime. The difficulty of obtaining a large supply, and the expense attending it, as compared with a similar supply in a limestone country, where it occurs in abundance, can be readily understood.

TIMBER, LUMBER AND FUEL

These form a very important item in both the construction and operation of a property. At the time operations were started a careful investigation of the available fuel on the company's tract resulted in an estimate of 50,000 cords of both pine and oak. There have been cut up to date approximately 7000 cords, near-

the east of the Arroyo Amplio did not have to be hoisted and were consequently the cheapest of all logs to obtain, though they were snaked for distances of as much as two miles to the first log chute. The roads necessary for the transportation of the saw-logs cost from 50c. to as much as $1 per meter to build. The transportation of saw-logs formed from 75 per cent. to as much as 80 per cent. of the total cost of the sawed lumber. The cost of lumber averaged about $37.50 per M.

Another important item in connection with the cost of lumber has been the expense of maintaining mules in a country where there is absolutely no arable land of any kind. In these logging operations an equipment of some six logging trucks is employed, complete with chains and harness, as well as some 50 odd mules for hauling purposes.

MULES AND PASTURE

When working the animals are fed corn and hay, but when idle they are turned out to graze. Corn is purchased by the hectoliter; straw, hay, etc., by the arroba of 25 lb. A hectoliter contains approx-

imately 2.83 bushels. The average price of corn delivered at Dolores is as follows:

	Hectoliter.	Bushel.
Limited local supply	$4.00	$1.47
Supply from railroad	4.25	1.50
Lowest price	3.25	1.15
Average price	3.625	1.28

The so called "hay" consists of dried grass collected in the arroyos and on the mesas and sells for 18½c. per arroba. Wild reeds, very much liked by the mules and very nutritious, are collected in the arroyos near the Tutuaca river, and sell for 25c. per arroba. Corn fodder comes from the small ranches on or near the Aros river, 15 miles distant, over a rugged trail, and varies greatly in price. These ranches are small and cannot be depended upon for supplies.

Owing to the increased activity in Mexico a great demand for mules has arisen within the last three years in all parts of the republic, and prices have advanced accordingly. At the present time the ordinary small Mexican pack mule, selected, costs on the ranches about $30 per head. Pack saddles of good quality cost about $12.50 each. To these costs should be added the expenses of buying and delivering the mules. This can be conservatively fixed at $2.50 per head. It is difficult to estimate the cost of operating a pack train, as so many unforeseen conditions enter into it, such as high water, snowstorms, drought, loss of animals, etc., but experience shows that the cost per ton for a foreign company is always more than the contract price with Mexican freighters.

LABOR CONDITIONS

At the time the company began operations at Dolores the labor conditions in Chihuahua were not bad, though the scarcity was beginning to be felt. As time passed, and other large enterprises began to take shape, the scarcity of labor became more and more pronounced, and wages were correspondingly advanced in all sections in a wild but futile scramble to get an adequate supply. Labor conditions in the isolated districts of the Sierra Madre were seriously affected by the advent of the Greene interests, which raised wages abnormally and drew heavily from the old sections. At Dolores the rates of wages, already high, were raised an average of about 25 per cent., and the prices of merchandise in the store greatly reduced in an effort to hold the labor and compete with the new conditions. To show the effect on other sections of the Sierra Madre, I quote from a recent letter from the superintendent of a mine that has long operated at Ocampo:

"The wages have been raised by the entry of Colonel Greene to such an extent that the company I represent cannot hope to pay; in fact, the miners, timbermen, carmen, watchmen, and so on, simply dictate as to what they shall be paid, or they will not work."

Many of the large enterprises in other parts of Mexico, such as the American Smelting and Refining Company, the Stillwell Railroad and others, are looking to a solution of the trouble by the introduction of Chinese. However, one of the chief officers of the American Smelting and Refining Company told me that it had imported 200 at a cost of approximately $80 per head. They were not adapted to the labor required of them, and soon decamped.

The Greene interests are said to have imported laborers from the United States —Scandinavians, etc.—who proved unsuitable and speedily left.

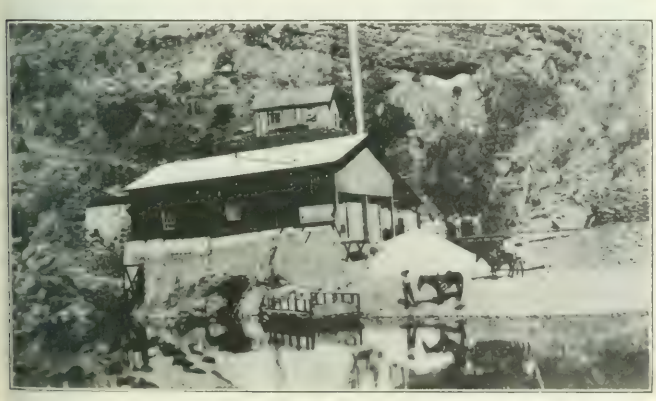
How long the present labor situation will continue in the Sierre Madre it is difficult to tell, but there seems to be no relief in sight.

The Dolores camp has a good reputation as one of the cheapest in the Sierra Madre to live in, but its isolated position and absolute lack of amusement has operated seriously against it. The Mexican is a good deal like a child and must be amused in order to be contented. The lack of proper quarters for housing the native workmen operated seriously against the company. It was supposed that laborers coming in with their families would build their own little cabins, but experience shows that they will not do this. The company was therefore forced to build barracks for them. Also it has been determined to erect a casino for the Mexican population, where they can secure liquors to a limited extent, and where they can gamble up to certain hours in the evening. This casino will be under the control of the company, and the drinking and gambling will be regulated and supervised by the police. In addition to this, it is advisable to furnish musical instruments and organize a home band. The Mexicans are very fond of music, and nothing tends more to make them contented.

MILL

The Dolores mill is exceptionally well constructed and well appointed, location and the necessity for sectionalizing the machinery being considered. I have never seen a better sectionalized mill, and when

THE DOLORES MILL FROM THE SOUTH

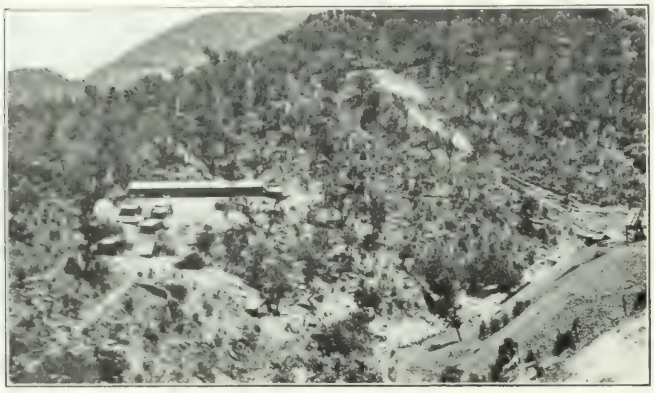


CAMPING STATION ON THE TUTUACA RIVER

we consider the difficulties with labor, freighting, lime, lumber, and in fact in every direction, Mr. Hardy, the manager, is entitled to great credit for the success attained.

The mill is equipped with four 54 in. x 10 ft. boilers rated at 65 h.p. each. The [illegible] Corliss. The

this screen the battery duty will probably be found to average about 4.25 tons per stamp per 24 hours. When crushing for the amalgamation pans through five stamps, without the aid of the Bryans, and through a 30-mesh screen, the duty drops to about three tons per stamp per 24 hours. To effect this crushing the dis-



LOG CHUTE AND BARRACKS

engine room also contains a 7x10-in. Chandler & Taylor engine, used to drive the dynamo for electric lighting, the dynamo being a 10-kw. Bullock, direct-current generator; also a 9x12-in. Sullivan belt-driven air compressor, taking power from the main engine shaft and furnishing air at a pressure of about 25 lb. for general use in the cyanide plant.

ROCK BREAKERS

At the top of the mill there are two rock breakers, 10x7 in. It was originally intended that these rock breakers should deliver the broken ore into a small auxiliary bin which was planned to deliver it to a picking table where the richer parts could be hand-picked for special treatment in the pans, the remainder being carried over to the main battery bin for general mill and cyanide purposes. This arrangement excluded the grizzlies called for in the original plan, so that all ore had to go through the breakers. The picking table intended to receive the ore from these rock breakers was found to be impractical to operate, due to the scarcity of labor and the impossibility of obtaining any sufficiently steady and expert to carry on the picking. With the introduction of concentration such hand-picking as was contemplated is rendered unnecessary.

BATTERY

There are three batteries of five stamps each. The stamps weigh 900 lb. each when newly shod, and make about 102 drops per minute from a hight of 6 in. to 7½ in. For ordinary crushing purposes a 4-mesh screen is used on the batteries when feeding to the Bryan mills. With charge is kept approximately 2½ in. above the top of the dies, though with wear the discharge sometimes rises to 4 in. Back and end liners are used in the mortars to protect the mortar boxes. All the batteries are fitted to crush either in water or in stock cyanide solution, and have a combined capacity, when crushing for Bryan mills, of upward of 60 tons per day.

A CLOSE VIEW OF THE LOG CHUTE

BRYAN MILLS

The secondary crushing is effected by three Bryan mills of the 4-ft. drum-driven, sectional pattern, manufactured by the Risdon Iron Works of San Francisco. In adapting these machines to the requirements of Dolores a considerable amount of experimenting was required, leading gradually to increased efficiency. At the

best this machine is an expensive crusher, though at the same time a good one when in proper repair. Of the three mills one is constantly hung up in the hands of the repair gang, but the remaining two have an average capacity of at least 25 tons per day each, when fed with material crushed in the battery, through a quarter-inch screen and crushing to 60 mesh. Were the Dolores mine located at a point easily accessible by rail or wagon road, Bryan mills would not have been installed, but for secondary crushers of sectional design, I have yet to hear of any machine that is better.

AMALGAMATION

The installation in this connection consists of four standard 5-ft. pans with two 8-ft. settlers, and a clean-up pan. Installed originally as a side issue and as a temporary expedient, this little plant has put through over 9700 tons, yielding a bullion of over $480,000 from ore valued at over $780,000. While the ore is not an ideal one for pan amalgamation, the recovery has been good and the tailings are lying ready, as was intended, for future cyanide treatment. When concentrators are installed the pans will still play an important part in the operations, as it is intended to use them for fine grinding for sliming the pulp for the cyanide plant, and also as a means for continuing a satisfactory output during such time as the tube mill may be out of commission.

TUBE MILL

This mill was an experiment, and is probably the first and only tube mill ever sectionalized and taken into a mountain country. To this end various improve-

ments and additions were made to the original standard pattern and the efficiency of these changes have shown themselves in practice. The machine is of the Gate pattern, 16 ft. long and 42 in. in diameter. Thus far it has run satisfactorily, with the exception of the feed, and completely slimes the material after due returning of sands to a 200-mesh scree

with the exception of a relatively small percentage that remains between the 150 to 200 mesh. At the time of my visit no great wear had been shown by the white iron liners, and the consumption of pebbles (imported from Norway) appeared to be very low. The capacity of this mill has been its disappointing feature, as even under the best conditions it has not been able to slime more than 35 tons per 24 hours. Under unfavorable conditions and during repairs and hang-ups in the mill, this capacity falls off materially. The main condition on which tube-mill capacity hinges is that of feeding it with an exceedingly thick pulp. To effect this the stream of pulp from the Bryans is led into a spitzkasten which also receives the air-lift discharge of sandy material thrown out by the classifying cones from the pulp, after it passes through the tube mill. The maintenance of a thick product from the spitzkasten has given a great deal of trouble and arrangements are now being made to remedy this defect.

It is altogether probable that a second tube mill will have to be installed to obtain a satisfactory capacity. In this event the pans will be used as reserve grinding machinery in case of a breakdown to either of the tube mills.

CYANIDE PLANT

The installation of this plant was a heart-breaking affair, through the difficulty of obtaining saw-logs in such a rugged country, the insufficiency of the ordinary labor, and the lack of skilled labor. The native timber is at best poor for such purposes, and many logs were cut before a selected

COMPANY'S BRIDGE OVER THE TOSANOCHIC RIVER

quality even approximately good enough to be put into tanks was obtained.

The slime plant consists of an installation of four agitating tanks, 22 ft. in diameter by 15 ft. in depth, followed by three decanting tanks of the same dimensions, which deliver their washed contents to the two final settling tanks, 30 ft. in diameter by 15 ft. in depth. These latter tanks discharge the tailings directly to the dams. All the tanks are fitted with decanting arrangements whereby solutions are drawn off to be passed through the classifiers and thence to the zinc house. In addition the agitators and decanters are fitted with agitating arms on a vertical spindle connected by bevel gears from line shafts running over the top of the tanks. These line shafts are connected up to the main engine shaft by rope transmission, and also furnish the power for the pumps. Of these there are two Morris 6-in. manganese steel-lined slime-circulating pumps, two Deane 8x8-in. triplex plunger solution pumps, and one 2-in. Morris centrifugal, which returns the battery solution to the mill supply. The arrangement, as installed, is giving satisfaction, but the material composing it has in several instances brought on shut-downs through breakages. The greatest trouble has been with the bevel gears actuating the agitating spindles, and as these spindles are in two sections, connected by a compression coupling, these couplings have also given trouble through weakness or poor material. Spare parts have been ordered and patchwork repairs have kept the plant running. Much of the trouble in connection with agitation is due to improper classification owing to the sands that come over, packing in the bottom of the [illegible]. It is proposed to remedy this by a mechanical Dorr classifier and new separating boxes. In order to bring the capacity of the slimes plant up to the full crushing capacity of the mill, it will be necessary to erect another agitating tank and to make some other slight improvements.

In addition to the slimes plant there is a sand plant with a capacity of from 8 to 10 tons per day ready for use. Experience at Dolores on a working scale, however, has shown that an all-slimes treatment is to be preferred.

CAMPING ON THE TRAIL AT ZAPATO

MILL IMPROVEMENTS

In order to perfect the mill and bring up its capacity to a total of 1500 to 1600 tons per month, the following changes and additions are being considered. The rearrangement of the rock breakers and ore bins and the throwing out of the picking table. The installation of the grizzly, so that the fine ore from the mine will drop into the main ore bin without passing through the crushers. It has been decided to install three No. 5 Wilfley standard concentrators. The installation of an additional tube mill is also under consideration. Probably another Bryan mill will be necessary to insure ample crushing capacity during repairs. In the cyanide plant, classification will be modified by the introduction of a Dorr mechanical classifier and additional separators. An additional tank will be erected, and the zinc-precipitating space will be extended.

According to *Reuter*, several big nuggets of gold have recently been discovered at Poseidon Rush, near Taraguella, Australia. Two were unearthed weighing respectively 373 and 967 ounces.

THE ADJUSTING OF ORES

Mixing and Selecting Material to Secure the Maximum Selling Price

BY L. S. AUSTIN*

In Engineering and Mining Journal, page 1179, David Wallace says: "There are many legitimate methods adopted by miners and ore dealers to obtain better prices for their products, such as mining two or more different classes in order to 'bring down' the silica, zinc and sulphur, or to 'raise' the contents of gold, copper or lead to above the point unpaid for by the smelters." So far as lead is concerned, this is well illustrated by a graphic diagram deduced from the schedule of prices of lead ores given in the table and issued by the American Smelting and Refining Company in 1906 for Clear Creek and Gilpin county, Colo., ores.

SCHEDULE OF PRICES AND SMELTING CHARGE FOR DETERMINING THE VALUE OF LEAD ORES

Gold, $19.50 per oz., if 5/100 oz. or over per ton.

Silver, 95 per cent. of New York quotation date of assay.

Lead, prices flat.

Copper, $1 per unit dry (1.5 per cent. [illegible] per unit wet.

Zinc, limit 10 per cent., 50c. up.

NEUTRAL SCHEDULE

[illegible] per unit, $8.00 W.C.
Over 10 to 15 per cent. Pb. incl., 25c. per unit, $7.00 W.C.
Over 15 to 20 per cent. Pb. incl., 25c. per unit, $5.00 W.C.
Over 20 to 25 per cent. Pb. incl., 25c. per unit, $4.00 W.C.
Over 25 to 30 per cent. Pb. incl., 30c. per unit, $4.00 W.C.
Over 30 to 35 per cent. Pb. incl., 30c. per unit, $3.00 W.C.
Over 35 to 40 per cent. Pb. incl., 30c. per unit, $2.50 W.C.
Over 40 to 45 per cent. Pb. incl., 32c. per unit, $2.00 W.C.
Over 45 to 50 per cent. Pb. incl., 35c. per unit, $2.00 W.C.
[illegible] per unit, $2.00 W.C.

[illegible]

[illegible] per unit, $12.00 W.C.
Over 10 to 15 per cent. Pb. incl., 25c. per unit, $10.50 W.C.
Over 15 to 20 per cent. Pb. incl., 25c. per unit, $8.50 W.C.
Over 20 to 25 per cent. Pb. incl., 25c. per unit, $6.50 W.C.
Over 25 to 30 per cent. Pb. incl., 30c. per unit, $6.50 W.C.
Over 30 to 35 per cent. Pb. incl., 30c. per unit, $4.50 W.C.
Over 35 to 40 per cent. Pb. incl., 30c. per unit, $3.00 W.C.
Over 40 to 45 per cent. Pb. incl., 32c. per unit, $2.00 W.C.
Over 45 to 50 per cent. Pb. incl., 35c. per unit, $2.00 W.C.
[illegible] per unit, $2.00 W.C.

In the diagram the lower line, marked "lead values" for both schedules, shows a sudden increase in the value of the lead per unit at 25 per cent. For example, while an ore of 25 per cent. is worth 25c. per unit, one of 25.1 per cent. brings 30c. per cent. Taking the line of curve as a whole, we find a slight acceleration of rate up to 50 per cent. and then a uniform increase. Despite this irregularity it will be seen that for a neutral ore the net returns show a uniform increase both on the flat and neutral schedules (aside from the steps at each 5 per cent.) up to 45 per cent., beyond which point both schedules coincide. Nevertheless, these steps are rather irregular, as though unguided by an exact rule. The negative values at the first indicate that for an ore containing lead only, the expense of treatment would be paid for only at from 20 to 25 per cent. of contained metal, and that accordingly in low-grade ore gold and silver would have to be present to meet this expense.

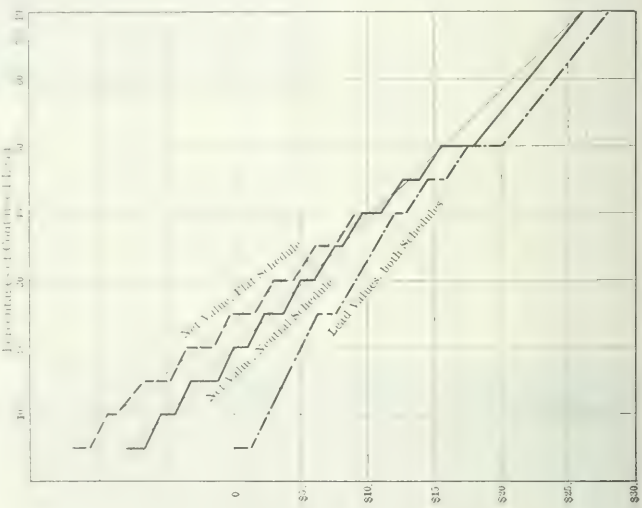


CHART SHOWING INCREASE OF VALUE PER TON

A FEW ANOMALIES

It appears from these lines that at first the silica excess on the neutral schedule must be as much as 40 per cent. to bring it in comparison with the flat schedule. At the point of 20 per cent. in the ore the difference is equivalent to 45 per cent. silica excess, and at 20.1 per cent. it would be but 25 per cent. silica excess. At 25 per cent. lead the anomalies are still more striking, so that an ore seller, whose ore carrying 25 per cent. silica excess on lead alone would leave him a few cents in debt, can by a little sorting bring it up to 25.1 per cent. lead and to $2.50 in value. On the other hand, a neutral ore of 25 per cent. lead would have but 75c. more value than one of 15 per cent. silica excess and with 25.1 per cent. lead figured on the flat basis.

The present system of preparing a schedule is defective from the fact that for the purpose of making it plain to the ore seller, it has been necessary to lay down rules which would be within the comprehension of the ordinary miner. The method of proceeding by a series of jumps certainly introduces anomalies.

On the other hand there is a pecuniary reward to the ore seller, who by means of these graphic curves can sketch out a plan and take advantage of the knowledge thus obtained to increase the returns by a judicious manipulation of his ore. At the present high rate on lead in ores the figures given are not applicable without modification, but by plotting new curves to suit altered prices, new and valuable conclusions can be drawn for any given set of conditions.

The dredging returns in New Zealand exhibit a falling off as compared with the terms of the three previous years. The yield to the end of September this year was 41,480 oz., against 59,514 oz. in 1905, 68,812 oz. in 1904, and 68,620 oz. in 1903. The west coast dredges for the present year obtained 9659 oz., contrasted with 16,128 oz. in 1905, and 3644 oz. in 1904.

Metallic carbides may be divided into two classes; the first is decomposed by water and the second is not affected. Zirconium carbide belongs to the second class.

*[illegible] Michigan College of Mines, Houghton, Mich.

An Electrical Indicator for Water Tanks

BY C. H. GLASSER

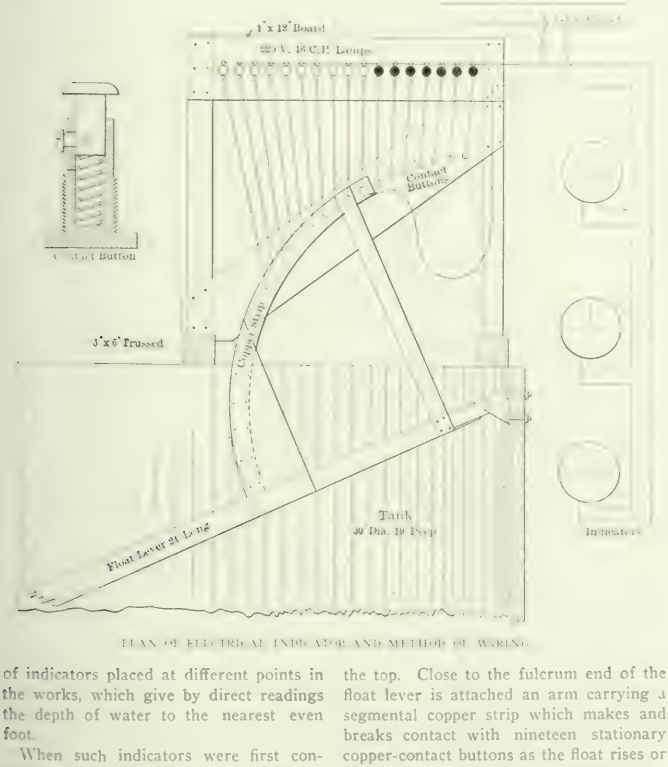
The water supply of the Tennessee Copper Company's smelting plant is delivered to the smelter-service tanks by a belt-driven centrifugal pump operating under a head of 120 ft., and located about 2000 ft. from the smelting plant. It was not feasible to regulate the speed of the pump to the variable requirements of the smelter consumption, and it is important that the pump operator, chief engineer and furnace foreman is at all times correctly informed as to the depth of water in the service tanks. This is now accomplished by means of indicators placed at different points in the works, which give by direct readings the depth of water to the nearest even foot.

When such indicators were first contemplated considerable correspondence was conducted with different parties claiming to supply electrical equipment which would accurately give the required indications, but it was found that the apparatus proposed was of such complexity or required such multiplicity of wiring that they were not deemed feasible for the purpose. The depth of the tanks is 19 ft., and we required the apparatus to indicate the approximate hight of water in the tanks at any desired number of stations throughout the works.

One correspondent stated positively that such indications could not be obtained without the use of 19 separate wires to each station. Another offered a complicated and delicate clock-work mechanism which he claimed would give the necessary indications with the use of two wires. After these proposals had been abandoned the following apparatus was devised and installed by D. J. Kerr, the smelter electrician. It is simple, gives accurate readings at any desired point or number of points, and requires but two wires. It can be installed at small cost by any electrician, and thereafter requires no attendance to insure continual service.

DETAILS OF THE INDICATOR

A float lever the length of which is nearly equal to the diameter of the tank, is attached to the inside of the tank, near the top. Close to the fulcrum end of the float lever is attached an arm carrying a segmental copper strip which makes and breaks contact with nineteen stationary copper-contact buttons as the float rises or falls. These buttons are attached to a board opposite the moving segmental strip and are spaced the proper distance apart to make successive connections with the copper strip at each foot rise of the float. The contact buttons are connected in parallel through a lamp resistance to one wire of a 220-volt circuit, and the movable copper strip to the opposite wire. These two wires are run to the different points where indications are desired, and ammeters are connected in the line to give the desired readings. The ammeters are calibrated to give full scale deflection with a current of 5 amp. and scale markings are from 1 to 20 consuming 0.25 amp. to each division.



PLAN OF ELECTRICAL INDICATOR AND METHOD OF WIRING.

depth of water at all times.

When the indicator at the pumping station registers a depth of 18 ft., the pump is stopped and remains shut down until the indicator shows 12 ft. of water in the tanks, which depth is assumed as a minimum supply.

The greater portion of the water is for blast-furnace use, and it was deemed advisable to erect an indicator near the furnaces, for in case of an accident at the pumping plant it sometimes becomes necessary to cut down the water consumption to the lowest possible point, and at such times the indicator is of especial value to the furnace foreman. The recording indicator at the power-house gives a check on the efficiency of the operator at the pumping station.

A Concentrating Plant at the Jamestown Exposition

A feature of the Jamestown Exposition will be the concentrating plant that is to be operated by the United States Geological Survey. While this plant is primarily to test gravels from placer deposits and especially those containing what is known as the black sands, it will also be used to test pulp obtained from deep mines and all kinds of gravel and sand deposits. Its object is really twofold, that of testing the gravels and ores and also of comparing the different concentrators.

The plant will consist of various concentrating tables, magnetic separators, crushers, classifiers, etc. A complete assay laboratory will be operated in connection with the concentrating plant. Many gravel deposits and sands contain, besides the precious metals, such minerals as magnetite, chromite, ilmenite, monazite, garnet, chrysolite, zircon, quartzite, etc., and one of the objects will be to determine the commercial value of these minerals

British Coinage in 1906

The coinage of the British mint for the year 1906 is reported as follows, the number of pieces being given:

	British.	Colonial.	Total.
Gold	14,712,418		14,712,418
Silver	31,442,452	7,[illegible],843	8,[illegible],295
Nickel		1,[illegible],000	1,[illegible],000
Bronze	54,431,104	4,150,000	58,581,104
Total	100,585,974	12,298,843	112,884,817
Total, 1905	5[illegible],650	45,[illegible],[illegible]	9[illegible],780

The increase in the number of pieces coined was 17,097,087. The face value of the British coins made was: Gold, £12,-165,000; silver, £1,705,070; total, £13,870,-070. The face value of coins withdrawn from circulation in 1906 as light weight, defaced, etc., was: Gold, £2,700,000; silver, £666,340; total, £3,366,340. No nickel coins are used in Great Britain, though the mint strikes some for colonial circulation.

The Montana Society

The following account of the recent dinner of the Montana Society is condensed [illegible]

The peaceful braves of the Montana Society, who scalp the tenderfoot in Wall street six days in the week with a copper tomahawk and celebrate it on the seventh, held their big powwow last night in the tepee of old Chief Delmonico, at Fifth avenue and Forty-fourth street, just east of the Broadway bad lands.

They sang the praises of Montana from Virginia City to the Yellowstone, and every third word of their strenuous table talk dealt with copper. There were Montanans present who went there before the Northern Pacific was built, and other Montanans who have never been west of Rahway, N. J., but knew the language and the warwhoops just the same.

More than 200 of them met in Delmonico's at 7 o'clock and put on their war paint and feathers. As each brave laid aside his top hat he received from attendants a drop of red paint and his own special war bonnet of red, yellow and green turkey feathers. President W. B. Thompson rigged himself out in the full regalia of a sachem, while Secretary Jim McEvilly, to lend variety to the celebration, got himself up as a Snake river cowpuncher, wide-brimmed Stetson, red flannel shirt, chaps and a leather quirt. They assembled in the hall with wild whoops of joy and gave Big Chief Bill Thompson a full salute in their own tongue, a salute which ran something like this:

"Wollygaloop, galoop, galoop, wally galoop, galoop, galoop. Yee-yip-yee-ow!'

As the braves danced into the dining room, every man with a red paint spot on his forehead and a savage war bonnet on his head, they gave the peace dance of the society, cavorting, hopping, skipping around and around Chief Thompson until to placate them the chief grunted an order for a round of Cheyenne cocktails, a new cocktail of wonderful potency.

Edwin O. Holter was toastmaster. After a few introductory remarks he called for the "Montana Anthem," and they sang it with great joy to the tune of "The Girl with the Dreamy Eyes." Part of the anthem runs this way:

[illegible]
Where there's rattlesnakes an' ticks;
[illegible]
[illegible]
[illegible]
Take me where there ain't no subways
[illegible]
[illegible]
[illegible]

A. J. Seligman announced the organization of the Rocky Mountain club.

"We settled the details today," said Mr. Seligman. "We elected for our first pres[illegible] start with a membership of about 300 and to insure the success of the club some of us have clubbed together and put up $50,000 to make it a certain go. We will soon have a board of governors to represent the eligible States—California, Oregon, Washington, Montana, Idaho, Wyoming, Utah, Nevada, Colorado, Arizona, New Mexico, North Dakota, South Dakota, and Alaska. We intend to make it the biggest club in this country, and we are now looking for suitable headquarters."

Mr. Seligman was followed by George Woodworth, the oldest Montanan present, and an old-time miner. Mr. Woodworth went to Montana in 1865 from Ohio, and he told the banqueters some of his experiences. He came all the way from Montana to attend the dinner, his first visit to New York.

"I took the railroad to Grinnell where it ended," said Mr. Woodworth. "Then I staged it to Fort Kearney, got an escort of Pawnee Indians to Julesburg, and then by stage and horseback worked to Denver, Salt Lake City and Virginia City. I had to buy flour on the way at $150 a sack, $5 for a plug of tobacco. When I got to Montana I had just $2.50 left out of $500, enough for a shave and shampoo. My brother ran a vegetable farm there. I saw him one day cutting the eyes out of potatoes for seed planting. 'What d'ye do with the potatoes you have left?' I said. 'Sell 'em for 25 cents a pound,' said my brother. 'Hell,' said I, 'Guess I can make money in this country, too, if a man can sell blind potatoes for that price.' It took me seventy days to get to Montana, boys, and just sixty-four hours to get here from Montana, in a parlor car, too; how's that for an old miner?"

The toastmaster said he had a new "copperation" poem to spring on them, sent him by John Kendrick Bangs. He read it during intervals of quiet:

A Copperation is a beast
With forty 'leven paws
That doesn't ever pay the least
Attention to the laws.

It grabs whatever comes in sight
From hansom cabs to socks,
And with a grin of mad delight
It turns 'em into stocks.

And then it takes a rubber hose
Connected with the sea
And pumps 'em full of H$_2$O's
Of various degree.

And when they're swollen up so stout
You'd think they'd surely bust,
They seize 'em once again and out
They come at last a trust.

Nome, Alaska, in 1906

The detailed study of the geology of that portion of the Nome region represented on the Nome and Grand Central special maps, which was begun by Frank L. Hess and Fred H. Moffit, of the United States Geological Survey, in 1905, was continued during the season of 1906 by Mr. Moffit and Philip S. Smith.

The remarkable discoveries made on Little creek during the winter of 1904-5 led to very active prospecting on the tundra last winter. The result was an extension of the workings along this old beach line, in which the Little Creek diggings are found, as far east as MacDonald creek, a distance of about 5 miles. Prospecting on the tundra was continued through the summer and was carried on chiefly by means of drills. With the exception of operations on Glacier and Anvil creeks, and at the head of Dexter creek, mining in the Nome region during 1906 was almost restricted to the exploitation of tundra gravels. This condition can hardly exist for any considerable length of time, however, and when the excitement over beach deposits is past there will be a return to the earlier found stream deposits.

The absence of rain during the summer occasioned a scarcity of water, which was less severe than would have been the case if it had not been for the supply drawn from the Miocene ditch and other ditches more recently constructed.

The gold production of Seward peninsula, most of which comes from the Nome region, was greater during the past season than it has been in any previous year.

Langlaagte Deep, Limited

The annual report of Langlaagte Deep, Limited, shows that during the year ended July 31, 1906, the tonnage mined amounted to 274,974 tons, of which 71,262 tons were obtained from the main-reef leader and the balance from the south reef, the stoping widths of the reefs being 64 in. and 75 in. respectively. Mining costs averaged 14s. 10d. per ton; comprising 6s. 8d. for stoping, 2s. 5d. for development, 2s. 6d. for shoveling and trimming, 1s. 2d. for winding, 7d. for pumping and 2d. for trimming and handling on the surface.

The mill treated 240,406 tons of ore after 12.57 per cent. of waste had been hand-sorted out. There were 120 stamps employed in the mill and the crushing duty per stamp averaged 5.7 tons per 24 hours. The value of the ore was 7.6 fine dwts. per ton and the yield per ton averaged 4.5 dwt. The cyanide plant handled 237,010 tons for an average return of 2.4 dwt.; the theoretical extraction being 78.97 per cent., as against 80 per cent. actual extraction. The reduction expenses averaged 4s. 2d. per ton; of which milling cost 3s. and cyaniding 1s. 2d. per ton. The extraction was improved during the year, the total being 92.016 per cent., as compared with 90.75 per cent. in 1905, there being a gain in the mill and decrease in the cyanide work due to the operation of the tube mills.

A discovery of gold is reported two miles from Mullumbimby, N. S. W., on the road to Brunswick Heads. Many claims have been pegged.

Copper Prospects of Prince William Sound *

BY U. S. GRANT†

A considerable number of prospectors were at work in Prince William Sound, Alaska, during the summer of 1905, and previous to that time other prospects had been explored which were not being worked last summer. In none of the places is machinery used, with the one exception of the workings of the Reynolds-Alaska Development Company, at Boulder bay. The chief center of interest for prospectors is the vicinity of Copper mountain. This is a ragged-crested mountain, rising nearly 4000 ft. above sea level and situated about 4 miles southeast of Ellamar. Boulder bay is at the west base of this mountain and Landlocked bay at its south base. The rock of Copper mountain is greenstone, with a small amount of sediments (slate, graywacke, and quartzite).

Two mines on Prince William sound have demonstrated that copper ore of good grade occurs in this district and that it can be produced at a profit, notwithstanding the fact that the ore is shipped, at an expense of $2.50 to $3 per ton, to Tacoma, Wash., before it is smelted. Up to the present time nearly the entire output has been from the Gladhaugh mine. At the Bonanza mine existing developments warrant the prediction that there will be an early increase in production and that a large body of ore will be found available. None of the prospects, as developed in the summer of 1905, showed indications of as large an orebody as is known at either of the two mines.

Erosion in very recent time has been general throughout the Prince William sound region, so that no considerable secondary concentration of ores exists. The ores of possible commercial importance have all the characteristics of primary deposits and are a phase of a general sulphide deposition along certain channels or zones. In general there is no reason to expect that stringers of ore on the surface will develop in depth to payable veins or that veins of considerable width at the surface will continue with unvaried dimensions and richness to great depths. On the contrary, it is known that orebodies pinch out in individual cases, and, on the whole, irregularity of form is to be expected. Developments of prospects should be confined to the following of ore. Running long crosscuts to catch stringers or veins in depth is bad practice, since experience has shown that the continuation of the deposits is by no means assured.

Throughout the district much of the development work has been misdirected and nowhere except on Latouche island and at Virgin bay have excavations gone far enough to definitely prove the presence of workable orebodies. However, at a number of prospects the copper and gold contents of the ore are sufficiently high for profitable mining and these places are worthy of further prospecting. These facts, coupled with the location of many of the veins at or very close to tide water and the present demand for ores of this character for furnace mixtures, give reason to expect an increase of copper mining outside of the two mines already in operation. Should the future see the establishment on Prince William sound of plants for smelting the copper ores of the Copper river district, for which purpose the coal of the Bering river or Matanuska field could be utilized, the prospect for mining on the sound would be still brighter.

COPPER PROSPECTS NEAR PRINCE WILLIAM SOUND.

*From Bulletin No. 284, U. S. Geological Survey, 1906. "Copper and other Mineral Resources of Prince William Sound, Alaska."

†Professor of Geology, Northwestern University, Evanston, Ill.

Minerals in Hunan, China

The following remarks with reference to the mineral wealth of Hunan are from the report for 1905 of the acting commissioner of customs at Chang-sha, issued by the imperial Chinese maritime customs: "The mineral wealth of Hunan is believed to be very great, and although but few serious attempts have been made to extract these natural riches by modern methods, owing mostly to the opposition of the Hunanese to foreign exploitation in their province, enough has been learned from the results of native mining enterprises to warrant a conviction that, given up-to-date appliances and expert direction, the supply of coal as well as of several kinds of metals would prove to be well nigh inexhaustible. There are known to be hundreds of coal mines scattered throughout the province, but all are worked in the same primitive manner; and as soon as a certain depth has been reached, the shafts, or rather, manholes, have to be abandoned for want of ventilation or because of the presence of water. There are also known to be deposits of gold, lead, antimony, zinc; but these, like the coal, are still practically untouched.

At the present time the Chinese authorities are, of their own accord, taking steps for the throwing open to foreign trade of the two largest marts in the province—Hsiang-t'an, 30 miles above Changsha, and Changteh, on the Yuan river, which, like the Hsiang, flows into the Tungting lake. Sites for custom houses have already been selected or purchased, and suitable port regulations drawn up for submission to the central government.

Japan, until recently, held sixth rank among the copper-producing countries of the world, but she has risen to fourth place, with an output of copper equal to 5 per cent. of the total production of the world.

Blaisdell Apparatus at El Oro Cyanide Plant

[illegible] Railway Company, Ltd., at El Oro, Mex[illegible] Blaisdell vat excavators and sand dis[illegible] from the collecting and leaching vats, and to charge the latter, and Robins belt conveyors are used throughout to transfer the sand from the collecting to the leaching vats, and from the latter to the waste [illegible]

[illegible] in many cases plants in the United States, Mexico and South Africa, including those of the Tonopah Mining Company, and the Tonopah-Belmont Development Company, both of Tonopah, Nev.; Montgomery-Shoshone Consolidated Mining Company, of Rhyolite, Nev.; Peregrina Mining and Milling Company, San Prospero Mines Company, and the Guanajuato Amalgamated Gold Mining Company, of Guanajuato, Mexico; Cia. Minera Las Dos Estrellas, S. A., of El Oro, Mexico; Black Mountain Mining Company, of Magdalena, Mexico; Veta Colorado Mining and Smelter Company, of Parral, Mexico; New Modderfontein Gold Mining Company, Langlaagte Deep Gold Mining Company, and Robinson Gold Mines Company, Ltd., of Johannesburg, South Africa.

The Two-shaft System for Prussian Potash Works

BY ROBERT GRIMSHAW*

There has been for some months considerable agitation in Prussia about the proposed law requiring the sinking of a second shaft in all potash workings in the kingdom, the result of popular excitement immediately following the occurrence of accidents endangering, and even causing loss of, life and limb. The proposed law is very rigid and public feeling is very acute on the subject.

[illegible] STAMP MILL AND CYANIDE PLANT AT EL ORO

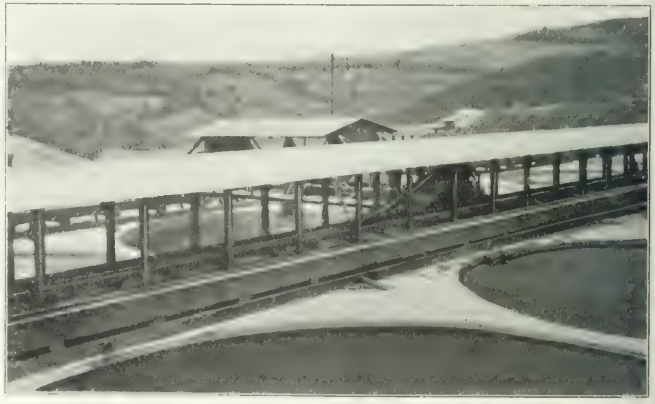
The tailing from the mill launder flows to a wet-pulp distributor, which discharges it into nine 22x10-ft. steel collecting vats, arranged in three rows. The slime overflows and passes to the slime-treatment vats. The sand, after being drained, is discharged from the collecting vats by a 22-ft. vat excavator, and is carried by one of the three 18-in. belt conveyors (Nos. 1, 2 and 3) to the inclined cross-conveyors (Nos. 4 and 5). The latter deliver to another 18-in. belt conveyor (No. 6), located above and between the two rows of leaching vats, each row containing six steel vats 40 ft. in diameter and 6 ft. deep. Belt conveyor No. 6 delivers to a belt conveyor on the sand distributor, which spreads the sand lightly and evenly in the leaching vats in an ideal condition for rapid and uniform leaching and percolation.

After treatment the sand is removed from the leaching vats by a 40-ft. excavator and carried by 18-in. belt conveyors (Nos. 6A and 6B), located beneath the leaching vats, to the stacking conveyors. These latter are 18-in. belt conveyors arranged so that, by moving the second one radially, with the far end of the first as a center, a very large tailing pile may be built up before it will be necessary to extend the conveyors. This plant was designed to treat the output of No. 2 mill (100 stamps), which was placed in commission in the spring of 1905, but the efficiency of the system has made it possible to treat the entire products of mills Nos. 1 and 2, each of 100 stamps.

The Blaisdell system, together with [illegible] is

The gold output of New South Wales for the month of November amounted to [illegible] oz., valued at £30,629, as compared with 33,913 oz., valued at £122,622, for November, 1905, says *Reuter*. The yield for the eleven months of 1906 amounted to 285,554 oz., valued at £1,012,726, as compared with 300,979 oz., valued at £1,057,006, for the corresponding period of 1905.

The Prussian ministry will in January discuss the subject thoroughly by means of a mixed commission representing both sides of the question—the royal government through its ministry and its technical advisers and the potash-mine owners through their accredited representatives. The latter are represented by eight delegates, the government by as many officials, who are members of the "Berghauptmannschafts" of Halle and Clausthal, and consequently experts in matters relative to mining.



ROBINS BELT CONVEYOR DISCHARGING CYANIDE SAND TO TANKS

The introduction of the two-shaft sys-

*Mining engineer, Hannover, Germany.

tem in the potash mining industry is of special interest in the present Prussian province, formerly the kingdom, of Hannover, where are situated all the potash workings of Germany, and where in fact there is a practical monopoly of the potash-producing industry of the world. The Prussian Ministry of Commerce and Industry demands the change; the officials from the Halle and Clausthal districts, all of them mining experts in government employ, are called upon to discuss the matter with the representatives of the potash-producing industry, with the view of proving to the latter that the ministry is not unreasonable in its demands. The potash magnates have on general principles expressed themselves as opposed to the measure, giving as their reasons the great outlay which would be necessary to carry out the reforms, when made compulsory, and the greater risk of loss and damages by water with two shafts.

On the other hand, the Prussian government claims, and expects to prove by its experts, that the two-shaft system would entail no pecuniary loss and cause no increased risk; and that, even supposing it did, the question of safety of the underground employees is paramount to all others.

In the first place, say the government authorities, the two-shaft system affords so much better ventilation of the underground workings, especially at great depths, that the temperature would be reduced 10 to 12 deg. F., making possible an increased output, which alone would pay for the improvement. In the second place, the government authorities claim the advantage of having two shafts instead of one would appear in case of trouble with the hoisting and pumping in one shaft. The second shaft would enable the operations of the mine to be carried on without interruption, thus increasing the average annual output, and by preventing suits for damages for non-delivery at the

As proof of the sincerity of the ministerial statements, and the sound common sense of the matter from the business point of view, all government workings with but one exception have had the second shaft put in, both for politico-social and for financial reasons. The result has justified the expenditure, say the officials, from both the monetary and the humanitarian standpoints. In the case of the solitary government working in which there is but one shaft, the reason for making this an exception to the rule was that the working is so small that the second shaft would add no additional security to life and propetry.

London silver shipments to the East in 1906, at the average quotation for the year, amounted in quantity to about 116,808,000 oz.; or, estimating the December exports, to about 126,400,000 oz., or nearly two-thirds of the world's production.

A Machine Mucker

A Park automatic loader and conveyer has recently been installed in the Gold Lion tunnel in Ouray county, and is described in the Ouray *Herald*. The loader consists of the main housing mounted on a heavy cast-steel truck frame, with an endless chain carrying steel scoops or shovels every two feet. These shovels reach out over the shoe plate and scoop the muck up the carrying channel, which is 24 in. wide, and dump the load upon a heavy rubber belt, 30 in. wide. This belt conveyer is independently driven and mounted on a ball-bearing turntable which can be swung through an arc of 180 deg. The discharge of the belt is swung over the mine car, which is loaded in less than half a minute, and the next car is switched up to the machine. There are a number of methods of handling the cars and the manufacturers have arrangements for handling six, eight or ten cars at a time without stopping the machine.

EXCAVATOR, DISTRIBUTOR AND BELT CONVEYER

BUCYRUS VAT EXCAVATOR

In the Gunnison tunnel, where one of the old machines was in operation for some time, the machine cleaned up a 5-ft. round of holes in the No. 12 or No. 14 tunnel in about 1¼ hours, and the longest time required was one hour and 50 min. The loader is the invention of Thomas M. Park, who is now at the Gold Lion with the machine.

In a rock-salt mine at Oakwood, Detroit, immense streams of water defeated every effort to proceed after the 200-ft. level had been reached. The flow was so great that a pump made but little impression on the flood. When a stream was encountered, an iron pipe was driven in and cement was forced into the crevice with compressed air, until the water was driven back and the flow stopped. Before the water stratum was passed, several thousand barrels of cement had been used.

A Device for Reducing the Size of Assay Samples

BY [illegible] S. BELL

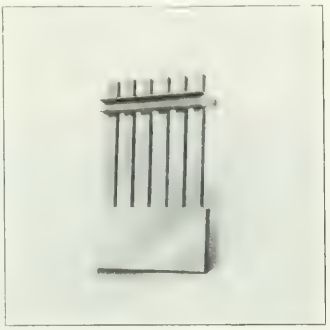
The device herein described is, with slight modifications, one which was used by the writer at a mill in northern Idaho. The original idea was furnished by H. E. T. Haultain. When I was connected with the plant I used the cabinet continuously in cutting down both mine and mill samples and found it a rapid and accurate labor saver. It is, therefore, with this to recommend it, that I venture to submit it to those readers of this paper to whom it may be of value.

CONSTRUCTION AND OPERATION

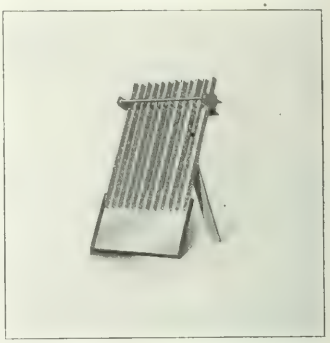
The cabinet itself is made of 2x4-in. sticks and 1-in. boards and its construction is sufficiently clear from the drawing and photographs. There are three compartments, one for concentrates, one for mine samples, other than first class, and one for tailings, thus reducing the danger of salting to a minimum. Each compartment has two riffles, one for coarse and one for fine ore. The shelf on top is for small sample pans and the lower shelf is where the pan rests which catches the ore retained by the riffles. The hight of the bottoms of the hoppers above the floor is sufficient to allow an ordinary galvanized iron pail to be placed there for removing the discarded ore.

The riffles should be made of 15-gage sheet brass. The channels should be riveted to the top of their frame and soldered to the bottom. They may be made of a width to suit the size of the ore particles, always bearing in mind, however, that this width should never be less than three and one-half times the diameter of the largest ore particle to be passed through them. It is hardly necessary to say that the spaces between the channels should be exactly the same as the width of the channels themselves.

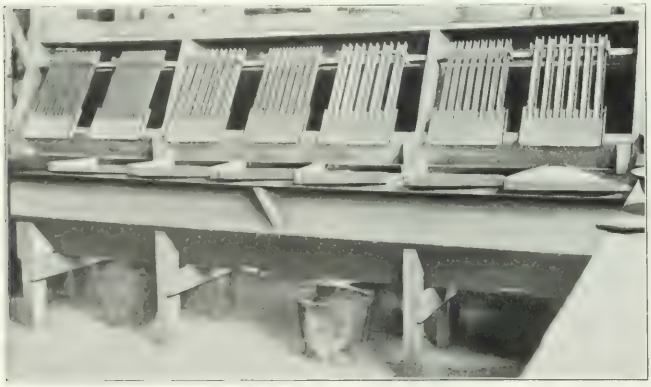
The operation is very simple. The ore to be cut down is placed in one pan and an empty pan is put on the shelf under the riffles. The ore is then thrown in a flat stream against the riffles when the pan in the hand, now empty, is substituted for the full one on the shelf and the operation is repeated until the sample is of the size desired for bucking.



RIFFLE, REAR VIEW



RIFFLE, SHOWING CHANNELS



THE SAMPLING CABINET COMPLETE

[illegible] Engineer, Denver, Colo.

Idaho Lead Mines in 1906

BY ROBERT N. BELL

The most notable development in lead mining in Idaho during 1906 has been the remarkable performance of the Bunker Hill and Sullivan lead-silver mine, at Wardner, which, in spite of a nasty fire in one of the principal stopes, paid enormous dividends. The deposit is operated through a single entry and from a single orebody, yet the dividends paid during the year amounted to $2,340,000. There has been developed in the mine within the past eighteen months an entirely new and independent ore channel that has already been blocked with three intermediate levels, exposing the longest and largest ore-shoot ever discovered in the property. This lies below the 2000-ft. horizon between the Read and Kellogg levels, and is estimated to contain ore to the gross value of something like $15,000,000, with the definite prospect that this estimate will be trebled before the shoot is completely developed down to the main Kellogg adit level.

The Tiger Poorman mine is sinking below the 2000-ft. station of its vertical shaft. The Standard mine, at Mace, is also sinking another lift from its 1000-ft. vertical shaft, which is 2500 ft. below the apex of the vein.

The Frisco mine was freed from water in the early part of the year, and has since been sinking for new levels on a magnificent ore-shoot 900 ft. long. The Morning mine has been connected between the No. 6 tunnel, two miles long, and the No. 5 tunnel, with several extensive intermediate levels, which show much larger and better orebodies than the levels above 5.

The Hecla mine continues to improve as development progresses, and seems to be destined to make one of the biggest producers in the district, while the Hercules is simply being played with. It has paid over $1,000,000 in profits during the year, and could have doubled that great record by crude-ore shipments without crowding its resources very seriously.

The Relief mine, in Blaine county, owned by the Idaho Consolidated Mines Development Company, has disclosed some large bodies of good concentrating ore at considerable depth, which may prove a continuation of the Minnie Moore ore channel. This property is being equipped with a new electric hoist and its extensive development will be undertaken to great depth at once under the management of Irwin E. Rockwell.

A large amount of low-grade ore was shipped from the Minnie Moore dump during the year.

[illegible] inspector of mines, Idaho

Engineering Periodicals*

BY H. WADE HIBBARD†

Among the most valuable members of the engineering profession today are the moving spirits of the engineering press. Books, monographs upon particular subjects, necessary as they are by their gathering within one cover all the required material of years and many places, and by their orderly classification, logical discussion, and evolving of principles, are, by the very necessity of their production, always and inevitably behind the times. The reason for existence of the engineering press is to collect all recent valuable information—news, if you please—and present it weekly or monthly, less or more digested, to as large a circle of readers as possible. Unthinkingly or deliberately to neglect forming acquaintance with so great a source of engineering knowledge is not fitting for the student who has his own future to make in a country where ruts and old fashions are only for the failures.

Should one read, and preserve what he reads? To take knowledge into one's hand temporarily, and then not afterward have that knowledge available for desired use, is as foolish as once to have seen a life preserver and not be able to find it at midnight collision.

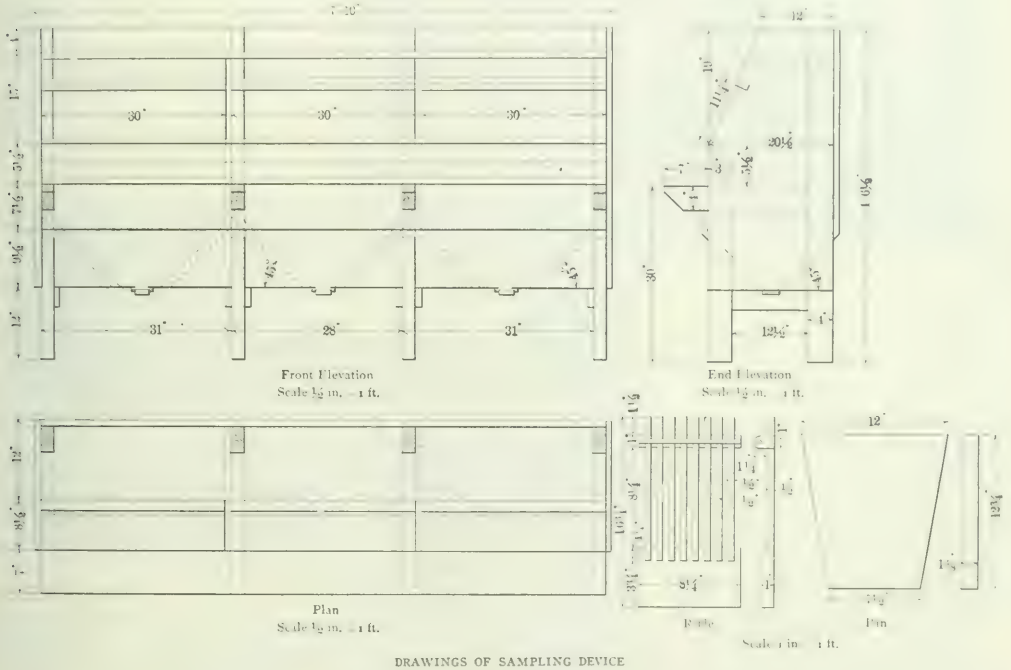
Habits are excellent balance wheels, generally. Brilliancy being given to but few men, the great majority must hammer out lesson or problem or engineering feat. In fact, genius has been defined as an infinite capacity to take trouble. Regularity of mind, a habit of most intense, undivided application, may place the worker far beyond the one who thinks to accomplish by fits and starts. It is well to form the habit of regular perusal of the weekly technical paper.

Scepticism is the normal state of the scientific mind. It is ever looking for something better, not satisfied that the present is perfect. The reading of articles over the names of famous engineers, afterward to find them severely criticized, is good for the confiding student who perhaps has supposed that all engineers and professors are agreed. It is just as well for him to learn not to believe all that is in print, unless there are good reasons presented. Independent investigation is promoted by reading the papers. A printed controversy stimulates anyone who loves a fight. Blessed be the man whose engineering eye is fired and mettle aroused by the prospect of a battle royal between men of fame.

Commercial methods are often not fully practicable in college shop, drafting room, and laboratory, because of the necessary limitations for instruction purposes. The papers, if read with discrimination, will throw light upon these departments. The reading student will learn of the difference between "exactly right," and "good enough;" between no payment of wages, and production under competition; between instruction designing, and the spur of a contract date for completion.

A *good* engineering paper should be one of the life partners, ready at hand when moments of leisure permit its instruction and enjoyment, better understood and liked as the years roll on, acquaintance or perhaps friendship formed with editor, contributions made, suggestions given and taken, some share had in its mighty influence in the engineering world.

A superintendent's office will take regularly several papers or several copies of one most useful paper. He marks in these papers articles appropriate for the instruction or spurring of particular subordinates and sends them out. Later he will call for meetings of these heads of divisions or departments in his office, and the resulting interchange of opinions on the papers, tempered with experience, will prove of decided advantage to the business, promoting unanimity of feeling between the departments and the introduction of the best methods suited for each or perhaps all. I recall with much pleasure such meetings on the Lehigh Valley Railroad, and have been told only recently by President Vreeland of the Metropolitan Street Railway of New York City, of the success attending his marking of such articles and sending them out, not merely to subordinates, but to thousands of motormen and gripmen.



DRAWINGS OF SAMPLING DEVICE

*Excerpts from an address delivered before the students of the Society of Mechanical Engineers, Sibley College of Mechanical Engineering, Cornell University.

†Professor of mechanical engineering of railways, Cornell University.

STEEL MAKING AT PUEBLO

The Reconstructed Plant of the Colorado Fuel and Iron Company—Bessemer Department and Rail Mill—Equipment and Capacity

BY LAWRENCE LEWIS*

The first steel was made at the Minnequa Works on [illegible] 7, 1882, and the first rails were rolled on the same date. The bessemer and rail departments were gradually increased until at the time when additions and improvements were begun on a large scale about five years ago, the old bessemer converting department had an average daily capacity of 700 tons and was equipped with two five-ton converters and three iron- and two spiegel-melting cupolas; the old rail mill was equipped with four ingot-heating furnaces and two bloom-heating furnaces. The mill consisted of one two-high 36-in. reversing blooming mill; one three-high 28-in. roughing mill; and one 3-high 26-in. finishing mill.

THE NEW BESSEMER DEPARTMENT

The new or present bessemer department, in which steel was first made December 22, 1902, has a daily capacity of 2000 tons of ingots. It is equipped with two 300-ton molten-metal storage reservoirs, which are served by two 50-ton electric traveling cranes. There are two 15-ton vessels, three 10-ft. iron cupolas and three 7-ft. spiegel cupolas. The molds are stripped from the ingots by two Aiken duplex hydraulic strippers. The bessemer blowing engine is a duplicate throughout of the blast-furnace blowing engines, except that it has 80- by 60-in. instead of 90- by 60-in. air cylinders. This engine is located in the northern end of the engine house for blast furnace *D*, and is so connected up that it may be used as a spare for the blast furnaces, or in the event of its being shut down at any time a spare blast-furnace engine can be used to furnish air for the bessemer department. The boilers are located in the boiler house of furnace *D*, and are so arranged that they can be fired with blast-furnace waste-gas or with coal. The cupola stock-hoists are operated by electric power and were furnished by the Otis Elevator Company. The blast for the cupolas is supplied by Sturtevant pressure blowers, driven by direct-connected electric motors.

[illegible]

Owing to the difficulties incident to construction while operations are going on, some of the improvements and enlargements planned at the rail mill at the Minnequa works are yet to be made. Reconstruction has been going on for five years, a little at a time, and throughout this period the rail mill has been in continuous operation night and day; except on Sundays when the bessemer department is closed down to reline the vessels. It has been run continuously, even during break-downs and during the coal strike of 1903-4.

Throughout this period orders were booked months ahead. At present the engagement for steel rails will absorb the entire output of the department well into 1908. The following description, is of the rail mill, not as it is at present, but as it will be when the work of improvement and reconstruction is entirely complete.

With the exception of the blooming mill, where the ingots are reduced, and a portion of the buildings, the rail mill will be practically new throughout. The main building, which covers all mills, is 55 ft. 6 in. wide by 581 ft. 4 in. long, and is provided with crane runways throughout its full length and two 15-ton and one 25-ton electric traveling cranes, which cover all tables and mills. The building covering the engines for all mills, except the finishing train, is 45 ft. 5 in. wide and 367 ft. long, and is equipped with a 40-ton electric traveling crane. The house for the engine which drives the finishing train is located on the opposite side of the building and is 27 ft. 8 in. wide by 76 ft. 7 in. long. It is covered by a 25-ton hand crane. The hot-bed building is 121 ft. 6 in. wide by 174 ft. long, and that covering the finishing department 60 ft. wide by 774 ft. long.

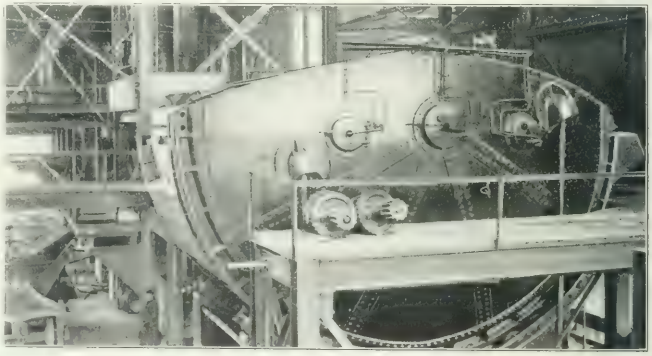
[illegible]ING FURNACES AND ROLLING MILLS

The pit heating furnaces are six in number, each containing four holes, holding six ingots each, and are housed in a steel building 89 ft. 4 in. wide by 256 ft. long, equipped with two electric automatic charging and drawing cranes. The ingots when taken from the pits are deposited in an automatic tilting car, which conveys them to the blooming mill table. Producer gas is used and is supplied by twelve Duff gas producers.

The ingots, 18 by 20 in., are reduced in thirteen passes to 8x8 in. in a 36-in. mill, driven by a 40x54-in. reversing engine built by the William Tod Company, and are sheared by a direct-acting hydraulic shear, the resulting blooms being conveyed by roller tables to the first roughing train of the rail mill. This is a three-high 28-in. train having five rail and five billet passes driven by a 34-in. 62x60-in tandem-compound Porter-Allen engine, built by the Southwark Foundry and Machine Company. These rolls are fed by two lifting tables, driven by a 10x12-in. Crane engine.

The second roughing and intermediate trains are side by side, 13 ft. 4 in. between centers, and are driven by a 40-in., 75x60-in. tandem-compound Porter-Allen engine. The second three-high roughing train has three rail and two billet passes, and is equipped on the north side with tilting table, and on the south side with tilting table and stationary table, which receive the rails from cross transfer and convey them to the intermediate train; 4x4-in. billets will be finished in this train and will be carried by roller tables to the shear, from which they will be conveyed to a loader.

The intermediate three-high train has four rail passes and is equipped on the north side with a tilting trough working between rollers of a stationary table, and on the south side with tilting table and stationary extension. From the last pass of the intermediate train the rail is run through the finishing pass of the 26-in. two-high finishing train, which has one chilled pass only. This train is driven by a 32-in., 56x48-in. horizontal-vertical com-



HOT METAL STORAGE TANKS OR "MIXERS"

*The writer is indebted for assistance in preparing this article to J. M. McKennan, manager of the Minnequa works, and to J. A. Linden, assistant manager.

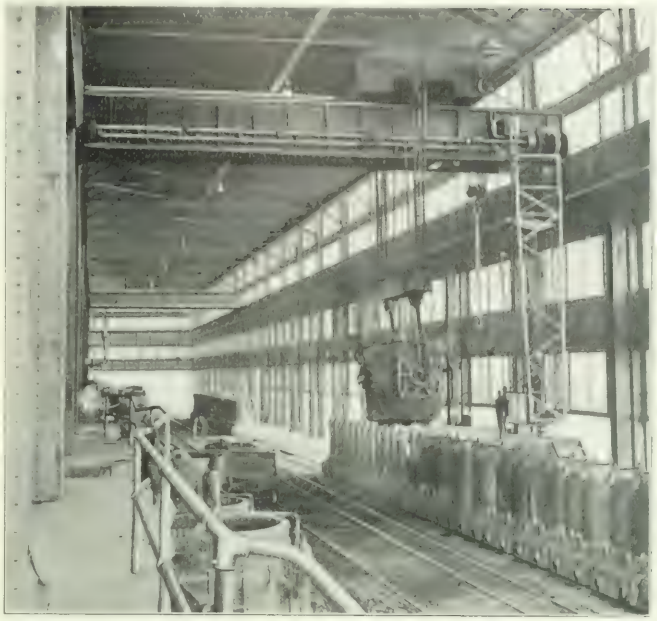
pound engine, built by the Westinghouse Machine Company.

HOT SAWS AND FINISHING DEPARTMENT.

Five hot saws are installed at proper centers to cut rails, either to 30 or to 60-ft. lengths, or by sliding each alternate saw on shoes, 33-ft. lengths can be cut. These saws are driven by a 15x27 in. Buckeye engine and manipulated through a 12-in. hollow shaft operated by an 8-in. hydraulic cylinder working at 500 lb. pressure. These saws are fed by roller tables driven by 10x12-in. reversing Crane engines.

The cambering machine is driven by a 25-h.p. electric motor. The hot bed is so arranged that either 60-, 33- or 30-ft. lengths of rail can be accommodated, and is supplied with wire-rope transfer, driven by electric motors.

The rails are distributed the whole length of the building by rollers driven by electric motors. Ten straightening presses driven by electric motors are used, and are spaced to accommodate 60-ft. rails. The rails are fed to these machines by a hydraulic transfer, which places them within reach of men operating presses. Twelve pairs of drill presses are to be installed, to be spaced to suit 30- and 60-ft. lengths of rails. Shoes are provided under these presses, so that when 33-ft. lengths are to be drilled, the presses can be moved to the proper centers. These drill presses are driven by independent motors.



CASTING STEEL INGOTS

BESSEMER CONVERTER AT MINNEQUA WORKS

MAKING BESSEMER STEEL.

The molten iron from the blast furnaces is conveyed in pots or ladles holding 20 tons each, and mounted by trunnions upon cars, to the bessemer department building. The ladles are picked up from the cars by the 50-ton electric traveling cranes, lifted 30 ft. and emptied into the two 300-ton hot-metal storage reservoirs. In these reservoirs or tanks the iron is kept in a molten state by oil burners and is drawn off as required into other ladles, from which it is poured into the converters. These converters or vessels, with a capacity of 15 tons of iron each, are shaped like great claret bottles, with the neck somewhat shortened and slightly bent to one side. They are constructed of steel plate lined with refractory material, chiefly ganister.

After the molten iron has been poured in, a current of air is blown through the contents from tuyeres below. By this process the manganese, silicon and carbon are removed from the iron by oxidation, the oxygen in the air combining with the carbon to form carbon monoxide and carbon dioxide, and with the silicon to form ferrous silicate slag. After the manganese and carbon have been entirely "blown out" or removed, a certain fixed quantity of carbon and manganese, in the form of melted spiegel or spiegeleisen, iron com-

tion is for hardening and the manganese to remove gases from the steel and to diminish the injurious effect of sulphur.

The contents of the vessel are then emptied into a large ladle, in the bottom of which is a hole which is closed with an iron stopper protected by fire clay. The ladle is swung around by means of a crane to a point immediately above a series of cast-iron ingot molds, 6 ft. long and 18x20 in. in section, mounted on cars. The stopper is lifted from the hole in the bottom of the ladle, whereupon the steel runs out, the slag floating on the top being retained and pure steel only being poured.

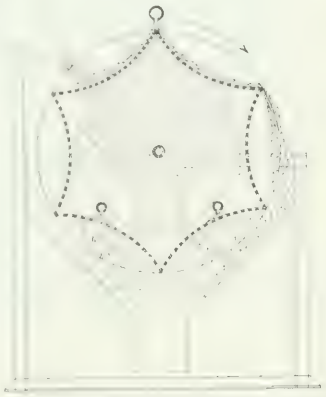
The ingot cars are then run to the stripper building, where the molds are withdrawn from the ingots. After being weighed on track scales the ingots are taken to the rail-mill department, where a great electric traveling crane lifts the ingots from the cars and places them in the ingot-heating furnaces, where they are kept hot by means of burning gas. In due time the ingots are again lifted by the crane and placed upon an automatic tilting car, which carries them to the blooming table at the rail mill. The ingots are then passed through the reversing blooming mill, which reduces the ingots in sectional area to 8x8 in. and increases them proportionately in length. These are then sheared into two or three pieces—depending on the size of rails to be rolled—which go to other roll trains by successive passes, through which they are fashioned into the section of a rail. They are then sawed into 30-, 33- or 60-ft. lengths and are automatically conveyed to the hot beds, where they cool. The rails then go to a man known as the rail straightener, who manipulates them under his straightening press. They then go to drill presses, where the bolt holes are drilled through the web near the ends. Finally, after being inspected, they are loaded upon railroad cars and carried to the construction camps.

A large proportion of the rails turned out at the Minnequa works are rolled from open-hearth steel, the method of handling being the same as in the case of bessemer rails. The average daily capacity of the rail mill, when all improvements and enlargements are completed, will be 1500 tons.

Fan blowers are classified as "volume" and "pressure." A volume blower is primarily designed to discharge air in large quantity under low pressure with the minimum expenditure of power. This requires a wide and comparatively slow-running wheel. A pressure blower, on the other hand is designed for the purpose of creating a high pressure, which may be as great as 20 oz. per sq.in., while delivering a relatively small volume of air.

A Revolving Screen with Outside Feed

The King revolving ore screen recently placed upon the market by the Hendrie & Bolthoff Manufacturing and Supply Company, Denver, Colo., receives the ore upon the outside of the rotating screen cloth, a reversal of the ordinary method of feed. The machine, the general appearance and principle of operation of which are clearly shown in the accompanying illustration, is



SECTION SHOWING FLOW OF PULP

the invention of Howard G. King, a well known mill-man of Colorado.

The revolving screen is hexagonal in form, its six sides being curved toward the axis upon a radius equal to that of a circumscribed circle. The fines are received in a stationary discharge hopper within the screen. Water is fed through perforated pipes, one branch extending above the machine, while another forms the stationary shaft upon which the screen revolves. The spray inside the cloth is said to prevent blinding effectually.

Several advantages are claimed for this form of screen. The wear of the cloth is said to be much less than in the ordinary trommel, owing to the gentle motion and the uniform feed. The ore is fed over practically the entire surface, and in the direction of travel, permitting the smaller particles to fall directly upon a clean surface, thus securing superior results and maximum capacity. There is no grinding of ore particles, and the power required is very small, the machine being almost self-operated on the principle of the overshot water wheel.

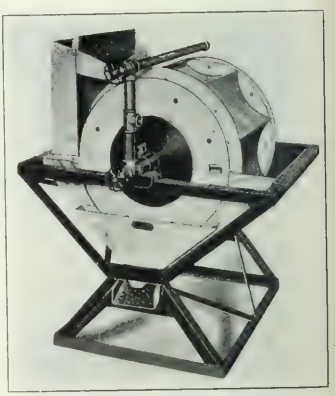
The machine weighs only 300 lb., and occupies approximately 4x4x4 ft. of space. One of its secondary features is an automatic sampling device, which delivers full sections of the stream of pulp from the undersize.

The Nitrate Industry of Iquique, Chile

Consul C. S. Winans reports that the foreign commerce of the consular district of Iquique, Chile, both imports and exports, showed a remarkable increase during 1905.

The principal exports consisted of borax, valued at $953,142; copper ores, $693,404, and nitrate of soda, $67,314,977. The exports to the United States amounted to $17,776,517, an increase of $4,716,399 over 1904. The leading articles were: Nitrate of soda, valued at $15,112,909; iodine, $1,893,583, and silver ore, $592,069. The total amount of nitrate of soda produced in the Iquique district in 1905 was 1,902,578 tons, an increase of 202,909 tons over 1904. The exports amounted to 1,793,707 tons.

At the beginning of 1905 there were in operation 113 nitrate plants, with an estimated producing capacity of 2,896,450 tons annually, and there were in process of construction 19 new plants, with a producing capacity of 950,000 tons a year. Practically the world's production of this mineral is manufactured in and exported from this district. It is controlled by a combine in which all the manufacturers agree to limit their production to a certain amount, according to the capacity of their plants. During the present fiscal



KING SCREEN, OUTSIDE VIEW

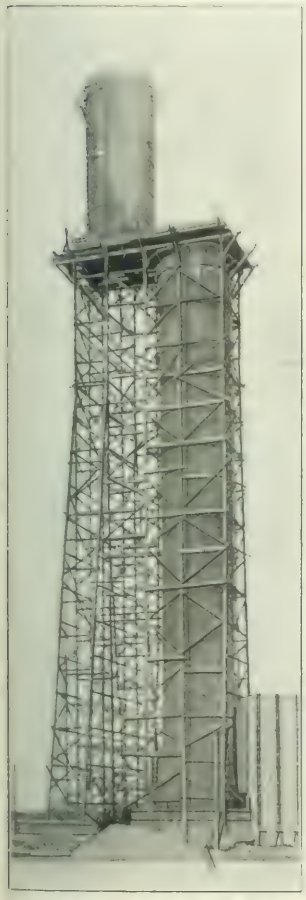
year ending March 31, 1907, the production and exportation is to be limited to 2,175,000 tons. The combine not only controls the output and exportation, but sends experts in the use of nitrate to different parts of the world to study conditions and to extend the sales.

Pure copper cannot be cast in sand without considerable difficulty; in fact, some deoxidizer is always used. For common copper castings from 2 to 5 per cent. zinc is generally added to get sound castings.

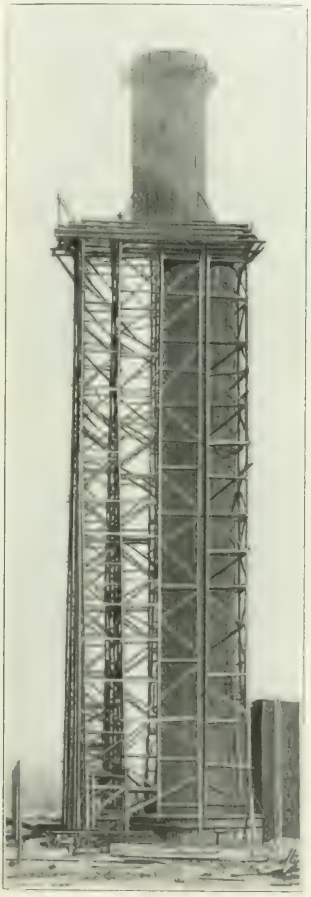
Increasing the Hight of a Smelter Stack without Shutting Down

BY J. F. JACKSON.

A 60-ft. extension has been placed upon the 200-ft. steel stack of the Copper Queen smelting works at Douglas, Ariz., without interfering with the operation of the plant. The extension was erected upon false work built to the level of the stack and later moved into place and secured.



NEW SECTION UPON FALSE WORK



MOVING EXTENSION INTO PLACE.

The plan was devised by the writer and the contract was taken for the Wisconsin Bridge and Iron Co. several months ago. The moving over was successfully accomplished on Dec. 26, the work being in charge of Herman Eastland, foreman. As shown in the accompanying illustration, the high false work was built to the level of the top and surrounding the stack. A track consisting of 15-in. I-beams was laid across the false work just outside of the old stack. Runners of I-beams of the same dimensions were attached to the new section, and nests of rollers were placed between the runners and the I-beam track.

On completion of the new section, which weighed about 40 tons, the shift into place, although a somewhat nerve-trying process to the men employed, was not particularly difficult. The old and new sections were connected by outstanding angles, and ample provisions for wind loads were made.

Some additional weight was also added to the original foundation to provide for the wind pressure on the 60-ft. extension. The original stack was built by Peter & Connelly about four years ago, and was said to be the largest plate stack in the country. Geo. B. Lee, superintendent of the smelting works, approved the plans for doing the work.

The actual time of moving the new stack upon the old one was about three hours. The foreman explained that it could have been done in less time by using a wire rope and engine, but he preferred the slow method, using a Barrett and a track jack and stopping frequently to reduce the vibration in the false work. The volume of smoke from the 25-ft. flue interfered more or less during erection, but when the new section had been moved so far that it covered one-half the area of the old stack, the gases promptly adopted the new channel.

Mining in the Yukon

SPECIAL CORRESPONDENCE

A report by W. B. McInnes, late commissioner of the Yukon, on the mining operations and general conditions of the Yukon Territory, was presented to the Canadian Parliament Jan. 10. The commissioner reports that the cruder methods of working which prevailed exclusively during the earlier days of the camp, are being rapidly discontinued. Large hydraulic plants have been in operation during the summer, and others of great magnitude have been started. The old method of prospecting by shaft-sinking has been largely superseded by the use of steam drills. The operations of dredges last season confirmed the conclusion drawn from the work of the pioneer dredges of 1905; that the auriferous gravels of the Klondike district are admirably adapted to this manner of working. The advantage of operating claims by dredges and efficient hydraulic apparatus has become so apparent that the owners of many claims on the older creeks and hills preferred not to work their properties by the more primitive methods, but to await the installation of dredges, or a plentiful supply of water. For this reason the number of gold-yielding claims was temporarily reduced. The output up to Oct. 31, 1906, amounted to $5,179,948, as against $7,160,032 for the whole of 1905. In view of the transition going on, however, this output was quite satisfactory.

On the creeks lying north and west of the Indian river divide, comprising Bonanza, Hunker and Eldorado creeks, with their tributaries, primitive placer mining has almost entirely given way to modern methods. On the Indian river side, owing to the expense of transportation and the virgin state of many claims, placer methods, aided by a few mechanical contrivances, are still employed. This section includes Dominion, Gold Run, Eureka, Sulphur and Quartz creeks, and their tributaries. The report notes that there is more attention being given to agriculture, with a probability that in future more people will engage in that pursuit, though mining will continue to be the great industry of the territory.

*Contracting engineer, Houghton, Mich.

ELECTRICAL WINDING PLANTS

Details of Arrangements, with Descriptions of Several German Plants

BY ALFRED GRADENWITZ

Electricity affords a number of advantages in the operation of main-pit-winding plants, the most important of which are safety in working, ease of control and simplicity of superintendence.

A necessary condition is that the number of turns should be susceptible of alteration within wide limits, irrespective of the actual magnitude of the useful load and capable of adjustment, especially for a maximum speed of 0.5 m. per second, as in the case of a change in depth of shaft, while any fluctuations in load should be compensated, in certain cases, so as to render the amount of energy derived from the central station practically constant, to correspond with the mean output of the winding plant. The efficiency of the whole plant should finally be as high as possible, even in the event of the number of runs decreasing considerably below the normal.

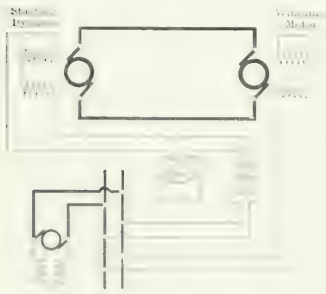


FIG. 1. LEONARD CONNECTION

CHOICE OF SYSTEMS

The following alternatives may be resorted to in choosing the system most suitable for each given case: 1, operating the winding machine directly by means of rotary-current motors; 2, operating the winding machine by direct-current motors through a Leonard connection in conjunction, if necessary, with motor generators, and with or without devices for compensating for fluctuations in load.

With respect to the direct operation by means of rotary-current motors, the safety of working, ease of control and simplicity of superintendence will be warranted only in part, so long as it is possible to alter the number of revolutions with the aid of resistance inserted in the motor circuit, when this factor, as well as the speed of winding, will be dependent upon the magnitude of the useful load. On lowering the load, there is no possibility of altering the speed, in the above manner, without actuating the brake, when the speed of winding will be dependent upon not only the position of the controlling lever, but on the magnitude of the load as well. In order automatically to slacken the speed toward the end of the run, it will not be sufficient to slowly push the controlling lever back from the depth gage, which operation of adjusting for the load would result in an increase of speed. Whenever, for the sake of changes, the low speed has to be adjusted, the mechanical brake will also have to be simultaneously employed, thus adding to the load of the motor. A considerable loss of energy is moreover produced in the resistance to starting and in lifting the loaded cage, while a heavy current shock is experienced on starting the winding motor, which corresponds to the increase in energy noted on starting the load.

Further, it is usually found difficult to compensate for fluctuations in load, on account of the sudden absorption of energy in starting. Fly-wheels are not able to insure a perfect compensation, as they yield large amounts of energy only in the case of a considerable drop in speed, which should be strictly avoided in generators. When using a buffer battery, a rotary direct-current converter should be inserted, which practice is rather troublesome in large plants.

One other alternative, viz., operating by a direct-current motor and using the Leonard connection (Fig. 1), is far more satisfactory, as regards its safety of working, ease of control and simplicity of attendance. The speed of the winding motor is changed by altering the field intensity of the steering dynamo, with the aid of a simple shunt-regulated resistance. The speed will vary proportionately to the armature tension of the steering dynamo, the tension curve of the latter corresponding with the traveling speed. The direction of travel is reversed by the aid of a small switch in the field coil. The winding speed is independent, within wide limits, of the magnitude of the useful load, being the same in lifting and lowering the load. In fact, the speed is almost exclusively dependent upon the position of the controlling lever that actuates the resistance. It is thus possible to connect with the depth gage a simple and reliable safety apparatus, which by acting on the controlling lever will prevent both too rapid starting and too slow stopping. Any speed, down to practically nothing, may be provided for, with all loads, without actuating the mechanical brake, while during the slackening stage any surplus energy, deducting the generator losses, can be recovered.

The power diagram of the direct-current motor which supplies the current for operating the winding motor is very favorable for the driving engines at the central station, the load rising slowly from about zero.

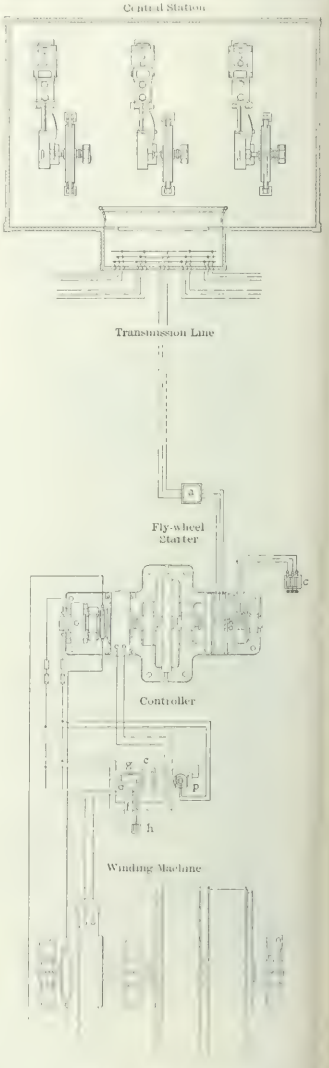


FIG. 2. ILGNER SYSTEM

Whenever means are required to compensate for fluctuations in the load, with a view to the relative dimensions of the winding machine and central station respectively, both fly-wheel and battery arrangements will prove equally acceptable, when the following alternatives may be

*Berlin W. 35, Korner-Strasse 25.

chosen from: 1. Actuating the steering dynamo directly from the engine in the central station and compensating for any fluctuations in the load by means of a heavy fly-wheel, with a considerable drop in the number of turns (15-20 per cent.). The steam consumption per effective mine horse-power will in this case be found very low. This arrangement cannot be chosen when rotary-current generators are to be driven for other purposes from the same prime movers as the steering dynamos, on account of the heavy drop in the number of revolutions. 2. Actuating the steering dynamos directly from a prime mover in the central station in connection with a buffer dynamo and buffer battery. In this case, a perfect compensation of the fluctuations in load will be attainable with practically a constant number of revolutions. The steam consumption is very low. This arrangement will be preferred especially in potash and ore mines, as the battery affords a means of performing operations in the mine, during the frequent closing down of the central station, as on Sundays and holidays, as well as at night. 3. Actuating the steering dynamo and a buffer dynamo connected in parallel with a buffer battery by a special motor. The advantages of this arrangement are similar to those afforded by the second plan, especially when considering the possibility of connecting the effect of the fly-wheels, remarkable for the uniform load on the converter motor, and the extensive alteration in the current intensity of the winding motor.

The consumption of energy for each run, even when the number of runs per hour is decreased considerably, is relatively low. In order further to decrease the consumption of energy in the case of small outputs, the fly-wheel has been in some recent plants connected to

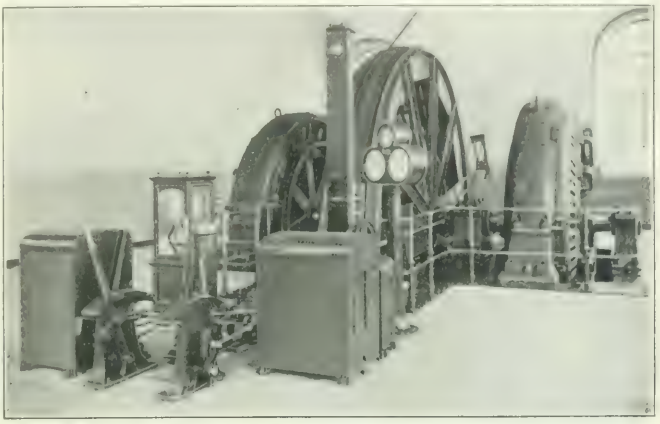


FIG. 5. HOIST AT MAIN PIT, DE WENDEL MINE.

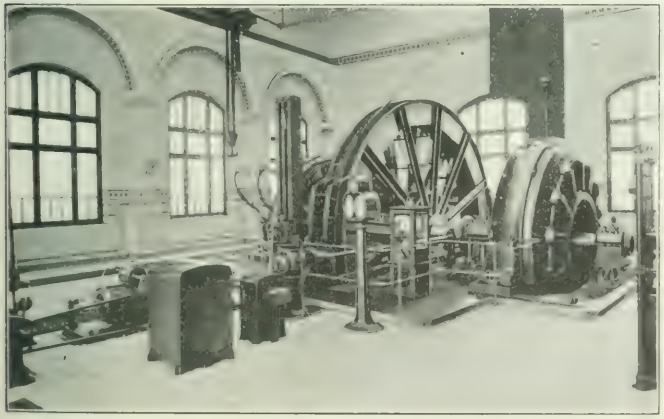


FIG. 3. HOIST AT MATHIAS STINNES MINE, CARNAP, WESTPHALIA.

the plant with central stations containing any desired number of generators and prime movers of different sizes. 4. Operating the steering dynamo by a special motor in connection with a fly-wheel, the Ilgner-Siemens-Schuckert system.

This scheme also enables the plant to be connected to any central station, both rotary and direct-current.

USE AND ARRANGEMENT OF A FLY-WHEEL.

Electrically operated winding plants designed on the Ilgner system, of which a sketch is given in Fig. 2, are, owing to the motor generator by a clutch. The uniform load on the driving engine at the central station and the boiler plant will result in a considerable decrease in the consumption of fuel.

In case of two or more winding plants installed side by side, there is used either a common fly-wheel or separated fly-wheel converters coupled together electrically or mechanically, thus compensating for any difference in load in the converter plant without requiring any increase in the weight of the fly-wheels.

winding plant is higher than that of a steam-operated hoist, the increase is by no means considerable when considering the cost of installing the boiler plant, conduits, etc., and especially when decreasing the converter expenses for each machine by combining the converters of several winding plants. The additional expense will nearly always be compensated for in the fuel saving, as central stations are usually equipped with economical driving engines.

The special feature is the possibility of constructing a plant for a new mine, in stages as follows: 1, a converter without a fly-wheel, the winding speed being so low as to not exceed the maximum output of the converter motor; 2, adding a fly-wheel and raising the winding speed to its full amount; 3, adding another converter and another winding motor and doubling the useful load.

DESCRIPTION OF INSTALLATIONS.

A few typical plants designed on the above system are briefly described in the following:

One of the two main-pit winding machines installed at the Mathias Stinnes mine, near Carnap, Westphalia, for an output of 100 tons per hour from a depth of 500 m., is shown in Fig. 3. The shaft is to be increased, eventually, to 800 m. The useful load for each run is 4800 kg., and the maximum speed of winding 14 m. per sec. Fly-wheel converters fed from the Rhenanian-Westphalian electrical works, situated at a distance of 9 km., serve to operate all of the four machines. (Fig. 4.) The fly-wheel converter plant provisionally comprises two converters coupled together, each of which consists of a fly-wheel, a rotary-current motor and two steering dynamos.

Owing to the impracticability of concentrating the fly-wheel mass, required for [illegible] a single fly-wheel, two fly-wheels, each of

43 tons weight, have been provided. Together, these compensate for any fluctuations in the load of a winding machine, while being coupled not only to the motor generator of one winding machine, but to that of the other as well. The mass of the fly-wheels calculated for one winding machine thus serves simultaneously for two machines. Should the two winding machines happen to start simultaneously under full load, the fly-wheels will not suffice, and a convenient loading up, i.e., a proper increase in the number of turns to the normal, is insured by locking the controlling lever, so that it can be moved only half way, which is accomplished by means of a locking magnet arranged in the controller of the winding plant. The winding speed will thus reach only one-half its normal value, the fly-wheels being allowed sufficient time to reach their proper speed.

In addition to the two winding machines above mentioned, there have been installed two other machines, which may, in case of necessity, be connected momentarily to a double fly-wheel converter. As soon as this machine has been regularly installed, another fly-wheel converter of exactly similar design will have to be provided. In order then to provide for a further interchange of energy derived for the third and fourth winding machines with those used in operating the first installation, two steering dynamos have been provided for each winding machine; and in the event of all four winding machines being operated, their connections are such as to enable either steering dynamo of one double fly-wheel converter to be connected up in series one with the other and the two to the other converter. The four large fly-wheels will then be coupled together both electrically and mechanically.

The main-pit winding machine of the De Wendel mine, near Hamm, Westphalia, is shown in Fig. 5. The output of this machine is 175 tons per hour, the depth of pit being at present 750 m. (to be increased to 900 m.), the useful load with each run is 5200 kg., and the maximum speed of winding 18 m. per sec.

The design of this plant is similar to the one above described, with the exception that there is only one winding machine and accordingly only one motor generator installed at the present time. However, two fly-wheels, of 43 tons weight each, had to be installed from the very beginning in order to compensate for the oscillations in load of this winding machine.

Finally may be mentioned the main-pit winding machine of the Larisch-Mönnich Mining Company, at Karwin, Austria. This machine is worked at a depth of pit of 530 m., with an output of 125 tons per hour, and a useful load of 3050 kg. at a maximum speed of 12 m. per sec. This plant is supplied with power from a central station operated by coke-oven gas engines.

Hydraulic Power Plant with 12,000-h.p. Impulse Units

The Stanislaus Electric Power Company, through its working company, the Union Construction Company, has just closed a contract for an electric power transmission system involving the largest impulse wheels ever built. The site of the proposed plant is at Vallecito, on the Stanislaus river, near Angles Camp, Cal., and the scheme contemplates the utilization of the waters of the Stanislaus river, transmitting the power electrically to San Francisco, and incidentally tapping the southern mines and the upper San Joaquin valley. The operating head is 1400 ft., equivalent to a pressure of 608 lb. per sq.in. The present equipment calls for three 6700-kw., 400 r.p.m., General Electric generators, each of which will be driven by a Pelton water-wheel unit of 12,000 h.p. capacity. Not only are the individual units larger than heretofore attempted, but the capacity of the station in excess of 36,000 h.p. is greater than any existing at the present time.

The only instance approaching this in impulse water-wheel practice is the plant of the Puget Sound Power Company at Electron, Wash., in which are installed 4 Pelton wheel units, each driving a 3250-kw. generator, with a combined maximum capacity for the station of 30,000 h.p.

The units for the Stanislaus plant will be of the "double overhung" construction. Each unit will consist of two Pelton wheels overhanging the ends of a heavy shaft which carries the rotor of the generator in the center. Each wheel will consist of a cast-steel annealed disk center to which are to be attached the Pelton buckets, also of cast steel. The shaft will be of fluid-compressed hollow-forged nickel steel, 28 ft. in length, 20 in. in diameter at the center where the rotor is located, and 16½ in. at the water-wheel journals. The wheels and rotor will be designed for a press fit on the shaft at 100 tons pressure. The journals, one on each side of the generator, will be larger than any heretofore designed for this class of work, being 16½ in. diameter by 60 in. long. They are of the ring-oiling, ball and socket type, water jacketed and provided with an oil-pressure and gravity-feed lubricating system. There will also be electric thermostats and indicators to give warning in case of excessive rise in temperature.

The nozzles will be of the needle-deflecting type, admitting of close regulation and water economy, and are to be of cast steel, as will be also the gate valves. The latter will be of the single-disk Pelton type with phosphor-bronze seats ground in place. They will be provided with roller bearings to relieve the thrust on the stems and will be actuated through gearing by means of small Pelton motors.

At the switchboard will be located the main pilot control, by means of which the operation of gates, nozzles and needles may be under the immediate control of the station attendant, small Pelton motors and direct-acting plungers being employed for this purpose.

This contract is under the direct supervision of the engineering firm of Sanderson & Porter, New York, the complete hydraulic equipment being furnished by the Pelton Water Wheel Company of San Francisco, and the electrical apparatus by the General Electric Company.

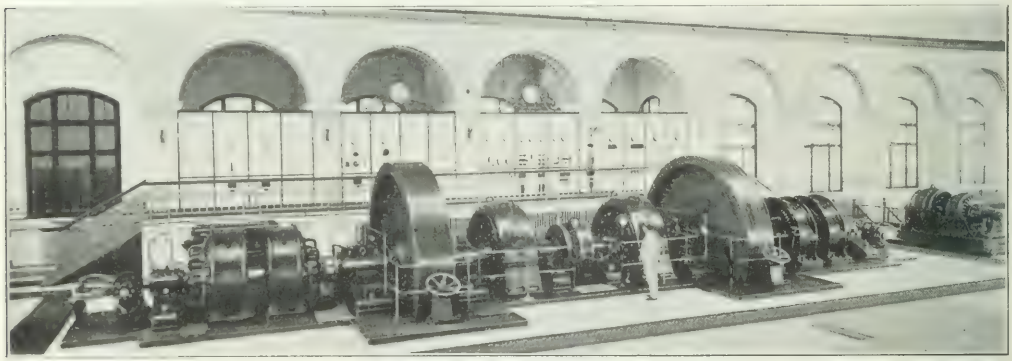


FIG. 4. 800-KILOWATT TRANSFORMER FOR SHAFTS NOS. 3 AND 4, MATHIAS STINNES MINE, CARNAP, WESTPHALIA

THE USE OF ELECTRICITY IN ANTHRACITE MINING

Advantages of Modern Equipment Compared with Obsolete Methods

BY H. M. WARREN*

One of the most notable features in the development of the mining and preparation of anthracite coal during the last few years has been the marked improvement in the generation, transmission and economical use of power. While the improvements have taken place to a greater or less degree in all of the anthracite coal companies, this article will refer particularly to those made in the coal-mining department of the Lackawanna Railroad, with which I am familiar. Although not pertaining strictly to the subject of the article, a few words about the generation of steam will not be out of place.

GENERATION OF STEAM

The old and inefficent "cylinder" boiler plants have been replaced by modern water or fire-tube boilers designed to burn the smaller sizes of anthracite and erected in well ventilated, properly lighted buildings, with economical means for handling the coal and ash.

Fig. 1 shows a typical "cylinder" boiler plant and Fig. 2 the modern boiler plant replacing it. In a few instances, where conditions were favorable, one large plant has been erected to supply a number of collieries, thereby producing a still greater saving in operating expenses. The Hampton central boiler plant, is an illustration of this type. It has a rated capacity of practically 5000 h.p., contains 15 Babcock & Wilcox water-tube boilers, two Green fuel economizers with their induced fans, duplicate air-blast fans, boiler-feed pumps and feed-water heater. Thoroughly covered steam lines convey the steam to five collieries, one washery, one coal-storage plant and one central electric station, containing five 500-kw. turbo-alternators. This boiler plant has at times developed over 9000 h.p. when burning a mixture of about 50 per cent. rice and 50 per cent. barley coal.

The above remarks give in a very general way an idea of the trend of development in steam generation and boiler-plant economy. The utilization of this power in the form of electricity is increasing rapidly for reasons of safety, convenience, comfort and a decreased cost.

ADVANTAGES OF ELECTRIC POWER

Economies due to the use of electricity may be produced in a number of ways; such as the elimination of steam-line losses, due to condensation and leaks which often account for large percentages of the total steam generated, particularly when steam is carried in the mines to a large number of small pumps and hoists. These pumps and hoists are also inefficient, usually being of the simple slide-valve type with the drains often left open on account of the high percentage of moisture in the steam. The exhaust steam is also detrimental to the mines, as the heat and moisture is disagreeable and one cause for the rotting of mine timber.

FIG. 2. NEW BOILER PLANT AT BELLEVUE BREAKER

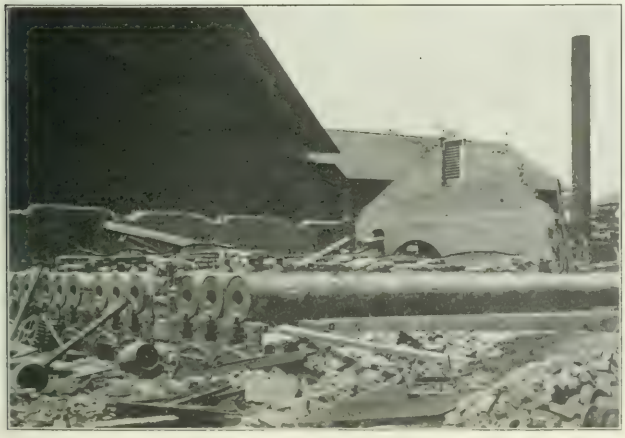


FIG. 1. [illegible] CYLINDER BOILER

The judicious use of electric locomotives in the mines in place of mules reduces haulage cost due to decreased track maintenance, saving in labor and mules and increased output over a given track, the output over a single road in some instances being doubled. Generally speaking, the more severe the haulage conditions the greater the saving by the introduction of electric locomotives. The use of electric lights properly installed in the mines at the foot of shafts, mule barns, track switches, pump rooms, etc., is a source of safety to life and limb, is productive of a greater output and decreases the fire risk over the ordinary methods of lighting. This also applies to the lighting of breakers electrically.

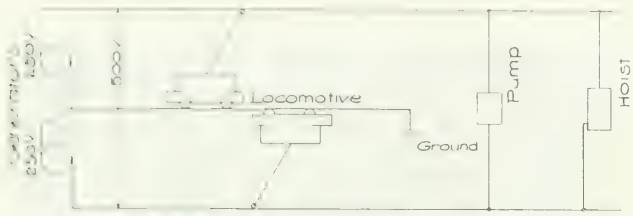
Individual induction-motor drives for breaker machinery should decrease the fire risk and increase the safety to employees by the elimination of a great many belts or ropes and bearings which are always a source of danger from fire, be-

*Electrical engineer, Delaware, Lackawanna & Western Railroad Company, Scranton, Penn.

sides leaving more space for the convenient placing of coal chutes, due to the elimination of countershafting and belts.

The above are some of the reasons why electricity is being so extensively introduced. I will not attempt to give a history of the rapid development which has taken place along these lines, but rather outline what the conditions are at present.

The Lackawanna company has a number of isolated direct-current stations containing direct-connected and belted units varying in size from 150 to 300 kw. The



SYSTEM USED WITH WOODWARD GENERATORS

station usually started with one unit of about 150 kw. and other units of various capacities were added as the load required.

INSTALLATION AT WOODWARD MINES

A typical station of this kind is located at the Woodward mines, Kingston, Penn., which now contains one 165-kw. direct-connected unit driven by a simple engine, one 330-kw. direct-connected generator driven by a simple engine, and one 330-kw. direct-connected generator driven by a cross-compound engine, Fig. 3. All of these generators compound from 250 volts at no load to 275 volts at full load and are controlled from a marble switchboard fitted with proper switches and instruments so that any or all of the machines may be run in multiple or any two in series on a three-wire system. This three-wire system is used with the neutral wire grounded so that there is not over 250 volts between any wire and the ground and 500 volts across the two outside leads as shown in Fig. 4. This arrangement allows the use of 250-volt locomotives and 500-volt hoist and pump motors, so that we have the saving in copper due to the use of 500 volts, but no more danger from shock than as though 250 volts were used, so that the trolley lines cannot be considered dangerous. The total generating capacity of this station is about 1000 h.p. and often carries 50 per cent. overload, or 1500 h.p., and as it is about 1200 ft. from the power house to the foot of shaft the saving in copper due to the use of this system is a very important item.

When it is desirable to run only one engine, as during part of the night when the load is light, the two outside wires can be connected together at the power house by suitable switch and this arrangement run as a straight 250-volt system. In this case, however, it would be necessary to have a ground connection at the hoist and pump motors if it was desired to use them on 250 volts.

Formula for Mining Thin Seams of Coal

BY M. S. HACHEN.*

The mining of anthracite coal has heretofore been confined to the thicker seams, and veins less than 3 ft. have been left untouched on account of the large expense in cutting the roof or bottom so that a proper hight may be maintained in order to load the cars in the working faces and haul them away by means of mules.

The mining of the minimum thickness of a vein depends largely upon local conditions and a general formula to determine the least workable thickness of a seam is not applicable to all cases; for breast or chamber workings I would suggest the following formula:

Let a = required hight of chamber, in feet.

b = width of chamber, in feet.

c = cost of mining and preparing (including royalty, etc.) per ton of coal, in dollars.

d = specific gravity of coal times 62.5.

m = market value of one ton of coal at mine, in dollars.

t = number of pounds in one ton (long or short).

s = price paid for roof or bottom rock cut, one foot thick per linear yard, in dollars.

x = thickness of rock cut, in feet.

Then, $\frac{3b(a-x)md}{t}$ = market value of coal per linear yard of working.

$\frac{3b(a-x)cd}{t}$ = cost of mining and preparing coal per linear yard under normal conditions.

sx = price paid at mines on account of increase in rock cut; therefore, mining a vein without profit may be expressed as follows:

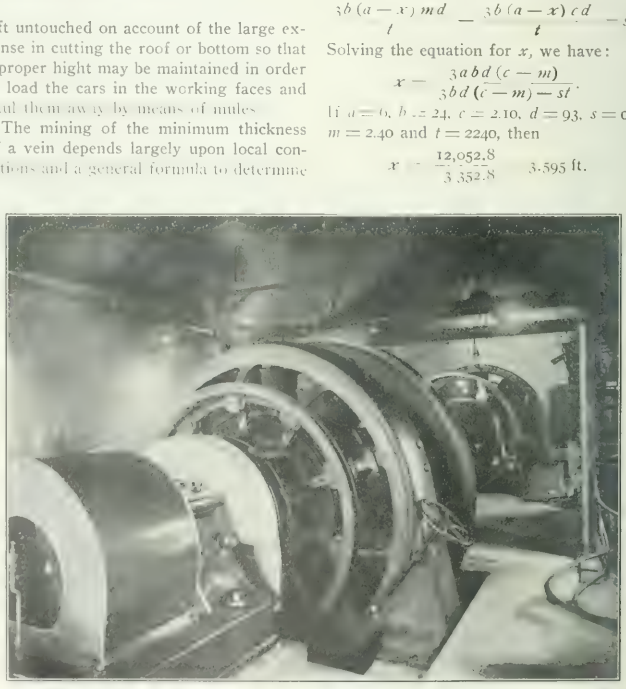
$$\frac{3b(a-x)md}{t} - \frac{3b(a-x)cd}{t} - sx.$$

Solving the equation for x, we have:

$$x = \frac{3abd(c-m)}{3bd(c-m)-st}.$$

If $a=6$, $b=24$, $c=2.10$, $d=93$, $s=0.69$ $m=2.40$ and $t=2240$, then

$$x = \frac{12{,}052.8}{3{,}352.8} = 3.595 \text{ ft.}$$



THE 330 GENERATORS AT THE WOODWARD MINES

$6 - 3.595 = 2.405$ = thickness of vein.

Assuming the mine waste to be 10 per cent., then $\frac{2.405}{0.90} = 2.67$, or 2 ft. 8 in., which is the minimum thickness of a vein workable under the conditions above stated.

*Division engineer, Lehigh Valley Coal Company, Wilkes-Barre, Penn.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

[illegible] can load from 15 to 20 cu.yd. of dirt into a cart in nine hours.

[illegible] should be sent in so that the return air current will not contain more than 0.5 per cent. of fire-damp.

Common brick masonry, such as is found in or about a mine, will generally cost from $7.50 to $8.50 per cu.yd., which includes both material and labor.

Economy requires that in excavation work as many shovelers as can labor without mutual interference be employed in loading a cart. Seven laborers are sometimes used, while five is the minimum number that should be employed.

Ordinary belting of good quality and fairly well adapted for driving will safely carry, on an average, 50 lb. per in. of width. Although no "hard and fast" rule can be adopted, it is generally found safe to consider "600 ft. velocity per minute per in. of width for each horse-power."

The existence of an underground fire may often be discovered by analyzing the return air. It is fairly certain that if more than 0.02 per cent. of carbonic oxide is present in the air in which a light will burn, there is a mine fire, or a considerable heating of the coal somewhere in the workings.

As a general rule where belts are used and a greater driving capacity is desired, it should be remembered that double belts are not doubly strong, if the affected driving contact is not increased proportionately. As a maximum addition per in. of width for double belt driving a 75 per cent. increase is advised.

The cost of concrete work varies considerably, according to the locality and prevalent conditions. In average work where the concrete consists of one part cement, two to three parts sand, four to six parts gravel or broken stone, the cost for material, mixing and laying in place, will vary from $3.50 to $4.50 per cu.yd.

In a coal washery or other similar operation, two shafts connected by a belt should not be placed one directly above the other, for in such a case, the belt must be kept very tight to work successfully. In this same connection, it is generally found advisable to see that the angle of the belt with the floor is not more than 45 degrees.

Nearly 60 per cent. of the entire coal output of Ohio is machine mined. The output of Kentucky shows the second highest percentage of machine-mined coal; while North Dakota, Pennsylvania, Montana, Indiana and West Virginia follow in the order named. Illinois, Colorado and Tennessee produce the lowest per centages of machine-mined coal.

The advantages derived from compressing coal before putting it into an oven to manufacture coke are: A 10 per cent. net increase in the coke output; a firmer, denser, stronger coke, with a higher specific gravity; elimination of the spongy appearance of the top coke; less breeze and a more even size of product. The disadvantages of this method are due to an increase of about 20 per cent. in the coking time of the coal, because of the water present in the compressed coal, and the additional labor cost and repairs to the machinery.

A mine air may often contain one volume of fire-damp to four or five parts of black-damp, and still be mixed with sufficient diluted air to enable a miner's lamp to burn. If the oxygen in the air is diminished by about 3 or 4 per cent., the lamp will go out. In a case of this kind, a miner, after having his light extinguished by such a mixture, may cause a serious explosion by going farther along the entry, and again striking a light, thinking that the air contains only black-lamp. The gaseous mixture in a mine air is so uncertain that under no circumstances should an attempt be made to relight a lamp that has been extinguished by the presence of black-damp or any other gas.

A satisfactory method for securing a sample of mine air for the purpose of analysis is to use a bottle holding about ½ gal., and in addition to the narrow-necked top having another narrow opening in the bottom, or in the side near the bottom. This bottle is filled with water and taken into the mine, the lower cork is withdrawn and the water permitted to flow out when the bottle fills with mine air; it is then again corked. In case it is desired to secure a sample of supposedly dangerous mine air in a cavity in the roof, the stopper in the upper neck has a small glass tube inserted through it, and to this is attached a piece of india-rubber tube. The end of this latter tube is put into the cavity, the water is then allowed to run out and the bottle fills with the gas from the fissure.

In handling coal, whether underground or on the surface, it is most economical to install and operate a self-acting plane, if the necessary inclination is available. In such cases, gravity supplies the motive power, the principle being to have the loaded cars, descending, pull the empties up. The gradient necessary to operate a self-acting plane varies with the length of the slope, the size and conditions of the wheels and axles of the cars, and the condition of lubrication of the rolling stock. On a short incline where the weight of the rope is not so great, a gradient of 1 in 25 will often suffice. The friction and weight to be overcome is greatest at the start, which necessitates having the gradient at the top of the incline greater than at the bottom. If the incline has a dip of more than 30 deg., the cars should be placed on special carriages to keep the coal in a horizontal position.

One important consideration often overlooked by mine operators in developing a property is to carefully study the different strata passed through in sinking a shaft. An accurate record of this sort supplemented by a careful consideration of the data of all bore holes is certain to be of great value in later developments. If an entry encounters a fault, it is not always possible to determine whether the dislocation is an upthrow or whether the continued portion of the seam is lower down. The old law, which states that the inclination of the face of the fault, pointing away from the seam indicates the direction of the continued portion of the vein, will answer satisfactorily if the fault is normal; however, if the dislocation is of the reverse type and is overlapped, the safer method of solving the problem is either by boring, or by cutting through the base of the fault into the rock ahead, then comparing it with the strata passed through in sinking the shaft.

Since it has been discovered that coal dust plays an important part in mine explosions, the determination of the quantity of dust floating in the air has become a problem of much interest to mine operators. A simple method of performing this work is to provide a glass tube about 12 in. long and 2 in. in diameter; the bottom of the tube is drawn out to a smaller circumference, while the top is somewhat widened out. The tube is filled with cotton-wool for about two-thirds its length. It is also necessary to use a cylinder holding about 3 gal. of water; at the top of the cylinder is a small hole into which the narrow end of the tube is fitted, while at the bottom of the cylinder is a hole stopped by an india-rubber cork. The bottom stopper is removed and the water allowed to run out, which operation acts as an aspirator, causing a specified amount of air to be drawn through the filtering material in the tube. This action causes the dust to separate from the air and deposit on the cotton. The difference in the weight of the tube before and after the operation determines the amount of dust contained in the specified quantity of air.

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The Withdrawal of Public Coal Lands

There have been published in the daily papers some protests against the action of the President in advising the withdrawal of the public coal lands. These protests are evidently based on a misunderstanding of the case. In many of the Western States there are large operating coal companies which have made it a practice to approach directly or indirectly not only their own employees, but also other citizens, and attempt to purchase for a small sum the individual's coal right. If the purchase be made, a claim is filed in the name of the person from whom the right is acquired, although the payment money is not forthcoming until the entry has been satisfactorily completed. This common action on the part of large corporations is certainly deserving of the Federal attention it has received.

Criticism has also been based on the alleged impossibility of segregating the coal lands. This is entirely erroneous. The boundaries of the coal lands of West Virginia, Pennsylvania and nearly all of the older States are generally defined, and if, for instance, anyone in West Virginia should like to know the extent and definite boundary of any of the coal seams underlying parts of that State, he would only have to write the director of the State Geological Survey and receive a map showing accurately the outcrop of the various coal beds in the region. The Western States are not so far advanced in this work as are some of the Eastern, but the Geological Survey has already published folios showing the general extent and outcrop of many of the coal seams of these States.

As bearing upon the latter point it is argued that the limit of the anthracite field in Pennsylvania is still in doubt. It is true that some parts of the anthracite coal field are not yet definitely defined, but generally the owners of land in Pennsylvania will state in no unmistakable terms whether any of it is underlaid by coal, and if it be attempted to buy an acre [illegible] will be [illegible] impressed. The running of coal outcrop in Colorado, especially the central and southern parts, where the greatest development has taken [illegible] when compared with the difficulties met in running the outcrop of an anthracite vein. The coal in Colorado is generally uniform in pitch, while the anthracite beds are so folded that the dip may be anything from zero degrees to vertical.

Two points brought out in these criticisms are deserving of consideration, viz., that the present laws have not been properly enforced; and that the coal lands which the Government now controls are held at too high a price. It is a question whether the present laws could have been properly enforced; however, it is certain that considerable harm has been done by the laxity of their administration. As to the price of any coal tract, the one great influencing factor is its location. Quality, thickness, and uniformity materially influence the value of a coal bed; however, a recent tract of Pittsburg coal land that was sold for more than $2800 an acre would not actually be worth $100 an acre in many Western States.

The steps that have recently been taken are not premature. Large tracts of valuable coal lands have already been accumulated by large corporations without any adequate compensation to the State or the intermediaries who have been used as tools. Speaking from practical experience in Western coal mining, and knowing the conditions as they have existed, we trust that some policy will be satisfactorily developed to eliminate the prevalent evils.

The Tin Production of Cornwall

The production of tin in Cornwall in 1906 does not show any substantial increase over 1905. We base this statement on the records of the tin ticketings and not on the official returns from each mine, which are not yet available; but this method of comparison is a very good index of the actual state of things. Every Cornishman knows (and every other miner ought to know, but perhaps does not) that most of the tin ore produced in Cornwall is sold by public auction at Redruth every fortnight. These ores are bid for by the five customs smelters in the neighborhood, and little, or none, goes to buyers outside the duchy. A certain amount of the product of the mines and stream works is sold by private contract. Perhaps from one-tenth to one-fifth of the output is disposed of in this way.

The total ore sold at the fortnightly ticketings during 1906 amounted to 6006 long tons, against 5796 tons in 1905. There were 27 ticketings in 1906, so that the increase is more apparent than real. The

total value of the ore sold during 1906 was £630,067, as compared with £480,628 during 1905, which reflects the result of the increase in the price of the metal. It is inadvisable to go into statistics as to average prices; for, unless the details are entered into very minutely, the figures and deductions may be easily misinterpreted. Suffice it to say that the above mentioned values are the prices actually paid by the smelters and represent the "market value." Most of the ores are very good concentrates and some of these represent 70 per cent. metallic tin. Others are second-class concentrates, while others fetch lower prices on account of the presence of arsenic, copper or wolfram. Perhaps nine-tenths of the concentrates will average 65 per cent. tin, and the remaining tenth, including poor quality of concentrates and stream tin, will range from 40 to 65 per cent.

It is interesting to compare the figures for the ticketings during 1905 with the official returns of production. At the ticketings during 1905 the ores amounted to 5796 tons, while the official returns of the actual actual output were 7201 tons, which were estimated to contain 4467⅓ tons of metal. It is inadvisable to deduce statistics for 1906 by working out a proportion sum on these figures, owing to the variation in the amounts sold by private contract; but the general position is sufficiently clear.

It may be a surprise to many to find that the amount of ore sold at the ticketings was not greater, so much having been said recently as to the revival of Cornish mining. The present high price of tin has no direct connection with the state of things in Cornwall, being due solely to the shortage of supplies from the East Indies. Consequently Cornishmen and London capitalists do not see their way clear to reopen old mines precipitately. They are going slowly and carefully, reorganizing the methods of mining and dressing at some of the producing mines, and reopening others that paid in earlier days. But as yet the output has not been increased sensibly by these new developments. Another cause for delay in the revival is the scarcity of labor. During the years 1895—1900, while the yearly output of ore was dropping from 13,000 tons to less than 7000 tons, both skilled miners and laborers left for other parts to seek work, and it is not easy to draw them back again, nor to find efficient substitutes. Though Cornishmen are returning in disgust from South Africa, their number is not sufficient to flood the labor market in their own country.

The Safety of Workmen

The purposes of the American Institute of Social Service, which has this week opened an exposition of safety devices and industrial hygiene at the American Museum of Natural History, New York, are so praiseworthy and humanitarian that they should receive earnest support. Few realize the enormous loss of life among the workers engaged in our industries. According to Dr. Josiah Strong, president of the Institute, 57,513 persons in the United States suffered violent deaths in 1900, while half a million more were injured. A large proportion of these accidents unquestionably are needless; are due to heedlessness. In this American employers are especially guilty; the percentage of accidents appears to be decidedly greater here than in Europe, where more attention has been given to the remedial measures which the Institute is advocating.

Governor Hughes' earnest appeal at the banquet, Jan. 28, with which the exposition was inaugurated, should do much to awaken public interest in the necessity for the introduction of safety appliances for the workingmen, wherever it is possible, and that is almost everywhere. Every mining and metallurgical engineer, for whom only we shall speak, knows that although the work he conducts is inherently hazardous in some branches, nevertheless a large part of the loss of life and limb that is suffered is due to carelessness and is preventable. Our readers know the emphasis with which we have repeatedly made this statement. It will be humiliating and shocking if the employers of labor permit the unnecessary waste of men to go on without conscientious and serious effort to check it. Apart from humanitarian grounds, it is an economic waste of high consequence, as Col. Carroll D. Wright, who followed Governor Hughes, lucidly and logically pointed out.

The free exhibition of safety appliances, which it is hoped will become a permanent one, is designed to show the people at large some of the things that can be done. We recommend to our readers who can avail themselves of the opportunity the usefulness of a visit to this exhibition.

Clearing House for Freight Cars

The American Railway Association has decided to test the plan proposed a few weeks ago by Hamilton Fish for securing a better and more prompt distribution of rolling stock by means of a central clearing house. As J. J. Hill and other railroad officials have shown repeatedly, the transportation difficulties from which the industries of the country have been suffering are due less to an actual shortage of cars than to a low rate of service per car. The clearing house is intended to reduce unnecessary delays to a minimum and to increase the ton-mile service of cars by keeping them in motion.

The plan is still in an experimental stage, but it has so far progressed that headquarters have been established in Chicago and officers have been chosen. Various methods of relieving car congestion will be tested. The original plan involved a central office for keeping records of all cars belonging to the different railroads, distributing the cars equitably according to the quota supplied by each line and apportioning charges for the use of rolling stock.

The difficulties of the undertaking are great, and most of the roads will give the clearing house jurisdiction over only a small number of cars, and that only for experimental purposes. To keep a working record of two million or more cars belonging to several hundred different owners and consigned to ten times as many points would require an enormous and unwieldy office force, and the complications which would appear in apportioning charges would be endless. There are cars with a capacity of 100,000 lb. and cars intended to carry less than a fourth of that weight; cars which cost $10,000 and others worth less than $500. It is obvious that the car will not be accepted as a unit for distribution.

The Geological Survey

The resignation of Doctor Walcott makes a vacancy at the head of the Geological Survey. The filling of this important post directly concerns the mining industry, with which the survey is most closely connected. Two names are prominently mentioned: Prof. C. R. Van Hise and Dr. J. A. Holmes. The former is president of the University of Wisconsin, and is a geologist of international reputation. Doctor Holmes was formerly State geologist of

Department of Mining and Metallurgy at the St. Louis Exposition, and is now in charge of the experimental station of the Geological Survey at St. Louis.

Either Professor Van Hise or Doctor [illegible] Geological Survey. Both have had administrative experience, and are in close touch with the practical applications of geological science. As a geologist Professor Van Hise is the more eminent. Among scientists his acceptance of an invitation to the directorship of the survey would add to the latter a special distinction. However, much as eminence in geology is desirable, the field of the survey is so broad and the duties of the director are so multifold, its relations with the Congress, and with the people are so delicate, that the man at its head must be one who is able to obtain the support that is requisite, reconcile differences in the corps, maintain proper relations with the State surveys, and direct the work into the most useful channels. Doctor Holmes has already displayed signal ability in such administration, which will win him strong support for the directorship of the survey.

Among others who have been mentioned for this important position are Prof. William Bullock Clark, State Geologist of Maryland, and Dr. C. W. Hayes, the geologist in charge of geology in the U. S. Survey. Both are strong and able men. It is cause for congratulation that there is so good a field to chose from. The Geological Survey has many urgent problems before it, and much will depend upon the selection of the man who is most competent to handle them.

The Economics of Mining in Mexico

The article by John B. Farish on mining conditions in the mountains of Chihuahua, published in this issue, is an excellent discussion of the economic conditions which govern operations in the Sierra Madre. We do not recall having seen a better presentation. The conditions which Mr. Farish outlines in connection with the development and operation of the Dolores mine are by no means confined to that property, or the section of Mexico in which it is located. Substantially the same conditions, in many cases precisely the same, have to be contended against throughout the entire length of the Sierra Madre. These conditions are radically different from what obtain in the United States, where railways reach to most of the important camps.

In Mexico the machinery has often to be brought in sectionalized form on mule back; lumber and brick have to be sawed and made on the ground; water supply is frequently a serious difficulty, and finally it is troublesome to secure and retain the necessary supply of labor. The building of such a mill as Mr. Hardy constructed at Dolores is an engineering feat of high character. The handling of the men and the transportation problem are factors which often determine success or failure in Mexico. In the case of the Dolores mine they were of supreme consequence, and in reporting upon that property, Mr. Farish properly emphasized the importance of careful attention to those conditions. His article is one that should be carefully studied by prospective operators in Mexico, who may learn from it a great deal which otherwise they would get only by costly experience.

A Copper Trust?

It is reported that an association, called the Northeastern Metal Dealers' Association, has been formed to urge the Federal Government to investigate the alleged existence of a copper trust, which, it is averred, practically controls the copper-mining industry of the United States and has been instrumental in artificially maintaining high prices.

We have repeatedly heard, during the last year, expressions of that idea. Nothing could be more absurd. The high price for copper is caused by the conditions which we have discussed many times, most recently last week, namely an increase in the demand for consumption, which is greater than the ratio of increase in production, and has swept the American market bare of stocks on hand. It is perfectly true that a large part of the American production of copper is controlled by interests which have been operating in harmony, but there is a sufficient independent production to upset the idea of a trust, in which connection the recent failure of a proposed consolidation of Michigan producers is contributory evidence that anyone may read. Instead of artificially boosting the price for copper, the large interests have deprecated the upward movement and have used efforts to restrain it, realizing that some day there must be a reaction, and the greater the hight, the greater will be the fall. Conflicting interests can easily work in harmony on a rising market; the test will come on a falling market.

Colliery Explosions in France and Prussia

On Jan. 28 two serious colliery explosions occurred in Europe, one at the Reden mine, at St. Johann am Saar, opposite Saarbrücken, Rhenish Prussia; the other at Liévin, in the Courrières district, France. In the former, it is estimated that 200 lives were lost. In the latter, fortunately only three were lost, although a large number of men were in the mine. According to the press despatches both explosions were of firedamp.

The fact that both these explosions occurred on the same day will create especial interest in the inquiry as to the atmospheric conditions at the time, and the possible connection between the latter and the development of gas in the mines. The explosion at the Reden colliery is said to have occurred at 8 a.m. That at Liévin also happened in the morning, precise time not stated. Liévin and Saarbrücken are only 220 miles apart in a direct line, wherefore the barometric pressure may be expected to have been more or less the same.

The Standard Oil Company

The report of the Interstate Commerce Commission, delivered to Congress Jan. 28, is the most scathing indictment that has been made against the Standard Oil Company. The latter is declared to be the most perfect monopoly yet developed in the United States, and to have used, and to be using, highly unfair methods to preserve its position. All of these are old charges. The novelty in the present report is the destruction of the idea that while reaping vast profits for itself the Standard has been fair to the consumers. According to the commission the evidence shows little basis for the claim that the great dividends are the legitimate result of industrial economies. In fact it is now alleged that this idea has been created by a Standard Oil press bureau operating through many subsidized newspapers.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

False Economy

Someone has aptly said, "Virtue carried to excess becomes a vice." Nothing could be more true than the application of this saying to the principle of economy. Not the least of a manager's qualifications for a mine should be his ability to judge of what is true or false economy.

No one will deny the necessity of keeping a strict account of expenditure and receipts, but when this accounting implies, for example, a red-tape system, employing half a dozen clerks to distribute and subdivide a pay-roll which could by a simpler method, equally trustworthy, be done by two men, it is quite time that system should be discarded.

There are a hundred and one things cropping up at outlying mining camps which require a rough and ready style of handling, and what apparently strikes the auditor at headquarters as reckless extravagance is really often exactly the reverse and *vice versa*.

I recall a case in which apparent economy was in reality the hight of extravagance. A superintendent of a mine, distant three days from a railroad and practically isolated during twelve weeks of rainy season, requested to have an assistant, he being the only white man on the place. This was refused by the company on the ground of needless expense. Shortly afterward the superintendent fell sick and died. No one could reach the camp for several days and the consequence was that nearly all the lumber, tools and supplies were *non est*, having been appropriated by the laborers, who had scattered all over the surrounding country. The net result was the loss of $12,000 against the salary of an assistant.

In another case, a hide-bound edition of frugality, who ought never to have entered the mining business, so heckled and harassed his men and made his mine contracts so onerous and irksome as to make life a burden, resulting in half-hearted service and very poor returns. The treatment meted out to the rank-and-file so disgusted them that the mine had to suspend operations. Shortly afterward the property changed hands, the new manager by a more liberal policy, not so much in the direction of increased wages as by erecting comfortable rooms, providing good meals, etc., soon created a different "atmosphere" which reacted upon the company in the form of much better results.

If the etiquette of the profession permitted, what uncalled for criticism and petty corrections emanating from auditors' offices could mine managers disclose. A particularly bright official, noted for his cheese-paring proclivities, decided to "cut out" the expense of loaning sacks to miners for their shipments of ore to smelters, which expense amounted to about 2 per cent. of the operating costs in the ore-buying department. Commencing with a shipper whose deliveries aggregated $100,000 for the year the profit from which in round figures came to 15 per cent., the "economizing order" was put into effect, with the result that the man stopped shipments, resulting in a net loss to the purchaser of $13,000.

To avoid heavy express charges on some cyanide precipitates worth $30,000 per ton, a shipper thought he would economize by shipping as ore at a declared value of $25 per ton. This proved rather more expensive than shipping by express for, upon the arrival of the shipment three sacks were missing and claim could be made only for the proportion of the declared value.

On a smaller scale but with the same principle involved, a superintendent who had purchased some garden hoes for concentrates, valued at $1.50 each at the mine, refused to issue one from the warehouse to a mason for mixing his mortar, telling him to get the blacksmith to make one out of old sheet iron. This was done, at a total cost, including labor, fuel, loss of time of the mason and his helper, of $10. "A word to the wise is sufficient."

DAVID WALLACE

Oil vs. Coal as a Fuel

What is the comparative cost of burning crude oil against coal for fuel purposes, in this or any other district that you may have figures on? Any information you can throw on this subject, or references you can give, would be very interesting to me as well as many other subscribers of your paper in this district.

Webb City, Mo. D. T. BOARDMAN.

One pound of oil develops about 21,000 B.t.u., while the best quality of Pittsburg coal yields about 14,000 B.t.u. These figures give oil a heating power as compared with that of coal of about 3 to 2. That is, theoretically 2 lb. of oil would equal about 3 lb. of good coal. But the practical efficiency of burning oil is relatively greater, particularly in some of the Western States, where local coals have a low heating value. In some parts of Kansas 1 lb. of oil may equal 2 lb. of coal in practical heating value irrespective of the cost.

With respect to the ordinary Kansas coal, which has a calorific power of only about 10,500 B.t.u., 1 lb. of oil would theoretically be equivalent to about 2 lb. of coal. But owing to the greater efficiency in burning the oil the ratio would be somewhat more in favor of the latter. The Kansas coal could hardly be expected to give an evaporation of more than 7½ lb. of water.

The following tests to determine the relative cost of the two fuels, made, one at Minneapolis and the other at South Chicago, are from William Kent's "Steam Boiler Economy," page 141:

"A test by the Twin City Rapid Transit Company, of Minneapolis and St. Paul, showed that with the ordinary Lima oil, weighing 6 6/10 lb. per gallon, and costing 2¼c. per gallon, and coal that gave an evaporation of 7½ lb. of water per pound of coal the two fuels were equally economical when the price of coal was $3.85 per ton of 2000 lb. With the same coal at $2 per ton, the coal was 37 per cent. more economical, and with the coal at $4.85 per ton the coal was 20 per cent. more expensive than the oil. These results include the difference in the cost of handling the coal, ashes and oil.

"Comparative tests of crude petroleum and of Indiana block coal for steam raising at the South Chicago Steel Works showed that, with coal, 14 tubular boilers 16x5 ft. required 25 men to operate them; with fuel oil, six men were required, a saving of 19 men at $2 per day, or $38 per day.

"For one week's work 2731 barrels of oil were used, against 848 tons of coal required for the same work, showing 3.22 barrels of oil to be equivalent to 1 ton of coal. With oil at 60c. per barrel and coal at $2.15 per ton, the relative cost of oil [illegible]"

Luminous Paint

In the issue of the JOURNAL for Dec. 29, Mr. Dickson, in his article on "Safety Chambers in Coal Mines," states that arrows made on the sides of the entries with luminous paint could be used for pointing out the direction of the safety chambers.

For some time I have been trying to find out just what luminous paint is, but with very little success. I would be

following questions through your correspondence column:

1. What is the chemical composition of the so called luminous paint?

2. Does it actually have the property of emitting light in the dark, and if so, for how long a period will the paint retain its luminosity without replenishment?

3. Where can luminous paint be obtained?

4. Does pitch blende possess the property of luminosity; if not, are there any substances that do? B. W. L.

Argentine, Kan., Jan. 7, 1907.

Luminous paint is made in the following manner: Take oyster shells, wash and clean them in warm water; put the shells into a fire for half an hour; after taking them out and allowing them to cool, they are finely powdered by pounding, and the gray parts, which are of no use, are thrown away. The powder is then put into a crucible in alternate layers with flowers of sulphur, the lid is put on and the crucible sealed up with a paste made of sand and beer. After this is dry, the crucible is put on the fire and baked for one hour, then cooled, and the cover taken off; all gray parts are now separated, and the remaining substance is mixed into a thin paint with a mastic varnish. Before applying the luminous paint, the article should be given two coats of white lead and turpentine, to form a body ground for the luminant.

This luminous paint, which is really a polysulphide of calcium, has the property of emitting, in darkness, light which was previously absorbed, and when kept in darkness for 12 or 15 hours without being subjected to any light, loses its luminosity. Luminous paint of this sort has been used for clock dials, lanterns, etc.; however, its practical application can hardly be said to have met with success.

Such paint as here described can be obtained from the larger manufacturers of paints and varnishes. Devoe & Raynolds, 101 Fulton street, New York City, are one of the firms who have luminous paint for sale.

Pitch blende possesses the property of luminosity in a very small degree.

In connection with the use of luminous paint in mines, it may be stated that when subjected to the light from electric bulbs or an electric arc light, such paint will retain its luminosity and emit light when placed in darkness. For this reason, it is possible that where arrows are painted on the sides of an entry that has been lighted by electricity, should the light suddenly go out, the arrows painted with luminous paint would still emit the light

Magnetic Iron Oxide in Copper Matte Smelting

Can you refer me to any literature on the smelting of magnetic iron oxide in a copper matting blast furnace? Our problem is to smelt copper-oxide ores, having an almandite and andradite gangue, together with a considerable quantity of magnetite and a small quantity of pyritous ore. The greater part of the iron on the furnace charge is magnetite. The small sows, and also the matte and slag, show considerable magnetic iron. D. B. H.

Denver, Colo., Jan. 5, 1907.

We infer from our correspondent's statement of his case that his problem is to smelt an oxidized ore to which only enough pyrites will be added to serve as matte-forming agent, which would involve the employment of the usual quantity of coke, it not being intended to develop any considerable portion of the necessary heat from the pyrites added. These conditions, assuming that we have correctly understood the case, will make the smelting more difficult than ordinarily, but not impracticable if the proper kind of silicious flux be available. As stated by our correspondent, all of his silica being already pretty well neutralized by the bases with which it is combined, there would be a total lack of the energetic "free silica" so essential to combine with the ferrous oxide when the latter is formed.

We do not know of any metallurgical literature that is of value in the present case. Our opinion is that the problem is not impossible, but the furnace must be run more carefully and scientifically than copper-matting furnaces are usually run. The operator must steer between two evils, viz. (1). If he does not get reducing action enough, a lot of the magnetic iron, because of its high specific gravity, will go into the matte, lowering its grade and its fusibility, and making it hard to crush or melt. (2). If he gets too much reduction, the magnetic oxide, instead of stopping at ferrous oxide, as it ought to do, and combining with the silica, will reduce to metallic iron and go into the matte, or make sows. It will be particularly disposed to do that because of the absence of free silica, as mentioned above. Moreover, if there be much almandite and andradite in the charge, the slag will require rather a high temperature to be thoroughly liquid, owing to its magnesia and alumina contents.

We know too little of the exact conditions to give specific advice, but the above are some of the points that should receive special attention. The magnetic oxide of iron likes to go into the slag when the smelting is slow, making the slag heavy, thick and sluggish. The presence of much magnetite would make the smelting a little more expensive than if the iron flux were hematite. We think that a good metallurgist who has some originality, and some idea of surmounting obstacles, need not fear to tackle the problem.

Bed of Cast-iron Balls in Jigs

In THE MINERAL INDUSTRY for 1905, pages 522-527, R. K. Painter describes "Pyrites Mining and Milling in Virginia" (Louisa mines, Cabin Branch mines, etc.), and in it he states that jigging is done through a bed of *cast-iron balls.* You would oblige us by kindly letting us know either the size and exact shape of these balls, or where a supply of them may be obtained. It would be interesting to know if the same size of balls is used for all grades of the jigs, or if there is any variation in the size of the balls, according to the size of the grain of the ore (whether finely grained or coarsely grained).

H. & F. B.

This request was forwarded to R. K. Painter who sends the following reply: I left the Virginia field a year or more ago and my answers to your questions in regard to jigging may not be in accord with more recent practice.

The balls employed to form a bed in the jigging of iron pyrites are spherical rough castings and those used at the Cabin Branch mine were supplied by Hy. H. Meyer, 110 So. Howard street, Baltimore, Maryland.

It was customary to use a bed made up of iron balls upon the "fines" jigs only, and the balls used were of about ½ in. diameter. These jigs were handling ore crushed to pass a 3/16-in. aperture. The coarse jigs were allowed to make their own bed or else were bedded with larger pieces of particularly hard dense ore.

The balls make a very lively bed, but the chief advantage to be gained by their use is the preservation of the fine sieves from the excessive wear always experienced in handling pyrites. ROBT. K. PAINTER.

New Brunswick, N. Y. Dec. 21, 1906.

Small Steel for Drilling

Will you kindly answer the following inquiries: 1. What is the diameter of the smallest steel used in single jacking in gold mines? 2. Is steel as small as half-inch diameter used? 3. How deep is an average hole with such small steel? 4. What grade of explosive would be used? 5. What would be considered a fair eight hours' work for one miner drilling such small holes? WERNER.

Steel of five-eighths inch diameter is usually considered to be the minimum. Seven-eighths and one-inch are the sizes commonly used. We do not know of any use of steel as small as half-inch in single jacking.

During the twelve months ended with Dec. 31, there were exported from the United Kingdom 11,324,789 cwt. of coal products other than dyes, the value thereof being £1,447,424; this total compares with 10,319,544 cwt., valued at £1,348,491, in 1905, and 10,063,817 cwt., valued at £1,375,880, in 1904.

New Publications

"Catechism on Producer Gas." By Samuel S. Wyer. Pp. 42; illustrated. 4½x6½ in., cloth, $1 net. New York, 1906: McGraw Publishing Company.

"Self-propelled Vehicles. A Practical Treatise on the Theory, Construction, Operation, Care and Management of All Forms of Automobiles." By James E. Homans. Fifth edition, revised. Pp. 598; illustrated. 7½x8½ in.; cloth, $2. New York, 1907: Theo. Audel & Co.

"The Science Year Book with Astronomical, Physical and Chemical Tables, Summary of Progress in Science, Directory, Biographies and Diary for 1907." Edited by B. F. S. Baden-Powell. Pp. 365; illustrated. 6x9 in.; cloth, $2. London, 1906: King, Sell and Olding.

"California State Mining Bureau. Report of the Board of Trustees and State Mineralogist covering the Fifty-sixth Fiscal Year Ending June 30, 1905, and Fifty-seventh Fiscal Year Ending June 30, 1906." Pp. 20. 5½x9 in.; cloth. San Francisco, 1906: California State Mining Bureau.

"Second Report on Oaks View Gold Mines (Near Rockhampton) and Notes on the Mines Talgai and Thane's Creek Goldfields." By Lionel C. Ball. Publication No. 205 of the Geolcgical Survey of Queensland. Pp. 36; illustrated. 6x9½ in.; paper. Brisbane, 1906: George Arthur Vaughn, Government Printer.

"Preliminary Report on Black Ridge, Clermont, Queensland, with Appendices on the State of the Mineral Industry in the Clermont District during 1904." By Lionel C. Ball. Publication No. 201 of the Geological Survey of Queensland. Pp. 141; illustrated. 6x9½ in.; paper. Brisbane, 1906: George Arthur Vaughn, Government Printer.

"Illustrated Technical Dictionary in Six Languages: English, German, French, Russian, Italian, Spanish. Vol. I. The Elements of Machinery and the Tools Most Frequently Used in Metal and Wood Working." Compiled by K. Deinhardt and A. Schloman. Pp. 401; illustrated. 4x7½ in.; cloth, $2 net. New York, 1906: McGraw Publishing Company.

Patents Relating to Mining and Metallurgy

UNITED STATES

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Jan. 8, 1907

PROCESS OF MANUFACTURING PRODUCER GAS—William H. Adams and Frederick Powell, Portland, Oreg., assignors of twenty-five per cent. to said Adams, fifteen per cent. to [illegible] and sixty per cent. to The Ladd Metals Company, Portland, Oregon. No. 841,051. Filed June 20, 1904.

ELECTRIC FURNACE—Leon Derr, Wilkes-Barre, Pa., assignor to The Americus Electro-Hermetic Company, Wilkes-Barre, Pa. No. 840,481. Filed Apr. 30, 1906.

ORE CONCENTRATING MACHINE—Henry C. Holthoff, Milwaukee, Wis. No. 840,604. Filed Apr. 22, 1905.

EXTRACTING METALS FROM SULPHIDE ORES—Robert L. Packard, Washington, D. C. No. 840,511. Filed Jan. 11, 1906.

FURNACE CHARGING APPARATUS—Edwin H. Messiter, New York, N. Y. Nos. 840,573; 840,574; 840,575. Filed Feb. 7, 1905.

TRIPPER OR DELIVERER FOR BELT CONVEYERS—Baxter Morton, New York, N. Y. No. 840,579. Filed May 5, 1906.

TRIPPER OR DELIVERER FOR BELT CONVEYERS—Arthur B. Proal, Jr., New York, N. Y. No. 840,585. Filed May 5, 1906.

TRIPPER OR DELIVERER FOR CONVEYING APPARATUS—Thomas Robins, Jr., New York, N. Y., and Clarence K. Baldwin, Chicago, Ill. No. 840,587. Filed May 5, 1906.

BRIQUET-MACHINE—James H. Curell, New York, N. Y. No. 840,608. Filed Oct. 2, 1905.

CONVEYER—Freeman R. Willson, Jr., Worthington, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. No. 840,729. Filed May 4, 1906.

APPARATUS FOR CRUSHING, CONVEYING AND COOLING ROCKS, ORES, ETC.—Robert F. Wentz, Siegfried, Pa. No. 840,730. Filed Aug. 23, 1899.

APPARATUS FOR EXTRACTING AND SAVING GOLD—Joseph A. Coombes, Atlantic City, N. J., assignor to The Aurum Mining Company, Arizona. No. 840,752. Filed Nov. 10, 1905.

ELECTROSTATIC SEPARATOR—Greenleaf W. Pickard, Amesbury, Mass., assignor to Huff Electrostatic Separator Company, Boston, Mass., a corporation of Maine. No. 840,802. Filed Jan. 29, 1906.

HAMMER-DRILL—William Prellwitz, Easton, Pa., assignor to Ingersoll-Rand Company, New York, N. Y. No. 840,803. Filed June 28, 1906.

ROCK-DRILL—Thomas E. Adams, Cleveland, Ohio, assignor to The Adams Drill Company, Cleveland, Ohio, a Corporation of Ohio. No. 840,816. Filed Oct. 24, 1901.

DRY SEPARATOR—William N. Beach, New York, N. Y. No. 840,818. Filed June 25, 1906.

CRUCIBLE—Edward A. Colby, Newark, N. J. Nos. 840,825; 840,826. Filed Nov. 23, 1905. Renewed Oct. 9, 1906.

CYANIDE PROCESS—Howard B. Goetschius, Dumont, N. J. No. 840,840. Filed Mar. 28, 1906.

TRAVELING HOPPER—William J. Patterson, Pittsburg, Pa., assignor to Heyl & Patterson, Incorporated, Pittsburg, Pa., a Corporation of Pennsylvania. No. 840,863. Filed July 13, 1906.

HYDROCARBON ROCK-DRILL—John V. Rice, Jr., Edgewater Park, N. J. No. 840,867. Filed May 9, 1903.

ROCK-DRILL—Thomas E. Adams, Cleveland, Ohio, assignor to The Adams Drill Company, Cleveland, Ohio. Nos. 840,890, 840,891. Filed Jan. 24, 1903.

ENGINEER'S TRANSIT—John A. Early, Batchtown, Ill. No. 840,923. Filed Apr. 17, 1904.

APPARATUS FOR PUMPING OIL WELLS—Julien E. Tinker and Joseph Crawford, Jr., Bradford, Pa. No. 840,972. Filed Dec. 22, 1904.

SELF-CONTAINED ROCK-DRILL—Otho C. Duryea and Morris C. White, Los Angeles, Cal., assignors to National Gas Drill Company. No. 841,001. Filed Apr. 28, 1903.

APPARATUS FOR THE MANUFACTURE OF REDUCING AMALGAM—Herbert P. Ewell, Rochester, Mich. No. 841,006. Filed Jan. 8, 1906.

COKE-OVEN—Mathew E. Rothberg and Alfred Ernst, Pittsburg, Pa. No. 841,052. Filed Oct. 8, 1906.

SUPPORT FOR CONVEYER-BELTS—Chas. Rouse, Pittsburg, Pa. No. 841,053. Filed Mar. 22, 1905.

PNEUMATIC DRILL—Harry P. Taylor, Salt Lake City, Utah. No. 841,069. Filed Apr. 28, 1905. Renewed July 14, 1906.

CONVEYING APPARATUS—John H. Gilman, Ottawa, Ill., assignor to King & Hamilton Company, Ottawa, Ill. No. 841,085. Filed Mar. 2, 1906.

SUPPORT FOR CONVEYER-BELTS—[illegible], Pittsburg, Pa. No. 841,[illegible]. Original application filed Mar. 22, 1905. Divided and this application filed [illegible].

REISSUE.

[illegible] Issued Jan. 8, 1907.

ORE CONCENTRATOR—Joseph W. Pope, Salt Lake City, Utah. No. 12,500. Filed Feb. 28, 1906. Original No. 744,229, dated Nov. 17, 1903.

ORE CONCENTRATOR—Harry P. Taylor, Howard, Oreg., assignor of one-fourth to W. P. Keady, Howard, Oreg. No. 12,502. Filed July 28, 1903. Original No. 682,371, dated Sept. 10, 1901.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Jan. 12, 1907

PROCESS FOR TREATING PULP—J. D. Wolf, London. Improvements in the inventor's process for catching metallic or sulphide particles from wet pulp, by passing the pulp over a traveling belt which is coated with oil or grease. No. 20,322 of 1905.

PRODUCTION OF ALUMINA—G. Muth, Duisburg, Germany. In producing alumina from bauxite by boiling bauxite in soda lye, maintaining a certain proportion between the two so that it is not necessary to use pressure. No. 25,477 of 1905.

DESULPHURIZING COKE—W. S. Simpson, London. For removing sulphur from coke, closing the oven after distilling is complete and subjecting the coke to the action of a vacuum. No. 25,574 of 1905.

TRAY FOR CUPELS—W. L. Rawson, London. Providing assay cupels with specially designed trays on which to stand, so that the litharge may not penetrate to the floor of the muffle furnace. No. 26,073 of 1905.

HEAT TREATMENT OF STEEL—W. F. L. Frith and C. G. Grist, London. In the heat treatment of steel, surrounding the metal with mercury or its vapor in a hermetically sealed vessel which is subjected to heat, thus distributing the heat more evenly. No. 26,577 of 1905.

CHLORIDIZING PROCESS—H. Baker, Runcorn. In the process for producing chlorides from sulphides such as Broken Hill slimes by acting on them with chlorine, adding to the solution a certain amount of hydrochloric acid to prevent the precipitation of the zinc with the lead. No. 26,790 of 1905.

ELECTROLYSIS OF FUSED SALTS—E. A. Ashcroft, London. In the system of electrolysis of fused salts in which two cells of different temperature are used, the arrangement of pipes connecting the two through which the electrolyte can circulate and so make full use of the heat. No. 26,813 of 1905.

LAMP FILAMENTS—J. Lux, Vienna, Austria. In preparing filaments of tungsten or molybdenum for electric lamps, using a compound of the hydrate of the metal with ammonia or polyamines. No. 27,002 of 1905.

REMOVAL OF SCALE FROM STEEL—W. R. Hodgkinson, J. H. Hardcastle and A. H. Coote, London. Removing metallic coatings from steel by immersing in an ammoniacal solution and passing an electric current through. No. 717 of 1906.

NITRATE OF AMMONIA PROCESS—W. Feld, Honningen, Germany. Producing nitrate of ammonia by passing blast furnace or other gases through a solution of the nitrate of an alkaline earth. No. 5776 of 1906.

SOLUBLE PYROPHOSPHATES OF TITANIUM—Peter Spence and Sons, Manchester. The production of double pyrophosphates of titanium and an alkali, which are the first phosphates of titanium that are soluble. No. 6329 of 1906.

METALLIC LAMP FILAMENTS—J. Lux, Vienna, Austria. A method of manufacturing tungsten or molybdenum filaments by mixing the oxides with ammoniacal solutions of casein or other organic substances. No. 9020 of 1906.

STORAGE BATTERIES EMPLOYING COBALT—T. A. Edison, New York, U. S. A. Improved method of forming cobalt and cobalt-nickel films used in the manufacture of the inventor's storage battery.

ROCK CRUSHER—F. Newnham, Los Angeles, Cal., U. S. A. A jaw crusher, arranged in such a way that the rock is broken along its natural line of cleavage, and so makes less fines. No. 17,776 of 1906.

Personal

Mining and metallurgical engineers are in- [illegible] Mining [illegible] and [illegible]

Chester W. Purington, of Denver, Colo., is in London.

T. R. Miller has returned to Denver from South Dakota.

R. A. Niles has left Breckenridge, Colo., and taken up his residence in Denver.

We regret to hear that J. C. Ralston is ill at his home in Spokane, Washington.

Frederic Nicholls, of Toronto, has gone on a trip to the West and the Pacific coast.

Robert Linton ,of R. M. Atwater & Co., Helena, Mont., is in Utah, on professional business.

W. E. Wilson, president of the Lost Bullion Spanish Mines Company, is in Baltimore.

F. J. H. Merrill, mining geologist, of New York, is about to go to Sonora on professional business.

L. F. S. Holland is in Nova Scotia, and is reopening the Evangeline gold mine at Cow Bay, Halifax county.

John Hays Hammond, of New York, sailed on Jan. 23 for Bermuda, where he intends to remain a month.

George C. Smith is now general manager of the Old Union Mining Company at Breckenridge, Colorado.

H. S. Joseph, a Salt Lake mining operator, has been elected speaker of the lower house of the Utah legislature.

Wm. Hedenscog has returned to Denver from Frisco, where he has been on a visit inspecting his mining holdings.

Norman Parsons, an Australian mining engineer, who has for some time past been in South America, is in Denver.

George Sage Brooks, of Milwaukee, Wis., has returned from an investigation of zinc properties in western Kentucky.

W. A. Walker, of Mt. Pleasant, O., has been appointed manager of the Gold Dust Puzzle mines at Breckenridge, Colorado.

W. F. Tye, of Montreal, representing the Canada Electric Syndicate, has gone to Mexico to take charge of engineering work.

Hudson H. Nicholson, of Chicago, passed through Denver recently, on his way to Goldfield, Nev., on professional business.

Paul R. Forbes, mining engineer, of New York, has gone to Mexico on business in connection with his personal mining interests.

L. A. Dunham, mining engineer, of New York, spent several days in Butte recently on business connected with the Lewisohn interests.

H. W. Hall, of Rockford, Ill., treasurer of the Lenawee Mining and Milling Company, has been visiting the property at Montezuma, Colorado.

Huntington Adams is manager of the Consuelo Mines Company, Ltd., and El Rosario (Taviches) Syndicate, Ltd., operating in Oaxaca, Mexico.

W. J. Freeman, secretary of the Bingham Consolidated Mining and Smelting Company, of Boston, is visiting Salt Lake City on company business.

Alex. W. Scott, who has obtained an interest in a copper property near Sudbury, Ont., has gone to Mexico to look after some of his holdings.

G. H. Hadley, manager of the property of the Butte-Montana Copper Company, of Butte, is visiting Pittsburg, where the backers of the company live.

Henry E. Callahan, for years manager of the Lake View Consols Mine in Kalgoorlie, Western Australia, is in Denver, Colo., on his way to Nevada.

Frederick F. Sharpless, mining and metallurgical engineer, of New York, has recently returned from examining the Emma mine, Dolores county, Colorado.

J. B. Risque, recently appointed manager of the Utah Consolidated Mining Company, has arrived in Salt Lake, and has entered upon his new duties.

George B. Lee, superintendent of the Copper Queen smelter, Douglas, Arizona, has been recently in New York, where he has been spending a well-earned vacation.

George W. Otterson, president of the Big Sandy Dredging Company, of Newsome, Idaho, and lessee of the Silver Boy placers, near Juneau, Alaska, is in New York.

J. C. Murray has resigned the position of chemist at the Londonderry Iron Company's plant, to accept the editorial management of the *Canadian Mining Journal*, Toronto.

Forbes Rickard has completed an examination of the Micmac Gold Mining Company's property at Leipsigate, Lunenburg county, Nova Scotia, and has returned to New York.

G. F. Carr, recently connected with O. & F. Braniff & Co., at Maconi, Mexico, has become mining engineer for the Arizona Commercial Copper Company, at Globe, Arizona.

G. H. Duggan, general manager, and Charles Fergie, superintendent of mines for the company, have been chosen also directors of the Dominion Coal Company, Cape Breton.

D. J. Heller, of Douglas, Arizona, has been a recent visitor in New York. He has gone to Index, Washington, where he will be manager for the Chelan Consolidated Copper Company.

George Hardy, of Carnegie, Penn., has taken temporary charge of the pan amalgamation mill of the Pittsburgh-San José Reduction and Railroad Company, at San José del Silio, Chihuahua, Mexico.

J. L. Parker has resigned his position as manager of the Brown-Alaska company, Prince of Wales Island, Alaska, and intends to open an office as consulting mining engineer in Seattle, Washington.

M. Parry Gosset, Mexican agent for the Tominil Mining Company, the Jalisco Mining Syndicate and the Estados Syndicate, passed through New York last week, on his way from London to Mexico.

Samuel Newhouse, William B. Thompson, president and vice-president of the Nipissing Mining Company, together with other directors of the company, have been at Cobalt this week inspecting the property of the company.

J. P. Hutchins, consulting mining engineer, of 52 Broadway, New York, is now in Dutch Guiana on professional business. He intends also to make a trip to French Guiana. His absence from New York is likely to be somewhat prolonged.

R. H. Channing, Jr., who recently retired from the management of the Utah Consolidated to accept the presidency of the Cerro de Pasco mining and railroad companies, in Peru, has left Salt Lake for New York. He will leave for South America in February.

R. B. Hutchinson, recently with the Compania Beneficiadora Concheño, at Concheño, Sonora, Mexico, has left there, as the property has been sold to the Greene Gold-Silver Company. After a visit to the United States, he will open an office as consulting engineer and metallurgist in the City of Mexico.

Obituary

Noah W. Gray, a prominent figure in the Lake Superior charcoal-iron trade for nearly 35 years, died at Marquette, Mich., Jan. 9, aged 59 years. In 1873 Mr. Gray and William Burt built Carp furnace at Marquette, Mich. Later in turn he became connected with the Peninsular furnace at Detroit and afterward took charge of Ashland furnace at Ashland, Wis. In 1899 Mr. Gray and Charles H. Schaffer were associated in the reconstruction of the Carp furnace at Marquette, and were identified with that enterprise until the furnace was sold to the Pioneer Iron Company. The Boyne City Charcoal Iron Company was then organized, with Mr. Schaffer as president and Mr. Gray as secretary and treasurer, the company rebuilding at Boyne City, Mich., the old St. Ignace furnace. The headquarters of the company were at Marquette.

John F. Snyder, for 44 years chief mining engineer for the Delaware, Lackawanna & Western Railroad, died a few days ago, after a brief attack of grip, aged 71 years. He was a prominent factor in anthracite operations and was known throughout the State of Pennsylvania in mining circles. He was born in Auresville, N. Y., and removed with his

parents to Scranton, when 12 years of age, and later went to Indiana. He returned in 1855 to the anthracite region and after being employed for a few years by the Delaware & Hudson was appointed chief mining engineer for the Lackawanna in 1801, which position he held until 1905, when he retired upon a pension well earned. There is not a breaker in all the system of the company which does not bear some indications of the work of Mr. Snyder in its planning. When he was appointed chief mining engineer the output of the company was only a matter of a few hundred thousand tons and during his last year it reached 9,000,000 tons.

Societies and Technical Schools

Canadian Society of Civil Engineers—The twenty-first annual meeting was held in Montreal, Jan. 29-31. The program included three business meetings, visits to various manufacturing plants in and near the city, and the annual dinner.

Canadian Mining Institute—The nominating committee has submitted the following nominations for officers for 1907: President, Frederic Keffer, Greenwood, B. C.; vice-presidents, J. Bonsall Porter, Montreal, P. Q.; W. G. Miller, Toronto, Ont.; W. Fleet Robertson, Victoria, B. C.; secretary, H. Mortimer Lamb, Montreal; treasurer, J. Stevenson Brown, Montreal; members of council, E. W. Gilman, Montreal; James McEvoy, Fernie, B. C.; Frank B. Smith, Edmonton, Alberta; R. W. Brock, Ottawa; J. C. Gwillim, Kingston, Ont.; F. D. Adams, Montreal; H. E. T. Haultain, Craigmont, Ont.; David H. Browne, Copper Cliff, Ont. Other nominations may be announced later.

Industrial

The Crocker-Wheeler Company, Ampere, N. J., notes among recent sales an equipment of direct-current generators for the Edna No. 2 mine at Wendel, Penn., owned by the Pittsburg & Baltimore Coal Company.

The Crane Company, Chicago, now has the new steel foundry in full running order. In this department steel valves and fittings will be a specialty, and the facilities are such that promptness in the filling of orders for these goods is assured.

The National Producer Gas Power Company has been organized, with $500,000 capital, to make suction-gas producers under the patents of J. R. Wilmot; also gas engines and power-plant accessories. J. R. Wilmot is president, with office at 1123 Broadway, New York.

The DuBois Iron Works, DuBois, Penn., have taken over the entire business of the Lazier Engine Manufacturing Company, Buffalo, N. Y. The DuBois Iron Works have been manufacturing gas and gasolene engines for years under the patents and designs of Arthur A. Lazier, who has now sold out his entire interests and retires from the business management. While in general appearance the future engine manufactured may look the same, numerous improvements and changes will be made in the DuBois engines. It will be possible to operate them on natural, illuminating and coke-oven gas, gasolene, alcohol, distillate, crude oil and kerosene, in sizes ranging from 5 to 300 horse-power. Peter Eyermann is chief of the engineering department and under his designs and supervision the new "DuBois" engines will be produced. The officers of the company are: John E. DuBois, president; W. C. Pentz, vice-president; E. A. Badger, secretary and treasurer; I. N. Hamilton, general manager. The head office and entire management will be at DuBois, Penn., and at Buffalo a branch office will be retained.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Stephens-Adamson Mfg. Company, Aurora, Ill. "Conveying and Transmission." Pp. 24, illustrated, paper, 6x9 in.; Jan., 1907.

Chas. Butters & Company, Ltd., Virginia City, Nevada. Catalog A. The Butters Patent Filter. Pp. 10, illustrated, paper, 6x9 inches.

Wendell & MacDuffie, 26 Cortlandt street, New York. Catalog No. 16 with supplement and discount sheet. "Everlasting" Asbestos-Cement Material. Pp. 23, illustrated, paper, 4x6 in.

Construction News

Big Stone Gap, Virginia—The Kentenia Corporation has been organized to develop coal and iron-ore lands, and will soon be in the market for machinery. George L. Taylor, Big Stone Gap, Va., is secretary.

Weimer, Idaho—The Weimer Copper Company, owner of property in Fremont county, Idaho, but with headquarters in Salt Lake City, Utah, is considering the matter of building a smelter. J. B. Weimer is manager.

Mount Troy, Virginia—The National Manganese Company will develop manganese deposits at Mount Troy, near Staunton, and will need machinery. J. H. Ralston, Bond building, Washington, D. C., is president.

Dorchester, Virginia—The Sutherland Coal and Coke Company is preparing to open a coal mine; also to build coke ovens. A power plant and other machinery will be needed. John A. Esser, Dorchester, Va., is general manager.

Special Correspondence

San Francisco Jan.

The miners' strike at Grass Valley is at an end. At a late hour on Jan. 19 committees of the Miners' Union and the Mine Owners' Association agreed upon terms to settle the strike that has been on since Jan. 1. The men are to start down the shaft at 7 o'clock, and work until 12 o'clock. They will have a half hour for lunch, and will work until 3.30 when they will start for the cage to leave the mine. The terms are satisfactory to both sides. In the two largest mines, the North Star and the Empire, the management had prepared to hoist out their mules and stop the pumps. Quite a number of miners had also left for other camps, and for some days the deadlock continued. The result settles the eight-hour day in the district, when 10 hours has always been the rule heretofore.

Secretary Hitchcock has issued an order withdrawing from all forms of disposal under the public land laws, except mineral, the vacant public lands in Siskiyou and Modoc counties, California. The lands withdrawn will be added to the Modoc forest reserve. They include about 469,160 acres in northeastern California, adjoining the Mount Hoffman withdrawal and the Modoc reserve. The order was issued primarily for the benefit of the miners, and will stop scrippers and timberland grabbers from making further raids on the public domain in those two counties.

All the lands of the Southern Pacific Company included in the Government grant to the Central Pacific Railroad in California, Nevada and Utah, with the exception of the timber property, will be placed on sale not later than July 1 this year. The railroad company's holdings in these States amount approximately to 6,000,000 acres. The sale of this vast area has been urged by the public for more than a decade. While small pieces of the Government grants were sold from time to time through the land office, this will be the first general disposal. The timber lands are reserved from this sale, but nothing is said about the mineral lands. Miners have not cared to prospect on these railroad lands because if they found anything of value high prices were charged.

The miners have always contended that the mineral lands were reserved from the grants and have made many efforts to have Congress take action as to segregation of mineral from agricultural land before passing patent to the railroads. The railroad companies, however, have always had more influence with Congress than the miners or the California Miners' Association did. The latter organization gave the railroad company a hard fight on the question, but finally had to give it up.

The Mammoth Copper Company, of

voluntarily introduced the eight-hour schedule for its miners and smeltermen, has now raised wages without being asked. In order to adjust wages and at the same time give the employees a share in the benefit due to the advanced price of copper, the company has compiled a new schedule of wages, to go into effect Jan. 15. The advance in wages is contingent upon the price of electrolytic copper in New York being 18c. or higher per pound and a reduction will be made when the price drops below that figure. The company employs from 750 to 800 men and the wages are increased from 9 to 12 per cent. The smelters of the company are reducing 1500 tons of ore daily.

The long expected has happened at last. The State Anti-Débris Association—a private organization having no authority whatever from the State—has commenced suit against every dredging company in the Oroville district, Butte county, for letting material go into the Feather river, increasing the hight of water plane and causing floods and damage to the surrounding country.

This would seem rather a high-handed proceeding but it is in strict keeping with the former actions of this association. By having the suits tried before judges of courts in the anti-mining counties of the valleys, the miners have always got the worst of the litigation. The association contends that the companies can, at comparatively small expense, erect levees or barriers of cobbles or rock along the river channel which will prevent the débris from reaching the stream, and that they have failed to do this. Those right in the stream can do this and have done it, but the others working inland from the river have no necessity of doing it. Their débris is dumped back of them into the pit gradually vacated by the dredge as it moves onward in the course of daily work.

The United States Supreme Court has handed down a decision confirming the judgment of the California Supreme Court in the case of the East Central Eureka Mining Company and others, plaintiffs in error, against the Central Eureka Mining Company of Amador county. This was a case of a defendant holding under a mineral patent against a plaintiff, the holder of an agricultural patent, to quiet title to the mineral ledge underlying the farm of the plaintiff. The Supreme Court of the United States confirms the former judgments, which finally settled the right of the Central Eureka Company to follow its ledge even under the ground covered by the agricultural patent.

Judgment by default has been rendered in the United States Circuit Court in favor of Wellington Gregg, Jr., in the suit of Wm. H. Daily and the Pacific Coast Smelting and Refining Company vs. Christopher Furness, Frank P. Deering, the Copper King, Ltd., and Wellington Gregg, Jr. A decree was entered to the effect that the deeds signed and acknowledged by Daily on February 13, 1900, and May 25, 1900, were valid and did convey to the Copper King, Ltd., the title to all the lands therein described, and recognizing Gregg as guarantee of the Copper King and as the owner in fee simple absolute of those lands. The court ordered also that the complainants must convey the lands to Gregg within 30 days by a quit-claim deed. The property is near Bay Point, Contra Costa county. Gregg recovers costs also.

Salt Lake City Jan. 26

At the annual election of the Kennebec Mining Company, operating near Alta, W. J. Craig was named president; S. M. Levy, vice-president; Charles Dupont, secretary; Bismark Snyder and Alex Colbath, all of Salt Lake, directors.

Much interest is being taken here in the Seven Troughs, Nevada, district, where more sensational gold discoveries have been reported. Several prominent Utah mining men have acquired property there.

The management of the Yampa Smelting Company, at Bingham, has experienced considerable difficulty in keeping its plant in operation during the past two weeks, owing to a scarcity of fuel and ore. The Copper Belt railroad, upon which the company depends to transport ore from the mine, is short of motive power. The Utah Copper Company has been unable to keep its mill going for the same reason. During December about 8000 tons were received at the plant, whereas between 24,000 and 30,000 tons should have been received. In Beaver county mine operators are handicapped in the same manner, and at this writing practically every mine in the county which is using coal for fuel is out of commission.

The Federal authorities are still probing into the alleged coal-land frauds. A civil action has been brought against the estate of Stanley B. Milner, to set aside title to several thousand acres of coal lands in Iron and Emery counties, which are said to have been obtained fraudulently. The grand jury has indicted C. M. Freed, Walter G. Filer, Don C. Robbins and E. W. Senior, all prominent Salt Lake citizens, for having been parties to other alleged coal-land irregularities.

The annual election of the Lower Mammoth Mining Company resulted in the selection of A. C. Ellis, president; John Dern, vice-president; W. S. McCornick, treasurer; August Reeves, secretary; all of Salt Lake. The condition of the mine was reported to be excellent.

Official announcement of the settlement of the Silver King-Magnolia-St. Louis litigation at Park City has been released. In addition to the purchase of the property and rights of the Magnolia-St. Louis Mining Company, the Silver King Mining Company acquires all the interests of the Pinyon Ridge and Baltimore mining companies; as well as those belonging to James McGregor.

The name of the Copper Glance Mining Company, of Bingham, has been changed to that of the Bingham Amalgamated Copper Company.

At the annual election of the Bingham Central Mining Company the matter of consolidation with the Bingham Standard Copper Company was brought up and the arranging of the deal in behalf of the Bingham Central Company has been left to Samuel Newhouse, who has been chosen president of that corporation. The Bingham Central Company has a cash balance of $26,000 on hand, with about 106,000 shares of treasury stock.

Duluth Jan. 27

There will be 13 new electrically driven Brown hoists ready for operation at lower lake receiving docks by spring, and these should add about 300,000 tons each to the capacity for taking out ore by receiving ports. Most of these are at Cleveland and Fairport.

Total shipping capacity on the lakes for iron ore the coming season will be 42,000,000 gross tons, as against 39,000,000 capacity during 1906. It is considered probable by vessel-men that this capacity will be in use, and most of them have covered their tonnage by contracts at the prevailing rates well into the fall. Some of the chief concerns have taken tonnage to 80 per cent. of their capacity, and the various steel-making concerns with vessels have arranged to maintain their ships full all season. The United States Steel Corporation will have some 2,000,000 tons greater capacity in 1907 than last year, and expects to move all the ore its mines can produce and its roads handle to docks. Last year it shipped in its own vessels 11,355,000 tons of ore, which was about half its total business.

Scranton Jan. 28

An effort is being made throughout the anthracite region to boost up the assessments upon the properties of the coal companies. The grand jury in the county of Luzerne conducted an investigation of the coal assessments throughout the valley and on Saturday presented a report to the court suggesting that the assessment of the county be increased $40,000,000, or, by one stroke of the pen, more than doubling the assessment of the entire county, all the increase to fall upon the coal lands. The report is the most drastic in the history of the anthracite region and the authorities in Lackawanna and Schuylkill counties are taking up a similar movement.

In the case of Luzerne county the grand jury examined a number of witnesses to test the assessment made by the regular assessors and cite the valuations now in force. In the case of the holdings of the Pennsylvania Coal Company in Jenkins

township the city recommended that the valuations be increased at least 150 per cent., while a considerable increase should be made on the breakers and other buildings. In connection with the holdings of the Lehigh Valley Coal Company and the Hillside Coal and Iron Company in the same townships they recommended that the valuation be raised from $2,000,000 to $5,000,000. In Pittston township they recommended that the average price per acre be increased from $180 to $500 in the case of the lands of the Pennsylvania Coal Company. The Lattimer colliery of the Lehigh Valley Coal Company, which is assessed at $91,400, it was recommended should be assessed at $488,000. Other recommendations were made, but the examples given indicate the wholesale manner in which it is threatened to tax the coal companies. Similar action is being taken in the other anthracite counties.

Representative Herbst has introduced a resolution in the State house of representatives directing the attorney-general to institute *quo warranto* proceedings against the Temple Iron Company to determine by what right it mines and transports coal.

Judge Kelly, of the court of common pleas of Lackawanna county, decided in the case of William Miles vs. The Pennsylvania Coal Company that the defendant company had the right to mine coal under the property of the plaintiff, regardless of the effect it may have upon the surface, as the lease gave that right.

London Jan. 19

The shareholders in the Montana Mining Company, which operates the Drumlummon mine, have been much pleased to hear that the Supreme Court at Washington has decided the lawsuit between the company and the St. Louis Mining Company in their favor. The lawsuit was originated by the St. Louis Company and based on the complicated mining laws of the United States, which are too deep to be fathomed on this side. The local court had awarded the St. Louis Company $195,000 as damages for trespass and for the value of ore extracted from the disputed area. The Montana Company appealed, but had to put up £35,000 as security. During all this time the capital of the company has been locked up in this way. The earthquake at San Francisco and the subsequent fire caused delay, because the records of the trials were kept there. The end has come at last, and the capital will once more be available for the legitimate purposes of the company. There have been lawsuits between these two companies for the last 15 years, the St. Louis always being the aggressor and always the eventual loser. It stands to reason that the energies of the officers of the Montana company are alienated from their legitimate work by lawsuits of this sort.

General Mining News

ARIZONA

COCHISE COUNTY

New Nonpareil Copper Company—This company was recently organized at Tucson, as successor to the Chiricahua Development Company. The following directors were elected: Thomas F. Cole, N. M. Kauffman, N. W. Haire, J. A. Duncan, W. G. Rice, S. R. Kaufman, Thomas H. Collins. The officers of the new company are: N. M. Kaufman, president; N. W. Haire, vice-president; S. R. Kaufman, secretary and treasurer. The capital is $2,500,000 in $10 shares.

Butte & Arizona—This company has completed the purchase of a group of copper claims in the Huachuca mountains, 35 miles from Bisbee. Work will be begun on the property at once, under charge of Capt. Jack Hoatson.

CALIFORNIA

AMADOR COUNTY

Asbestos—The asbestos claims owned by Fayette Mace & Sons, in Mt. Echo district, have been bonded to Eastern men who will at once begin doing necessary work.

CALAVERAS COUNTY

Benson—At this claim, near Angels, the mill is being enlarged to 30 stamps. A 14-ft. vein has been encountered on the 500 level.

EL DORADO COUNTY

Hardscrabble—At this mine work is soon to begin on a tunnel to prospect the gravel channel.

Alpine—At 300 ft. a ledge of good paying ore has been struck in this mine near Georgetown.

INYO COUNTY

Rochelle Mining and Milling Company—This company, with Ringwald Brothers and Ira C. Jackson as chief stockholders, owns six claims east of Hamil station, and has been organized to open up the property.

LAKE COUNTY

Iron Ore—R. C. Wight has found a body of iron ore south of the Rincon School district, but no work has been done upon it.

MODOC COUNTY

Hoag District—Work is now being done in two claims in this district and others will shortly be operated. So far no production has been made, development work only being done.

NEVADA COUNTY

Boss—For this mine near Sweetland, J. H. Collier, superintendent, machinery has been ordered and shaft-sinking will be commenced at once. The machinery consists of a pumping plant, hoist and compressor.

Delhi—This mine is near Columbia hill and was at one time a large producer. A rich shoot of ore has been found and Superintendent H. Eddie will start the 20-stamp mill as soon as conditions permit. The mine is well equipped.

PLUMAS COUNTY

At Beckwith—Between the heads of Big and Little Grizzly creeks, near the old emigrant road, between Beckwith Pass and Quincy, a Salt Lake syndicate has secured many acres of land covering the southern extension of a region on Ward creek that contains gold and copper. Another company, the California Hercules, is opening up ground that adjoins that of the Salt Lake syndicate.

COLORADO

LAKE COUNTY—LEADVILLE

New Monarch—One of the latest of the big propositions in the Leadville district is the New Monarch mine in South Evans. The New Monarch territory comprises about 100 acres on the northwest slope of Little Ellen hill, in the vicinity of such well known properties as the Resurrection, the Diamond group, the Fortune and the Penfield. This great mine, a genuine bonanza in the best sense of the word, came into existence only about ten years ago, the New Monarch company being organized by Timothy Goodwin, Mr. Kortz and others interested in the Ohio & Colorado Smelting and Refining Company. In a short time after active work was started the mine was shipping a high grade of ore, and its record has been that of a continuous dividend-earner up to the present time. Arrangements are being made to tap the deposit at a lower depth, to add to the stoping room of the mine as much as for any other reason, and during the last few days a contract has been let to Leadville parties for sinking the New Monarch shaft 150 ft. at that part of the workings known as the Cleveland. At this point the shaft is already down 500 ft. The management has already for any emergencies that may result from the deepening of the shaft a heavy pumping plant, capable of taking care of any large volume of water that may be encountered.

Jaybird—The Jaybird property, one of the oldest mining claims in the district, has been leased to a party of Leadville people, and work has been started on the mine. In cleaning out the workings, which have lain idle for many years, and in opening up an old shaft, the lessees have uncovered a considerable body of sulphides. The deposit runs well in copper and carries about 23 per cent. in zinc. The ore also contains about 15 oz. silver to the ton and some gold, which is expected to increase as depth is gained. Shipments from this property will be started within the next few days.

PARK COUNTY

Horseshoe—Reports from the Horseshoe mining district in Park county indi-

that point, just across the Mosquito range from the head of Iowa gulch. The lessees on the Clover group of claims in the Horseshoe report the discovery of a 14-ft. vein of quartz running well in both silver a[illegible] a large body of good milling ore from which shipments will begin at once.

[illegible] On Jan. 23 an explosion occurred in this company's colliery at Primero, by which 20 men are reported killed. It is said to have been caused by a windy shot.

IDAHO

SHOSHONE COUNTY

It is reported that smelting works are to be built at Mullan. The Greenough interests are said to be concerned.

Arlington—At this mine, near Burke, a strike has been made in the lower tunnel. The vein is said to carry 3 ft. of good milling ore.

MICHIGAN

[illegible] COPPER

Copper Range—It has been decided by the management that the mills operated by the company will not be equipped with electric power. The stamps and pumps must be supplied with steam and it was thought to be unnecessary to introduce electric power in addition. The mines, shafts and shops will, however, be electrically operated and power will be supplied by a power-house which is being considered. It will probably be constructed near the Michigan smelter, but the time for construction has not been decided upon. It is believed that 2000 kw. will be sufficient power at first and the plans are so drawn that this may easily be increased.

MONTANA

BUTTE DISTRICT

Boston & Montana—After a suspension of nearly three days on account of cold weather and a shortage of coal, the mines of this company have gone into commission again, the weather having moderated sufficiently to permit resumption. Considerable time has been lost by the company during the last 10 days, and the result will be a reduction in the output of copper for the month. All other companies of Amalgamated have suffered a similar experience.

North Butte—The new vein of copper ore struck in Gem ground is showing up well, and has been developed sufficiently to bring it into prominence as a factor in the company's assets. While not the equal of the Jessie vein, it promises to develop into as great a producer as either the Jessie or Edith May. The company is drifting east and west on it, and is driving the cross-cut north to tap the Berlin vein.

Montana Consolidated Company—This company has taken over the property held by the General Development, a Lewisohn company, with the exception of the Granite Mountain, which adjoins North Butte possessions. It is developing the Montgomery group, in which it has cut a 6-ft. vein of sulphide copper ore at 200 ft. which is said to carry high values in copper and silver. It is equipping the property with heavy machinery preparatory to more extensive development. The company is backed by the Lewisohns.

NEVADA

NYE COUNTY, TONOPAH

No ore shipments were made for the week. The sampling and other mills were closed down, on account of scarcity of fuel.

Tonopah Company—For the quarter ending Nov. 30 this company reports 26,452 tons of ore mined, of which 8902 tons were shipped, 9978 tons sent to mill and 7572 tons placed on dumps. The receipts from ore shipped were $304,334; ore milled, $161,177; total, $465,512. In addition the sum of $137,129 was received from the Tonopah & Goldfield Railroad. Dividends amounting to $350,000 were paid.

SOUTH DAKOTA

CUSTER COUNTY

Ohio Beaver Creek Placer—A placer dredge will be installed by this company, which owns 1068 acres of ground along Beaver creek. This dredge has a capacity of 1000 tons of gravel per day.

LAWRENCE COUNTY

The present strike in the Black Hills has again brought before the mine operators the question of an aërial tramway between the mines of Bald Mountain and the mills of Deadwood. It is estimated that this tramway, 7 miles in length, could be equipped at a cost of from $13,000 to $14,000 a mile, or about $150,000 for the whole. The cost of transporting ore over the railroads from this district is 50c. a ton for all $6 ore, and a sliding scale for higher values. Ore could be carried over the tramway for 25c. a ton at most, thus cutting in two the cost of transportation. The companies directly benefitted would be the Golden Reward, Dakota, Mogul, Portland-Clinton and Imperial, all of which are now shut down because of their inability to grant the eight-hour day.

TENNESSEE

The board of prison commissioners by a majority vote has passed a resolution to close negotiations for the purchase of the Kittel coal lands, known as the Herbert domain. The property is located in Bledsoe, White, Van Buren and Sequatchie counties, comprising about 11,000 acres, and is said to be underlaid with seams of Bon Air and Sewanee coal. The purchase price is stated at $12 per acre. The property will be worked by the State, with convict labor, as the Brushy Mountain mines are now operated.

UTAH

JUAB COUNTY

May Day—This company has resumed operations at its dry concentrating plant.

Tintic Ore Shipments—Operators have experienced a shortage of cars and the output last week was only 86 carloads, the contributing mines being: Ajax, Black Jack, La Clede and Swansea, 1 each; Bullion Beck, Godiva, May Day, Yankee Consolidated and Uncle Sam, 2 each; Eureka Hill, 3; Grand Central and Scranton, 4 each; Beck Tunnel, Eagle and Blue Bell and Tintic Iron, 5 each; Gemini and Mammoth, 6 each; Centennial Eureka, 32 cars.

Colorado Mining—This company has made an important strike of ore on the 250 level near the sidelines of the Beck tunnel mine. It carries high-grade values in gold, silver and lead.

SALT LAKE COUNTY

Tiwaukee—A deal is pending for the sale of the property of this company, which is located in Bingham.

Laura May—A compressor plant has been ordered for the Laura May mine in the Little Cottonwood district, and development will be resumed. H. L. Berkey, of Salt Lake, is manager.

SUMMIT COUNTY

Park City Ore Shipments—Shipments last week amounted to 1,285,300 lb., the contributing mines and respective amounts being: Daly Judge, 508,000; Daly Judge (zinc middlings), 743,000; Little Bell, 161,500; Ontario, 94,300; Silver King, 992,000; Daly West, 786,000 pounds.

Naildriver—This company has arranged with the New York Bonanza Mining Company for power, and will resume development work. Ernest Bamberger, of Salt Lake, is manager.

WEST VIRGINIA

UPSHUR COUNTY

Twelve miners, five Americans and seven Italians are known to be dead as the result of an explosion of firedamp in the Pennsylvania Company mine at Lorentz, near Buckhannon, which occurred on Jan. 27. After the explosion the mine caved in and 100 miners narrowly escaped. The explosion occurred just as the day force was leaving the mine. The mine cage had just started up the shaft with 20 men on board, leaving 80 more at the foot of the shaft. The cage was kept running, however, until all were brought up. A rescue party found the bodies of the men who were killed about 100 ft. back in the mine. Apparently they had been overcome with gas, as their bodies were not burned.

Coal Trade Review

NEW YORK, Jan. 30

Coal trade in the West shows little variation. There is still complaint of car shortage, but the condition is not as acute as it has been, and supplies are generally fair, except in some remote places.

In the East both anthracite and bituminous trades are quiet. There has been a little cold weather, but not enough to put any marked activity into the markets.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Jan. 19 were as follows, in short tons:

	1906.	1905.	Changes.
Anthracite	285,951	270,447 In	15,504
Bituminous	2,940,021	2,809,498 I	69,477
Coke	725,673	730,785 I	7,112
Total	3,909,645	3,110,730 I.	61,085

The average daily tonnage was 152,482 tons in 1906, and 163,723 tons in 1907; an increase of 11,241 tons.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to Jan. 26 were 76,745 tons.

Coal and coke tonnage of the Norfolk & Western Railroad for the 11 months ending Nov. 30, was as follows, in short tons:

	Coal.	Coke.	Total.
To Line points	7,682,382	1,930,064	9,612,446
To Tidewater	2,763,421	151,344	2,914,765
Total	10,445,803	2,081,408	12,527,211
Total, 1905	9,393,768	2,197,122	11,590,890

The total increase in 1906 was 936,321 tons, or 8.1 per cent. The tidewater tonnage in 1906 was 23.3 per cent. of the total.

Shipments of anthracite coal in December were rather less than expected, chiefly on account of shortage of cars. The total was 4,836,028 tons, which was 346,125 tons less than in November, and 559,085 tons less than in December, 1905. For the full year the shipments by companies were as follows, in long tons:

	1905. Tons.	Per Ct.	1906. Tons.	Per Ct.
Reading	12,574,502	20.5	11,258,295	20.2
Lehigh Valley	10,072,120	16.4	8,536,254	15.4
N. J. Central	7,983,274	13.0	6,983,217	12.5
Lackawanna	9,554,046	15.6	9,201,875	16.5
Del. & Hudson	5,640,528	9.2	5,346,695	9.6
Pennsylvania	4,890,685	8.0	4,856,004	8.8
Erie	6,225,622	10.1	5,636,537	10.2
N. Y., Ont. & W.	2,864,096	4.6	2,444,273	4.4
Del., Sus. & Schu'l	1,605,378	2.6	1,435,445	2.4
Total	61,410,201	100.0	55,698,595	100.0

The total decrease was 5,711,606 tons, or 9.3 per cent. The largest proportional decrease was 1,535,866 tons, or 15.2 per cent., on the Lehigh Valley; the smallest, 34,631 tons, or 0.7 per cent., on the Pennsylvania.

The shipments by months in 1906 were as follows:

Jan.	5,458,084	July	4,681,448
Feb.	4,712,000	Aug.	5,400,511
March	5,506,167	Sept.	4,926,886
April	488,200	Oct.	4,768
May	3,254,200	Nov.	4,184,154
June	5,676,018	Dec.	4,836,028

Six months of the year—January, February, March, July, August and October—showed increases over the corresponding months in 1905; the remaining months showed decreases. If the quantity of coal in the storage yards at the close of each year is taken into account, there was probably little difference in actual consumption between 1905 and last year.

New York Jan. 30

ANTHRACITE

The market is very dull, although there are a few dealers who report that trade has been fairly active during the past week. Cars have been in better supply during the last two days than for some time, and there seems to be less difficulty in getting coal through on schedule time. Small steam sizes are still scarce. Prices remain at $4.75 for broken, $5 for egg, stove and chestnut. Prices for small steam sizes are nominally $3 for pea, $2.25 @2.50 for buckwheat, $1.50 for rice, $1.40 for barley; all f.o.b. New York Harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade continues to show little change. Shipments come with fair regularity, but the tone has a tendency toward quietness. Car supply is better than it has been for some time.

Trade in the far East is about the same as when last reported. Along the Sound the demand is fairly good. New York Harbor trade is quiet, there being a light demand and a fair offering of steam coal at $2.50@2.75 f.o.b. New York Harbor shipping points. All-rail trade shows some activity, with car supply better than usual and coal coming through quite rapidly.

In the coastwise vessel market, boats are in fair supply, but there is a growing tendency to substitute coal barges for many of the small schooners that have heretofore been used. We quote freight rates as follows: From Philadelphia to Salem and Boston 95c.@$1 and discharge, the loading and discharging clause being included.

Birmingham Jan. 28

Coal operations in Alabama continue steady and further development is noticed on all sides almost.

Whitfield Brothers during the past week sold their coal properties in the vicinity of Palos, in the western part of Jefferson county, 800 acres, for $300,000 to Daniel Pierson and associates, who have organized the Pratt Central Coal Company.

The Sloss-Sheffield Steel and Iron Company is making an output daily of 500 tons of coal at the Bessie mines.

There is but little likelihood that the new administration in Alabama will make any changes in the convict system in coal mines.

J. R. Kennamer, of Piper, Ala., has been elected president of the Alabama district No. 20, United Mine Workers of America, to succeed Edward Flynn, who becomes assistant State mine inspector.

Cleveland Jan. 29

The supplies of coal on hand have about been exhausted and in a comparatively short time the market here will be dependent upon the shipments direct from mines. The best grades of mine-run steam coal are selling at $1.15@1.25 at the mines for Ohio, with Pennsylvania lower. Ohio slack is selling at $1.10 and Pennsylvania at 85c. at mines.

There is a good demand for coke. The best grades of 72-hour coke are selling at $4 to 4.25 and furnace coke at $3.50@3.60 at oven.

Owing to the large increase of Coshocton, Middle district, or No. 8, and Pennsylvania lump, the price of Massillon lump has about reached the maximum for the year at $2.30 at mines.

Chicago Jan. 28

The coldest weather of the last two years, coming at the end of a long period of mildness, has greatly increased the demand for both bituminous and anthracite, in the city trade. Country business has felt less stimulation from the change, but its increase is pronounced satisfactory by dealers.

Shipments from Illinois and Indiana mines have been curtailed. Some of the mines have been closed and others are operating at much less than full capacity. Lump and egg from Illinois and Indiana mines sells for $2@3.50; run-of-mine for $1.75@2.50, and screenings for $1.30@1.75. Smokeless lump and egg are in large supply, making prices weak, the circular quotation of $4.30 being cut 25@35c. Smokeless run-of-mine holds up to $3.40, the supply being short. Hocking is weak at $3@3.25. Youghiogheny has been overabundant and sells for $3@3.15. Pittsburg is also plentiful and brings $2.90@3.05, for No. 8 lump.

Indianapolis Jan. 26

After three weeks of turbulent deliberations the eighteenth annual convention of the Mine Workers of America closed Jan. 21. The sessions were characterized by factional differences, personal and district grievances and efforts to secure advancement in the order. The report of Secretary-Treasurer Wilson showed a decrease in membership of 16,000 and also a material decrease in the finances. Vice-President Lewis sought to forestall the policy of President Mitchell by a resolution declaring that the settlement of strikes by the body as a whole would result in a greater good to the organization than the policy of sectional settlements. President Mitchell opposed this and defended his policy of local settlement, and was sustained by the delegates.

mine workers was how to secure a resumption of the joint conference with the operators. It was generally admitted that this was both advisable and desirable, and the work of renewing such relations was left to a committee.

After a warm discussion the engineers, firemen and blacksmiths in a number of districts, who had petitioned for separate charters and said they would no longer pay dues to the union without representation, were denied the right to form a separate organization.

Senator Beveridge's child-labor law was indorsed. Patrick Gilday, of Pennsylvania, and Thomas Burk, of Illinois, were elected delegates to the International Mining Congress to be held this summer in Saulzberg, Austria. The convention opposed the reappointment of James Epperson as mine inspector for Indiana and sent a resolution to the legislature asking for an investigation of the recent mine explosions in the State.

John Mitchell was elected president for the ninth time; Vice-President Lewis and Secretary Wilson were also re-elected.

Pittsburg Jan. 29

Coal—Prices are a trifle weaker and sales are being made on the basis of $1.10 @1.15 a ton for mine-run coal at mine. There is a good supply of railroad cars, but a number of mines are idle owing to a lack of orders. The river mines are running to capacity, and the harbor and pools are crowded with empty coal-boats and barges that came up on the recent high water. The rivers were navigable all week, and all the coal loaded was shipped to lower ports, but there was not a great deal remaining after the recent heavy shipments. It is estimated that about 2,000,000 bu. got out on the last rise. Tow-boats are still coming in with empties.

Connellsville Coke—The coke market is as strong as ever, and prices are unchanged. Furnace coke for February delivery is quoted at $3.40@3.50, and for shipments through the year at $3@3.15. Foundry coke for prompt shipment is quoted at $4@4.25, and for all year at $3.85@4. According to the *Courier*, the production for the week amounted to 286,944 tons, and in the lower Connellsville region to 125,067 tons. Shipments aggregated 14,650 cars distributed as follows: To Pittsburg, 4616 cars; to points west of Pittsburg, 8306 cars; to points east of Connellsville, 1728 cars.

Foreign Coal Trade

Jan. 30

Coal production in the Transvaal for the month of November was 328,026 tons, of which 239,395 tons were sold, and 88,631 tons used at mines or stored.

The coal production of Natal in November was 110,662 tons, an increase of 15,825 tons over November, 1905. The coal exported and bunkered during the month was 62,335 tons.

Shipments of Nova Scotia coal for the full year are reported as follows, by companies:

	1906.	1905.	Changes.	
Dominion	2,945,000	3,143,000	L.	218,000
N. S. Steel	655,000	638,000	I.	17,000
Acadia	258,000	275,000	L.	17,000
Intercolonial	288,000	280,000	I.	72,000
Cumberland	117,000	154,500	D.	37,500
Inverness	133,000	206,000	L.	73,000
Small Companies	224,000	235,000	L.	11,500
Total	4,793,500	5,170,500	L.	377,000

The increase was 7.9 per cent. Only one company showed a loss in trade. The Dominion Coal Company's shipments, in 1906, were 60.5 per cent. of the total.

Iron Trade Review

NEW YORK, Jan. 30

The iron and steel markets are somewhat quieter this week. Buying of pig iron is less, and there is comparatively little new business in finished material. The inclinations are that a lot of structural steel will be called for later, but matters are quiet for the present. The mills are all busy, however, and specifications on contracts are being received, which keeps them up to their work.

United States Steel Corporation—The preliminary statement, issued Jan. 30, gives the net earnings for the fourth quarter and the full year as follows:

	1905.	1906.
Fourth quarter	$35,278,088	$41,744,964
Year	119,850,282	156,619,111

This shows for the year an increase of $36,768,829, or 30.7 per cent. The financial statement for the fourth quarter may be summed up as follows:

Net earnings	$41,744,964
Depreciation reserve, etc.	$6,016,374
Special reserve fund	1,000,000
Interest, sinking fund, etc.	7,027,613
Total deductions	$14,073,987
Net balance	$27,670,977

Appropriations from this surplus were $6,304,919 for a dividend of 1¾ per cent. on preferred stock; $2,541,513 for one of 0½ per cent. on the common stock; $15,500,000 for additions to property—including $9,000,000 for the Gary steel plant; a total of $24,346,437, leaving a final surplus of $3,324,545. The total unfilled orders on the books Dec. 31 were 8,489,718 tons, the largest quantity ever reported.

Baltimore Jan. 29

Included in the exports from the port of Baltimore for the week were 3097 tons rails and 224 tons splice-bars to Havana; 2122 tons rails and 121 tons splice-bars to Vera Cruz; 1900 tons rails and 96 tons splice-bars to Buenos Aires.

In the imports were 816 tons spiegeleisen and 304 tons ferromanganese. Imports of iron ore were one cargo, 4800 tons, from Cuba.

Birmingham Jan. 28

Despite the fact that the shipments of pig iron out of the Southern territory during this month have been much better than those for the last three months of 1906, there will be a large quantity of iron still in Alabama on Feb. 1. The advance of 25c. per ton will go into effect Feb. 1. The manufacturers made a strong protest against the advance on such of the iron as had accumulated by reason of the railroad-car shortage, but the protest was in vain. The iron make in Alabama has not been improved this year. It is a hard proposition to increase the raw-material supply with labor not abundant, and the work of repairing furnaces is not a light task. However, there is hope for an appreciable improvement in the output during the spring.

Chicago Jan. 28

The iron market remains strong, but there is considerable variation of prices.

For delivery in the second half, Southern iron brings $18.50@19 Birmingham ($22.85@23.35 Chicago.) Northern iron is selling at $24@25 for the second half, with the demand variable but sales in general large. Spot iron brings $23@24 for No. 2 foundry.

Coke is still scarce for immediate deliveries, Connellsville 72-hour bringing $6.65. Supplies are increasing, however.

Cleveland Jan. 29

Iron Ore—The market continues to hear of small lots of iron ore being sold for immediate delivery, most of these lots being off Lake Erie docks. In a majority of instances these lots are sold at prices unchanged from 1907 quotations, being therefore $5 f.o.b. Lake Erie docks for bessemer Old Range. In this case the quotation is straight, the new metallic-content guarantee not being a feature. The movement away from Lake Erie docks is beginning to be heavy.

Pig Iron—For spot shipment most of the Northern consumers of foundry iron are depending upon imports. It is known this supply is comparatively small for some time to come. Prices vary considerably on all deliveries, but it can be said the spot-shipment material is selling at $26 delivered, while second-half No. 2 Northern is selling at $22 at furnace as a minimum. There is a good stiff demand for basic and bessemer; some producers are asking $24.50@25 for second-half material.

Finished Material—There is a good demand for material, which goes into second-quarter and second-half delivery extensively. The strongest demand comes in semi-finished materials such as sheet-bars and billets. Bars are strong, especially

bar iron, which is selling on the basis of 1.85@1.90c. Youngstown. Plates and shapes are in big demand.

Philadelphia Jan. 30

Pig Iron—The pig-iron market is showing some contradictory features in which a weakening of prices appears to be indicated, but careful inquiry fails to substantiate any break or even downward tendency. We have been treated to so many surprises of late that it is dangerous to draw inferences from patent facts. The present indications are that there will be shortly a resumption of ordering, especially by foundries, engineering plants and pipe works. Basic is under urgent inquiry, and it is understood that while orders have not been accepted under recent inquiries, these orders are liable to be placed at any time. Quotations may be fairly given at $26.50 for No. 1 X foundry; $24.50@26.50 for No. 2 X foundry, according to delivery; $23 for No. 2 plain; $22.50@23 for standard gray forge; basic, $25.50 for second-quarter delivery. Scotch irons are quoted at $25 on dock; Middlesboro, $23.

Steel Billets—While there are very few buyers openly in the market at the present time, prices are firm at $34 for ordinary steel and forging steel brings from $38 to $40.

Bars—The bar-iron situation is about as it has been for some time past, and prompt shipments command premiums.

Sheets—New business continues to come in, taxing the facilities of the manufacturers for delivery within the next 60 days.

Pipes and Tubes—A large demand is presenting itself for spring delivery and the mills are reported as booking large orders.

Plates—A good deal of nervousness prevails among some of the larger buyers on account of the failure of some consumers to obtain promise of delivery during the second quarter at dates desired.

Structural Material—There is a fresh rush of small orders for construction purposes in cities for lots ranging from about 100 tons up to 1000, for which premium prices are readily paid.

Steel Rails—The steel-rail market is rather quiet, and premium prices have been offered for special accommodations.

Scrap—Scrap prices are dodging up and down in a way which cannot be easily explained. No. 1 steel scrap is in more request than any other kind at present, but only a moderate amount of business has been done, owing to the difficulty of agreeing upon prices. Wrought railroad is quoted at $23; No. 1 forge fire at $17; machinery scrap will bring $22 readily.

Pittsburg Jan. 29

The iron and steel markets continue strong despite the fact that there is but little buying in any line. Heavy buying in the past [illegible] and in plates deliveries cannot be guaranteed this side of July 1. The event of the week was the advance in galvanized sheets, corrugated roofing and blue annealed sheets, ordered by the American Sheet and Tin Plate Company, effective Jan. 24. Galvanized sheets were advanced $2 a ton to 3.75c. for No. 28 gage; galvanized corrugated roofing 10c. a square, from $3.15 to $3.25 a square, for No. 28 gage, 2½-in. corrugations; blue annealed sheets $1 a ton, making prices as follows per 100 lb.: No. 10 gage and heavier, $1.90; 11 to 12, $1.95; 13 to 14, $2; 15 to 16, $2.05. The advance in galvanized sheets was predicted several weeks ago and is due to the high price of spelter. Blue annealed sheets have been selling at a higher price than was quoted and the advance will have no effect on the market. No change was made in prices of black sheets or painted corrugated roofing. Sales of spelter in carload lots were made in Pittsburg during the past few days at $6.77½ per 100 lb., and it is now quoted at $6.80. This is a record price in this market for spelter. While black sheets remain unchanged, mills are behind in deliveries and consumers are offering premiums in some instances for prompt shipment.

Pig Iron—Consumers of bessemer and basic iron continue out of the market for second half, and while there is considerable buying of foundry iron, secrecy is being observed regarding the transactions. It is understood the Standard Sanitary Manufacturing Company bought about 20,000 tons of foundry, 15,000 of Northern and 5000 tons of Southern. The Westinghouse Electric and Manufacturing Company also is reported to have closed for a large tonnage. Furnaces have advanced the price. Until last week No. 2 foundry for second half was quoted at $21.50@21.75; now some furnaces are quoting $22, Valley, as the minimum for deliveries extending through the last half. For prompt, $25@25.50 is quoted, and for second quarter the price is $23@24. A sale of 16,000 tons of bessemer was made three weeks ago, but no announcement was made of the transaction. It leaked out, however, and it was learned that the price was $22, Valley furnaces; deliveries are to extend through the first half. The only sales recorded this week include 1000 tons of bessemer at $22.50 and 800 tons of basic at $22, Valley furnaces, for February and March deliveries. For last half furnaces continue to quote $21.50 for bessemer and $21.25 for basic. Gray forge is quoted at $20.85@22.85, Pittsburg, according to delivery.

Steel—Deliveries of billets on regular contracts continue to show improvement, but prices remain firm, bessemer billets still being quoted at $29.50 and openhearth at $32. Plates are firm at 1.70c. and merchant-steel bars at 1.60c.

Ferro-Manganese—There has been a slump in the ferro market, and for prompt shipment sales have been made at $73, and for second half $70@71 is quoted.

Dusseldorf, Germany Jan. 20

Imports of iron and steel, and manufactures thereof, into Germany for the 11 months ended Nov. 30 were, in metric tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Machinery	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The total increase was 82.7 per cent.; the gain being chiefly in raw and semi-finished iron and steel. The exports for the 11 months were as follows:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Machinery	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The total increase was 10.2 per cent. The gain was largely in finished products.

Cartagena, Spain Jan. 12

Iron and Manganiferous Ores—Messrs. Barrington & Holt report for the week: Shipments were, for the week, four cargoes, 10,935 tons dry ore, to Great Britain; one cargo, 2450 tons dry ore, to France; one cargo, 4600 tons dry ore, to Philadelphia; total, 17,985 tons. The demand for iron ore of every description remains unaltered, and sellers in most cases seem indisposed to make quotations, probably owing to available stocks having been disposed of. The port continues full of tonnage waiting turn to load, and although freights are still ruling high, a considerable amount of chartering is taking place.

Metal Market

NEW YORK, Jan. 30

Gold and Silver Exports and Imports.

At all United States Ports in [illegible] for calendar year

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1906...	$1,729,194	$ 7,[illegible]	Imp.' $5,859,429
1905	2,666,502	1,[illegible]	1,[illegible]
Year 1906.	46,500,307	155,[illegible]	108,[illegible]
" 1905...	46,794,467	50,[illegible]	3,498,948
Silver:			
Dec. 1906...	5,486,094	1,[illegible]	[illegible]
1905...	8,196,149	4,692,746	[illegible]
1906	59,[illegible]	44,[illegible]	14,685,444
1905	57,518,102	35,939,135	[illegible]

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Jan. [illegible] from [illegible]

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
[illegible]	1,344,585	[illegible]	[illegible]	[illegible]
1906	[illegible]	[illegible]	[illegible]	150,809
1905	12,561,460	[illegible]	[illegible]	[illegible]

Exports of gold for the week were to [illegible] and Panama. Imports for the week, both gold and silver, were from the West Indies and Mexico.

The joint statement of all the banks in the New York Clearing House for the week ending Jan. 26 shows: loans, $[illegible], an increase of $22,028,100; deposits, $1,007,011,000, an increase of $24,577,200, as compared with the preceding week. Reserve account shows:

	1906.	1907.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

The surplus over legal requirements shows a decrease of $2,897,900, as compared with the previous week.

Specie holdings of the leading banks of the world on Jan. 26 are reported as below, in dollars:

	Gold.	Silver.	Total.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Belgium.....	16,500,000	8,280,000	24,880,000
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Aust.-Hungary.	232,485,000	59,645,000	292,130,000
[illegible]	[illegible]	[illegible]	[illegible]

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Jan. 17:

	1905.	1906.	Changes.
India	£ [illegible]	£ [illegible]	D £ 1,092,500
China	[illegible]	[illegible]	[illegible]
Straits	[illegible]	[illegible]	[illegible]
Total.....	£ [illegible]	£ [illegible]	D £ 1,092,500

Receipts for the week were £260,000 in bars from New York, and £92,000 in dollars from Mexico; a total of £352,000. Exports were £188,500 to India.

Indian exchange has been strong, the council bills offered in London being taken at an average of 16.09d. per rupee. Business is active in India, and further purchases of silver are expected.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	[illegible]	$0.55
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Twenty francs.....	3.86	3.90
[illegible]	[illegible]	[illegible]

SILVER AND STERLING EXCHANGE

January	Silver. London Pence.	Silver. New York Cents.	Silver. London Pence.	Sterling Exchange.	Silver. New York Cents.	Silver. London Pence.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, [illegible] fine.

Other Metals

Daily Prices of Metals in New York.

January	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
[illegible]	25	24	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	42	6.00	@6.80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.70	6.55
[illegible]	[illegible]	[illegible]	107	42	6.00	@6.80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.70	6.55
[illegible]	[illegible]	[illegible]	[illegible]	42	6.00	@6.80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.70	6.55
[illegible]	[illegible]	[illegible]	107	41¾	6.00	@6.80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.70	6.55
[illegible]	[illegible]	[illegible]	106¾	41¾	6.00	@6.80	[illegible]
[illegible]	25	24	[illegible]	[illegible]	[illegible]	6.70	6.55
[illegible]	[illegible]	[illegible]	106¾	41¾	6.00	@6.80	[illegible]

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—Business during the week has not developed any new features. Europe has not been buying anything, but there has been some buying by home consumers which was sufficient in volume to bring about a further advance in prices, the supply being so scant. The close is firm at 25@25½c. for Lake copper; 24¾@25c. for electrolytic in ingots, cakes and wirebars. Business in casting copper was done at from 24¼@24½.

The standard market has been barely steady, there being a great deal of pressure on the part of European dealers, which in a measure was offset by the supporting orders from this side. The closing quotations are cabled at £106 7s. 6d. for spot, £107 12s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £108 10s.; best selected, £113 10s.; strong sheets, £122 10s. @123 10s.

It is reported that the average price received by the United Metals Selling Company for all its electrolytic copper for December was 23.03c. per lb., delivered, 30 days. This would correspond to 22.78@22.83c. per lb., cash, New York. The average of our quotations for the same month was 22.885c.

Copper Sheets—The base price of copper sheets is 30c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—Prices continue to move within a narrow range. During this week the bears had the best of it and were able to depress the quotations in London to £189 17s. 6d. for both spot and three months'. Consumers here persist in their indifferent attitude, and only buy their current supplies on weak spots. Business was done in this market at 41½c.

Lead—The quotation remains unchanged at 6c. New York.

Following the advance in the London market during the previous week, there has been a steady gradual decline, which brought quotations at the close down to £19 12s. 6d. for Spanish lead, £19 15s. for English lead.

St. Louis Lead Market—The John Wahl Commission Company telegraphs under date of Jan. 30 as follows: Lead is quiet, and is selling at 6.07½c. for ordinary Missouri brands, and 6.15c. for refined corroding lead.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 12, that the price of pig lead has been 89.50 reales per quintal, silver being paid for at 14 reales per ounce. Exchange, 27.21 pesetas to £1. The price of silver, on current exchange, is equal to £18 8s. 4d. per long ton, f.o.b. Cartagena. The total export of pig-lead from the port of Cartagena during 1906 was 38,876 tons, of which 23,338 tons was argentiferous, the remaining 15,538 tons having been desilverized in the district before exportation. Of the total quantity 23,394 tons was shipped to England, 11,352 tons to France, and the remainder was divided up in small quantities to various Continental ports.

Spelter—Owing to the shortage of cars and the congested condition of the railroads, there appears to be quite a scarcity of near-by spelter at the consuming centers and premiums have been paid for early deliveries. There has been a fair amount of business for the future months. The market closes at 6.70@6.80c. New York, 6.55@6.65 St. Louis.

The foreign spelter market eased off somewhat during the week, closing at £26 15s. for good ordinaries, £27 for specials.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 12, that exports for the week were 1509 tons blende to Antwerp. The total export of zinc ore (blende and calamine) from the port of Cartagena during 1906 was 89,189 tons, of which 63,688 tons went to Antwerp, 15,550 tons to Stettin, and 5377 tons to Swansea, the remainder having gone in small quantities to other ports.

Zinc Sheets—The base price is $8.40 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—Quite an active inquiry for this metal is reported, the market being firm at 23½@24¼c. for the outside brands, 24¼@25¼c. for Hallett's, 25@26c. for Cookson's, the ranges in price being chiefly according to delivery.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb. according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at $38 per oz. For good scrap $31.50@32 is paid.

Quicksilver—There is no change. New York prices are $40.50@42 per flask of 75 lb., according to size and conditions of order. San Francisco prices are $39@40 per flask for domestic orders, and $37@38 for export trade. The London quotation is £7 per flask, with £6 18s. 9d. asked by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Minor Metals—For minor metals and their alloys, wholesale prices are, f.o.b. works:

	Per Lb.
Cadmium, 99.5% f. o. b. Hamburg	1.40@1.46
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Chrome (50)	14c.
Ferro-Chrome (2% carbon) per lb Cr	10c.
Ferro-Chrome (4% C for each lb Cr)	11@11.5c.
Ferro-Chrome (60-64% Cr., 3-4% C.)	12@12.5c.
Ferro-Chrome (66-70% Cr., 1% C or less)	38c.
Ferro-Molybdenum (50%)	1.00
Ferro-Titanium (20%)	80c.
Ferro-Tungsten (67%)	90c.
Ferro-Vanadium (25-50% per lb vanadium contents)	$5.50
Magnesium, pure (N. Y.)	1.50
Manganese, pure (98%, N. Y.)	75c.
Manganese, Copper (80-70, N. Y.)	45c.
Molybdenum (98%, N. Y.)	$1.75
Phosphorus, foreign (f. o. b. N. Y.)	90c.
Phosphorus, American yellow (f. o. b. Niagara Falls)	42c.
Tungsten (best) pounding lots	1.25
Ferro-silicon (50%), spot. Ex ship, Atlantic ports	$95@100 ton

Variations in price depend chiefly on size and conditions of orders.

Missouri Ore Market

JOPLIN, Jan. 26

The highest authenticated price paid for zinc concentrate was $51 per ton, but semi-official information indicates that $52.50 was paid for at least one bin, where a three-cornered competition was on. The assay basis price was very elastic, as low as $45 and as high as $49 being reported offered. The average price was $46.10 per ton.

Sharp competition was noted in the lead market; $88.50 per ton is known to have been offered for at least one bin of concentrate assaying 83 per cent. metallic lead, and another bin of this grade was rumored sold at $89. The average price was $85 per ton.

Broken gas mains, from which the supply of natural gas is drawn, reduced the output approximately one-sixth each of the two past weeks, and this lower capacity, added to an already strained market for both minerals, is the cause of the flurry, which may be only temporary, yet producers are expecting to receive $90 for lead and $55@56 for zinc by the end of February. Following are the shipments for the week:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin	[illegible]	[illegible]	[illegible]
Oronogo-Duenweg	[illegible]	[illegible]	[illegible]
Alba-Neck City	1,084,320	[illegible]	[illegible]
Duenweg	411,000	233,010	19,583
Oronogo	[illegible]	15,470	[illegible]
Prosperity	[illegible]	[illegible]	12,115
Badger	124,[illegible]	[illegible]	10,331
Spurgeon	351,590	[illegible]	[illegible]
Granby	[illegible]	[illegible]	[illegible]
Aurora	[illegible]	[illegible]	6,717
Cave Springs	[illegible]	[illegible]	4,125
Sheffield	[illegible]	[illegible]	3,712
Zincite	[illegible]	[illegible]	3,027
Carthage	[illegible]	[illegible]	2,021
Carl Junction	[illegible]	[illegible]	[illegible]
Stott City	[illegible]	[illegible]	1,389
Totals	11,201,360	1,539,330	$823,650
January totals	42,823,150	6,008,280	$1,257,490
January, 1906	42,066,100	5,443,130	1,163,245
Increase	[illegible]	[illegible]	[illegible]

Zinc value, the week, $258,213; the month, 981,534
Lead value, the week, [illegible]; the month, [illegible]

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	85.58
February	47.37	....	February	75.84	....
March	42.68	....	March	73.75	....
April	44.65	....	April	75.13	....
May	40.51	....	May	78.40	....
June	41.83	....	June	80.06	....
July	43.25	....	July	74.31	....
August	44.50	....	August	75.36	....
September	42.58	....	September	79.64	....
October	41.55	....	October	79.84	....
November	44.13	....	November	81.98	....
December	45.68	....	December	81.89	....
Year	44.24	....	Year	77.40	....

Wisconsin Ore Market

PLATTEVILLE, Jan. 26

A marked improvement in zinc in this district was shown in the week. A slight scramble between two of the buyers set the price of $48 for 60 per cent. ore. Some few lots are reported as having been sold for $51.50. In spite of the cold snap, the usual turn-in has been reported, with a small surplus in the bins at the different mines. Prices on low-grade ores are holding up above the average of last year.

The camps of the district loaded ore for the week ending Jan. 26 as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	439,020	[illegible]	[illegible]
Boscobel-Bagley-Beetown	74,[illegible]	[illegible]	[illegible]
Benton	142,740	[illegible]	[illegible]
Highland	132,000	[illegible]	[illegible]
Linden	[illegible]	[illegible]	[illegible]
Galena City	[illegible]	[illegible]	[illegible]
Mineral Point	81,160	[illegible]	[illegible]
Lindon	[illegible]	[illegible]	[illegible]
Livingston	50,000	[illegible]	[illegible]
Total for week	1,909,140	124,540	48,000
Year to Jan. 26	[illegible]	[illegible]	[illegible]

A little better condition exists in the car supply, more cars being furnished to the district.

Chemicals

NEW YORK, Jan. 30

[illegible] steady and firm, though rather quiet. Prices continue $7.25 per 100 lb. for carload lots, and $7.50 for smaller orders.

Nitrate of Soda—There is nothing new to report. Prices are $2.55@2.60 per 100 lb. for spot, and a little higher for futures.

[illegible] rock from southern ports during the years 1905 and 1906 are given in the following table, in tons of 2000 lb.:

Ports.	[illegible]	[illegible]	Change.
Savanah	[illegible]	[illegible]	[illegible]
Port Tampa	[illegible]	[illegible]	[illegible]
Tarpon Bluff	[illegible]	[illegible]	[illegible]
Pt. Inglis	[illegible]	[illegible]	[illegible]
Brunswick	[illegible]	[illegible]	[illegible]
Total	572,311	561,040	D. 11,271

Shipments of land pebble through Port Tampa for the same years amounted to 404,985 and 482,912 tons, respectively, showing an increase of 77,297 tons in 1906. In 1905 the total tonnage included 238,668 tons of foreign pebble, while in 1906 there were 214,727 tons shipped through this port.

Mining Stocks

NEW YORK, Jan. 30

An irregular market, with spasmodic liquidation, still continues, and a hardening of money rates has helped to make matters unfavorable. Mining stocks have followed the general market and have been quiet and rather weak. The Boston market has cooled down considerably, but San Francisco is still rampant.

Boston

Jan. 29

The market has been hammered considerably through the week, and this was aided by stiffer money rates. Yesterday and today, however, its underlying strength was shown. Today, especially, great rallying power was evident, and there were many recoveries.

Copper Range, which had been off to $88.25, gained to $90.75, losing only a fraction. Shannon, which had been $20, went up to $21.75. The Trinity craze is still in evidence and the stock went to $39.50, closing at $38.75. Calumet & Arizona closed at $181; North Butte, $111.25; Bingham, $31; Osceola, $166; Mohawk, $87.50.

The statement that the rumored Lake deal was off, owing to the high prices asked for properties—notably Copper Range—is accepted by some; most people, however, believe that there is more to come in this matter.

The American Gold Dredging Company stockholders have notice of a meeting on Feb. 8 for the purpose of dissolving and winding up the company.

A matter of much interest to State Street is the report on taxation just submitted to the General Court. One of the recommendations is for a stock transfer

York. There will be strong opposition to this.

Colorado Springs Jan. 25

Trading on the local stock market has been fairly active the past week, but there has been a general decline in prices. Portland showed the greatest falling off, dropping [illegible] Pass and Work each declined several points, but Isabella held firm, with a fair amount of sales. The semi-annual report of the Mary McKinney shows this company to be in good condition, which accounts for the advance the stock has made on a declining market. The report that Pharmacist will soon be in the shipping list encourages holders to wait for better prices.

STOCK QUOTATIONS

Name of Comp.	Clg.
[illegible]	
Butte Coalition...	
Cobalt Contact...	
Colonial Silver...	
[illegible]	
Foster Cobalt...	
Furnace Creek...	
[illegible]	
Gold Hill...	
Greene Gold...	
[illegible]	
Guanajuato...	
[illegible]	
McKinley Dar...	
[illegible]	
Mines Co. of Am...	
[illegible]	
[illegible]	
Nipissing Mines...	
[illegible]	
Tennessee Copper	
[illegible]	
West Columbus...	

Name of Comp.	Clg.
Adventure...	
[illegible]	
Atlantic...	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
Cal. Mexican	
Copper Range	
Daly West	
[illegible]	
Granby*, New	
Greene Con.	
[illegible]	
Mass.	
Mi[illegible]	
Mohawk	
Mont. C. & C.(new)	
[illegible]	
North Butte	
Old Colony	
Old Dominion	
[illegible]	
[illegible]	
[illegible]	
Rhode Island	
Santa Fe	
[illegible]	
[illegible]	
Trinity	
United Cop., com.	
[illegible]	
[illegible]	
U. S. Sm. & R., pd.*	
Utah Copper*	
Victoria	
[illegible]	
[illegible]	

*Ex. Div. †Ex. Rights.

BOSTON CURB

Bethlehem Steel	
Colo. Fuel & Iron	
Inter. Salt	
National Lead	
National Lead, pf.	
[illegible]	
Republic I. & S.	
Republic I. & S., pf.	
Sloss-Sheffield	
[illegible]	
Tenn. C. & I.	
U. S. Red. & Ref.	

Name of Comp.	Clg.
Ariz. Com	
Cananea Cent	
[illegible]	
Hancock Con.	
[illegible]	
[illegible]	
[illegible]	
Shawmut	
[illegible]	
[illegible]	
[illegible]	
[illegible]

CHEMICALS, MINERALS, RARE EARTHS, ETC. CURRENT WHOLESALE PRICES.

ABRASIVES—
Bort, good drill quality, carat ... $85.00
Carborundum, f.o.b. Niagara Falls, powd. lb. .08
Grains. " .10@.17
Corundum. " .07@.10
Crushed Steel, f.o.b. Pittsburg " .05½@.06
Emery, in Kegs: Turkish flour " .01½@.02½
Grains " .02@.04½
Naxos flour " .01@.02
Grains " .03@.04
Chester flour " .01
Grains. " .03@.04½
Peekskill, f.o.b. Easton, Pa., flour " .01½@.01½
Grains, in kegs " .02@.02½
Garnet, per quality ... sh. ton 25.00@35.00
Pumicestone, Am. P. wd. 100 lb. 1.50@2.00
Italian, powdered " .01¼@.01½
Lump, per quality " .03@.05
Rottenstone, ground " .02½@.03½
Lump, per quality " .05@.25
Rouge, per quality. " .06@.30
Steel Emery, f.o.b. Pittsburg " .07½@.07¾

ACIDS—
Acetic 28%.....lb. .02½@.02½
Boric " .09¼@.10
Hydrofluoric, 30% " .02¼@.03
48% " .06
60% " .10@.10½
Hydrochloric acid, 20°, per lb..... 1.25@1.50
Nitric acid, 38° ..... per lb. 4.25@4.62½
Sulphuric acid, 50°, bulk, per ton.. $12 up.
60°, 100 lb. in carboys .85@1.12½
66°, bulk, ton., 16.00@18.00
66°, 100 lb. in carboys 1.00@1.25
66°, bulk, ton..... 18.00@20.00
Oxalic.. .08@.09

ALCOHOL—Grain.....gal. 2.46½
Refined wood, 95@95% " .70@2.75

ALUM—Lump.....100 lb. $1.75
Ground..... 1.85
Chrome Alum..... lb. .03¼@.03½

ALUMINUM—Sulphate, com'l. " 1.25@1.60

AMMONIA—24 deg. lb..... .04½@.05½
26 " " " .04½@.05½

AMMONIUM—
Bromide..... lb. .28
Carbonate ... " .07½@.08
Muriate grain... " .06½@.06¾
Lump . " .09@.09½
Sulphate, 100 lb..... 3.10@3.15
Sulphocyanide com..... " .50
" chem. pure " .80

ANTIMONY—needle, lb..... .15@.16

ARSENIC—White.....(nominal) " .07@.08
Red " .06@.06½

ASPHALTUM—
Barbadoes.....per ton. 40.00@80.00
West Indies " 20.00@60.00
Egyptian.....lb. .06@.07
Gilsonite, Utah, ordinary per ton. 50.00
Trinidad..... 30.00@40.00
California..... 20.00@30.00

BARIUM—
Carb. Lump, 80@90%. sh. ton. 30.00@35.00
Powdered 80@90%..... lb. .02@.02½
Chloride com'l.....ton. 37.50@40.00
Nitrate, powdered, in casks..lb. .06
Sulphate (Blanc Fixe). " .02¼

BARYTES—
Am. Ground.....sh. ton. 14.50@21.00
Floated..... 22.00
Foreign floated. 19.50@22.50

BISMUTH—Sub-nitrate..... lb. 1.50

BLEACHING POWDER—35%, 100 lb. 1.30@1.50

BLUE VITRIOL—(copper sulphate), carload, per 100 lb. 7.25

BONE ASH. ..... lb. .02½@.03

BORAX..... " .07½@.07¾

CALCIUM—Acetate, gray " 2.35@2.40
Acetate, brown. " 1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y., or Jersey City, N. J.....sh. ton. 65.00
Chloride, f.o.b. N. Y " 13.00@15.00

CEMENT—
Portland, Am. 500 lb.....bbl. 1.55@1.60
Foreign " 2.25@2.50
"Rosendale" cement for (in sacks) .75
Slag cement..... " 75@1.25

CHROME ORE—
New Caledonia 50% ex ship N. Y. per lb. ton. 17.00@17.50
Bricks, f.o.b. Pittsburg, M. " 175.00

CLAY, CHINA—Am. common ex-dock, N. Y..... " 8.00@9.00
Foreign " 11.00@18.00

COBALT—Oxide..... lb. 2.75

COPPERAS—Bulk.....100 lb. $0.55
In bbls " .75
In bags " .65

CRYOLITE..... lb. .06½

FELDSPAR—Ground best...sh. ton. 12.00@15.00

FIRE BRICK.
American .per M. 30.00@40.00
Imported " 30.00@40.00
St. Louis No. 1... " 16.00
" No. 2 " 14.00
Extra " 20.00@25.00

FIRE CLAY.
St. Louis mill. per ton. 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump sh. ton 8.00@10.00
Ground " 11.50@13.50
Gravel. " 4.25@4.50
Foreign crude ex. dock..... 8.00@10.00

FULLER'S EARTH—Lump 100 lb. .80@.85
Powdered. " .85@.90

GRAPHITE—
American, ore, common... lb. .01@.10
Artificial..... " .06
Ceylon, common pulv..... " .02½@.03½
Best, pulverized..... " .04@.08
German, com. pulv. " .01½@.01¾
Best, pulverized " .03@.02
Italian, pulverized " .01@.02

GYPSUM—
Fertilizer.. " 7.00
Rock.....lg. ton. 4.00

INFUSORIAL EARTH—
Ground Am. best lb. .01¾
French.....lg. ton. 50.00
German .....lb. .02¾@.03

LEAD—Acetate (sugar of) lb. .07½
Nitrate, com'l " .08@.09

MAGNESITE—Greece,
Crude (95%).....lg. ton. 7.00@8.00
Calcined .....sh. ton. 30.00@35.00
Bricks, domes, per qual. f.o.b. Pittsburg..... M. 160@200

MAGNESIUM—
Chloride, com'l.....100 lb. .90@1.25
Sulphate (Epsom salt)...100 lb. .90@1.25

MANGANESE—
Crude powdered:
70@75% binoxide..... lb. .02
75@85% binoxide. " .02½
85@95% binoxide " .04
90@95% binoxide. " .05½
Ore, 80% 85%. sh. ton. 27.00@35.00

MARBLE—Flour.....sh. ton. 9.00@9.50

MINERAL WOOL—
Slag, ordinary. " 19.00
Selected " 25.00
Rock, ordinary. " 32.00
Selected " 40.00

MONAZITE SAND—
Guar. 97¼ with 5% Thorium oxide, nominal..... lb. .08 and up.

NICKEL
Oxide, crude, lb. (77⅞) for fine metal contained.. .47
Sulphate, single.....lb. .16@.20
" double..... " .10@.12

NITRATE OF SODA—100 lb. 96% for 1907 2.45
95% for 1908 2.35
95% for 1909 2.30
96% is 5c higher per 100 lb.

OZOKERITE—best.. lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered " .07½@.07¾
English glassmakers' " .08½@.08¾
Lith pulp " .04@.05
Metallic, brown sh. ton 19.00
Red " 16.00
Ocher, Am. common " 8.50@9.00
Best " 16.00
Dutch, washed..... lb. .02½@.03
French, washed. " .01½@.02
Paris green, pure, bulk..... " .21@.23
Red lead, American.. " .07½@.07¾
Foreign " .07¾@.08
Turpentine, spirits (bbl. per gal .70@.71
White lead, Am., dry..... lb. .06½@.07
American, ground " .07@.07½
Foreign, ground " .09½@.10
Zinc white, Am. extra dry.. " .05½@.05¾
Foreign, red seal, dry... " .07½@.07¾
Green seal, dry.. " .07¾@.08

PHOSPHATES—Acid..... .65@67½c per unit
*Fla., hard rock..... 7.50
land pebble 68%..... 4.50
†Tenn., 78@80% 6.50@7.00
78%..... 5.50
75%..... 5.00
68@72% 4.50
‡So. Car. land rock..... 6.00
" " river rock. 5.00

*F. o. b. Florida or Georgia ports. †F. o. b. Mt Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—
Bicarbonate, crystal lb. $0.[illegible]
Powdered or granulated. " [illegible]
Bichromate, Am..... " 0[illegible]
Muriate " 11
Bromide..... " 16
Carbonate, calcined " .04@.04½
Caustic, ordinary " .04@.05
Lump, 98% " .05@.05½
Chlorate, powdered " 1.90
Crystals " .09½@.09¾
Cyanide (98@99%)..... " .18@.19
Ferrocyanide, yellow, lumps, 99.5% " .30@.31
Permanganate lb .10@.10
Prussiate, yellow..... " .16½@.17
Red " .33@.35
Sulphate per lb 2.18½@2.21½

PYRITE—
Domestic, non-arsenical, furnace size, per unit 11@11½c
Domestic, non-arsenical, fines, per unit. 10@10½c.
Imported, non-arsenical, furnace size, per unit. .13@.13½
Imported, arsenical, furnace size, per unit. 12@12½c.
Imported fines, arsenical, per unit 8@9c.
" non-arsenical, per unit..... 10@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.18
N. Y. agricultural.....sh. ton. 3.@4.60

SALTPETER—Crude 100 lb. 4.25@4.50
Refined, crystals.. " 5.25@5.75

SILICA—
Ground quartz, ord'ry...sh. ton 13.00@15.00
Silex.. " 30.00@35.00
Lump quartz " 2.50@4.00
Glass sand. " 2.75

SILVER—Nitrate, crystals..... oz. .43½@.45¾

SODIUM—
Acetate..... lb. .04@.04¾
"Alkali," per 100 lbs., at works .80@.87½
Bicarb. soda, per lb ..... 1.20@1.50c.
Soda, caustic, per 100 lb., 76/60... 1.80@1.90
" powdered..... .02¾@.03
Salt cake, per 100 lb..... .60@.85
Soda, monohydrate, per lb..... .[illegible]
Bichromate..... lb. .06@.06½
Bromide..... " .17
Chlorate, com'l " .08@.09
Cyanide, 96@98% KCN " .18@.19
Hyposulphite, Am. " 1.35 up
German " 1.60@1.70
Phosphate 100 lb. 1.85@2.00
Prussiate..... " .13@.14
Sal soda, f.o.b. N. Y. ....100 lb. .65@.75
Foreign, f.o.b. N. Y. " .80
Silicate, com'l.....100 lb. .75@1.00
Sulphate,com'l,(Glauber's salt) 100 lb. .50@.60
" calcined " .65@.85

STRONTIUM—Nitrate.. .... lb. .08@.09

SULPHUR—
Louisiana(prime)to New York, Boston or Portland..... .....lg. ton 21.[illegible]
To Philadelphia or Baltimore " 22.50
Roll 100 lb. 1.85@2.15
Flour " " 2.00@2.40
Flowers, sublimed..... " " 2.20@2.60

TERRA ALBA—Foreign & Eng. 100 lb. .90@1.00

TALC—Domestic.....sh. ton. 15.00@20.00
French, best..... " 25.00
Italian, best..... " 35.00@40.00

TIN—Bi-chloride, 50% ..... lb. .[illegible]
Crystals " .25@.27
Oxide, lb..... .44

URANIUM—oxide .[illegible]

ZINC—Metallic ch. pure..... " .[illegible]
Chloride solution, com'l.... " .02½@.04
Chloride, granular " .[illegible]
Dust. .[illegible]
Sulphate .[illegible]

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

DIVIDENDS.

Metal and Mining Companies—U. S.

Name of Company and Location.	Authorized Capital.	Shares. Issued.	Par Value.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska Mexican, g.	$		$ 5	$1 [illegible]	Jan. 1907	$ .50
[illegible]	[illegible]	[illegible]	25	[illegible]	Jan. 1907	.50
[illegible]	[illegible]	[illegible]	25	[illegible]	Jan. 1907	0.50
Amalgamated, c..	Mont	155,000,000	1,530,879	100	44,461,272	Nov. 1906	2.00
[illegible]	[illegible]	[illegible]	[illegible]	100	[illegible]	Jan. 1907	1.75
[illegible]	[illegible]	[illegible]	[illegible]	100	23,456,553	Jan. 1906	1.75
[illegible]	[illegible]	17,000,000	170,000	100	1,175,000	Dec. 1906	1.50
[illegible]	[illegible]	[illegible]	200,000	100	2,250,000	Dec. 1906	1.25
[illegible]	Mont.	[illegible]	2,000,000	25	42,750,000	Jan. 1907	1.75
Arizona Commercial	Ariz.	4,000,000	25,000	100	465,061	July 1905	.50
Arizona	Ariz.	3,725,887	1,682,520	...	6,182,361	Apr. 1906	.05
Atlantic	Mich.	2,000,000	100,000	25	990,000	Feb. 1905	.02
Bingham	Mont.	4,000,000	400,000	1	10,000	Dec. 1905	.01
Bonanza	Utah	1,000,000	1,000,000	1	205,000	Jan. 1907	.04
Boston & Montana	Mont.	2,000,000	226,000	5	22,000	Sept. 1906	.10
Bunker Hill & Sullivan	Ida.	3,750,000	150,000	25	17,550,000	Nov. 1906	12.00
Butte & Boston	Mont.	1,000,000	1,000,000	10	2,518,400	Oct. 1906	.10
Butte Coalition	Ida.	3,000,000	300,000	10	8,046,000	Jan. 1907	.60
Butte & Superior	Mont.	15,000,000	1,000,000	15	800,000	Dec. 1906	.40
Calumet & Arizona	Ariz.	2,000,000	200,000	10	6,000,000	Dec. 1906	4.00
Calumet & Hecla, c.	Mich.	2,500,000	100,000	25	98,350,000	Dec. 1906	20.00
Camp Bird, g., s....	Colo...	5,000,000	820,000	5	3,382,500	Feb. 1906	.24
Carlisa, c.g.	Utah...	500,000	500,000	1	55,000	Nov. 1906	.01
Central Eureka, g.	Colo...	400,000	200,000	2	778,925	Mar. 1905	.07
Columbus Con. c...	Utah ..	1,500,000	300,000	5	45,000	Jan. 1907	.15
Combination Fraction	Nevada	400,000	320,000	1	688,000	Sept. 1906	.15
Con. Mercur, g.....	Utah....	1,000,000	1,000,000	1	1,205,000	Dec. 1906	.02½
Continental, g.	Mont.	550,000	22,000	25	286 000	Jan. 1907	.50
Copper Range Con.	Mich ..	38,500,000	383,781	100	3,791,334	Dec. 1906	2.00
Cresson United, g..	Colo....	2,000,000	1,625,000	1	214 053	July 1906	.01
Cripple Creek Con g	Colo....	2,000,000	2,000,000	1	180,000	Mar. 1905	.00½
Daly Judge, g. s. l	Utah.	300 000	300,000	1	112,500	Jan. 1907	.37½
Daly West, g. s. l.	Utah.	3,600,000	180,000	20	5,499,000	Dec. 1906	.60
De Lamar, g. s	Ida ..	400,000	67,180	5	2,926,370	May 1905	.72
Dillon, g.	Colo....	1,250,000	1,250,000	1	21,875	July 1905	.01
Doctor Jack Pot....	Colo..	3,000,000	3,000,000	1	268,000	July 1906	.00½
Dos Rios, M.	Mex....	10,000,000	59,062	100	933,010	May 1906	.50
Elkton Con., g.	Colo....	3,000,000	2,750,000	1	1,683,000	Dec. 1906	.02½
El Paso, g.....	Colo....	2,500,000	2,450,000	1	1,022,750	June 1906	.01
Fed Sm. com.	Idaho..	10,000,000	60,000	100	1,748,750	Dec. 1906	5.00
Federal Sm., pf....	Idaho....	20,000,000	120,000	100	2,441,250	Dec. 1906	1.75
Findley, g.	Colo....	1,250,000	1,250,000	1	325,000	Aug. 1906	.01
Frances-Mohawk, g	Nevada	1,000,000	1,000,000	1	141,000	Dec. 1906	1.10
Gemini Keystone	Utah.	500,000	5,000	100	1,850,000	July 1906	10.00
Gold King Con	Colo....	5,750,000	5,750,000	1	1,407,500	May 1905	.07
Gold Sovereign	Colo....	2,000,000	2,000,000	1	10,000	Jan. 1905	.00½
Grand Central, g...	Utah.	250,000	250,000	1	1,131,000	Jan. 1907	.06
Gwin Mine, Dev., g.	Cal	1,000,000	100,000	10	35,000	Mar. 1906	.25
Hecla, s. l.	Idaho ..	250 000	1,000 000	0.25	780,000	Sept. 1906	.02
Homestake, g.....	S. D...	21,840,000	218 400	100	15,425,350	Jan. 1907	.50
Hornsilver, g.s.c.l	Utah.	10,000,000	400,000	25	6,522,000	Dec. 1906	.05
Inderl Sand. pf	N. Y.	12,000,000	97,416	100	524,000	Feb. 1905	1.50
Iron Silver.....	Colo...	10,000,000	500,000	20	3,300,000	Jan. 1907	.20
Jamison, g.....	Cal	3,900 000	390,000	10	247,270	July 1906	.03
Jerry Johnson.	Cal	2,500,000	2,500,000	1	61,700	Apr. 1906	.03
Kendall, g.....	Mont	2,500,000	500 000	5	1,035,000	Dec. 1906	.03
Liberty Bell, g. s....	Colo....	700,000	130,551	5	110,857	Jan. 1906	.15
Lightner, g.	Cal	125,000	102,255	1	295,694	Aug. 1905	.05
Mammoth, g. s. l....	Utah.	10,000,000	400,000	25	2,080,000	Oct. 1906	.05
Mary M. Kinney, g.	Colo....	1,500,000	1,304,252	1	723,509	Oct. 1906	.06
Mohawk, c.	Mich	2,500,000	100,000	25	900,000	Jan. 1907	4.00
Mont. Ore Purch....	Mont	2,500,000	80,833	25	9,447,274	Jan. 1907	15.00
Monument, g.	Colo....	300,000	300,000	1	27,124	Apr. 1905	.01
New Century, z., l..	Mo.....	300,000	300,000	1	211,500	Nov. 1906	.01
New Idria, q.	Cal	500,000	100,000	5	880,000	Jan. 1907	.20
New Jersey Zinc	U. S.	10,000,000	100,000	100	8,400,000	Feb. 1906	3.00
North Butte.....	Mont	6,000,000	400,000	15	3,400,000	Dec. 1906	2.00
North Star, g.	Cal	2,500,000	250,000	10	1,286,989	Dec. 1906	.40
Northern Light, g. s.	Utah....	2,000,000	400,000	5	20,000	Feb. 1904	.05
Old Dominion, c.	Ariz....	7,500,000	281,589	25	280,843	May 1906	.50
Old Gold	Colo....	2,101,150	2,101,150	1	10,506	Mar. 1906	.05
Ophir, g. s.	Nevada.	392,490	100,800	3	1,797,400	July 1904	.25
Osceola, c.	Mich	2,500,000	96,150	25	6,362,500	Jan. 1907	6.00
Parrot, c.s.	Mont ..	2,300,000	229,850	10	6,656,262	Dec. 1906	.25
Pennsylvania, g....	Cal	5,150,000	51,500	100	284,925	July 1905	.10
Platteville, l. z.	Wis....	20,000	500	40	89,500	Oct. 1905	10.00
Portland, g.	Colo....	7,000,000	1,000,000	1	7,417,086	Oct. 1906	.05
Quincy.	Mich ..	2,500,000	100,000	25	16,470,000	Dec. 1906	2.50
Red Boy, g.	Nev.....	15,000	15,000	1	9,600	May 1906	.03
Rocco Homest'k l.s.	Nevada.	300,000	300,000	1	112,000	Dec. 1906	.02
Sacramento, g, q....	Utah....	3,000,000	1,000,000	1	245,000	Jan. 1907	.00½
Salvator, g. s. l....	Utah.	200 000	200,000	1	6,500	Aug. 1904	.01
St. Joseph, l.....	Mo.	20,000,000	1,000 000	10	4,658,357	June 1906	.15
Silver Hill, g. s	Nevada	108,000	108,000	1	59,400	Feb. 1906	.05
Silver King, g. s	Utah....	3,000,000	150,000	20	10,325,000	Oct. 1906	.33⅓
Shannon, c.	Ariz....	3,000,000	300,000	10	150 000	Dec. 1906	.50
Snowstorm, s. l....	Ida	1,500,000	1,500,000	1	90,000	Oct. 1906	.06
Spearfish	S. D.	1,500,000	1,500,000	1	105,000	Jan. 1907	.01½
Standard Con., g.	Cal	2,000,000	178,394	10	4,222,772	Dec. 1906	1.10
Stratton's Independence	Colo....	5,000,000	1,000,000	5	4,895,865	Apr. 1906	.12½
Tamarack	Mich	1,500,000	60,000	25	9,180,000	Jan. 1907	3.00
Tennessee	Tenn	5,000,000	175,000	25	1,093,750	Jan. 1907	1.25
Tonapah	Nev.....	1,000,000	500,000	5	900,000	June 1906	.48
Tonopah Belmont	Nevada.	1,000,000	1,000,000	1	2,650,000	Jan. 1907	.35
Tonopah Ext'nsion	Nevada	2,000,000	1,295,007	1	259,000	Jan. 1907	.10
Tonopah Mining	Nevada	1,000,000	1,000,000	1	278,530	Apr. 1906	.15
Tuolumne	Cal	1,000,000	1,000,000	1	300,000	Jan. 1907	.05
Uncle Sam, g.	Utah.	500,000	500,000	1	130 000	Oct. 1906	.01
United Zinc	Mont.	75,000,000	450,000	100	4,387,500	Jan. 1907	1.75
United, c. pf.....	Mont	[illegible]	[illegible]	[illegible]	1,350,000	Nov. 1906	3.00
United, z. l. com.	Mo.....	500,000	92,400	5	37,450	Oct. 1906	.05
United, z. l., pf....	Mo.....	500,000	10,556	25	247,680	Jan. 1907	.50
United, z. l., c.	[illegible]	5,000,000	4,000,100	1	280,071	Apr. 1905	.00½
United Verde, c....	Ariz....	3,000,000	300,000	10	17,085,322	Dec. 1904	.75
Utah Apex, g.	Utah.	37,500,000	750,000	50	2,625,000	Jan. 1907	.87½
Utah Con., g. s. l.	Utah.	4,000,000	39,458	100	887,805	Jan. 1907	1.50
Utah Copper	Utah.	1,000,000	100,000	10	240,000	Nov. 1906	.05
Utah Con., g.	Utah.	1,500,000	300,000	5	6,035,000	Jan. 1907	3.00
Victoria, Utah.....	Utah.	250,000	250,000	1	77,000	Jan. 1907	.04
Vindicator Con., g.	Colo..	1,500,000	1,500,000	1	1,560,000	Jan. 1907	.03
Wolverine	Mich	1,500,000	60,000	25	3,450,000	Oct. 1906	9.00
Work, g.	Colo....	1,500,000	1,500,000	1	75,000	Dec. 1906	.02
Yankee Con	Utah.	[illegible]	[illegible]	1	140 000	Jan. 1907	.03

*Previous to consolidation $1,436,250 were divided.

Coal, Iron and Other Industrials—United States.

Name of Company and Location.	Authorized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Ala. Con., C. & I., pf..	Ala ..	$2,500,000	24,638	100	$905,265	May 1905	$1.75
Allis-Chalmers, pf...	U. S ...	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
Amer. Ag. Chem., pf..	U. S ...	20,000,000	181,530	100	6,831,280	Oct. 1906	3.00
American Cement....	Pa.....	2,000,000	200,000	10	1,028,000	Jan. 1907	.40
American Coal.	Md	1,500,000	50,000	25	1,820,000	Sept. 1906	1.25
Associated Oil.....	Cal	21,000,000	21,000,000	1	630,000	ug. 1905	.01½
Bethlehem Steel, pf..	Pa.....	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel.....	Pa.....	50,000,000	900,000	50	7,650,000	Oct. 1906	1.00
Carthon Oil.....	Cal	100,000	80,000	1	56,000	July 1905	.07
Central C. & C., com.	Mo.....	5,125,000	51,250	100	1,845,000	Jan. 1907	1.50
Central C. & C., pf..	Mo.....	1,875,000	18,750	100	1,242,188	Jan. 1907	1.25
Central Oil.....	W. Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil.....	Cal	500,000	450,000	1	58,500	June 1906	.01
Col. & Hock. C. & I...	Ohio ..	7,000,000	69,244	100	173,086	Feb. 1906	.25
Consolidated Coal ...	Ill.....	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal...	Md. ..	10,250,000	102,500	100	8,531,650	Feb. 1907	3.50
Crucible Steel, pf....	Pa.....	25,000,000	250,000	100	1 000,000	Sept. 1906	1.50
Empire S. & I., pf....	N. J ...	5,000,000	25,000	100	537,500	Jan. 1907	3.00
Fairmont Coal,.....	W. Va.	12,000,000	120,000	100	840,000	Feb. 1906	2.00
Four Oil.....	Cal	500,000	300,000	1	105 406	July 1905	.01
General Chem. com..	U. S...	12,500,000	74,103	100	1,696,919	Sept. 1906	2.00
General Chem., pf....	U. S...	12,500,000	100,000	100	4,375,178	Jan. 1907	1.50
George's C'k Coal	Md	2,500,000	22,000	100	1,188,000	July 1904	3.00
Home Oil.....	Cal	100,000	100,000	1	507,500	Oct. 1904	.02½
Hydraulic.....	Cal	200,000	200,000	1	37,500	Jan. 1907	.01½
Imperial Oil.....	Cal	1,000,000	100,000	100	880,000	July 1906	.20
International Salt....	.....	30,000,000	182,280	100	927,060	Dec. 1906	1.00
Jeff & Cl'f C. & I., com	Pa.....	1,500,000	15,000	100	330,000	Aug. 1905	5.00
Jeff. & Cl'f. C. & I.,pf	Pa.....	1,500,000	15,000	100	825,500	Aug. 1906	2.50
Kern River Oil.....	Cal	2,000,000	20,000	100	39,500	May 1905	.13
Lehigh Coal & Nav...	Pa.....	14,345,650	346,897	50	24,920,891	Nov. 1906	2.00
Maryland Coal, pf....	Md	2,000,000	18,850	100	1,577,200	Dec. 1906	4.00
Monon R. Coal, pf....	Pa.....	10,000,000	100,000	100	3,154,945	Jan. 1906	.97
Monte Cristo Oil.....	Cal	500,000	500 000	1	120,000	July 1905	.01
National Carbon, pf..	U. S...	4,500,000	45,000	100	2,047,500	May 1905	1.75
National Lead, com..	N. Y...	15,000,000	149,054	100	1,788,648	Jan. 1907	1.00
National Lead, pf....	N. Y...	15,000,000	149,040	100	15,801,688	Dec. 1906	1.75
Nat'l Steel & Wire,pf.	N. Y...	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal....	Md	1,000,000	50,000	20	530,000	Nov. 1906	1.40
New River Coal, pfd.	W. Va.	6,000,000	3,761,700	100	564,255	Nov. 1906	1.50
Pacific Coast Borax...	Cal	2,000,000	19,000	100	2,086,500	Aug. 1906	1.00
Peerless Oil.....	Cal	1,000,000	92,000	10	396,320	May 1906	.14
Penna. Salt.....	Pa.....	3,000,000	60,000	50	13,988,000	Oct. 1906	3.00
Penna. Steel.....	Pa.....	25,000,000	168,214	100	7,026,995	Nov. 1906	3.50
Phila. Gas, com	Pa.....	28,963,029	579,061	50	6,684,142	Nov. 1905	.75
Phila. Gas, pf.....	Pa.....	5,744,813	114,896	50	1,583,505	Mar. 1906	1.25
Pittsburg Coal, pf....	Pa.....	35,000,000	297,010	100	11,434,962	Apr. 1905	1.75
Pocahontas Coll., pf..	W. Va.	1,500,000	15,000	100	437,500	Feb. 1907	1.50
Republic I. & S., pfd.	Ill.....	25,000,000	204,169	100	3,371 282	Jan. 1907	3.75
Sloss-Sheffield, com..	Ala	7,500,000	75,000	100	750,250	Oct. 1906	2.50
Sloss-Sheffield, pf....	Ala	20,000,000	67,000	100	3,093,500	Jan. 1907	1.75
Standard Oil.....	U. S...	100,000,000	970,000	100	319,285,000	Dec. 1906	10.00
Tenn. C. & I., com....	Tenn ..	22,653,600	225,536	100	2,906,425	Feb. 1907	1.00
Tenn. C. & I., pf.....	Tenn ..	7,548,000	2,480	100	380,090	Feb. 1907	2.00
Texas & Pacific Coal.	Texas..	2,000,000	20,000	100	1,930,000	Mar. 1905	2.00
Thirty-three Oil.....	Cal	500,000	100,000	5	430,000	July 1905	.10
Union Oil	Cal	10,000,000	100,000	100	1,118,766	May 1905	.50
U. S. SteelCorp., com..	U. S...	550,000,000	5,083,025	100	60,985,515	Dec. 1906	.50
U. S. Steel Corp., pf..	U. S...	360,281,100	3,603,141	100	168,539,389	Nov. 1906	1.75
Va. Carolina Ch., pf..	U. S...	20,000,000	180,000	100	11,460,869	Jan. 1906	1.00
Westmoreland Coal..	Pa.....	3,000,000	60,000	50	8,580,000	Oct. 1906	2.50

Canada, Mexico, Central and South America.

Name of Company and Location.	Authorized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia.	Mex...	$480,000	9,600	50	$258,064	Jan. 1906	$1.71
Buffalo, s.....	Ont...	1,000,000	900,000	100	14,000	Jan. 1907	.03
Butters' Salvador, g..	Salv ..	750,000	150,000	5	600,000	Apr. 1905	.25
Cariboo McKin'y, g..	B. C...	1,250,000	1,250,000	1	546,837	Feb. 1904	.04
Consolidated M & S..	B. C...	5,500,000	48,338	100	473,255	Feb. 1907	2.50
Copiapo, c.....	Chile..	1,125,000	112,500	10	3,000,000	Oct. 1904	1.20½
Crow's Nest Pass....	B. C...	3,500,000	140,000	25	1,581,148	Apr. 1906	.62½
Dominion Coal, com.	N. S...	15,000,000	150,000	100	1,050,000	Dec. 1903	1.75
Dominion Coal, pf....	N. S...	3,000,000	30,000	100	3,330,000	Jan. 1906	4.00
Dos Estrellas, g. s....	Mex ..	150,000	3,000	50	1,020,585	July 1905	13.65
El Oro, g. s.....	Mex ..	5,750,000	1,080,000	5	2,708,800	July 1904	.15
Esperanza, s. g.....	Mex ..	2,275,000	455,000	5	5,520,440	Jan. 1907	2.50
Fosterville Cobalt, s.	Ont....	1,000,000	500,000	2	60,000	Dec. 1906	.06
Granby Con.....	B. C...	16,000,000	1,350,000	10	1,753,630	Dec. 1906	.30
Greene Con., copper..	Mex...	8,640,000	864,000	10	5,468,600	Nov. 1906	.40
Greene Con., gold....	Mex...	5,000,000	500,000	10	300,000	July 1905	.20
Guanajuato.....	Mex...	3,000,000	540,000	5	74,250	Oct. 1906	.07½
Guggenheim Expl....	Mex...	17,000,000	105,000	100	2,910,000	Jan. 1907	2.50
LeRoi No. 2, g.....	B. C...	3,000,000	120,000	25	687,600	Oct. 1906	.48
McKinley-Darragh,s.	Ont....	2,500,000	2,000,000	1	60,000	.....	.03
Mexican Coal & Coke	Mex...	5,000,000	50,000	100	600,000	Dec. 1906	3.00
Mex. Con. M. & S. Co.	Mex...		240,000		600,000	Feb. 1907	.50
Mines Co. of Am.....	Mex...	2,000,000	2,000,000	1	2,425,000	Dec. 1906	.02
N. Y. & Hond. Ros....	C. A..	1,500,000	150,000	10	2,212,000	Dec. 1906	.20
Nipissing, s.....	Ont....	6,000,000	1,200,000	5	780,000	Jan. 1907	.25
North Star.....	B. C...	1,500,000	1,300,000	1	351,000	Dec. 1906	.03
N. S. St. & Coal, com.	N. S...	3,000,000	49,703	100	788,600	Nov. 1904	2.00
N. S. St. & Coal, pf....	N. S...	1,030,000	10,300	100	329,600	July 1906	2.00
Penoles*.....	Mex...	250,000	2,500	100	7,813,375	Dec. 1906	20.00
Platanillo.....	Mex...	500,000	206,989	1	5,580	Sept. 1906	.00½
Reco, g. s. l.....	B. C...	1,000,000	958,000	1	327,082	Apr. 1906	.02
Silver Queen, s.....	Ont....	1,500,000	1,500,000	1	130,000	Jan. 1907	.08
Slocan Star.....	B. C...	500,000	500,000	1	575,000	Dec. 1904	.06
St. Eugene Con.....	B. C...	3,500,000	3,292,000	1	402,120	Oct. 1905	.02
Tezutlian Copper....	Mex...	1,000,000	10,000	100	.....	Jan. 1907	2.00
Tilt Cove, c.....	N. F...	1,000,000	89,000	2	21,360	Jan. 1906	.48
Trethewey, s	Ont....	1,000,000	1,000,000	1	40.000	Dec. 1905	.04
Tyee, c.....	B. C...	940,000	180,000	5	136,800	Dec. 1904	.24

*Mexican Currency.

THE MINING INDEX.

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

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ABRASIVES

2071—CARBORUNDUM. The Modern Abrasive. J. G. Lorriman. (Amer. Engineer, Jan., 1907). Short outline of the process of manufacturing carborundum carried on by the Carborundum Co. at Niagara Falls. 20c.

ALUMINUM

2072—ALUMINUM—Recherches recentes sur la fabrication de l'aluminum. (L'Echo des Mines, Jan. 10, 1907). A brief review of all recent experiments which aimed at new means of producing aluminum. 40c.

ASPHALT

2073—ASPHALTUM. El Astalto y sus aplicaciones. E. Colland. (La Ingeniería, Nov. 30, 1906). Gives a very complete account of the history and origin of asphaltum, with a discussion of its uses as a pavement, together with the methods of preparation. 40c.

CEMENT INDUSTRY

2074—Cement for Sea-Water Construction. S. B. Newberry. (Cement Age, Jan., 1907; 4 pp.) Brief description of the chemical action of sea-water upon cement, and a discussion of the production of a new cement which shall be unaffected by salt water. Gives analyses of and methods of working the new "ore cement" designed to be used under these new conditions. 20c.

2075—CEMENT INDUSTRY of the World. Compiled by R. W. Lesley. (Cement Age, Jan., 1907; a brief review of the production of cement in the United States, and the chief producing foreign foreign countries. 20c.

2076—CEMENT INDUSTRY—The Industrial Relations of the American Cement Industry. E. C. Eckel. (Eng. Mag., Jan., 1907; 8 pp.) Discusses the expansion of the cement industry, its concentration, and the influence of the steel corporation upon the cement industry as a whole. 40c.

2077. PORTLAND CEMENT—Fabbricazione moderna del cemento Portland. L. Fabre. (Rassegna Mineraria, Nov. 24 and Dec. 1, 1906, 5 pp.) Illustrated description of various plants for making cement. 60c.

2078—PORTLAND CEMENT—R. W. Lesley. (Eng. & Mg. Jl., Jan. 12, 1907). An analysis of the present condition of the portland cement industry, together with a tabulation of imports and exports. 20c.

COAL AND COKE

2079—ALABAMA COAL. L. W. Friedman. (Eng. & Mg. Jl., Jan. 5, 1907). Short summary of the important events which happened in this field during 1906. 20c.

2080—BORE HOLES. The Use of Bore Holes in Coal Mining. R. Lee. (Eng. & Mg. Jl., Jan. 12, 1907). Gives a few practical hints of the various uses to which bore holes can be put. 20c.

2081—CAR SHORTAGE in the Middle West. (Mg. & Sci. Press, Jan. 12, 1907). Short discussion of some of the causes for the prevailing car shortage throughout the western States. 20c.

2082—CHICAGO COAL MARKET. E. Morrison. (Eng. & Mg. Jl., Jan. 5, 1907). Review of prices of coal during the past year. 20c.

2083—CLEVELAND COAL TRADE. G. H. Cushing. (Eng. & Mg. Jl., Jan. 5, 1907). An account of the influences which a threatened coal strike and car shortage have had on prices. 20c.

2084—COAL CUTTING by Machinery. M. Robson. (Sci. & Art of Mining, Dec. 15, 1906). Paper read before the So. Yorkshire Mining Student's Assn., reviewing the progress made in installing coal-cutting machinery in Great Britain during 1906. 20c.

2085—COAL CUTTING—Notes on the Hardening of Coal Cutter Picks. W. Walker. (Iron & Coal Tr. Rev., Dec. 28, 1906). Paper read before the Nat. Assn. of Colliery Managers, describing a new method of hardening coal cutters by the use of a lead bath for tempering. 40c.

2086—COAL CUTTING—The Ingersoll-Sergeant Radialax Coal Cutter. L. Nettleship. (Sci. & Art of Mg., Dec. 15, 1906). Paper read before the So. Yorkshire Mg. Student's Assn., giving an account of the construction of this new coal cutter, and directions for operating. 20c.

2087—COAL HANDLING—Anlage für Transport von Griesskohle auf der Königlichen Grube Heinitz bei Saarbrücken. L. Hoffman. (Glückauf, Jan. 5, 1907). Describes and illustrates the equipment and operation of a plant for the rapid and economical handling of foundry coal at the Heinitz mine at Saarbrücken. 40c.

2088—COAL IN THE UNITED STATES and other Countries. E. W. Parker. (Mfgrs. Rec., Jan. 3, 1907). Reviews the production and consumption of coal in the United States since 1846, and discusses the question of exhausting the coal supply; also gives an account of the coal situation in various foreign countries. 20c.

2089—COAL MINING Operations of the Union Pacific Coal Co., at Rock Springs, Wyo. (Elec. Mining, Jan., 1907; 12 pp.) Illustrated description of the equipment of the mines of the above company, where electricity is largely employed. 20c.

2090—COAL MINING—Progress in Coal Mining in 1906. F. W. Parsons. (Eng. & Mg. Jl., Jan. 5, 1907). Comprehensive review of all the features attending coal mining during the past year, and an account of recent legislative action as affecting coal mining. 20c.

2091—COAL MINING—The Technics of Coal Mining. Geo. H. Winstanley. (Mg. Engineering, Jan., 1907; 3½ pp.) Second of a series of articles, giving examples of computing weight of coal on a given mine area, calculating calorific power, and directions for measurement of dip of seams. 40c.

2092—COKE OVEN—Die neuesten Koksöfen von r. h. von Bauer nebst Verladevorrichtung. (Stahl u. Eisen, Dec. 15, 1906). Detailed account of the construction, operation and method of working a [illegible] oven invented by [illegible]. 40c.

2093—COKING PEAT—The Ziegler Process for Coking Peat. O. K. Zwingenberger. (Eng. & Mg. Jl., Jan. 19, 1907; 2½ pp.) The construction and operation of this German plant is described, giving a complete account of the ovens for coking the peat and the methods of recovering the by-products. 20c.

2094—COLLIERY EQUIPMENT—The Hulton Colliery. J. Tonge. (Mines & Min., Jan., 1907; 5½ pp.) A complete account of various methods of developing and working the seams at this mine in the Lancashire coal-field, England. 40c.

2095—ELECTRICAL PLANT of the Dahibusch Mine. A. Gradenwitz. (Eng. & Mg. Jl., Jan. 12, 1907;). Gives an account of the installation of electric machines in this German mine, together with a description of the power generating units. 20c.

2096—EXPLOSION—A Lesson from the Courrieres Explosion. R. H. Dundas. (Iron & Coal Tr. Rev., Jan. 11, 1907.) Consideration of some of the causes of explosions in coal mines and measures for their prevention; also description of a proposed new method of working, whereby most of these causes will be done away with. 40c.

2097 — EXPLOSIVES — Accidents in Mines and the Use of Explosives. (Iron & Coal Trades Rev., Jan. 11, 1906.) A reprint of the new Act issued by the British Home Office, dealing with notices of accidents. 40c.

2098—FIRST AID TO THE INJURED CONTEST by Teams from Collieries of the Pennsylvania Coal Co., and the Hillside Coal Co., at Scranton, Pa., November 24, 1906. (Mines & Minerals, Jan., 1907; 2½ pp.) Gives an account of the present organization of first aid societies in Pennsylvania coalfields, and describes a series of competitive tests held by various first-aid teams. 20c.

2099—FUEL ECONOMY. H. B. Maxwell. (Coll. Guard., Dec. 28, 1906.) Discusses the influence of coal handling, type of boiler, stoking, super-heating, etc., upon the efficient utilisation of fuel. 20c.

2100—GASES Enclosed in Coal and Certain Coal Dusts. F. G. Trobridge. (Jl. Socy of Chem. Ind., Dec. 15, 1906.) Gives an account of the method of extracting gases from coal and analysing these gases, and results of proximate analyses. 80c.

2101—HAULAGE—A Propos du Manque de Wagons. (L'Echo des Mines, Dec. 24, 1906.) Discussion of a proposition made the Compagnie du Nord, to haul coal and coke in cars owned by the public at a reduced rate; the proposition was made in hopes of relieving car shortage. 40c.

2102—HAULAGE—[illegible] age at the Mirfield Collieries. T. Nevin. (Iron & Coal Tr. Rev., Jan. 4, 1907.) Paper read before the National Association of Colliery Ingrs., Dec. 1, 1906, describing the development of the present haulage system at these English collieries, with a complete account of the equipment and method of operation; contains also the discussion on the paper. 40c.

forecast for future production. 20c.

thods of the Illinois Midland Coal Company. M. F. Peltier. (Eng. & Mg. Jl., Dec. 29, 1906; 3 pp.) Gives a complete illustrated description of the equipment and methods of operation at this mine, ground. 20c.

2105—ILLINOIS COAL—Illinois State Geological Survey Bulletin No. 3. (Urbana, Ill., 1906; University of Illinois; 86 pp.) Contains "Composition and Character of Illinois Coal," by S. W. Parr; "Distribution of the Coal Beds of Illinois," by A. Bement; and "Tests of Illinois Coals Under Steam Boilers," by

el Estado de Coahuila. (El Comercio, Jan. 15, 1907.) Brief description of the occurrence of anthracite coal in Coahuila, Mexico, giving production and future prospects. 20c.

ide in Mines. J. T. Beard. (Mines & Min., Jan., 1907.) Complete account of the properties of carbon monoxide and tests for its detection. 23c.

2108—MONTANA COAL AND LIGNITE DEPOSITS. J. P. Rowe. (Mg. Wld., Jan. 19, 1907; 3½ pp.) Statement of the present condition of the coal and lignite market in Montana, and description of the development of coal and lignite mining which is taking place in the principal fields of the State. 20c.

2109—NEW MEXICO—Coal in New Mexico. J. E. Sheridan. (Eng. & Mg. Jl., Jan. 5, 1907.) Gives a brief analysis of statistics of the past year in this field. 20c.

sylvania. F. W. Parsons. (Eng. & Mg. Jl., Jan. 5, 1907.) Brief comments on the value of the product, shortage of cars and employment of boys in the Pennsylvania coal mines. 20c.

2111 — PENNSYLVANIA — Pittsburg District Coal. S. F. Luty. (Eng. & Mg. Jl., Jan. 5, 1907.) Short review of the principal events of the past year, with brief description of proposed operations for 1907. 20c.

elischaft Laura en Vereenigung zu Eygelshoven (Holl. Limburg.) H. Kukimeler. (Bergbau, Jan. 3, 1907; 2½ pp.) An illustrated account of the sinking of two shafts on the Laura coal mine in the province of Limburg, Germany. Describes the methods used in overcoming, damming and removing water during the process of sinking. 40c.

2113—SHAFT SINKING in the Pocahontas Coal Field. H. Rawle. (Mines & Min., Jan., 1907.) Gives the costs of shaft sinking in this coal region, and also figures on the rate of sinking. 20c.

2114 — SOUTHERN COAL MINING. Strides in. F. E. Saward. (Manufacturers' Rec., Jan. 3, 1907.) Discusses the possibility of continued gains in coal production in light of the production of previous years. 20c.

Virginia. F. W. Parsons. (Eng. & Mg. Jl., Jan. 5, 1907). Gives a brief description of the operations of the principal

COPPER

Mining and Smelting at Douglas during 1906. H. C. Warnack. (Ores & Metals, Jan. 5, 1907.) Brief account of the con-

Field in Australia. J. Plummer. (Mg.

overfire in Copper-Matting Blast Fur-

(Mg. & Sci. Press, Jan. 5, 1907.) Plea for reducing the overfire in blast furnaces, and utilizing in the smelting zone the

2119—CALIFORNIA—Handling California Copper. C. F. Dittmar. (Ores & Metals, Jan. 5, 1907.) Brief account of projected methods for handling the copper output of various mines in Shasta Co. 20c.

2120—CALIFORNIA—The Copper of Shasta Co., California. D. F. Campbell. (Mg. & Sci. Press, Jan. 5 and 12, 1907; 5½ pp.) First and second instalments of series, dealing with the geology of the region, and giving a description of the various rocks and ores occurring in the district and methods of mining employed. 40c.

2121—CALIFORNIA—Some Notes on Greenwater. E. R. Zalinski. (Eng. & Mg. Jl., Jan. 12, 1907; 5½ pp.) Gives a general description of this camp, with its geology, means of access, and its present state of development as seen in the recent trip by the author. 20c.

2122—CALIFORNIA—The Greenwater District. J. W. Abbott. (Mg. & Sci. Press, Jan. 12, 1907.) An account of a visit to this copper camp by the author, giving his impression that the occurrence of copper is very disappointing. 20c.

2123—CALIFORNIA'S COPPER OUTPUT. (Mineral Wealth, Jan. 1, 1907; 2½ pp.) Statement of the conditions of various principal copper producers in California, with some discussion of proposed development of different claims. 20c.

2124—COLORADO—Copper in Colorado. (Mg. Rep., Dec. 27, 1906; 3 pp.) Second and third instalments of article previously indexed, giving a detailed account of copper production in Colorado by counties, and discussing the possible future production of various Colorado camps. 60c.

2125—COPPER AND NICKEL MATTE —Verblasen von Kupfer- und Kupfer-Nickelstein. (Metallurgie, Jan. 8, 1907; 4½ pp.) A comparison and discussion of the different features of converting copper and nickel mattes. Reviews and comment upon an article by H. W. Hixon in the ENGINEERING AND MINING JOURNAL dealing with this subject, and amplifies it along the lines of present German practice. 40c.

2126—COPPER CONSUMPTION—The Kupfernot. (Bergbau, Jan. 10, 1907.) Gives the German view of the remarkable increase in copper consumption; also discusses the demand for copper in Germany, and comments briefly on the copper situation in North America. 60c.

2127 — COPPER PRODUCTION and Prospects. (Eng. & Mg. Jl., Jan. 5, 1907; 3 pp.) Statistics, conditions and commercial history of copper in 1906. 20c.

2128—COPPER SMELTING and Refining. Wm. Bettel. (So. Afr. Mines, Dec. 22, 1906.) Gives some of the experiences of the author in refining copper contaminated with nickel, cobalt and arsenic, and describes briefly some of the methods used by him in refining copper in its various stages of smelting. 40c.

2129—ELECTROLYSIS — Elektrolytischer Kupfergewinnungsprozess. Walter Stoeger. (Metallurgie, Dec. 22, 1906; 6½ pp.) Describes in detail the theory and practice of a method of extracting copper from ores by electrolysis. 60c.

2130—ELECTROLYSIS OF COPPER—Ueber as Acetatkupfer das sogen. allotrope Kupfer, C. Benedicks. (Metallurgie, Jan. 8, 1907; 17 pp.) A contribution to the present knowledge of so-called allotropic form of copper which is produced by electrolysing a solution of copper acetate. Describes in detail various experiments with this form of copper along metallographical lines. 60c.

2131—JAPAN—Sumitono Bessi; the Great Copper Mine of Japan. O. G. Bennett, Jr. (Eng. Mag., Jan., 1907; 16 pp.) Detailed account of the region surrounding this mine on the island of Shikoku, also of the power equipment and crushing and concentrating plants; also a special description of the Japanese "Mabuki method" of copper smelting. Illustrated. 40c.

2132—LAKE SUPERIOR—Some Problems Connected with Deep Mining in the Lake Superior Copper District. F. W. McNair. (Eng. Rec., Jan. 12, 1907.) Address before the Engineering Section of the Amer. Assn. for the Advancement of Science, giving an account of new features which deep mining has demanded in estimating pillar load and supporting walls, in surveying, and in hoisting and pumping. 20c.

2133—LEACHING PROCESS—Beschreibung des Arbeitsverfahrens fur die Kupferlaugerei bei Barby a. E. der Gewerkschaft Klingental-Graslitzer Kupferbergbau in Klingental i. S. (Montan-Zeitung, Jan. 1, 1907.) Description of the process of leaching copper ores in Germany, by which the solutions are regenerated and used over again, and all by-products recovered. 40c.

2134—LONDON COPPER MARKET in 1906. (Eng. & Mg. Jl., Jan. 22, 1907.) Gives a review of the year's progress in London mining stock month by month. 20c.

2135—MONTANA—Operations of Butte Mines during 1906. E. E. Thum. (Ores & Metals, Jan. 5, 1907.) Short outline of the causes which have prevented any considerable increase of copper production in this camp; also describes the smelter improvements of the Amalgamated plant, and gives the present condition of deep ore mining in the Butte district. 20c.

2136—ORE REDUCTION—The Boston Consolidated Reduction Plant. (Salt Lake Mg. Rev., Dec. 30, 1906.) Gives a general description of the new mill of the Boston Consolidated Mining Co. to be erected at Garfield, Utah. 23c.

2137—PYRITIC SMELTING — Einige neuere Betrieb-resultate der Verhüttung der Erze des Mount Lyell-Grubendistriktes. G. Kroupa. (Oest. Zeit. f. Berg- u. Hüttenw. Dec. 22, 1906.) A short account of the pyritic smelting of low-grade copper ore by the Mt. Lyell Mining and Railway Co. of Tasmania, and the subsequent refining of the matte. 40c.

2138—PYRITIC SMELTING—Notes and Comments on the Pyritic Process of Mount Lyell, Tasmania. R. Nicholls. (Jl. Chem., Met. & Mg. Soc'y of So. Afr., Nov., 1906; 4½ pp.) Outline of the process of pyritic smelting with analysis of the slag obtained at this plant, and discussion of the reactions taking place in the slag formation; also an account of laboratory methods in use at this smelter. 60c.

2139—SMELTING — The Wallaroo Smelting Works. T. C. Cloud. (Instn. of Mg. & Met., Bull. No. 28, Jan. 10, 1907; 14½ pp.) Further discussion on the paper of the above title, which was previously mentioned in the Index.

2140 WIRE DRAWING -Das Ziehen von Kupferdraht. W. Küppers. (Zeit. des Vereines deutscher Ingenieure, Dec. 15, 1906; 6½ pp.) Continuation of lengthy article on the process of drawing copper wire.

DIAMONDS

2141—DIAMOND MINES—A Visit to the De Beers Consolidated Diamond Mines. W. E. P. Rathbone. (Instn. of Mg. & Met., Bull. No. 28, Jan. 10, 1907; 4 pp.) An account of a visit by the author to these diamond mines, describing briefly the equipment, method of mining and the process of disintegrating the matrix and recovering the diamonds by the use of grease.

2142—DIAMOND MINING in the Orange River Colony. (So. Afr. Mines, Dec. 1, 1906.) Continuation of article previously indexed, being an extract from the Report of the Dept. of Mines, giving a summary of the prospecting operations for the fiscal year ended June, 1906. 20c.

2143—NEW SOUTH WALES—The Occurrence of Diamonds in Matrix at Oakey Creek, near Inverell, New South Wales. T. W. E. David. (Mg. & Sci. Press, Jan. 12, 1907.) Discussion of the origin of diamonds in the light of a discovery of this gem in the original rock matrix in New South Wales. 20c.

GOLD AND SILVER

2144—ALLUVIAL MINING: Its Necessary Plant and Appliances. S. C. N. Bell. (Proceedings, Australasian Inst. of Mg. Engrs., Sept., 1906; 38 pp.) General discussion of hydraulic mining, dredging and hydraulic sluicing, and the principles governing the installation of any particular type of hydraulic mining apparatus.

2145—ANTIMONIAL GOLD ORES—The Assay of Antimonial Gold Ores. Wm. Kitto. (Instn. of Mg. & Met., Bull. No. 28, Jan. 10, 1907.) Reply of author to remarks on his paper of the above title, which was previously indexed.

2144—ASSAY OF GOLD BARS [illegible] ducted in the Author's Assay Office, A. C. Claudet. (Instn. of Mg. & Met., Bull. No. 28, Jan. 10, 1907.) [illegible] by members of the Institution of the above paper which was previously indexed.

2145—ASSAY of Silver Bullion by Volhard's Method. E. A. Smith. (Instn. of Mg. & Met., Bull. No. 28, Jan. 10, 1907; 1 pp.) Describes a modification of Volhard's volumetric method of silver bullion assay, whereby the color of the end-point is much intensified and more accurate results obtained.

2148—AUSTRALIA—Deep Lead Mining in Australia. (Mg. Jl., Dec. 15, 1906.) Gives a short account of the geology of the mines of the Berry United Deep Leads, Ltd., situated in the State of Virginia; also a brief description of the method used in opening and working the mines. 40c.

2149—BRITISH COLUMBIA—The Le Roi Mine—Its Past History and Present Condition. E. Jacobs. (B. C. Mg. Rec., Nov., 1906; 9½ pp.) A complete account of the history of the Le Roi mine in British Columbia, together with its prospects under new management; gives also a very complete account of the mine's equipment. 40c.

2150—CALIFORNIA—The Past Year's Progress in Trinity Co. J. W. Bartlett. (Mineral Wealth, Jan. 1, 1907.) The conditions of quartz and placer mining in Trinity county are described and mention is made of proposed new operations for 1907. 20c.

2151—CARBONATE MINE, UTAH—The Reopening of the Carbonate Mine, Utah. F. C. Nicholas. (Mg. Wld., Jan. 5, 1907.) Discusses the advisability of prospecting this old mine with a view to reopening and working it again. 20c.

2152—CHLORINE—Cost of Electrolytic Production of Chlorine. G. H. Harrison. (Eng. & Mg. Jl., Jan. 19, 1907.) Gives a brief summary of the cost of producing chlorine from salt by electrolysis in order to apply it to the chlorination of gold ores. 20c.

2153—COBALT, ONTARIO. T. A. Rickard. (Mg. & Sci. Press, Jan. 5, 1907; 3 pp.) Description of the ores which occur in this famous camp; also an account of some of the principal mines and mining operations during the past year. 20c.

2154—COBALT, ONTARIO—The Mines of Cobalt. R. Meeks. (Eng. & Mg. Jl., Jan. 12 and 19, 1907; 6 pp.) Description of the camp, mines and general conditions existing at present in this district. 20c.

2155—COLORADO — Developments of Mining in Colorado during 1906. (Ores & Metals, Jan. 5, 1907.) An account of new installations of power equipments in some of the Colorado mining districts, which will enable the reopening of many abandoned mines and increase the profits of present productive ones. 20c.

2156—COLORADO—Review of Mining in Colorado. Geo. E. Collins. (Eng. & Mg. Jl., Jan. 5, 1907.) An outline of mining in Colorado by districts. 20c.

2157—COMSTOCK—Modern Mining on the Comstock. Claude T. Rice. (Eng. & Mg. Jl., Dec. 29, 1906; 2½ pp.) Gives a very complete review of the present conditions of mining practice on the Comstock, dealing especially with the prospects for a revival of mining interest there. 20c.

2158—CYANIDATION—A New Cyanide Plant. M. R. Lamb. (Mg. & Sci. Press, Dec. 29, 1906; 2 pp.) Discusses the design of a new cyanide plant to treat 250 crushed to a maximum of 150-mesh. Illustrated by plan and elevation. 20c.

2159—CYANIDATION— Sampling Cyanide Solutions. H. E. Vail. (Monthly Jl., Chamber of Mines of W. Australia, Jan. 26, 1906.) Brief description of the method followed at the Lake View Consuls mine for checking cyanide solutions. Illustrated. 60c.

2160—CYANIDE PRACTICE at Kalgoorlie. H. T. Brett. (Mg. & Sci. Press, Dec. 22, 1906.) Reply to an article by Mr. Alfred James on Crushing and Grinding Practice at Kalgoorlie. Also contains an account of mill tests at the Ivanhoe mill, bringing out the difference between tube mills and grinding pans as fine grinders. 20c.

2161—ELECTRIC POWER for Rand Mines. (So. Afr. Mines, Dec. 1, 1906.) A comparison of the advantages between electricity and compressed air in mines, and a plea for the introduction of electric drills on the Rand. 40c.

2162—FLUME CONSTRUCTION—The Water-Race for the Chuquitambo Gold Mines, Peru. (Instn. of Mg. & Met., Bull. No. 28, Jan. 10, 1907.) Contributed remarks by Bernard Hunt on the paper of the above title, which was previously indexed.

2163—GOLD DREDGING — Electric Gold Dredge No. 3 of Conrey Placer Mining Company, at Ruby, Montana. (Jl. of Electricity, Power & Gas, Dec. 29, 1906.) Describes the design and equipment of the gold dredge, with special reference to the electric power installation. 20c.

2164—GOLD DREDGING in 1906. J. P. Hutchins. (Eng. & Mg. Jl., Jan. 5, 1907). Outlines the advances made in gold dredging during the last year, and deals with various procedures of dredging, costs, and preliminary prospecting. 20c.

2165—GOLD DREDGING PRACTICE in Central Otago. H. R. MacDonald. (N. Z. Mines Rec., Nov. 16, 1906; 7 pp.) Short historical sketch of gold dredging in Otago, New Zealand, with a description of geological conditions, methods of prospecting, and the construction of the type of dredge now in use. To be continued. 40c.

2166—GOLD MILLING—Modern Gold Milling. George P. Scholl. (Electrochem. & Met. Industry, Jan., 1907; 4 pp.) A very complete discussion of all the new features which have entered into the equipment of modern gold milling plants. 40c.

2167—GOLD MILLING—Some Accessory Stamp Mill Appliances. G. O. Smart. (Jl. Chem., Met. & Mg. Soc'y of So. Afr., Oct., 1906.) Description of a device for driving Challenge feeders, and of a new appliance for measuring the actual drop of stamps, while running. 60c.

2168—GOLDFIELD—Developments in Mining at Goldfield, during 1906. C. J. Moore. (Ores & Metals, Jan. 5, 1907.) Describes the occurrence of veins at Goldfield and their secondary enrichment, and gives a short and interesting account of profits of stock-selling companies and high-graders. 20c.

2169—GUANAJUATO—The Later History of Guanajuato. T. A. Rickard. (Mg. & Sci. Press, Dec. 22, 1906; 3 pp.) General description of various mills, plants and labor conditions in this district. 20c.

2170—IDAHO—Mining Development in the Coeur d'Alenes during 1906. W. H. North. (Ores and Metals, Jan. 5, 1907.) Short account of some of the improvements in mining and ore dressing in this district; also an outline of present condition of various mining companies. 20c.

2171—NEVADA—Review of Mining Conditions in Searchlight. E. M. Martin. (Mineral Wealth, Jan. 1, 1907.) Brief account of the geology of the Seachlight mining district in Nevada, and a description of the condition of the principal mining companies now operating there. 20c.

2172—NEVADA—Review of Mining in Nevada in 1906. (Eng. & Mg. Jl., Jan. 5, 1907.) Discusses the effect upon Nevada mining of the new Goldfield, Bullfrog and Tonopah districts; discusses also the mining laws and new prospects. 20c.

2173 — NEVADA — Round Mountain Camp, Nevada. Geo. A. Packard. (Eng. & Mg. Jl., Jan. 19, 1907.) Description of a trip made by the author to this Nevada mining district; giving an account of the crude methods of mining now being used there. 20c.

2174—NEW ZEALAND — The First Gold Discoveries in New Zealand. R. A. Loughnan. (N. Z. Mines Rec., Oct. 16, 1906; 16 pp.) Conclusion of article previously indexed. 40c.

2175—ORE REDUCTION PLANTS—Descriptions of the Ore Reduction Plants and Processes of Reduction at the Principal Gold Mines of Western Australia. (Monthly Jl., Chamber of Mines of W. A., Nov. 30, 1906; 10 pp.) Addenda to several of the articles previously published in the above Journal, describing the treatment plants of the Associated Northern Gold Mine, Great Boulder Proprietary Gold Mine, Oroya-Brownhill Gold Mines, Kalgurli Gold Mine, etc. 80c.

2176—QUEENSLAND—Second Report on Gold Ore Treatment During 1906. A. James. (Eng. & Mg. Jl., Jan. 5, 1907.) A review of improvements in this branch of metallurgy during 1906, including crushing, fine grinding, amalgamation, roasting, concentration, slimes treatment, etc. 20c.

2177—OREGON—Southern Oregon Progress. D. H. Stovall. (Ores and Metals, Jan. 5, 1907). The application of electric power to mining in Oregon is briefly discussed, and also there is given a summary of the platinum production of this State. 20c.

2178—PLACER MINING METHODS in the Atlin District, B. C. Carmichael. (Mines & Min., Jan., 1907; 3½ pp.) Describes the physical features of the Atlin mining district of B. C., and outlines the present conditions of hydraulic mining. 20c.

2179—PRODUCTION of Gold, Silver and Platinum. (Eng. & Mg. Jl., Jan. 5, 1906.) Statistics of production of gold and silver in the U. S., and in the world for 1906; also review of the commercial movement of gold and silver, by F. Hobart. 20c.

2180—QUEENSLAND—Second Report on Oaks View Gold Mines (Near Rockhampton), and Notes on the Mines Talgai and Thane's Creek Goldfields. L. C. Ball. (Geol. Surv. of Queensland, Pub. No. 205; 36 pp., 3 plans and 2 plates.) Describes the development work accomplished on the various claims of this company, and their proposed extensions in the future.

2181—QUEENSLAND—The Starcke, Alice River (Philp), Hamilton and Coen Goldfields of the Cape York Peninsula. W. E. Cameron. (Queens. Gov. Mg. Jl., Dec. 15, 1906; 5 pp.) An account of the geology of these regions with a description of the principal mines that are worked in each district. 60c.

2182 — RAND METALLURGICAL PRACTICE and Recent Innovations. G. A. and H. S. Denny. (So. Afr. Assn. of Engrs., Nov., 1906; 16½ pp.) Discussion by members of the Association of the above paper, which was previously indexed. $1.00.

2183 — RAND METALLURGICAL PRACTICE, Recent Innovations in. G. A. & H. S. Denny. (Eng. & Mg. Jl., Dec. 29, 1906; 5½ pp.) Very complete account of the new method of continuous cyanide circulation now practiced on the Rand, with complete flow-sheet both of pulp and solution. 20c.

2184—RHODESIA—W. Fischer Wilkinson. (Eng. & Mg. Jl., Jan. 5, 1907.) Review of mining in Rhodesia during 1906, with tables of production. 20c.

2185—SAMPLING RESULTS—E. H. Garthwaite. (Instn. of Mg. & Met., Bull. No. 28, Jan. 10, 1907; 9 pp.) Very complete discussion of the differences in results obtained by varying the distance between mine samples of gold reefs.

2186—SLIMES TREATMENT — Proposed Process for Treatment of Zinc-Gold Slimes before Smelting. C. E. Meyer. (Jl. Chem., Met. & Mg. Soc'y of So. Afr., Nov., 1906.) Reply of author to the discussion of the above paper which was read before the June, 1906, meeting of the Society. 60c.

2187—SOLVENT FOR GOLD—The Manufacture of Cyanogen Bromide. T. Ewan. (Jl. Soc'y of Chem. Industry, Dec. 15, 1906; 3 pp.) Gives a detailed description of the manufacture of bromide of cyanogen, together with detailed procedure for analysis of solutions containing bromic acid. 80c.

2188—SOUTH DAKOTA—Review of Mining in South Dakota. J. V. N. Dorr. (Eng. & Mg. Jl., Jan. 5, 1907.) Short discussion of the present condition of mining in South Dakota. 20c.

2189—TAVENER PROCESS. L. A. E. Swinney. (Instn. of Mg. & Met., Bull. No. 28, Jan. 10, 1907; 7½ pp.) Discussion by various members of the Institution of the above paper which was previously indexed.

2190—TRANSVAAL. W. Fischer Wilkinson. (Eng. & Mg. Jl., Jan. 5, 1907.) Review of mining conditions in the Transvaal in 1906, with tables of production and data of costs. 20c.

2191—TUBE MILL LINING. W. W. Bradley. (Mg. & Sci. Press, Jan. 5, 1907.) Interesting account of various experi-

[illegible] Metallurgical Methods in Western Australia. R. Stokes. (Mg. Wld., Jan. 5, 1907.) [illegible] practice in Western Australia of smelting [illegible]

[illegible] Crushing and Concentration in Western [illegible] Mg. Wld., Jan. [illegible] of the mill[illegible]ing practice at the different mills of this Australian field, giving the results of comparative tests on the effi[illegible]

GRAPHITE

[illegible] Graphite in Queensland, with Special Reference to the Mount Bopple Graphite Deposits. B. Dunstan. (Geological Survey of Queensland, Pub. No. 203; 20 pp., 5 plates.) Discusses the occurrence of graphite in Queensland, its mining and concentrating; some analyses of Mount Bopple graphite are given.

GYPSUM

2195—PLASTER OF PARIS — Der Gips. (Tonindustrie-Zeit., Dec. 22, 1906.) Continuation of article, discussing the influence of grinding and temperature on the production of plaster of paris. Gives various tests for standard qualities of the same. 40c.

IRON AND STEEL

2196—AUSTRALIAN IRON. J. Plummer. (Mg. Wld., Jan. 19, 1907.) The deposits of iron in the various states [illegible] briefly described, with a view to their possible development. 20c

2197—BLAST FURNACE—Zur Frage [illegible] des Hochofenprofils. (Stahl u. Eisen, Dec. 15, 1906; 2½ pp.) Brief article giving a method for calculating dimensions and profiles of a blast furnace. 40c.

2198—BLAST FURNACE SLAG—Zerstäuben flüssiger Hochofenschlacke. (Tonindustrie-Zeit., Dec. 22, 1906.) Brief [illegible] of a new method of granu[illegible]

2199—CHROME IRON — Ueber den [illegible] des Chroms und die Losungsstufen [illegible] Bezug auf Kohlenstoff und [illegible] Graphitbildung. E. Guercns and A. Stadeler. (Metallurgie, Jan. 8, 1907; 8 pp.) An account of experiments to determine the behavior of chrome iron towards carbon and the effect of chrome [illegible] formation. Gives the [illegible] and [illegible] points of definite alloys with increasing amounts of chromium and to which silicon was added to prevent the formation of carbides, and discusses the results obtained. 60c.

2200—CONSOLIDATED STEEL AND IRON [illegible] Lewis. (Engg. & Min. J., Jan. 12 and 19, 1907; 1½ pp.) The first three instalments of articles on the [illegible] company, dealing with its history, plant equipment, water supply [illegible]

2201—COPPER IN IRON—Kupfer im Eisen [illegible] (Stahl u. Eisen, Dec. 15, 1906; 7½ pp.) Detailed account of present conditions [illegible]

2202—ELECTRIC SMELTING. L'Etat actuel de l'Electrosidérurgie. L. Guillet. (Genie Civil. Dec. 22, 1906.) Continuation of article reviewing the present state of development of electric smelting. 40c.

2207—FERRO-ALLOYS — Fabrication des Alliages Ferro-Métalliques au Four Electrique. P. Girod. (Bull., Société des Ingenieurs Civils de France, Nov., 1906; 16½ pp.) Gives a long account of the method of making iron alloys in an electric furnace. Discusses the effects of various metals, such as chrome, vanadium, tantalum, etc., upon iron, and gives a description of the furnace used, and analyses of the products made therein. 60c.

2208—FERRO-ALLOYS — The Girod Ferro-Alloy Works and the New Girod Steel Furnace. R. S. Hutton. (Electrochem. & Met. Ind., Jan., 1907.) Brief description of the ferro-alloy industry at this French plant, with an account of the furnace itself, and its working; also analyses of some of the products obtained. 40c.

2209—FOUNDRY—Coke Sampling for Foundries. C. Myers. Foundry, Jan. 1937.) Gives the procedure used by the author in sampling carloads of coke. 20c.

2210—FOUNDRY COSTS—A System for Obtaining Foundry Costs. C. J. Redding. (Eng. Mag., Jan., 1907; 20 pp.) Very detailed description of a method by which all estimation is eliminated in computing foundry costs. A full set of different tables and blank forms are given, with directions for using them. 40c.

2211—FOUNDRY IRON—Die Verwendung des Flammofens in der Giesserei, insbesondere zur Schmelzung von schmiedbarem Guss. Ing. Geilenkirchen. (Stahl u Eisen, Jan 2 and 9, 1907; 9 pp.) Gives an account of the use of reverberatory furnaces in producing foundry iron, with drawings and descriptions of various types of furnaces used. To be concluded. 80c.

2212—IRON AND STEEL WORKING—Le Travail du Fer et de l'Acier a la Temperature critique. Olry and Bonet. (La Metallurgie, Dec. 19, 1906.) Continuation of article previously indexed, dealing with the working of iron and steel at their critical temperature. 40c.

2213—IRON DETERMINATION—Zur Bestimmung des Eisens in Eisenerzen nach der Reinhardtschen Methode. A. Müller. (Stahl u. Eisen, Dec. 15, 1906; 7½ pp.) A discussion of the theory and practice of various methods of iron determination in iron ores, with special reference to Reinhardt's method. 60c.

2214—IRON ORE TRADE—The Lake Ore Trade in 1906. G. H. Cushing. (Eng. & Mg. Jl., Jan. 19, 1907.) A short outline of market conditions and prices, which obtained in the Lake ore trade during 1906. 20c.

2215 — MECHANICAL EQUIPMENT FOR STEEL WORKS—Maschinelle Einrichtungen für das Eisen-Hüttenwesen. F. Frölich. (Zeit. des Verines deutscher Ingenieure, Dec. 8, 1906; 7½ pp.) Continuation of article previously indexed, describing and illustrating various mechanical devices applicable to iron smelting and steel works.

2216—METALLOGRAPHY Applied to Foundry Works. A. Sauveur. (Fdy., Jan., 1907; 4 pp.) The sixth of a series of articles on this subject, this instalment treating of the microstructure of gray cast iron containing from 0.1 to 1 per cent. carbon. 20c.

2217—NITROGEN IN IRON — Ueber die Bedeutung des Stickstoffes im Eisen. H. Braune. (Stahl. u. Eisen, Dec. 15, 1906; 5½ pp.) Continuation of article previously indexed, this instalment describing the heat treatment of specimens, and metallographical tests. 60c.

2218—OPEN HEARTH STEEL CASTINGS. W. M. Carr. (Iron Tr. Rev., Jan., 17, 1907.) Twelfth and final instalment of article previously indexed, dealing with heat treatment and structure, and thermit repairs in steel castings. 20c.

2219—PIG IRON AND Iron Ore. (Eng. & Mg. Jl., Jan. 5, 1907; 9 pp.) Statistics of production; summary of commercial conditions and review of the industry by F. Hobart, S. F. Luty, G. H. Cushing, E. Morrison, L. W. Friedman and D. E. Woodbridge. 20c.

2220—RUSSIAN STEEL MAKING — Das Hüttenwerk der Metallurgischen Gesellschaft zu Taganrog. L. Fortunato. (Oest. Zeit, f. Berg- u. Hüttenw., Jan. 5, 1907; 4½ pp.) Gives a general account of the introduction of steel making in Russia, and a detailed description of the equipment of the plant at Taganrog, Russia, for making basic bessemer steel. 40c.

2221—SILICON AND CARBON IN STEEL—Beitrag zum Einfluss des Siliciums auf das System Eisen-Kohlenstoff. F. Wüst and O. Petersen. (Metallurgie, Dec. 22, 1906; 12 pp.) Reviews briefly the present condition of our knowledge of the behavior of silicon and carbon in steel; describes the apparatus and discusses the results obtained in a series of experiments to determine the amount of carbon which can exist simultaneously with a definite amount of silicon, as well as the influence of the silicon, on the fusibility and freezing points of the iron. 60c.

2222—STEEL DISTORTION — Studie über die molekularen Veränderungen eines durch Zug beanspruchten Stahlstabes. M. Kralupper. (Oest. Zeit. f. Berg- u, Hüttenw., Dec. 15, 1906; 3 pp.) Continuation of article previously indexed. 40c.

2223—THERMIT PROCESS—La Reparation des Grosses Pieces d'Acier par l'Aluminothermie. (Genie Civil, Jan. 5, 1907.) Very interesting account of mending very large steel castings by thermit. 40c.

2224—TUNGSTEN STEEL—Ueber die Wolframbestimmung im Wolframstahl. G. V. Knorre. (Stahl u. Eisen, Dec. 15, 1906; 4 pp.) Gives a method of determining tungsten in tungsten steel, with detailed notes on the influences of other elements. 40c.

LEAD

2225—METALLURGY OF LEAD in 1906. W. R. Ingalls. (Eng. & Mg. Jl., Jan. 5, 1907.) Comments upon the progress made in the metallurgy of lead during 1906, dealing especially with lime roasting, the installation of dust chambers and Betts process of electrolytic lead refining. 20c.

2226—MISSOURI — Lead and Zinc Mines of Missouri. S. F. B. Morse. (Manufacturers' Rec., Jan. 3, 1907.) Describes the history and prospects of the famous southeast Missouri lead field. 20c.

2227—MISSOURI—The Southeast Missouri Lead District. H. A. Wheeler. (Eng. & Mg. Jl., Jan. 5, 1907.) Review of conditions in this district during 1906. 20c.

2228—PRODUCTION—Lead and Spelter Production. (Eng. & Mg. Jl., Jan. 5, 1907; 6 pp.) Development in the lead and zinc industries in 1906, with statistics of production. 20c.

2229—PUMPING—The Dewatering of Center Creek Valley. Doss Brittain. (L. & Z. News, Dec. 31, 1906; 2½ pp.) Interesting account of several repeated attempts to unwater this Missouri-Kansas mining district, the eventual successful outcome of which has opened up a rich lead and zinc district. 20c.

2230—SILVER-LEAD SMELTING — Weight of Charge as Affecting Reduction in Silver-Lead Smelting. L. S. Austin. (Mg. & Sci. Press, Jan. 12, 1907.) A short account of an interesting accident in a silver-lead smelter, whereby it was found that feeding four charges at once greatly reduced the loss of silver. 20c.

NICKEL

2231 — COMMERCIAL NICKEL. (Brass World, Nov., 1906.) Gives a short description of the processes used in making various grades of commercial nickel. 20c.

2232—NICKEL RECOVERY — Ueber einige Versuche zur Gewinnung von Kupfer und Nickel aus Abfällen nickelplattierter Bleche. C. Richter. (Elektrochem. Zeitschrift, Dec., 1906; 5 pp.) Gives an account of some experiments to determine a method of recovering copper and nickel from by-products of nickel-plating establishments.

PETROLEUM

2233—MID CONTINENTAL FIELD—Oil and Gas in Mid Continental Field. E. Haworth. (Eng. & Mg. Jl., Jan. 5, 1907.) Reviews development and present market conditions in this district. 20c.

2234—PETROLEUM—Development in Louisiana and Texas. (Eng. & Mg. Jl., Jan. 5, 1907.) Reviews the commercial conditions of the Louisiana and Texas field, and discusses the present conditions there. 20c.

2235—PETROLEUM in Southwestern Fields.—H. S. Reavis. (Mfgrs.' Rec., Jan. 3, 1907.) Detailed account of petroleum production in Texas and Louisiana, and traces also the growth of these fields during the last decade. 20c.

2236—PETROLEUM INDUSTRY during 1906. (Pet. Rev., Jan. 5, 1907.) Very short review of the petroleum industry in the United Kingdom for 1906. 10c.

2237—PETROLEUM PRODUCTION in the Appalachian and Lima Fields. H. C. George. (Eng. & Mg. Jl., Jan. 5, 1907.) An account of the production and development of various Eastern fields. 20c.

PLATINUM

2238—RUSSIA—Among the Platinum Deposits of the Ural Range. L. Lodian. (Elec. Rev., Jan. 5, 1907.) Very interesting article on the platinum regions on Russia; also a discussion of the phenomenal rise in platinum value. 20c.

QUICKSILVER

2239—CALIFORNIA — Quicksilver in California. C. G. Yale. (Mg. & Sci. Press, Jan. 5, 1907.) Review of the quicksilver industry of California, giving a brief account of the production and consumption of this metal. 20c.

SALT

2240—OHIO—Salt Deposits and the Salt Industry in Ohio. J. A. Bownocker. (Geological Survey of Ohio, Bull. No. 8, June, 1906; 42 pp.) Monograph describing the deposits of salt in Ohio, with their locations, and a brief catalog of the salt-producing works.

TIN

2241—LONDON TIN MARKET in 1906. (Eng. & Mg. Jl., Jan. 19, 1907.) A review by months of the year of 1906 in regard to the tin industry, giving prices and stocks on hand. 20c.

2242—QUEENSLAND — The Annan River Tinfield. W. E. Cameron. (Queensland Gov. Mg. Jl., Nov. 15, 1906; 7 pp.) Conclusion of article previously indexed, giving a sketch map of the district, and describing the methods of mining in the district. 60c.

TUNGSTEN

2243—TUNGSTEN. W. Preus. (Revista Minera, Dec. 24, 1906.) A short article dealing with the uses of tungsten, its occurrence in mineral form, and its extraction. 40c.

ZINC

2244—LONDON SPELTER MARKET in 1906. (Eng. & Mg. Jl., Dec. 19, 1906.) Outlines the course of the spelter market of London for 1906, analysing trade conditions and prices. 20c.

2245—METALLURGY OF ZINC. Progress in. W. R. Ingalls. (Eng. & Mg. Jl., Jan. 5, 1907.) A review of conditions now existing in the smelting of zinc ores, with comments upon new installations of furnaces at various places. 20c.

2246—MISSOURI—The Joplin District in 1906. J. A. Zook. (Eng. & Mg. Jl., Jan. 5, 1907.) Review of development work in this district in 1906. 20c.

2247—ORE TREATMENT at the Broken Hill Proprietary Mine. G. D. Delprat. (Proceedings, Australasian Inst. of Mg. Engrs., Sept., 1906; 37 pp.) An excellent article describing the present condition of ore dressing practice at Broken Hill, also the smelting and refining of the lead and zinc. Illustrated by numerous half-tones and working drawings.

2248—WISCONSIN—Zinc and Lead Deposits in Wisconsin. A. A. Hoskin. (Mg. Rep., Dec. 27, 1906.) Gives an account of the mineral occurrences in this [illegible] the [illegible] of the principal [illegible]

2249—VIRGINIA—[illegible] ing in Virginia. J. A. Van Mater. (Eng. & Mg. Jl., Jan. 5, 1907.) Review of mining operations in this State during 1906. 20c.

2250—WISCONSIN—[illegible] Wisconsin in 1906. E. W. Moore. (Eng. & Mg. Jl., Jan. 5, 1907.) Review of mining conditions in this State in 1906. 20c.

2251—ZINC BLENDE—Smelting Blende Containing Calcareous Gangue. L. Bischopinck. (Eng. & Mg. Jl., Dec. 29, 1906.) Abstract of article in *Metallurgie*, Nov. 8, 1906, describing an improved method of smelting zinc blende contained in a limestone gangue. 20c.

2252—ZINC RETORTS—Ein neues Verfahren zur Herstllung von Zinkretorten. P. Speier. (Oest. Zeit. f. Berg-u. Hüttenw., Jan. 5, 1907; 3 pp.) Contains a review of the advantages and disadvantages of the present methods of making zinc retorts, and outlines a new process for manufacturing the retorts out of dolomite or magnesite with a hydraulic press. 40c.

ECONOMIC GEOLOGY—GENERAL

2253—ECONOMIC GEOLOGY and Mineral Deposits. F. C. Nicholas. (Mg. Wld., Dec. 29, 1906, Jan. 12 and 19, 1907.) Sixth, seventh and eighth instalments of the article, dealing with the occurrence of gypsum, chalk, feldspar, cement, stone, coal, etc. 60c.

2254—GENESIS OF ORE DEPOSITS—Fissures and Their Filling, Veins and Shoots. E. A. Ritter. (Ores & Metals, Jan. 5, 1907.) An account of the conditions of the earth which may give rise to the segregation of metalliferous deposits along fissures and veins. 20c.

2255—MAGMATIC WATERS. H. W. Hixon. (Mg. Jl., Jan. 5, 1907.) Gives some new contributions to the prevailing ideas on the action of magmatic waters in lavas. 40c.

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MINING—GENERAL

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MINING AND METALLURGICAL MACHINERY

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The Engineering and Mining Journal

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THE BUTTERS CYANIDE PLANT, VIRGINIA CITY, NEV.

A Gold-extraction Mill Equipped with Important Labor-saving Devices

BY CLAUDE T. RICE

This plant is situated in Six Mile cañon, at the foot of Sugar Loaf peak, 2½ miles south of Virginia City, Nevada. The plant was built a few years ago to treat the old accumulated tailings from the pan-amalgamation mills, which were so prominent on the Comstock in bonanza days. These tailings are worth from $3.50 to $4 a ton, carrying about $1.40 in gold and 4 oz. silver, together with 2 to 3 lb. of copper to the ton in the form of sulphate.

At first the plant ran on these tailings, which required no crushing, since 80 per cent. consisted of slimes, and the rest fine sands, the ores having been ground fairly fine in the pan-amalgamation process. Since that time, with the rapid development of the newer Nevada camps, the smelters have been oversupplied with silicious ores, and smelting charges have been very high. For this reason Mr. Butters has undertaken the treatment of some of these ores in his cyanide plant, crushing them in some Virginia City mills, and cyaniding the tails from the Frue vanners. As a result it is likely that in a few months one will see a custom cyanide plant competing with smelters for the lower grades of southern Nevada ores.

The treatment of Tonopah ores has already been perfected at the Butters plant. At present it is treating about 100 tons per day from Tonopah, mostly oxidized ore, but some sulphides from the Tonopah-Belmont mine. In order to strengthen himself in this field Mr. Butters in the summer of 1906 began the erection of a 20-stamp mill, having 1250-lb. stamps, to crush ores for the cyanide plant. This plant will be equipped with tube-mills for grinding, and there will be also tables, vanners and Wilfley slimers for concentrating the sulphides in the ore, which product will then be shipped to smelters. An aërial tramway will bring the ore from the Virginia & Truckee tracks in Virginia City, to the mill.

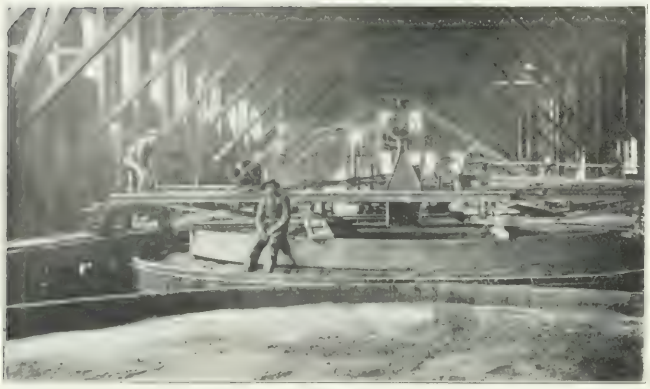
REMOVAL OF COPPER

The pan-amalgamated tailings, to treat which the plant was originally designed, contain considerable copper, owing to the large amount of copper sulphate used in the pan-amalgamation process. At first an attempt was made to treat them with an acid bath before cyaniding. Sulphur was burned in acid burners, and the SO_2 led into water in tanks to form sulphurous acid, was forced into the pulped tailings. This, after a short period of agitation, readily dissolved the copper from the tailings, and the decanted copper-bearing solution was taken to Siemens-Halske boxes for electric precipitation of the copper. But electric precipitation proved a failure because the solution became foul by the failure of the slimes to settle after the sulphurous acid treatment, and through no fault of the process.

KINKEAD MILL

BUTTERS CYANIDE MILL, VIRGINIA CITY, NEVADA

Now the tailings are treated directly with cyanide solution, which dissolves the copper along with the gold and silver. The resulting solution is then taken to Siemens-Halske boxes, and the solution regenerated in cyanide through the breaking up of the copper cyanide formed. Often the head solutions, carrying 0.05 per cent. KCN, after going through the Siemens-Halske boxes carry 0.09 per cent. KCN. The product from the electric boxes sometimes carries 52 per cent. copper, and averages about 30 per cent. copper when treating these tailings. The tailings are pulped in cyanide solution, and separated into sands and slimes, the slimes treated by agitation and filtration, and the



BLAISDELL DISTRIBUTER, BUTTERS MILL

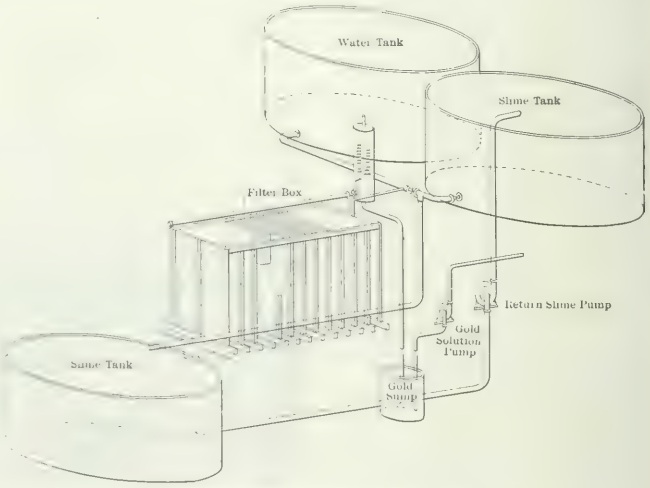
sands percolated. Mr. Butters has this supply of tailings to fall back on whenever he gets short of ore.

As the plant is running on ores from several of the mines of the Tonopah Mining Company and its allied companies, the ores are variable and the treatment differs [illegible] with the ores. The capacity of the mill is from 200 to 220 tons per day, but at present, owing to limited capacity of the mills that do the crushing, only 90 to 100 tons are treated.

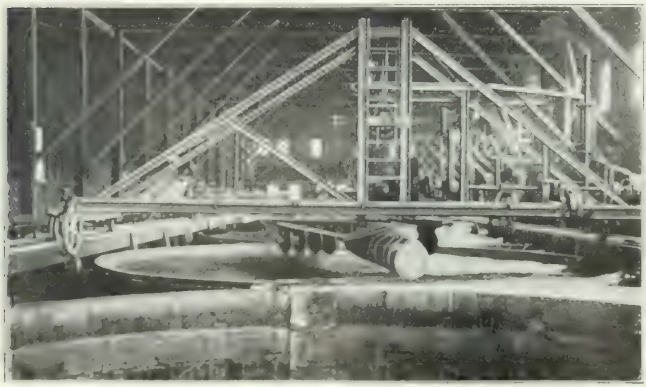
CRUSHING

The crushing of the ore is done in two mills in Virginia City, the Best & Belcher, and the Kinkead. Both these plants use Kinkead mills for crushing, and both have side-hill situations.

At the Best & Belcher mill, the ore which has already been crushed in a sampler is passed over a 1¼-in. grizzly. The fines go to 200-ton bins, while the coarse is crushed in a No. 2 Gates crusher. The crushed ore is fed by Kinkead feeders to six Kinkead mills having 30-mesh screens. The pulp is sent to a classifier; thence the [illegible]



ARRANGEMENT OF 100-TON SLIME FILTER



BLAISDELL EXCAVATOR

Butters mill, while the sands are concentrated upon five 6-ft. vanners. The tailings from the vanners are re-crushed in two Kinkead mills, two others at present being held in reserve. These mills have 40-mesh screens. The re-crushed pulp then goes to a classifier, the sands from which are concentrated upon four 6-ft. Frue vanners. The vanner tailings, joined by the slime from the two classifiers, go through sluice boxes to the Butters plant. This mill crushes about 50 to 55 tons of Tonopah ore per day.

At the Kinkead the ore is crushed in six Kinkead mills using 40-mesh screens, concentrated on six 6-ft. Frue vanners, and the tails are sent through sluice boxes to the Butters plant. This mill treats 35 to 40 tons of Tonopah ore per day. The plant is run by an 18-in. Pelton wheel driven by a ½-in. nozzle and 260-lb. water pressure. It is said to generate about 12 h.p. Recently the Kinkead mill has been greatly improved by making the bottom of the muller more spherical in shape. Formerly die rings had to be put in frequently to take up the play of the muller as it wore on the bottom. The more spherical shape of the bottom obviates this use of liners to a great extent.

HANDLING OF SANDS

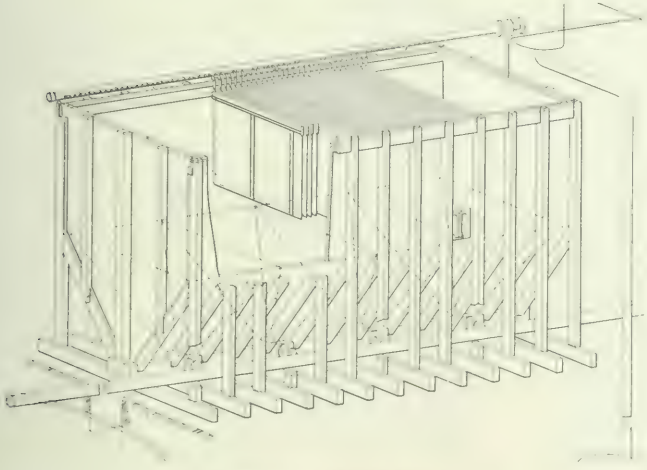
The crushed ore is taken in small sluice boxes to the Butters plant down the cañon, where it enters a 30-ft. sand wheel, which elevates to a launder feeding a Butters distributer, which in turn charges the collecting tanks. These collecting tanks are 30 ft. in diameter and about 5 ft. high, inside dimensions, and are made of wooden staves. The slimes overflow to the slime-collecting tanks, after having passed through a spitzkasten, which removes any sands and returns them to the sand wheel.

When the collecting tanks are filled with sands they are allowed to drain. Then the tanks are emptied by a Blaisdell excavator, which sends the sands through a central hole in the bottom, whence they are elevated to a belt conveyer; this takes them to a Blaisdell distributer, which, by means of revolving disks, scatters them over the tank to be charged. The Blaisdell excavator removes all the sand from a tank except the last few inches, which have to be shoveled through the hole. The bottom layer is removed only once in three or four chargings.

The Blaisdell distributer is equipped with a blade which can be moved so as to regulate the distribution of the charge over the tank area by making more of the sands go to one side or the other of the rotating disk. By means of a Blaisdell distributer all but the central ring under the disk is charged with sands. The excavator is then moved over the tank and it levels the surface, finally filling the central cavity flush with the rest. These collecting tanks hold from 114 to 120 tons of ore. A charge can be transferred from one tank to another in from two to three hours.

There are two of these collecting tanks and six sand-treatment tanks, all of which are on the top level or floor of the mill. The sands are given a double treatment, being transferred first from a collecting tank to a first-treatment tank, then after being leached for some time they are drained and transferred to a second-treatment tank where, before discharging, they are given a wash with a weak, barren solution. Owing to the fact that these ores carry a good deal of silver a long leach is necessary, varying from 12 to 14 days, according to the character and amount of ore received. The strength of cyanide solution used is 0.3 per cent.

DISCHARGE LAUNDER AND SLIME COLLECTING TANKS, E. TIES MILL



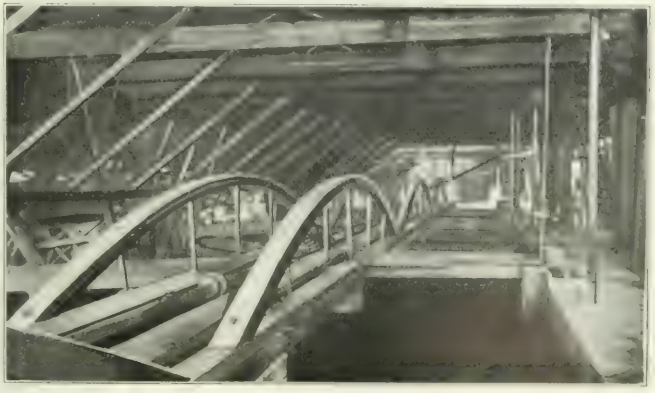
DETAIL VIEW OF FILTER BOX

HANDLING OF SLIME

The slime overflow from the sand tank, after passing a spitzkasten to remove any fine sands which may have been carried over, is taken to a slime-collecting tank of the same dimensions as the sand tanks. There are six of these collecting tanks and six slime-treatment tanks.

The slime flows into the tank through a launder extending 3 or 4 ft. below the overflow of the tank, thus insuring a quicker settlement of the slimes. This is also promoted by adding lime, not only to effect the settling, but also to neutralize any acid in the ore.

The slimes are allowed to settle, and then the water is decanted off. The pulp is then discharged into one of the six treatment tanks placed on the floor below. The treatment or agitation tanks are equipped with paddle agitators, and are also connected with a Butters slime pump, an improved centrifugal which draws the



AGITATING SLIME TANKS

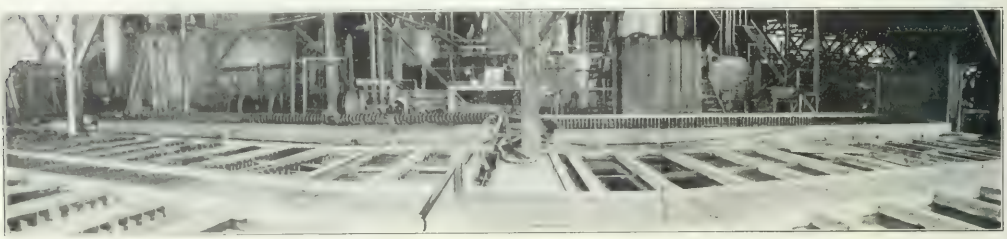
pulp off at the bottom and delivers it to the top of the tank, causing a very effective agitation. Compressed air is fed into the pulp at the pump, which gives a good aëration of the solution.

In these treatment tanks cyanide solution is added, the strength being brought up to 0.125 to 0.15 per cent. KCN, according to the case of the ore. The cyanide solution is then siphoned off and taken to the Siemens-Halske boxes, while the slimes are lowered to one of the four deep tanks on the main floor of the mill. From there they are taken to the Butters filter tanks.

FILTERING

The filter boxes used at the Butters plant are of electric precipitation boxes, than 10x5 ft. area. The pulped slimes are pumped into the tank, a vacuum of about 22 to 23 in. of mercury being used during the filtering.

This filtered solution is then taken to the Siemens-Halske boxes. The filtering is continued until a cake ¾ in. thick has been formed on the frames, when the vacuum is lowered to about 6 in. and the excess

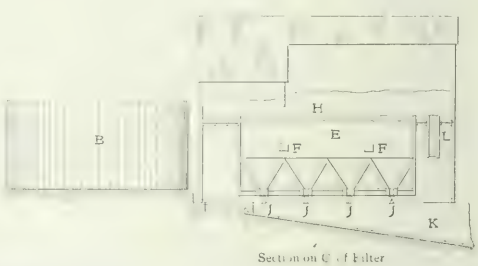


SIEMENS HALSKE PRECIPITATION TANKS

slimes from the accumulated pan-amalgamation tailings, which are pulped and treated directly, this solution contains only 0.05 per cent. KCN. The cyanide solution is added to the slimes only after the treatment tanks are reached, as otherwise the collecting tanks would become charged with some cyanide and some gold would be lost in the decanted water.

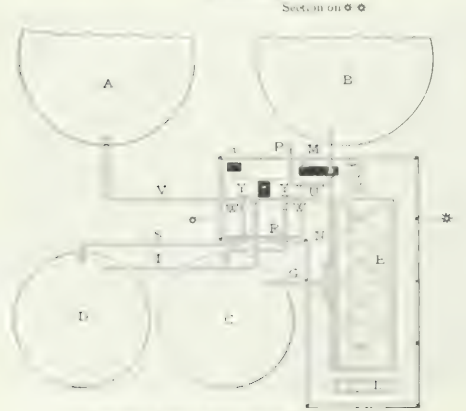
The slimes are agitated from 48 to 60 hours, as required, and as the amount of ore treated allows, and then it is settled. 29 ft. long, 10 ft. wide and 4 ft. deep, with V-shaped bottoms. In this are placed at 3⅞ in. between centers a series of rectangular filters consisting of an iron-pipe frame, over which is placed a canvas cover, and inside this cocoa matting. This cover is quilted over the frame. The pipes are perforated and connected with a system of pipes and valves so that they can be joined either with a vacuum pump or with a water pipe. In each tank there are 92 of these frames, which have a little less pulp pumped back to the stock tanks. The wash solution is then added to the tanks and the slimes washed on the filter frames. After the wash is effected the washing solution is withdrawn, sufficient water is added to the V-shaped part of the tank to form a sufficiently dilute pulp to run in the launders, then the valve connections are reversed and water is forced inside the filters, causing the slime cakes to fall into the bottom of the tank, whence they go through sluices to waste.

Section on ✲ ✲



Section on ✲ of Filter

80-FRAME VACUUM FILTER PLANT



A. Stock Pulp Tank.
B. Unprecipitated Solution Tank.
C. Wash Water Tank.
D. Wash. Solution Tank.
E. 80-frame Vacuum Filter.
F. Sluice Doors.
G. Surplus Water Discharge.
H. ¾" Spray Pipe.
J. 12" Q. O. Valve.
K. Discharge Flume.
L. Acid Wash Tank.
M. 10"x14" Wet Vacuum Pump.
N. Main Suction from Filter.
P. Discharge Water Pipe, 20' Head.
Q. 8" Centrifugal Pump.
R. Suction from Water Tank.
S. Suction from Solution Tank.
T. Discharge to Solution Tank.
U. Suction from and Discharge to Filter.
V. Suction from and Discharge to Stock Pulp Tank.
W. 8" Q. O. Valves.
X. Rods for Operating do.
Y. 3 Way Cocks with 4' Sheaves.
Z. Winding Drums for Operating do.
a. 30-h.p. Motor.
b. Friction Clutch Pulleys.
d. Pulley Blocks for Lifting Frames.
e. Water Service Under Pressure.

The filtering tanks will treat 150 tons of slime per day. There are two at the mill, and at present they are run only on 8-hr. shift. They require very little attention; once every few months the frames have to be given a wash in a very weak HCl solution to remove the lime which gradually accumulates on the canvas, clogging the pores.

PRECIPITATING.

Siemens-Halske electric precipitation boxes are employed for treating all the solutions and a small portion of the precipitated solution from the boxes is passed through zinc shavings in order to get a practically barren solution for final wash.

The electric precipitation boxes are 29 ft. long, 10 ft. wide and 4 ft. deep with V-shaped bottoms. Commercial tin plates are used for one pole while lead is used for the other. These are placed 6 in. between centers, there being 216 such plates 25 in. wide by 48 in. long in each box, arranged in 12 compartments. A current of 25 volts is used and at present about 250 amperes. One of these boxes can treat 10 tons of solution in one hour. The plant includes a small refinery.

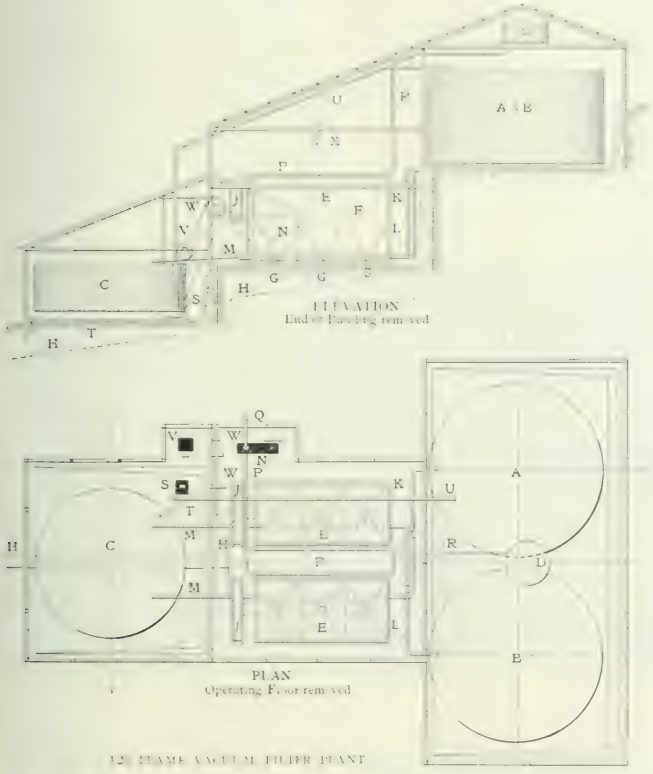
POWER EQUIPMENT.

The power equipment of the plant consists of the following: [illegible] and a 50-h.p. motor to run the main shafting; a 75-h.p. for the "platers;" a 15-h.p. for the wheel; a 20-h.p. for the pulping tanks and tramway; a 20-h.p. to run conveying belts; and a 5-h.p. motor is placed on both the Blaisdell excavator and the Blaisdell distributer. Power is obtained from the electric line which has been brought into Virginia City from the Truckee river.

At present only one 8-hr. shift is working on the Blaisdell machines and also only one 8-hr. shift on the filter tanks. On the other two 8-hr. shifts only one man is required at present. He attends to the solution machinery, etc.; when treating a large tonnage a few more men would be needed. The following is a list of the men working in the plant at present in 24 hr.: Three shiftmen; one Siemens-Halske box man; two men on digger (Blaisdell excavator, etc.); one filter man; and one motor man.

Except for the shoveling necessary to get rid of the last 3 in. of sands in emptying a sand tank, and the cleaning of the zinc and electric precipitation boxes, practically all the work is accomplished by machinery, which accounts for the small number of men required. All the men have to do is to tend the machinery, watch the tanks, and turn on and off solutions at the proper times.

The work of getting the old tailings into the mill is also accomplished in a very inexpensive manner. The tailings, after being loosened up with a plow or harrow, are loaded by horse scrapers into cars which are hoisted up the double-tracked incline, shown in the picture, to the bins on top.



12-FRAME VACUUM FILTER PLANT

A Stock Pulp Tank.
B Wash Water Tank.
C Surplus Pulp Tank.
D Discharge Water Tank.
E Filters, 60 Frames Each.
F Sawed Doors.
G 12 Q O Valves.
H Discharge Flume.
I Acid Wash Tank.
K Pulp Delivery to Filter.
L Wash Water Delivery to Filter.
M Surplus Pulp Discharge.
N Wet Vacuum Pump.
P Main Suction From Filter.
Q Discharge to Gold Solution Tank.
R Discharge Water Pipe.
S Centrifugal Pump.
T Suction from Surplus Pulp Tank.
U Delivery to Stock Pulp Tank.
V Motor.
W Friction Clutch Pulleys.
X Pulley Blocks.
Y Water Service.

The Output of Mineral Products in Japan

The output of mineral products during the first six months of 1906, with the ratio of increase or decrease as compared with the corresponding period last year, according to a report of the Yokohama Chamber of Commerce, published in *The London Mining Journal*, is as follows:

	Momme (= grains troy).	Ratio of Decrease or Increase Per Cent.
Gold	390,412	2.6 D.
Silver	9,900,713	15.8 D.
Copper	29,395,394	4.6 I.
Lead	2,929,660	55.4 I.
Tin	6,405	69.9 D.
Antimony	522,523	119.2 I.
Mercury	280	3.4 D.
	Kwamme (about 8 lb. Av.)	
Zinc	1,959,388	27.3 I.
Iron	7,984,668	23.8 I.
Sulphate of Iron	5,274,052	24.8 I.
Manganese	1,333,843	10.0 D.
	Kin (lb.)	
Arsenic	4,375	38.6 D.
Phosphor	405,000	10.0 I.
Black Lead	147,731	7.2 I.
	Tons (English).	
Coal	6,542,300	15.4 I.
	Koku (39.70 Imp. gal.)	
Kerosene Oil	619,663	4.4 I.
Asphalt	226,500	170.6 I.
Sulphur	18,476,071	0.2 D.

Gordon-Hellman Rock Drill

Alfred Lewis, writing to the *London Mining Journal* from Johannesburg, states that the Gordon-Hellman rock drill promises to solve the labor difficulty in the Transvaal. It may take the place of the Chinese reducing the number of stoping boys required from six to one. One boy can do only one hole in a shift by the usual method, while the machine, costing £40, with one boy, does from six to nine holes during the same period. It is calculated that the expense will be cut down 2s. per ton by means of this drill.

THE NIPISSING AND FOSTER-COBALT MINES

The Two Wider Veins in the District—Hydraulic Prospecting—Abandoning Primitive Methods at the Foster Mine—Variety of Rare Minerals

BY REGINALD MEEKS

Situated in the heart of a district producing silver for about 5c. per oz., and whose ore averages better than 650 oz. per ton, is the Nipissing mine, of which comparatively little is known, despite its two years' operation. During this time more than $2,000,000 in silver has been taken out, and from less than 10 per cent. of its territory. The remaining 90 per cent. has not been prospected at all, and it is not unreasonable to predict that new veins will be discovered when it is remembered that veins have been uncovered on properties adjoining the Nipissing on all sides, and also because of the peculiar vein system or, rather lack of system, in the district.

The Foster management has been operating under the most adverse conditions, but is now installing suitable equipment to develop the property.

Nipissing Mines Company

This company was organized under the laws of the State of Maine with a capital of $12,000,000 in shares of $5 each, to take over all of the stock of the Nipissing Mining Company, Ltd., of Canada, and to act in the nature of a holding company. Of the original 2,400,000 shares one-half remained in the treasury and were to be used to acquire new property. In the early summer of 1906, the company applied for permission to cancel this treasury stock which was granted. The Nipissing Mining Company, Ltd., was formed to take over the holdings purchased by E. P. Earle and associates and later the present company was organized.

The Provincial government of Ontario brought suit against the company and attacked the claims on the ground that they were acquired through fraud. However, it was conclusively shown that E. P. Earle and associates paid $250,000 cash for the property and were therefore purchasers in good faith, whereupon the government withdrew the claim and granted the company a clean title to the land and mineral rights.

The property consists of 846 acres in lots R. L. 400, to R. L. 408 inclusive, situated in the heart of the Cobalt district and surrounded by producing mines.

Character and Extent of Veins

It is claimed by the management that 58 or 60 distinct veins have been discovered on the property. It seems probable that many, now called veins, will later prove to be merely branches or extensions of other veins and that all will merge into 10 or 12 distinct veins. The veins strike in all directions and, as has been remarked before, the fissure formation resembles mud cracks. On this account it does not seem unreasonable to suppose that some of the veins will eventually merge and this view is accepted by many engineers at Cobalt. The veins which have so far been exposed are as follows:

No. 49—This is the widest vein in the district and contains sensational values. The surface has been stripped for 110 ft. and the ore removed in three steps by underhand stoping. Near the surface the width of the vein is about 12 in., and at about 10 ft. in depth it widens to 48 in. At the bottom of the third step the ore is lower in silver values but latest reports state that native silver is becoming more plentiful. The mineral portion consists of smaltite containing argentite and native silver. There is considerable earthy, black oxide of cobalt and some decomposed calcite. The total depth of the working is about 30 ft. The opening is covered with stulls and operated by a shaft house 18x36 ft. and 45 ft. high. The shaft is 4x8 ft. and contains a 3x4 ft man-way. The amount of development is shown in the accompanying illustration.

No. 55 — The outcrop of this vein is on a steep hillside and was discovered upon removing some wash or waste dirt that had accumulated in a depression. This is shown in the sketch. This vein has been stripped for 100 ft., and after leaving a portion untouched stripping was resumed for 75 ft. farther. The depth of the cut is probably not more than 40 ft., and in the first portion the vein shows 10 to 18 in. wide; the remainder of the exposed vein is from 4 to 10 in. in width. Veins 49 and 55 will probably be found to intersect.

No. 19—The opening extends for 150 ft. and sinking is being done below the 50-ft. level. The vein widens from nothing to 10 in., with an average width of 4 in. of smaltite and native silver. There is a shaft-house similar to the one at No. 49.

No. 26—An ore-shoot has been opened for nearly 200 ft., and a 70-ft. portion to the south has been cut to a depth of 60 ft.; the balance has been cut for about 25 ft. The vein averages 4 in. in width, and it is claimed that $300,000 worth of ore has been won from this opening. A horizontal fault occurs at a depth of 40 ft. The vein was found after drifting 20 ft. to the east and sinking has been resumed.

No. 27—The ore is not uniform, and in

[illegible] FROM COBALT LAKE

HYDRAULIC PROSPECTING AT NIPISSING

[illegible] The vein lies about 200 ft. southeast of vein 19, and has been uncovered for 120 ft. It has been worked to a depth of from 30 to 35 ft.; the average width is possibly 5 in., and there is a good showing of native silver.

No. 25—This vein probably connects with No. 25. It has been exposed for 120 ft., and shows a width of from 1 to 5 in., with an average of about 3 in. smaltite and native silver.

No. 25—An opening 60 to 70 ft. long and 60 ft. deep, shows 3 in. of ore. This year an extension to the south for 125 ft. exposes similar ore.

No. 40—There has been no work done on this vein, except to strip for a considerable distance on the surface, thus exposing a 3- to 4-in. vein of rich ore.

No. 10—A shaft is down 40 ft., and at a depth of 100 ft. a cross-cut will be run to intersect No. 20 vein.

[illegible]

There are at present five shaft-houses, and another is in course of construction. This shaft-house, when completed, is intended to [illegible] district by cross-cutting and then drifting along the vein. The veins thus intersected are known as Nos. 15, 21, 12, 13, 40, 53, 44, etc. Nos. 49, 55, 26 and 19 have their own shaft equipment.

One of the handicaps which has not yet been overcome is the shortage of men. At present 175 to 180 men are employed and of these 50 are mining and 25 mucking. The rest are employed on surface development, ore sorting, construction, timbering, teaming and lumbering, and as engineers, firemen, machinists, etc. With the present force it is a matter of great difficulty to clear the land and attempt to prospect nearly 800 acres of virgin territory.

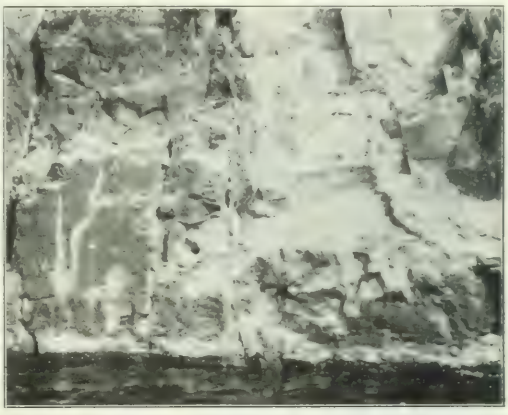
the veins being near one another. At each shaft there is a small boiler-house with a capacity sufficient to operate the bucket hoists.

[illegible] tion bunk-house, cooking establishment and dining hall accommodating more than 200 men. Four smaller bunk-houses provide quarters for the men. There are also 16 buildings, including superintendent's house, and office, three ore-houses, a sampling works under construction, clubhouse for the men, assay office, etc.

[illegible]

The ore is principally argentiferous smaltite and native silver, but there is also found argentite, niccolite, native bismuth, dyscrasite or artimonide of silver (Ag_6Sb), erythrite or cobalt bloom, annabergite or nickel bloom, and the white "bloom," which is a combination of the [illegible]

NO. 19 VEIN, NIPISSING.



VEIN RUNNING INTO THE LAKE, NIPISSING.

There are a number of smaller veins which have not been as actively worked as the foregoing.

METHOD OF MINING

Up to the present time all the veins have been worked by under-hand stoping in open cut. In a number of instances the work has progressed in steps, and owing to an inadequate force of men has necessarily been restricted. There has been very little machine-drilling in the open cuts, and a good many veins have been temporarily abandoned, while work has been pushed on others. Although one of the first mines to be operated, the workings are very shallow, the deepest cut being only about 80 ft. in depth.

Hand-drilling is being rapidly abandoned, and within the last few weeks many machine-drills have been installed, and stoping is rapidly progressing. The new power plant is in operation, and with the increased facilities, there should be a marked improvement in mining methods.

PROSPECTING

The veins on the Nipissing property have been discovered either by trenching or by means of the hydraulic plant. The latter consists of a pumping station on the shore of Petersen lake, containing a 150-h.p. engine, boilers and a pump. The washing away of the surface soil would be accomplished more readily if the pressure were higher. However, the experiment of prospecting in this manner was the means of uncovering several new veins.

POWER PLANT AND EQUIPMENT

The power for operating the various workings in lot R. L. 404, where most of the discoveries have been made, is centralized in one plant. This does not include the pump station before mentioned. The equipment at this power-house consists of two 125-h.p. boilers, and one 20-drill Canadian-Rand air compressor. The air supplied by this compressor will be piped only a comparatively short distance,

The first grade of ore averages as high as 2300 oz. silver, and is usually shipped in large oil casks. There were 45 such casks ready for shipment at vein 49 in December. The average value of the second grade is 150 oz. silver, and the dump will show rock which will probably assay from 60 to 75 oz. There are several hundred tons of ore ready for shipment at the property. The cost to produce ore, all development and construction expenses included, is stated to be approximately $100 per ton.

In the summer the sacked ore is transported across Cobalt lake in boats, and when the ice on the lake is strong enough, sleds are used. It is rumored that the railroad intends to run a branch to the east, which would be of great benefit to the Nipissing company.

A recent meeting of the board of directors resulted in the election of the following officers: Samuel Newhouse, president; W. B. Thompson, vice-president; David Fasken, secretary; F. W. Holmes,

In June, 1905, Clement A. and Albert [illegible] Gibson, [illegible] Groux lake; 13 acres are under water. The property is situated in the eastern portion of Lot 4, concession 4, Coleman township. Later a company was organized with a capital consisting of 1,000,000 shares of stock, the par value being $1 each.

This mine was among the first in the district to produce. Since reorganization the present company has shipped two cars of first-grade ore, one car of second-grade and one containing a mixture of cobalt ore and fines. Previous to this C. A. Foster shipped 100 tons of ore; the total returns to date have been from 220 tons of ore.

Six veins and three cross-veins (from vein No. 3 [illegible] discovered on the

[illegible]

Foster property, and these have been worked by both open cut and by sinking and drifting along the vein. Power facilities have been of the crudest type, but a plant is being installed and will greatly facilitate the extraction of the ore. When the mine was visited one vein was worked by a hoist operated by one horse hauling on a rope over a single pulley. The rest of the veins were equipped with ordinary hand-windlasses.

Vein No. 1—A cut 70 ft. long at the [illegible] vein along the surface which strikes northwest-southeast. The width of the vein averages 6 in. and shows fair values of silver in smaltite.

[illegible] a depth of 70 ft. and a drift to the south along the vein for 108 ft. terminates in a raise or air-shaft to the surface. They have also drifted for 45 ft. 60 deg. west of [illegible] for a distance of 20 ft. from the shaft and along the vein, the ground has been stoped out to the surface. The vein varies in width from 5 to 10 in. and shows an average of 6 in. of smaltite and native silver, containing some argentite and pyrargyrite or ruby-silver.

[illegible] this vein which strikes north-south and then turns 45 deg. to the southeast. It is situated in the eastern part of the property and shows 3 to 4 in. of argentiferous-smaltite.

Vein No. 4—Little more than stripping for 100 ft. has been done showing a vein 2 to 5 in. wide.

Vein No. 5—The ground has been stripped for 100 ft. and shows a vein, from 4 to 14 in. wide, striking northwest-southeast; this vein branches and these have been traced for 25 ft. One of them enters the University property; the other has not been traced for its possible length. The branches are about 2 in. in width and contain smaltite and possibly silver. There are also the cross-veins referred to above.

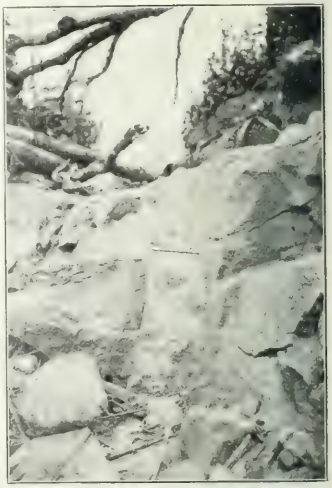
Vein No. 6—A shaft has been sunk to a depth of 78 ft. on this vein and drifting for 20 ft. to the southwest and 15 ft. to the northeast, along the vein, is all the development which had been done up to December, 1906. The vein averages 2 in. of smaltite and silver and there are good values in the wall-rock.

POWER EQUIPMENT.

The simple methods of hoisting and hand-drilling are to be abandoned and a more adequate power plant was being installed. This consists of two 60-h.p. tubular boilers; one 10-drill compressor; 3 hoists; one electric-light generator set; three 3-in., and four 2¼-in. air-drills.

Besides the power-hose, the mine is furnished with a bunk-house, boarding-house, stable, ore-house, office, etc.

A force of 45 men works in two 10-hour shifts, 24 men on underground de-



THE LAWSON VEIN

velopment and the others on construction, ore-sorting, etc.

The officers are as follows: President, W. K. George; vice-president, W. H. Blake; general manager, H. G. Adler; J. G. McMillan, superintendent.

Regulating Mill Returns in the Transvaal

BY A. SELWYN-BROWN

The banket formation, which supplies the largest proportion of the Transvaal gold ore, contains the gold in irregular pockets. As a consequence, in order to secure regular mill returns, it is necessary to "sweeten" the ore going to the mills. Much of the ore assays below 5 dwt. gold per ton, and this is unprofitable at the

BAILEY MINE, FROM THE FOSTER-COBALT MINE

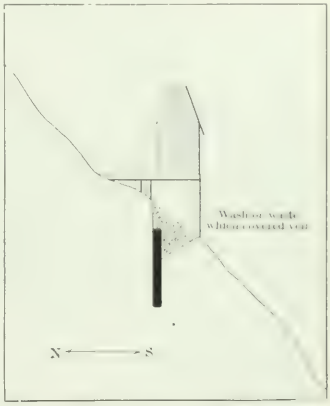
HORIZONTAL FAULT VEIN NO. 26, NIPISSING MINE

present high working costs. Such ore has to be "sweetened" by rich ore taken from a pocket, or bonanza, to bring its value up to about 7 dwt. per ton.

None of the companies supplies its shareholders with adequate information regarding the values of the ore found during development operations. The annual reports are full of figures of a general nature, or give the detailed costs of mining and milling; but investors are left absolutely in ignorance regarding the value of the ore in the mine, with the exception of the estimates, in round numbers, of the ore developed, which are appended to the manager's report, and the usual eulogistic predictions regarding future yields with which the chairmen end their speeches at the directors' annual meetings.

This serious lack of detailed information regarding the results of prospecting operations, and the value of recently exposed orebodies is being severely criticized in England, and the criticisms have so injuriously affected share values that some of the leading South African share operators on the exchange have induced a number of mining directors to explain the causes of the great secrecy enveloping mining strikes.

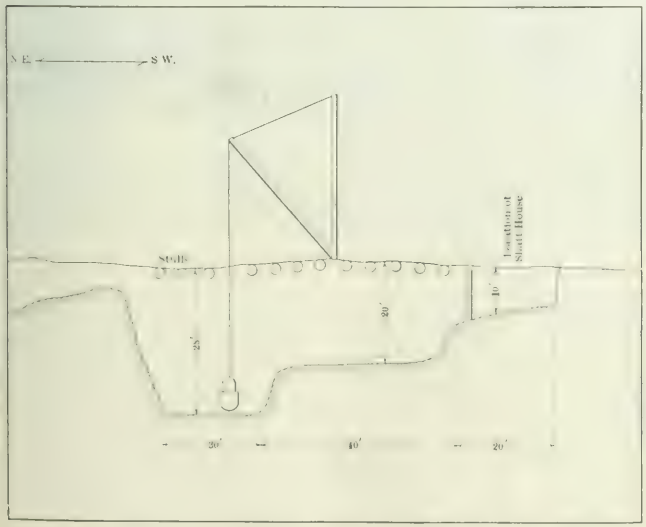
One of the clearest statements was recently made by the chairman of the Langlaagte Deep Company, at the ninth annual meeting in Johannesburg. In reply to the critics, and in defense of the company's actions, he said: "It is the practice on the Witwatersrand to regulate the declared gold yield so as to keep up a uniform grade based on the assay value of the payable ore developed, and only gradually to modify the grade as development shows any appreciation or depreciation in the value of the ore reserves. Although taken over a long period the average yield called for by the assay plan is, as a rule, approximately obtained, considerable variations occur from month to month and might, if published, give a false impression as to the real condition of the mine and lead to misconstruction—more particularly at times of active share dealing. These fluctuations may be caused by a variety of circumstances, such as unusually rich or poor patches in the stopes that are being worked. Experience has proved that the distribution of gold in these mines, although wonderfully even over a large extent of ground, is often most erratic over small areas. It must also be remembered that the process of gold extraction is not instantaneous, but occupies a certain length of time, and that the gold recovered in any given period is not the actual product, nor is it all the recoverable product, of the ore milled in that period. When the month begins there is on the plates and in solution a considerable quantity of gold from the ore milled previously, and in the same way at the end of the month there is left on the plates and in solution a certain quantity of gold which will be recovered with the contents of the ore milled in the following month. These are reasons why declarations for such a short period of time as a month may be unduly inflated or contracted, and are therefore apt to mislead shareholders. In order to guard against these fluctuations the policy was adopted—with the knowledge and consent of the Government—of keeping in reserve a certain quantity of



OUTCROP OF VEIN NO. 55, NIPISSING MINE

gold in very good months in order to level up the results of poor months. This practice was the result of careful and anxious consideration, and it achieves the object aimed at as far as it is possible to do so; that is, it gives the shareholders and the public as accurate an idea as can be given of the normal yield of the various mines, and it is undoubtedly a protection to shareholders as it tends to give stability to their investments. It has been urged that the practice of keeping any gold in reserve without publishing the fact may be open to criticism, and therefore in future we intend, as far as the companies in the Rand mines and Eckstein groups are concerned, to give with the declaration of the monthly output a statement of the reserve gold account, such as has always been given in the official returns to Government."

The practice of "sweetening" mill returns is not confined to South African mines, but is universally adopted where mining properties are operated in a regular and systematic manner. It is the mystery regarding the results of development work that calls for censure in South Africa.



LONGITUDINAL SECTION OF VEIN NO. 49, NIPISSING MINE

KAOLIN MINING IN GEORGIA*

The Deposits, Method of Mining and Preparation for the Market

BY OTTO VEATCH†

[illegible] mining and shipping of high-grade paper and pottery kaolins of the Cretaceous formations of Georgia. In the two States of Georgia and South Carolina, there exist, perhaps, the most remarkable beds of sedimentary kaolin in the United States, both as to the purity and extent of the clay. The kaolin in Georgia is, at present, being mined in large quantities at two localities, Dry Branch and Hephzibah. Besides, there are a number of other localities where occasional mining is carried on. About 25,000 tons are mined annually.

THE POTOMAC BEDS

The best kaolins occur in the Potomac formation, a narrow belt of kaolinic sand, gravel and clay, which lies in contact with the crystalline rocks of the Piedmont plateau, and extends in a northeast-southwest direction the entire width of the State. The Potomac is the basal member of the Cretaceous, and probably occupies the same geological position as the Potomac of Virginia and Maryland. Eastward from Macon, Georgia, the Potomac is frequently overlapped by tongues of Eocene strata, and is much obscured by superficial deposits of post-Tertiary sand, and is revealed only by stream erosion and artificial cuts.

The Potomac varies greatly in thickness, from 50 to 500 ft. The eastern belt, or that part lying between Macon and Augusta, Georgia, is divisible into a basal kaolinic sand and gravel, 50 to 400 ft. thick, and an upper clay member, 10 to 35 ft. thick. The basal member, near the contact with the crystalline rocks, consists of coarse clayey gravel and sand often an arkose. Higher up, it is a cross-bedded gray of characteristic pink clayey sand, made up principally of clear quartz, white mica and kaolin. In this sand member kaolin occurs in thin non-persistent beds and lenses. The occurrence of the kaolin in lenticular layers is one of the striking peculiarities of the formation. The lenses occur completely inclosed by sand, but are themselves pure white, massive, and comparatively free from quartz and mica. The kaolin of the lower member is fine in quality, but rarely persistent over any large area.

The upper member is a massive white clay bed, 10 to 35 ft. in thickness, which, unlike the kaolin of the lower member, is persistent over large areas. Outcrops of this bed, in varying degrees of purity and hardness, are observed throughout a distance of approximately 90 miles. It is overlain by red Tertiary sand and clay aggregating from a few feet to 200 ft.; while the underlying material is quartz sand. It is this clay which is most extensively mined and which contains the remarkable thickness of pure kaolin.

THE DEPOSIT AT DRY BRANCH

The best exposures of the kaolin are at Dry Branch, nine miles southeast of Macon, where mining is carried on. The kaolin here is in white to cream-colored massive beds, which are overlain unconformably by a maximum of about 100 ft. of loose Tertiary sand and impure clay. The kaolin is gray, drab, or cream color, becoming a pure white when dry. It often, however, contains yellow iron and black manganese stains along joint planes; but these oxides of iron and manganese have been carried in solution from the overlying red sands and clays and are not segregated from the kaolin itself.

The clay in its crude state is very free from grit, the top and the bottom of the bed being most likely to be quartzose and micaceous. Also, curious, isolated "fingers" of sand about an inch in diameter, and from a few inches to two or three feet in length, are seen in a number of places, and are found in a mass of clay in which no grit whatever can be detected by the eye or by the sense of touch. The sand forms, however, a very small per cent. of the kaolin mass; not more than 4 or 5 per cent., and as low as .45 per cent. are shown by rational analyses. This is

CLAY BED, AMERICAN CLAY COMPANY, DRY BRANCH, GA.

*[illegible]

†Geological Survey of Georgia, Atlanta, Ga.

remarkable ... are being mined which contain as high as 75 per cent. of sand.

The clay varies from very soft, about the consistency of cheese, to too hard to be scratched by the finger nail. The soft clay breaks with a peculiar fan-like or dendritic fracture, while the hard clay breaks with a conchoidal or hackly fracture. In some localities the kaolin has become indurated to such an extent that the term "flint kaolin" has been applied to it. Such clays break like flint, resist the action of weather and have almost no plasticity, even when finely ground. Soft and semi-hard kaolins predominate, however.

The following analysis shows the purity of the clay in its crude state, and is representative:

	Per Cent.
Moisture at 100° C.	1.222
Loss on ignition	13.409
SiO_2 (total)	44.767
SiO_2 sand	1.680
Al_2O_3	38.411
Fe_2O_3	.639
CaO	.209
MgO	.093
Na_2O	.696
K_2O	.455
TiO_2	1.379

Rational analysis:

	per cent
Feldspar	0.680
Mica	4.509
Ferric Oxide	0.479
Soluble Silica	3.189
Clay Substance	91.143

the overburden stripped off for a few feet back from the face, the clay is mined with broad-pointed, curved picks and shoveled into cars. The clay is broken off in flat chunks one to two feet in length. Blasting with powder is rarely resorted to, since the clay is blackened thereby and on account of the softness and elasticity of the clay only small quantities are torn off. The jointing is taken advantage of and large wooden or iron stakes are driven back from the face and large masses thus forced off. Drainage is one of the difficulties in

where it is placed in racks and the air allowed to circulate freely through it. After a few weeks of drying, it is either shipped in bulk or is crushed into flour and small chunks and shipped in sacks and wooden casks.

The kaolin is shipped largely to northern markets, and is used in the manufacture of paper and pottery. The soft, flour-like kaolins are most suitable in paper manufacture, where they are mixed with the wood pulp and act as a filler and give weight. Some of the lower grades

DRYING SHED, ALBION KAOLIN COMPANY.

CLAY PIT, ATLANTA MINING AND CLAY COMPANY.

The fusing point of a number of these clays has been tested, and it is found that it approaches that of Seger cone 36, 3362 deg. F.

METHOD OF MINING.

The kaolin is mined in open pits. The overlying strata, or "overburden," is removed either by hand labor or by steam shovels. The overburden varies from nothing to 100 ft. or more, but the price received for the clay does not warrant the removal of a thickness greater than 30 or 40 ft., since the overburden itself is valueless. After a face has been exposed and kaolin mining, since the clay bed forms an impervious stratum for the water, which seeps through the loose overburden of sand. A small drainage ditch is usually dug on top of the clay bed a few feet back of the face to carry off the water which issues at the contact between the overlying sand and clay. Water is kept from the pit by drainage ditches where practicable and by pumps.

PREPARATION FOR THE MARKET.

The kaolin is hauled from the pit in large chunks to long, open drying sheds,

are shipped to terra cotta and fire-brick manufacturers.

The German Cement Trade

In Germany there is a feeling of elation over cement prospects. A majority of the portland-cement manufacturers have formed themselves into groups or syndicates to promote the industry. Rudolph Dykerhoff, the well known manufacturer, writes to *Cement Age* that owing to the great impulse given to building construction the demand for cement has been extensive and a majority of the works have been fully engaged to meet it. Selling prices have advanced, but unfortunately for the manufacturer, as formerly stated, this advantage has been offset by the increased cost of the materials which enter into the manufacture of cement, and a general advance in wages, etc. There is also complaint concerning the introduction and sale of low-priced natural cement from Belgium, which is sold as portland cement.

The newly discovered copper deposits at Mount Carmel, in the Heathcote district, Victoria, are receiving much local attention. They are believed to be extensive, permanent and rich, the surface indications being traceable for miles. The country has been pegged out for about 7 miles, but so far only a moderate amount of development work has been done.

A Vertical Intercooler for Air Compression

[illegible] with two-stage air compressors is said to be equally efficient when employed as an ante-cooler or an after-cooler. The half-tone, Fig. 2, gives an external view and Fig. 1 is a sectional view showing the connections and appurtenances. The cooling water enters at the bottom, fills and flows slowly upward through thin brass tubes and overflows by a pipe at the top. The balance of pressure is outside and the tubes are

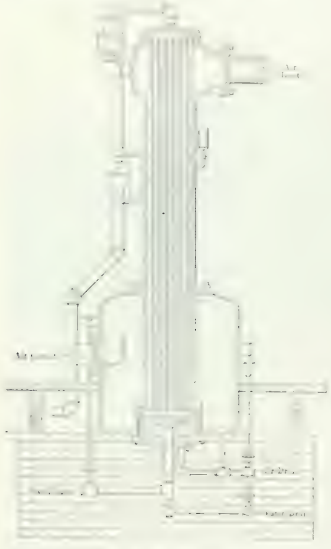


FIG. 1. INGERSOLL-RAND INTERCOOLER, WITH CONNECTIONS AND APPARATUS.

of thin brass. Any sediment which may collect in the lower water chamber is drawn off by the water drain. The upper head, into which the brass tubes are expanded and riveted, is held securely by the dome cover which is bolted over it, but the lower tube head is free to move up or down, as the expansion or contraction of the tubes may require. The central water pipe enters the bottom through a stuffing box, and when a slight movement occurs, the outside piping is always sufficiently yielding.

The air enters the intercooler at the top and passes out near the bottom, the final contact with the cooling tubes being where the water is at its lowest temperature. The air enters the upper chamber, striking across and spreading around and among the tubes, passing down the body of the intercooler through a space filled with tubes and so restricted that no eddying is possible. The shape of the body is continued by a petticoat down nearly to the lower ends of the brass tubes, where the air enters a large settling chamber. The air passes out from near the top of the chamber by the inverted elbow seen at the left in Fig. 1.

The various pipes are not necessarily placed as indicated, but, provided that their various functions are not interfered with, may be placed wherever the connections may be most convenient. The intercooler is easily taken apart for examination, cleaning, repair or renewal. The tubes may be lifted out upon removal of the top cover if there is sufficient hight for the lift. If the joint at the top of the lower chamber is broken, only about one-third of the high lift is required. The large capacity of the lower chamber gives it considerable value as an air receiver, although it is not intended as a substitute for the regular receiver. This intercooler is made in all required sizes; for higher pressures or for three- or four-stage compression the shell is made of corresponding strength.

First Cost of Mechanical vs. Chimney Draft

It is extremely difficult to make a general comparison of the first cost of a chimney with that of a mechanical-draft plant, because of the fact that most chimneys

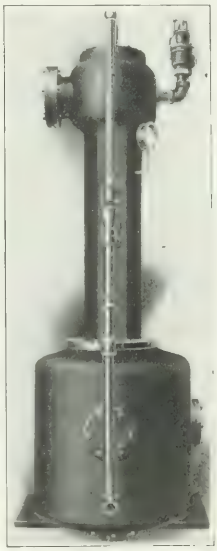


FIG. 2. INGERSOLL-RAND INTERCOOLER.

for power plants are usually put up with a view of obtaining a draft from 0.5 to 0.75 in. of water, while mechanical-draft systems are seldom installed except to give a draft of not less than 1 inch, says J. H. Kinealy in "Mechanical Draft." A chimney to give a draft of 0.75 in. must be about 125 ft. high, and one to give a draft of 1.5 in. would probably have to be at least 250 ft. high. The cost of the higher chimney would be very much greater than that of the lower.

In the case of a mechanical-draft apparatus, however, the apparatus to supply the air for the combustion of a given quantity of coal per hour under a maximum draft of 0.75 in. would be larger and cost more than the apparatus to supply the air for the combustion of the same quantity of coal under a maximum draft of 1.5 in. The diameter of the fan wheel for the higher draft would be only about 0.83 of the diameter of the fan wheel for the lower draft, and the dimensions of the engine, assuming it to be direct connected to the fan, might also be smaller for the higher draft. The work done in running the fan for the higher draft would be twice as great as that for the lower, and hence the running expenses would be almost twice as great; but even then the running expenses would be small. Thus to supply air for the combustion of about 5000 lb. of coal per hour, with an economizer under a maximum draft of 0.75 in. of water, an induced mechanical-draft apparatus would require a fan with a 7-ft. wheel; while to supply air for the combustion of the same quantity of coal under a maximum draft of 1.5 in. a fan with a wheel 6 ft. in diameter would be more than ample, and a 5½-ft. wheel would be almost large enough. The 7-ft. fan would have to be run at a speed of 195 to 200 revolutions per minute and would require a direct-connected engine having a cylinder 6 in. in diameter, with an 8-in. stroke; while the 6-ft. fan would have to be run at a speed of about 325 revolutions per minute, and an engine having a cylinder 6 in. in diameter and an 8-in. stroke would be more than ample for it, because of the greater number of revolutions made per minute. The dimensions of the engine are based upon the supposition that the boiler pressure would be at least 100 pounds.

Combination of Swedish Iron Producers

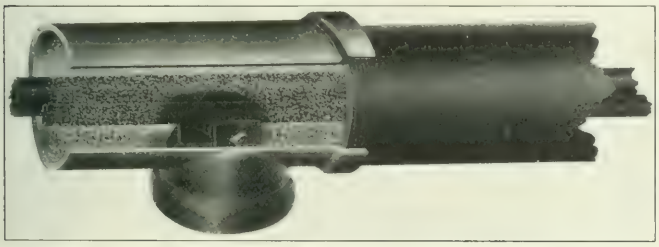
Consul R. S. S. Bergh, of Gottenborg, says that it is reported that the recently organized Aktiebolaget Jernexport is intended to be a combination of several of the largest Swedish iron works producing pig iron and iron-ore briquets, as well as of producers of steel and Lancashire iron, for the purpose of reducing competition with one another in foreign markets.

It is said that sales will be made direct by the Swedish works as well as from the Metallurgiska Patentaktiebolaget's plants in other countries. It is also the intention to obtain new markets for Swedish export of iron, and particularly for ore briquets. The company will establish offices in Sheffield, Hamburg and Paris, and at some place in the United States not yet decided upon. Besides this the company will also have agents in Japan, India and China.

Sectional Tile Conduits for Steam Pipes

The H. W. Johns Manville Company, 100 William street, New York, is placing upon the market a sectional tile-pipe conduit for steam pipes running underground. This is known as the "J-M" Portland Sectional Conduit, and consists of tile-pipe made in top and bottom sections, the division being made by cutting half through the shell of the pipe before it is baked, and breaking afterward. The use of neat hydraulic cement makes practically a perfect-looking piece. As the top and bottom sections are numbered to correspond the same sections can always be mated.

The inclosed pipes are supported by tee sections which are placed in the line of conduit from 12 to 18 ft. apart, depending upon the size of pipes inclosed. These supporting tee sections are placed firmly on a bed of concrete which is carried up into the supporting tee section, the concrete holding the metal roll frame carrying the rods and rolls upon which the pipes rest, thus the entire weight of the



PORTLAND CONDUIT—SECTIONAL VIEW OF TEE SECTION

pipes and their contents is entirely independent of the conduit itself.

The conduit with supporting tees and roll frames are laid section by section until a line is completed, and then the pipes are put in place and tested, after which the insulation may be applied. This insulation may be of either the sectional-pipe covering form, or the Asbesto-sponge conduit filling, with which the entire remaining space in the conduit about the pipes is filled. This insulation is applied while the top sections of the conduit are being applied length by length.

It is customary to place under this conduit an underdrain to remove the surplus water, which would otherwise lie against the conduit and absorb the heat. If it is found desirable to open the conduit after its installation for inspection, this can be readily done.

The conduit is water, fire and acid proof and no opening of the joints is caused by any movement or weight of the pipes on account of the form of support provided.

Tests have been made to determine the loss of heat in transmitting steam underground in this form of conduit. The most recent test which was made by George H. Barrus, expert and consulting engineer, of Boston, has shown that the loss of heat was less than that usually found in pipes installed in buildings with the best commercial grades of sectional-pipe covering to be had in open market.

The Cement Industry in Great Britain

As has been stated, there is the conviction on the part of some in England that the cement industry has a better prospect than has been the case for years. The chief problem is whether it is destined to be permanent.

As an indication of improved conditions, so far as they pertain to the export trade, the following table is going the rounds of the British press:

EXPORTS OF BRITISH CEMENTS, 1904 AND 1905

	1904	1905
South Africa, tons	83,629	85,019
India	87,685	97,864
New Zealand	24,805	28,351
Australia	16,292	15,432
Canada	15,561	28,303
Argentina	15,014	17,688
Brazil	6,445	13,919
United States	5,072	11,500
Netherlands	1,925	5,319

Concerning industrial and scientific progress in England, Mr. Bertram Blount, in an address on this phase of the industry delivered in London last June, presented an exceedingly interesting review of the situation. Mr. Blount, who is one of the highest authorities in England on the subject of cement, spoke in part as follows:

"The great producing centers, especially those in this country and in Germany, which had been developed rapidly on the strength not merely of their command of their home market, but also on their reliance on a great export trade, found themselves gradually opposed in those countries to which they were accustomed to export cement by a growing local manufacture, and in consequence had to be content with a non-progressive or diminishing export, or were obliged to lower their prices in foreign markets to a point that was barely remunerative. This natural shifting of the center of gravity of the cement industry, if it had taken place gradually, would have inflicted little injury to those manufactories whose position was economically sound; but it happened, during the time I am dealing with, that the largest single customer for ex-ported cement, the United States, took up and developed its home manufacture on so huge a scale and with such rapidity that the European works found themselves deprived of an outlet for a large part of their product with inconvenient celerity, losing a valuable consumer before they had time to find or create other directions in which their cement might be profitably disposed of.

Mine Accidents in Great Britain

The advance proof of the statement, compiled by the British inspectors of mines for the year 1906, gives the total number of persons killed in mines and quarries for two years past as follows:

	1905	1906	Changes.
Coal mines	1,159	1,133	D. 26
Metal mines	46	37	D. 9
Quarries	99	97	D. 2
Total	1,304	1,267	D. 37

As the number of persons employed is not given, the ratio of deaths cannot be ascertained.

In quarries, which include all open workings, the chief causes of accident were as follows, in 1906:

	Number.	Per Ct.
Falls of ground	39	40.2
Blasting	11	11.4
Falling from ledge	10	10.3
Miscellaneous	23	24.7
Surface, or outside	14	13.4
Total	97	100.0

It will be seen that the surface, or outside accidents, formed only a small proportion of the total.

The causes of accidents in metal mines are shown in the following table:

	Number.	Per Ct.
Falls of ground	11	29.8
Shaft accidents	8	21.6
Miscellaneous	12	32.4
Surface	6	16.2
Total	37	100.0

All but one of the shaft fatalities were the result of falling from the surface, or from cages or hoists.

The coal-mine accidents were naturally the most numerous, as coal is the greatest mining industry. The more prominent causes of these accidents will be found in the table given herewith:

	Number.	Per Ct.
Explosions, gas or dust	51	4.5
Falls of ground	547	48.3
Shaft accidents	78	6.9
Trams and tubs	185	16.3
Miscellaneous	144	12.7
On surface	128	11.3
Total	1,133	100.0

The year was free from any extensive explosions of gas or coal-dust; none of those reported caused more than two or three deaths. Falls of ground were the most important cause of death, the total number reported for all classes of mines being 597, or 47.1 per cent. of the whole number of fatalities. On the surface, the chief cause of accident was found in the movement of cars and locomotives.

The Snowstorm Copper Mine

The most important progress in Idaho's copper-mining development during 1906 has been at the Snowstorm mine, three miles from Mullan in the Cœur d'Alene district. The orebody resembles in size the great tabular lead-silver ore shoots of Cañon Creek on its strike to the west. It is a steep, pitching fissure, with a very pronounced footwall that cuts the thin, bedded quartzites at a quartering angle. The ore shoot shows a very indefinite outcrop high up on the steep mountain slope, and has been developed by three crosscut tunnels to a total depth of about 1200 ft.

For 600 ft. of this depth the ore was a uniform dissemination of clean copper carbonate impregnating the grain of the quartzite. One hundred feet below the middle tunnel the ore rapidly changes from a carbonate to the equally uniform dissemination of very fine-grain bornite and chalcocite, which seems to have transformed the rock back into a sandstone. A highly magnified thin section of this ore was recently illustrated in the *Mining and Scientific Press*, which shows these rich secondary minerals occupying the interstices between the sand grains, replacing the cementing silica and not the original sand grains, a very significant condition that may mean more important secondary enrichment at greater depth in the vein. Between the No. 2 and No. 3 tunnels there are four intermediate levels in which there is now blocked out a million tons of ore of shipping grade.

The shoot at these horizons of the mine is over 600 ft. long, and from 5 to 50 ft. wide. Where the sulphide ore is encountered it shows a pay streak 12 ft. wide, carrying from 10 to 12 per cent. copper. The shipping ore, of which 80,000 tons were sent out to the smelters during the past year, carries over 90 per cent. silica, 5 per cent. copper and about 5 oz. silver per ton. It is used for converter linings, for which purpose it is in good demand. A new compressor plant has recently been installed of 20 drills capacity, to be run by water power, also a new aërial tramway connecting the No. 3 tunnel with the railway at Larsen siding and other improved equipment which will admit of greatly increased productions during the year.

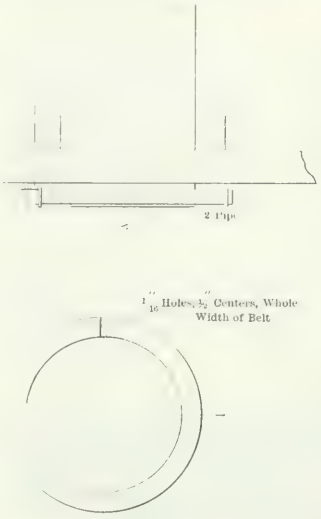
The property is also equipped with a leaching plant for treating its low-grade ores, of which there is a vast reserve. This is now in successful operation, and recently made an important shipment of high-grade precipitates.

The influence of molybdenum in nickel steels is similar to that of tungsten, but with quenched steels the results are not

*[illegible] Idaho.

A Device for Cleaning Conveyer Belts

Compressed air for removing wet and sticky materials from belt conveyers has been found effective when the usual method depending upon the use of brushes failed. The device illustrated in the



SECTION OF AIR PIPE AND MODE OF APPLICATION

sketches here shown has for some time been in use at the Cananea Consolidated Copper Company's works at Cananea, Sonora, Mexico, and at the Old Dominion Copper Mining and Smelting Company's plant at Globe, Ariz. As far as known all credit for the method and its application is due Chas. F. Shelby, superintendent of the reduction division of the Cananea Consolidated Copper Company.

The device depends upon the impact of compressed air; the method of application is clearly shown in the sketches. Air under a pressure of 90 lb. is brought to the belt at a point immediately below the return pulley. The pipe is provided with 1/16-in. holes spaced by ½-in. centers, on the side opposite the belt and extending the entire width. The force of the air escaping through the 1/16-in. holes effectually clears the surface of the conveyer.

POSITION OF AIR PIPE BELOW THE BELT

Graphite Mining in Canada

BY FRITZ CIRKEL*

Graphite mining promises to become an active industry in Canada. The Diamond Graphite Company, of which J. J. Tonkin, of New York, is president, has acquired several hundred acres of graphite lands five miles north of Buckingham, Quebec. These graphite properties have been known for more than twenty-five years. The graphite is of the flaky variety and occurs in a rusty, laminated gneiss. A number of prospecting ditches, open cuts and drill holes have proved the deposit to be of large extent. A 100-ton mill for the treatment of graphite rock is almost completed. The main building of the mill is 72x26 ft. square and will receive the ore from an inclined tramway. The mill proper is divided into several sections, each driven by a separate electric motor. The motive power will at first be steam, but later electric energy will be generated at Masson falls on the Lievre river at a distance of 8 miles from the mill. It is calculated that the mill will turn out 8 tons of finished product per day. Another 100-ton mill for the same company is in course of construction on another graphite property near by.

At Calumet station on the Canadian Pacific railway, the Calumet Graphite Mining and Milling Company, composed of American capitalists, is operating a graphite property containing over 300 acres. A large mill is in process of construction, the building being 60x90 ft. A new departure in this mill will be pebble-tube mills for the cleaning and polishing of graphite flakes.

It is announced that a financial interest has been taken by two Belgian companies in the Mines de Saint Pierremont, a French company, which has been formed at Maneieulles, for the opening up of iron-ore fields in the basin of Briey, French Lorraine.

*Mining engineer, Montreal, Canada.

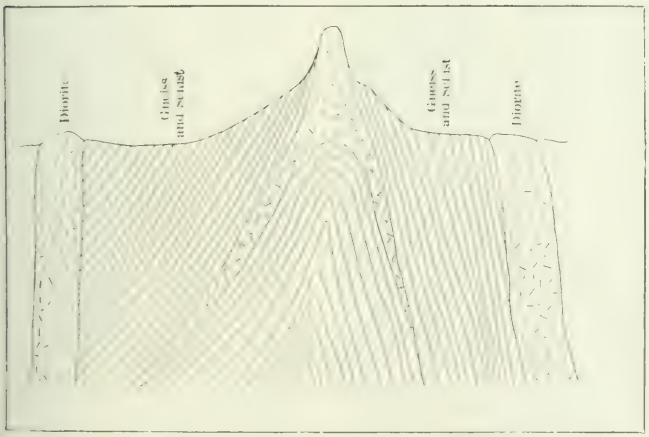
South Mountain, Idaho

BY [illegible]

One of the largest exclusively gold producing silver-lead prospects in the State of Idaho has recently been taken over by Wayne Darlington, former State engineer, on a working option for an Eastern syndicate. This is known as the South Mountain mine, and is situated near the extreme southwestern corner of Idaho, in Owyhee county, 25 miles southwest of Silver City.

The property consists of fifteen patented claims, and is owned by George A. Sonnemann, of Spokane, Washington, and is being developed by a force of 20 men at the present time. It bears a marked resemblance in geological structure, size, history, surroundings and mineralogical composition to the famous Broken Hill silver-lead zinc deposits of New South Wales. South mountain is an isolated uplift that rises to an extreme elevation of 8000 ft. in a broad plateau of Columbia basalt. It is about 10 miles long by 5 miles broad, and presents an anticlinal arch the crest of which has probably been broken by a fault and eroded to a deep gulch now forming the bed of Williams creek, which practically traverses the center of the uplift in a northwesterly direction.

CROSS SECTION, SOUTH MOUNTAIN LODE



IDEAL SECTION OF BROKEN HILL, N. S. W.*

THE DEPOSIT

Parallel to the bed of Williams creek, and climbing over the highest crest of the mountain, near its source, there is a belt lode or zone of white marbleized limestone showing a blocky structure with black lines of silica and impurities and presenting the appearance of a much altered original sediment. Its general strike is northwest and southeast, turning sharply to the east, where it crosses under the [illegible] near the head of the creek. It is from 100 to 300 ft. wide, and makes a distinct white line readily traceable for 10 miles. It has a dip to the southwest of about 60 deg., and is flanged on the hanging side by 1000 ft. of schist succeeded by a like width of gneiss, which in turn is succeeded by a wide belt of grano-diorite, and the same series on the footwall side. The schisted formations are doubtless an altered phase of the more massive grano-diorite. It is evident from the position of the limestone that it represents a sharply buckled fold or saddle-reef deposit and that other sedimentaries may be found in depth.

The Sonnemann property covers the choicest mineralized section of the limestone lode for two miles of its course, and consists of a combination of the best old claims that formed the basis of a big mining excitement from Nevada, in 1873, when the camp of South Mountain had a population for a short period of 1000 people, and in that respect differs from the Broken Hill schists, which are altered sediments. The rich lead-ore strike occurred associating with extensive brown gossan croppings, but wherever the lead carbonate ores were followed down to water level, which proved very near the surface, they changed to a massive mixture of marcasite, pyrrhotite, galena, zinc blend, and a sprinkling of copper sulphide, which proved too tough a metallurgical [illegible]

boom rapidly subsided, and the camp remained idle for years until the principal old claims were gathered together by Mr. Sonnemann, six years ago.

AN INTERESTING MIXTURE OF MINERALS

The most important mineral feature of the property, as it stands today, is a continuous body of rich, spongy brown gossan ore and rotten vuggy quartz that is 10 ft. to 50 ft. wide, replacing the limestone near its hanging side for 2800 ft. in length. This great gossan has been opened by shallow shafts, cuts and tunnels at about 100-ft. intervals for its entire length which in every opening shows spots, irregular patches and streaks of copper lead and zinc carbonate ores. All the gossan carries appreciable values of gold and silver, and where associated with the other minerals, runs quite high in the precious values. Accompanying this great outcrop of iron and manganese gossan and included in it are great masses of sandy garnet rock, together with sparry crystals of actinolite, siderite and calcite. The mineral zone is cut at nearly right angles by half a dozen cross fissures that are invariably accompanied by small dikes of granite-porphyry. One of these cross fissures had an ore-shoot 150 ft. long and from 1 to 8 ft. wide, of comparatively clean lead carbonate ore, changing to a massive base mineral at the depth of 60 ft.

The remarkable variety of metamorphic minerals contained in the gossan also includes some barite, and a rare form of

*State inspector of mines, Boisé, Idaho.

iron ore called hievrite, which was recognized by Waldmar Lindgren. The main gossan strikes directly into the steepest part of the mountain and affords an excellent adit tunnel site, which will gain a face depth of 200 ft. on the ore-body in a distance of 2000 ft. The gossan has been opened at the lowest point of its course at two places 600 ft. apart, and shows an equivalent body of the massive sulphide mixture, in which iron, zinc and lead sulphides are pretty intimately blended. The iron sulphides predominate, but there are streaks of very clean lead and zinc sulphides in the mass and where the galena is assayed separately, it invariably carries from 2 to 5 oz. of silver to each unit of lead. Specimen values are found occasionally in the clean lead and clean zinc minerals that run as high as $1000 per ton in gold.

It is a very refractory mixture of minerals, but with present methods of concentration it can unquestionably be separated into marketable products of lead, zinc and probably copper concentrates carrying high precious values. The proposition presents an enormous tonnage possibility. The district is 50 miles from the nearest railway point, but the intervening country is an easy one for railway construction.

FAMOUS NEIGHBORS

The veins of South mountain, like those of the Owyhee range, nearby, in which are situated the bonanza gold-silver deposits of Delamar and Silver City, are probably of early tertiary age. These rich silver-gold veins have been operated continuously for 40 years. They have produced fully $40,000,000.

In connection with the South mountain deposit and its variety of metamorphic crystals, the gangue of the Delamar veins presents a very interesting problem. The complex system of veins in this old bonanza is contained in an altered rhyolite formation above basalt and their gangue consists almost exclusively of pseudomorphic forms of barite, actinolite and calcite now pure silica, containing gold and silver milling values ranging from $10 to $60 per ton. It would seem that the original minerals, of which the crystal shells alone remain, may have originally been associated with lead and zinc values similar to those now found in the South mountain deposit, and that if the great mother lode of this property was developed through the volcanic cap down into the underlying formations which may prove to be sedimentary, that the original smelting metals that probably accompanied this sparry gangue may be developed in an enriched and concentrated form.

During the twelve months ending Dec. 31, 1906, 21,856 tons of mining machinery of British manufacture were exported from the United Kingdom, as compared with 27,854 tons in 1905 and 29,765 tons in 1904.

Duty on Nickel Anodes

District Judge Hazel, of the U. S. Circuit Court, southern district of New York, on Jan. 8, 1907, handed down a decision confirming the assessment of duty upon nickel anodes, cites the following reasons upon which his decision was based:

"The invoice in question, invoiced as rolled anodes, consists of plates of pure nickel about 12 in. long, 6½ in. wide and 7/16 in. thick, which are cut from sheets of nickel and chiefly used for suspension in a bath for nickel plating. They were assessed for duty under paragraph 193 of the present tariff act as a manufacture of nickel. The importers claim the classification should have been at 6c. per lb., under paragraph 185, reading as follows:

"'Nickel, nickel oxide, alloy of any kind in which nickel is a component material of chief value, in pigs, ingots, bars or sheets, 6c. per lb.'

"The Board held that the nickel must be shown to be either 'pigs, ingots, bars or sheets,' and inasmuch as the facts of this case do not bring the importation within the evident language of paragraph 185, the collector's classification was correct. The importers contend that the words last quoted refer and are restrictive only as to forms of nickel alloys, as evidenced by the fact that nickel oxide, nickel cubes and nickel in grains cannot be included in any of such restricted forms, and therefore the importation in question is clearly included in said paragraph as 'nickel.' But in this contention I do not agree, as it is proven that the nickel has been advanced by cutting and the plates are made capable of practical use by the mere drilling of holes in their upper ends.

"The Board expressed the opinion that the merchandise had a distinctive name, purpose and use; and accordingly testimony was given in this court in opposition thereto. Such testimony indicates that, although the articles are chiefly used as anodes, they are not precisely like the commercial anodes which have hooks or ears at their upper ends by which they may be suspended in a bath for plating. The evidence offered by the importers, however, to differentiate the imported article from the anode known to the trade is unimportant, in view of the fact that the plates properly belong to a variety or class desired by some users, who prefer to drill holes in a plate or supply their own hanging device; and that given tending to show that the articles are commercially known as nickel sheets and not plates is unsatisfactory and inconclusive. Ordinarily a sheet of metal is comprehended to be broad, thin and expanded, while the dimensions of a plate are appreciably less.

"The decision of the Board of General Appraisers is affirmed."

The Antimony Belt in the Coeur d' Alenes

BY J. J. O'LEARY*

The orebodies of the antimony belt in the Cœur d'Alenes, are located on the Northern Pacific Railroad, about 15 miles from Thompson Falls, Mont., and about the same distance from Wallace, Ida., on the eastern border of the quartzite mineral bearing zone of these two States.

Antimony was first discovered in 1884 during the early rush to the Cœur d'Alenes, when all travel passed by way of Thompson Falls. There are several good prospects in the vicinity, but no work has been done except on six claims located in 1890. These properties are now lying idle owing to dissensions among the owners. The buildings and wagon bridges were destroyed by forest fire during the past summer, and also considerable timber in the immediate neighborhood.

It is only in these six claims that any knowledge of the orebodies has been gained. The ledges are blanketed with a pitch of about 15 deg. Assays show from 12 to 60 per cent. antimony; 8 to 30 oz., silver; and 90c. to $17 per ton, gold. The ores are free from lead and arsenic and carry a high percentage of sulphur.

Development has not been extensive. On one of the claims a tunnel cuts the ledge about 80 ft. from the portal striking the ore chute near the center. Drifting was continued on the ledge for 20 ft., and four cars of ore were stoped for treatment. Two tunnels and an incline shaft cut the ledge on an adjoining claim and a raise from the lower to the upper tunnel connecting with a raise to the surface is in ore the entire distance. A short tunnel on a claim a short distance from this claim strikes the orebody and demonstrates the presence of an ore chute more than 300 ft. long.

After three carloads of assorted crude ore had been sold in the East at a very small profit the owners determined to treat the product on the ground. A furnace was erected which reduced the antimony to an oxide assaying 80 per cent., and upward. The plant was small, producing from 1000 to 1500 lb. oxide in 24 hours, using about ¼ cord of wood as fuel. The oxide was collected in sheet-iron flues, and in two chambers situated about 200 ft. apart on the hillside. Three cars of the oxide were sold at a good profit before operations were suspended.

Three miles below the property several promising deposits carrying silver and lead, are being developed, the most promising being the Montana Standard. This company has been shipping silver-lead ore and is using power drills driven by a compressor operated by water power from Prospect creek.

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*Mining engineer, Wallace, Idaho.

The Mount Cogran Mining Company

This company, incorporated at Phoenix, Arizona, Jan. 15, 1906, has since procured license to do business in the Philippine islands. The stock of the company is principally held in the Philippines. The following report covers the period from Jan. 15 to Oct. 31, 1906, and deals with the installations of machinery, tests of ores and development of the company's mines.

The first instalment of machinery, a 10-stamp Union Iron Works mill, was received Apr. 1, and was set up and ready to begin crushing ore on June 10, from which time it has been running almost constantly. This plant has been used for testing ore to enable the company at an early date to install a large plant.

The first test, of 15 days, commencing June 11, during which 600 tons of run-of-mine ore was crushed, cost as follows, in pesos: Wages of American superintendent, 200; American foreman, 60; native mill men, 200; native car men, 45; native miners, 150; sundry expenses and supplies, 25; total, 680 pesos. The gold extracted from this 600 tons of ore had a value of 1500.36 pesos, showing a net profit of 920.36 pesos.

During the test, samples of plate tailings were taken every hour, and when the mill run was complete the samples were mixed and sent to Manila for assay; they were found to contain 8.26 pesos to the ton, a loss of 4956 pesos. As a result of this test the company at once negotiated for 10 more stamps and a 100-ton cyanide plant, which it hopes to have in operation some time in 1907. The test demonstrates that the company can make a profit milling its ore with its present plant, even while losing 75 per cent. of the values in the ore.

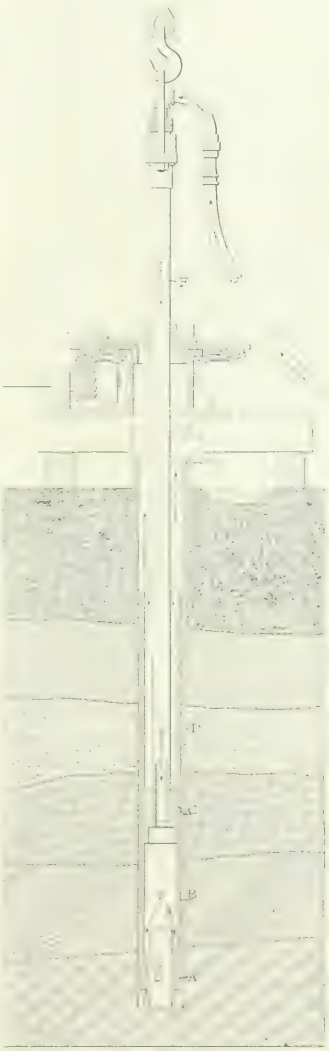
At the close of the test the company began a system of mine development, retaining all of the ore for future treatment by a process that will extract practically all of the values, except such ores as cannot be conveniently stored, which it will continue to treat in the mill as at present.

Assays range from $9.50 to $74.42 (U. S. gold) per ton, without much apparent reference to the depth from which the samples came. About 41,200 tons are blocked out in the richest paystreak, but the workings contain fully 120,000 tons of ore of sufficient value to pay to treat in a modern mill.

Mining and milling gold ores can be carried on in the Philippine islands for one-quarter of the cost in the United States; transportation to the Masbate fields is much more convenient than to many of the United States mining districts, and the Philippines contain abundance of the best mine timber in the world. Climatic conditions are also ideal for mining.

A Core Drill Without Diamonds

The Davis Calyx Diamondless Core Drill, described in a new catalog issued by the Ingersoll-Rand Company, is a prospecting drill producing cores from 15/8 to 15 in. in diameter from any depth to 6000 ft. It does not use diamonds, but has never found a material which it could not cut at



DAVIS CALYX DRILL IN POSITION

a paying rate. It gives a double record, depositing the cuttings successively as they occur and removing the core in convenient lengths. For ordinary materials a rotating toothed steel cutter is used, this having a chattering action instead of a smooth cut, and for the harder materials chilled-steel shot are used as an abrading material. The apparatus is built in different sizes, the smallest operated by hand and the largest requiring 20 or more horse-power, and capable of removing cores of large diameter from a great depth.

The Manufacture of Brass Wire*

The three principal operations in the manufacture of brass wire from copper and spelter are casting, rolling and drawing. The alloying of copper and spelter is usually performed in crucibles about 16 in. in depth and 10 in. in diameter at the top, tapering to about 9 in. in diameter at the bottom. These crucibles are generally heated in "wind furnaces," but gas furnaces, fired by producer gas or water gas, are also used. The wind furnaces are usually fired by coke.

Most of the grades of brass can only be rolled cold, and the oldest method in use is as follows: The metal is cast into long, narrow ingots of about 100 lb. each, and from 3 to 4 in. wide. The ingots are rolled between ordinary flat rolls until the desired thickness, depending upon the final gage of the required wire, is obtained. After the ingots have

TEETH OF CALYX DRILL CUTTER

been rolled into strips they are split up into threads, afterward to be drawn into wire.

The process of drawing consists of pulling the strips by hand through a die until a length sufficient to reach to a wire block has been pulled through. The drawn wire is then wound around this wire block in a continuous coil. Power is applied to the wire block itself and the force required to draw the wire through the die must be transmitted entirely by the wire, and consequently the limit of reduction of one wire is reached when the force required to pull the wire through the die is nearly equal to the maximum tensile strength of the resulting wire. For drawing, steel dies are chiefly used, and are set to size by the wire drawer, with a punch of the correct diameter. For very fine sizes of wire, diamond dies are used. The holes in the diamond dies are drilled by means of hardened-steel drills, pressed lightly against the stone while the latter is revolved at a very high speed, and fed with oil and diamond dust. Wire as fine as 0.001 of an inch is obtained from dies made in this manner.

*Abstract of a paper read before the British Institution of Mechanical Engineers.

COAL MINE FIRES†

Precautions to be Observed, and Successful Methods of Attack

BY R. V. NORRIS*

Taking up the subject of mine fires, I might say that it is a normal condition to have a mine fire somewhere in the anthracite-mining region. In fact, we always have three or four on hand as a little side amusement, and a good many of them are very serious ones. As to the causes of mine fires, the principal cause is from the miner's open lamp; I believe that 95 per cent. of the fires could be traced to that cause. When the lamp is full it stands up very nicely and is perfectly safe; but when it is nearly empty the wick will tip over easily, bringing the flame in contact with the coal or wood.

CAUSES OF MINE FIRES

A great majority of fires occur in underground pump rooms; when the pump engineer is pretty sure that the boss is not around he takes a quiet little snooze, and sets his lamp on a board beside him. His snooze lasts longer than he expects, his lamp tips over, and soon he is making tracks as fast as he can to escape the fire that is brought about in that way.

Another cause is hanging open lamps on timber, which miners will very often do. A few fires start from explosions of gas, and although such accidents are likely to start a fire, still the number so occurring is small. Occasional fires also come from dumping hot ashes along the caved outcrop of a seam.

Some fires start from the miners leaving feeders of gas burning in their rooms when they quit work. In the working places in gaseous mines there will often be small feeders along the floor or the roof; these are sometimes lighted to burn out the gas and get rid of it, and then the men often go home and leave this gas burning.

Such a fire I saw in the "Pennsylvania" colliery some eight years ago. In the bottom seam the breasts went up about 220 ft. on perhaps a 60-deg. pitch, and were full of coal. The miners left a feeder burning in the face of the breast and the fire got down into the coal; a hose was pulled up the manway and the top was watered, without notable success. The burning coal was then hauled out, which cured the fire in short order. It took about 16 hours to load out the fire and send it up to the surface.

Another cause of fire is sparks from lamps or inside locomotives. The latter are now prohibited by law, but the use of those locomotives already installed is not forbidden. The same danger applies also to electric installation inside, and from sparking or through the breaking down of the insulation. Another very common cause of fires is from mine carpenters and timbermen working with open lamps, when they are required to use glass lanterns or safety lamps in gaseous workings.

The first notice that you get of a fire, as a rule, unless of course you have an explosion, is the smell of smoke. Occasionally you see the flames, but in 19 out of 20 mine fires no evidence of flame is visible. This is principally due to the fact that it is usually impossible to get near the seat of the fire.

In describing several typical fires that have come under my observation I do not say that they have all been bad fires, but each one does present points of interest from a technical view.

THE BIG LICK FIRE

The Big Lick colliery was opened about 1842, in the Lykens vein, in the extreme southwesterly end of the anthracite region; it is next to the last colliery there. The slope is about 1800 ft. long, on a pitch varying from 40 deg. at the top to 70 deg. at the bottom. On the 9th of December, 1901, there was a gang of carpenters working in the third lift, 900 ft. down the slope, each lift being 300 ft. They came up about 4 o'clock in the afternoon; about 7 o'clock the flames were noticed in the slope. There is no question but that they dropped sparks from their lamps when they pulled the bell wire to be hoisted.

The slope is one of the very oldest openings in the anthracite region; it had been originally opened 40 ft. wide, as a four-track hoistway. On one side there was a pillar of about 160 ft., and then, as the mining progressed, the slope was cribbed, leaving it about 10 ft. wide (Fig. 1). It was the worst conceivable place for a mine fire. Within 40 min. after the discovery of the fire the flames were leaping out from 50 to 100 ft. above the top.

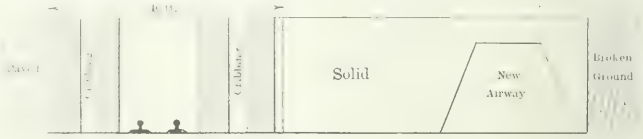


FIG. 1

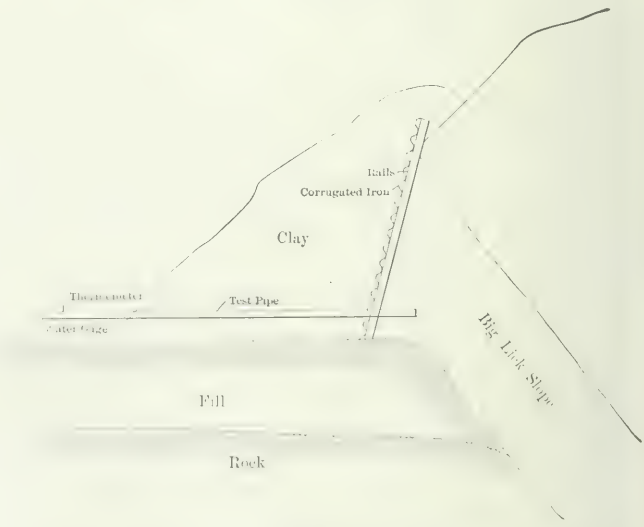


FIG. 2

There occurred a very exciting incident in connection with the start of the trouble. There were five men at the bottom of the slope when the fire broke out. They forgot that there was any other means of escape, being too frightened, I suppose, and the engineer, fearing there might be someone down there, let the car down to the bottom of the slope and left it there for about a minute, with the idea that anyone could get into it who might happen to

† A portion of a lecture delivered before the [illegible]

* [illegible] Wilkes-Barre, Penn

be there, and could be brought up. When he pulled the car up through the fire, five unconscious men were taken out of it, and within 30 sec. from the time the car landed the slope caved.

The whole force of officials arrived at the colliery about noon on the 10th. At that time the flames were leaping up perhaps 60 ft. and the mouth of the slope was so hot we couuld not get near it. There had been efforts to attack the fire from the inside, which might have cost several valuable lives. On inspection by the officials the immediate decision was to close the slope as the only hope of conquering the fire. The gangways were about 10 miles long, connecting three other collieries, so that absolute sealing was impossible.

METHOD OF TREATMENT

The first trouble was to close the mouth of the slope; the hight was perhaps 20 ft., and everything was red hot. By using sheet-iron shields we were able to lay a series of railroad rails against the face of the slope (Fig. 2). Then we placed corrugated iron from the boiler house behind the rails and resting on them, which acted as a shield that we could work behind, even while it was red hot; and we piled clay against that.

The fire started on the 9th; by noon of the 11th we had the slope closed. In doing this a pipe was left protruding through the clay battery, with a view of taking temperatures and water gages, and of analyzing the gases, which last, I may say, we did not do, there being too many other things of importance to consider.

The following are some of the records of pressure and temperature taken during the fire:

Date.	Water-gage	Temperature
Dec. 13, 1901	0.96 in.	
Dec. 14, 1901	0.95 in.	150 deg.
Dec. 20 1901	0.85 in.	150 deg.
Dec. 27, 1901	1.20 in. a	184 deg. b
Dec. 28, 1901	1.00 in.	194 deg.
Jan. 1, 1902	1.00 in.	224 deg.
Jan. 15, 1902	0.80 in.	260 deg.
Jan. 20, 1902	0.85 in.	302 deg. c
Jan. 22, 1902	0.80 in.	190 deg. d
Jan. 2, 1902	0.80 in.	182 deg.
Feb. 1, 1902		144 deg.
Feb. 15, 1902	0.60 in.	140 deg.
Mar. 1, 1902	0.50 in.	130 deg.
April 1, 1902	0.50 in.	110 deg.
May 1, 1902	0.40 in.	112 deg.
June 1, 1902	0.40 in.	114 deg.
July 4, 1902	0.40 in.	114 deg.
Dec. 1, 1902		100 deg.
Feb. 23, 1903		64 deg.

Commenced re-opening Feb. 23, 1903.

a. Maximum water-gage. b. Breach in stopping.

c. Maximum temperature. d. Breach in stopping.

You will note that on Dec. 14 we had a temperature of 150 deg. in the air coming out through the pipes, and the water-gage was 0.95 in. The water-gage got up to 1.20 in., when there was a breach in the clay battery; this released the pressure. The increase in temperature that was shown immediately after this was probably caused by a starting up of the fire near the mouth of the slope, due to access of air through the breach. This heating only the top of the slope would account for the lack of increase in water-gage. On Dec. 20 there was another breach; the water-gage rose to 0.85 in. on account of this breach and the temperature ran up again to 132 deg. The flame started at the top, just where the fresh air reached. The slope was left closed until Feb. 23, 1903, when the temperature had dropped to 64 deg. F. coming out of the pipe.

REOPENING THE FIRE

Then the idea of reopening was entertained and there was a very interesting method employed. In reopening the slope we had suction ventilation on the gangway; they drove a manway down through the pillar, parallel to the slope, to reopen in lifts. We found that so much of the old products of combustion that had been stored in the caved workings were drawn into the slope as to make it dangerous for the men working there. To avoid that we put a force fan on the head of the slope, which was run just hard enough to balance the pressure, keeping zero water-gage in the slope itself as far as practicable. On reopening, which work is now practically completed, it was found that the fire had extended down about 900 ft., and that the slope was caved almost to the bottom. The temperature at the lowest point was now about 85 deg., but by stopping the ventilation for a very few minutes it rose to 135 deg., showing what a very long time it takes for rocks to cool where there is no access of air.

There were a series of cave holes along the outcrop on both sides of the slope, where the surface had fallen in. These had to be closed off, and hydraulic mining was employed to accomplish this. A large pump was used and forced a heavy stream of water on the surface above the holes, bringing in gravel, sand and clay, and filled the openings for about 200 ft. on either side of the fire.

A DANGEROUS EXPERIMENT

We had, incidentally, a very close call, early in the work. The mouth of the slope had originally been lower here by about 8 ft. This cut had been filled with refuse of various sorts, as indicated in Fig. 2, and the engine-house stood perhaps about 150 ft. from the slope on this fill. After we had been working for some time and were all tired out, the whole crowd went to rest in this engine-house, and if it had not been for the other shift coming in, I believe we would have been there yet; the gases worked through this filling, and the engine-house was so full of carbon monoxide that we all experienced the symptoms of the "cold gray dawn of the morning after" for several days.

OTHER METHODS OF FIGHTING FIRES

Another method of handling a fire is illustrated by the work done in the No. 6 tunnel of the Susquehanna Coal Company, at Glen Lyon, Penn., above water level. It was at the head of a plane, on the traveling way, and above it were broken workings. The fire was probably caused by sparks from the miners' lamps. When discovered, the roof had fallen and there was a mass of fire covering a considerable area. The timbers along the broken territory were blazing, there was no water, and apparently no chance to fight it if it got above the gangway. The workmen could, however, pass between the fire and the broken workings, so the first thing done was to bring in a lot of hand fire-extinguishers, and to use them on the outskirts of the flame. It was a very high seam, with long timbers, but with the extinguisher streams the tops of the timbers were reached, and the flames extinguished. A bucket line was then formed up this plane, and water was hauled in in barrels; pails were passed from hand to hand up the incline in spite of the fact that the entry was on the wrong side of the fire, and the products of combustion made the air very bad.

A line of about 100 laborers and miners was employed passing buckets; as soon as a man worked at the head of the line for five minutes, he was sent down to the lower end, where the air was good; there he was allowed five minutes' rest, and then, starting in at the bottom, worked up to the head of the line again. We had the men passing water for several hours, and by that time the fire was surrounded and held fairly well on the outside.

Then came the problem of getting in to the burning coal; the roof had fallen, and the fire was under it, and we were up against the problem of removing these enormous pieces of slate; they were drilled and blasted, as they lay on top of a blazing furnace, and it was not by any means a joyous job to load those holes. In the course of some 14 or 15 hours the fire was out and the fallen roof cleaned up and carried away.

TREATMENT BY FLOODING

Fires below water level can always be treated by flooding, and it is frequently the only way to deal with them; however, you are always up against the question of how much water to put in. There is a very simple way of calculating this if your workings have to be flooded. You usually have records of the output of the mine, and considering that it takes about a cubic yard of water to replace a ton of coal, you can usually get at the approximate amount of water required for flooding.

In flooding a colliery you have to find some means of getting a large water supply. Perhaps the most prominent case of flooding in my experience was the Cameron colliery, at Shamokin, Pennsylvania, where about two billion gallons of water from Shamokin creek were sent in. Shamokin creek is a stream perhaps 30 ft. wide, and by blasting around the manway, in three or four days we were able to turn the entire stream into the colliery. In the flooding of that mine, there was a very interesting problem; the fire was in the Baltimore seams Nos. 8 and 9. These were connected with other workings only by an inside shaft, but the top of this in-

side shaft was below water level. We did not want to flood all the workings, only the upper seams, and I. A. Stearns, then general manager, suggested the idea of [illegible]. A dome-shaped dam was consequently built, and it held successfully under water pressure. Some difficulty was experienced in fitting in the keystone from underneath, as no one cared to close himself permanently in the shaft.

The flooding was carried to the level of the creek, leaving all the lower seams open; their only connection was up the shaft, and the dam saved thousands of dollars, because, while flooding is a very sure and simple way of putting out a fire, it is hard to clean the mines up afterward; the water causes the roof to fall, and you have to reopen through broken territory almost all the traveling ways of your mine.

A very nasty fire occurred in 1902 in the Cameron colliery, due to the tipping over of an ordinary miners' lamp. The fire started in the pump room and soon extended to three breasts, about 100 ft. along the gangway, and about 300 ft. high. It was one of the very few serious fires in my experience, that have been successfully fought back, with hose and an exercise of grim perseverance.

The work was taken charge of by the superintendents, and they fought it back inch by inch. First they got around it, and cut it off, so that it could not readily extend, and then they fought their way through it, and worked for over a month before it was entirely extinguished.

IMPORTANT PRECAUTIONS

In fighting a fire, it is always advisable to be on the intake-air side; you are then in the fresh air; on the return airways, the gases are something appalling, and the worst danger of carbon monoxide is that you go over suddenly. You feel all right until your knees give out, and then you fall unable to move, making it likely you will die where you drop, unless assistance comes promptly.

In all collieries it is advisable to have the fan arranged so that it can be reversed, because in many instances you can thus turn the air current so as to make the fire burn back over its track. It is then possible to come up to the fire with the knowledge that it has got to burn back over its former course, and will find comparatively little to feed on.

Another celebrated fire, that at Nanticoke, Pennsylvania, which was before my time (back in the late seventies) was fought by extending a sheet-iron tube up to the fire itself, carrying the ventilation in it, and eventually putting the fire out with water.

Zinc ore is now produced in northwestern Rhodesia. The shipments of calcined calamine in the last three months of [illegible]

The Action of Coal-mine Gases

BY RICHARD LEE.

The principal gases met with in coal mines are carbon dioxide, carbon monoxide, carbureted hydrogen and after-damp. Carbon dioxide is formed principally by the combustion of illuminants, by the respiration of men and horses, and by the rotting of mine timbers. This gas is considerably heavier than air and tends to occupy the lowest part of the mine. It has a peculiar odor and taste but no color, and its presence is generally manifested by its influence on the flame of a candle, as it will not support combustion.

Experiments have shown that 15 per cent. of carbon dioxide with air will extinguish the flame of a candle. It has also been proved that respiration may be maintained in a mixture containing 25 per cent. of CO_2; this fact, however, should not encourage anyone to remain in an atmosphere that will not support combustion, for after the light goes out there is no way to determine whether 15 per cent. or 50 per cent. of carbon dioxide is present.

When 50 per cent. of this gas is present, the breathing is accompanied with considerable distress. If 60 per cent. is present, the individual loses power over the limbs. This is also accompanied by confusion of the mind, and the appearance of a heavy haze before the eyes, which is undoubtedly due to an insufficient percentage of oxygen to saturate the blood as it passes through the lungs. If fresh air or oxygen is now supplied the victim, the recovery is almost instantaneous, and no after effects are experienced from breathing the black damp.

CARBON MONOXIDE

Carbon monoxide gas, generally known as white-damp, is not of such frequent occurrence in mines as black-damp. It is so poisonous that less than 0.5 per cent. will produce giddiness; when it is present in a quantity exceeding 1 per cent., the result is generally fatal.

It has been found that 0.06 per cent. of white-damp will visibly affect a mouse. This gas is generally known by its sweet odor and deadly results. Candles burn well when it is present, if anything the flame is brighter; when 13 or 14 per cent. of the gas is present the flame is usually elongated.

When this gas saturates the blood to the extent of 50 per cent., the individual loses all power over the limbs, so that it is almost impossible for him to escape. When the saturation of the blood reaches 80 per cent. consciousness is lost with no pain and little mental distress, and the victim passes away just as if a gentle anesthetic had been administered.

FIRE-DAMP

Light carbureted hydrogen, known as fire-damp, is the gas most commonly found in coal mines, and it is to this gas that explosions are principally due. Fire-damp is a mixture of several gases, and principally issues from the coal itself, where it is generally held in the pores or cells in a state of high tension.

It is disputed whether fire-damp can be detected by its smell. One thing, however, is true, that the greater the percentage of carbureted hydrogen contained in the gas, the harder it is to detect it by any odor. The gas if breathed for a considerable length of time would soon cause death; it quickly extinguishes the flame of a lamp if undiluted by air, but when found as it usually is in mine air, it can easily be detected by the elongation of the flame in a safety lamp. Experiments show that 7 per cent. of this gas is explosive, and that when about 12 per cent. is present, the explosion attains its maximum force; when 20 per cent. of the gas is present it is no longer explosive and will instantly extinguish the flame of any lamp.

AFTER-DAMP

After-damp is the product that results from the ignition and explosion of fire-damp and other mine gases. When 1 cu ft. of fire-damp is burned there are 40 cu. ft. of air rendered unfit for respiration. After-damp is the most dangerous gas with which the miners come in contact, and it is now generally known that the majority of those killed in explosions, have died from the effects of the after-damp which suffocated them.

Dr. Haldane, who made careful investigations at three different explosions, found that from 60 to 70 per cent. of the bodies were neither burned nor injured, and that about 77 per cent. might have escaped but for the effect of the after-damp.

Carbon monoxide, one of the deadly constituents of after-damp, cannot be detected by the safety lamp, as its action on the flame is almost unnoticeable. A mouse shows symptoms of poisoning from carbon monoxide 20 times quicker than a man, so that the little animal can often be used to detect a dangerous atmosphere. In a test of this sort it should be remembered that after-damp is lighter than air, so that the mouse must be kept as high above the head as possible.

When a miner has been rendered unconscious from the effect of after-damp, the best remedy is the prompt administration of pure oxygen, although this treatment is of no avail against the later symptoms which may occur long after the man has been removed from the mine. If breathing ceases, artificial respiration should be at once applied, and some authorities advise the use of weak stimulants to increase the heart action; this latter treatment is disputed, however, because of the shock the individual has already endured.

THE RICHMOND COAL BASIN

Youngest Coal the Earliest Developed—Sinking With Air-Hammer Drills

BY EDWARD K. JUDD

From the James river, a few miles west of Richmond, Va., an oval area of Triassic sedimentaries stretches southward for 38 miles with an average width of 9½ miles. The lower members of this series, which have been assigned to the Newark formation, carry a group of coal seams, usually three in number. The base of the group is a coarse conglomerate, and the most prominent rock above the coal is a sandstone of varying texture, often approaching the character of a conglomerate. It carries grains of glassy quartz, up to ½ in. diameter, and a large proportion of feldspar and mica fragments, for which reasons it appears to have been derived, at no great distance, from a granite land mass.

The region has been subjected to strong dislocations and a large amount of volcanic activity, although the igneous rocks resemble intrusions rather than surface flows. In many places diabase dikes have intruded along the bedding and, if in proximity to a coal seam, have driven off the volatile components of the latter, leaving a natural coke; this material is mined at several points. It is noteworthy that no trace of these volatile oils and gases can be found in the adjoining rock strata, although these seem admirably suited to absorb and retain them.

The western edge of the basin is defined by a nearly vertical fault which cuts off the coal deep below the surface. The coal outcrops on the eastern side, however, and here a thrust fault of low pitch has brought the underlying granite up into close proximity to the coal seams. It is often stated in the literature on this district that the coal is found actually resting on a granite floor; this phenomenon is certainly of rare occurrence and no opportunity is now available for observing it. In all the mine openings now approachable, the coal is nowhere found without its underlying bed of fireclay.

The Richmond coal is interesting because, with two comparatively insignificant exposures in North Carolina and Georgia, it is the only Triassic coal east of the Mississippi; in spite of its contemporaneity with the low-grade Triassic lignites of the West, it appears to be inferior in no essential respect to the Carboniferous coals of the East. It has more than local importance from the fact that, if we except the graphitic anthracite of Rhode Island, it is the only coal in the United States in immediate reach or even in the proximity of Atlantic tide-water.

It was here that the first coal was mined on the American continent. The easily accessible eastern outcrop of the coal soon attracted the attention of the Virginia settlers and it is a matter of reliable record that, as early as 1701, coal was being regularly consumed in this vicinity. In the days of slavery, each plantation with a coal outcrop within its boundaries supplied itself with this fuel. The outcrop line is still thickly dotted with caved pits and slopes dating from this period.

At the close of the war, organized attempts were made to develop the coal systematically. An important one of these took place at Midlothian, 12 miles southwest of Richmond. Here a shaft 600 ft. deep was sunk inside the outcrop and a certain amount of indiscriminate drifting and slope sinking was accomplished with a noble disregard for the rules of the art. A fault which cut off the seam terminated activities at this mine, and it has been idle for 30 years.

The James River Coal Corporation, of Richmond, has secured this and adjacent tracts and, under the management of Meriwether Jones, is reopening the coal in a workmanlike manner. The old workings will be abandoned, except one which falls in with the present system, and a few others which may provide return airways. The old shaft, with its hoist, is now utilized for lifting water. Each of the two cages, which are in balance, consists of a wooden box, of 30 cu.ft. capacity, provided with a valve at the bottom of one side. Track is laid over the top of the box so that a loaded car can be hoisted at the same time, if desired. The water is discharged automatically at the surface.

The new work thus far completed consists of a rock slope which has met the coal and connected with the most promising of the old workings. The most interesting feature of this slope is the use of air-hammers for doing all the drilling at the face. The rock is the coarse sandstone above described, which, though its components are hard enough, is not strongly coherent, breaks readily, and upon exposure to the weather, crumbles away to sand. The slope agrees closely with the pitch of the strata. The following observations must therefore be interpreted with strict reference to this peculiar nature of the rock, and to the fact that negro labor alone is available, although the latter seems unusually efficient.

Leyner and Rand drills were both tried, mounted on bars and tripods, without satisfaction, the main objections being that they were cumbersome to handle, and that the time spent in setting up, and in moving them out of the way for a blast, was too large in proportion to the time occupied in drilling holes. It was difficult also to maintain the dimensions of the slope. The Jap hammer drill, though easily wielded, was too slow in drilling and too complex in mechanism. The hand drill made by the Hardsocg Wonder Drill Company, of Ottumwa, Iowa, was then tried, and has since been the only tool employed. This is simple in the extreme, having but one moving part, and this is merely a partially hollow steel plunger, 17/16 in. diameter, 6 in. long, somewhat hardened and more solid at the striking end. The hammer is easily handled by one man, and strikes about 600 blows per minute.

The bits used with this hammer are made of 1-in. hexagon, hollow drilled steel; a set comprises 1-, 2-, 3-, and 4-ft.

SHAFT-HOUSE AT JAMES RIVER COAL CORPORATION'S MIDLOTHIAN MINE

bits, the cutting end of the starter being 1 7/16 in. diameter, and of the finisher, 1¼ in. The cutter is in the form of a six-pointed star. Before dressing the cutter, the blacksmith drives a steel pin into the center hole to preserve its shape and size, and the swage for forming the edges and incisions of the cutting face also has a central projection for the same purpose. The cutting faces on the bits as they come from the factory have rather a deep depression between points, which is found to be less suitable for this rock than a more shallow one, and the bits are dressed accordingly. A graduated gage is used to preserve the "follow" of the bits.

The slope in which they work is 7 ft high, 17½ ft. wide at the bottom and 14½ ft. wide at the top, and pitches 33 deg., which is also the average dip of the strata. Three shifts of six men each are at work. Three men in the slope handle as many drills, with the assistance of a fourth, and two men at surface dump the loaded cars. A round consists of three horizontal rows of eight to ten 4-ft. holes, the bottom row pitching steeply to break out a drag cut. This row is fired first, and the remaining holes then break to size. It is a common feat to drill a 4-ft. hole in five minutes, with 90 to 100 lb. pressure, and the miners have a saying that it takes less time to drill a hole than to load and tamp it. The rounds are fired by electricity and then the drillers clear out the broken rock. The average advance since these air hammers have been employed has been 60 to 65 and 70 ft. per month, not working on Sunday. In one month, 73 ft. was gained. The slope was begun March 4, 1905, and broke into its intended connection on Oct. 7, 1906, a total distance of 1012 ft. in 19 months. In places, a good deal of timbering was required, and here the advance was slower, so that the average of 53⅓ ft. per month, in view of all the circumstances, is highly creditable.

The Coal Industry in Indiana

Considering the fact that the past year has been filled with trouble, and that the coal industry got a bad start, the production has been equal to expectation, falling a little below that of the previous year. Anticipating a strike April 1, the operators worked their mines to full capacity during February and March, and then there was a general cessation until June 10. Following this there were local strikes, scarcity of water and lack of cars, which occasioned from two to three days' idleness each week. The price of coal has been fairly satisfactory, but this availed little while the operators were unable to get the coal into the market. The principal contentions during the year were over minor matters, such as removing slate, shot firing and transportation to and from the mines.

The year will pass into history as the first instance when the joint convention of miners and operators failed to agree upon a wage scale, and the subsequent failure upon the part of the operators to stand together for the old scale. However, the result of these peculiar events had little to do with the volume of production, the most serious handicap to a large tonnage was due to car shortage.

The prospects for next year are very good, and if present prices prevail throughout the year there need be little fear but that the coal industry in this State will yield a good profit. The operators take great hope that the legislature will pass measures calculated to afford the desired relief from unjust car demurrage and more prompt shipment of consignments.

The miners' workers are asking for a law to prevent the employment of incompetent men as miners. A bill has been prepared which provides for examinations of all who seek employment, and in many respects modeled after the Pennsylvania law. The bill provides for a commission of three miners, to be appointed by the Circuit Judge, whose salaries are to be paid by a fee of $1 from each applicant for a license. The applicant will be required to have had two years' experience as a mine laborer. It is understood that the operators will not oppose the bill, since the matter is largely within the province of the mine workers, and if they assume the responsibility to provide competent licensed men, the mine owners may escape the responsibility of their negligent acts.

The miners are still refusing to return to work in the Rosebud mine, where the serious explosion occurred. The conditions that the company insists upon, and to which the miners object, is that shot-firers shall examine all shots before they are set off, and if an illegal shot is found, the shot-firer shall make a report of it, including the name of the miner who put in the shot. The company also insists that when the miners return to work they shall fire their own shots on the first day. The miners profess to see in these restrictions the hand of the liability company which carries insurance in the mine, and recognize in it an effort to get evidence for the defense in the damage suits which will be brought by the victims of the Rosebud explosion against the Vandalia Coal Company and the liability company. The 30 injured miners have retained legal counsel in order to sue for damages.

There is a bitter contention between the miners on the one hand and the mine inspector and the company on the other hand as to whether it was a dust or a smoke explosion. The miners are greatly displeased with Inspector Epperson for deciding that it was a smoke explosion and will, they say, endeavor to prevent his reappointment.

There is considerable interest manifested in the proposed investigation of the coal-producing industry of Indiana by the Interstate Commerce Commission in February next. The commission proposes to direct its attention to the coal mines of the State with a view of ascertaining just how closely identified some of the mining companies are with railroads of the State. A point to be determined is whether stock in any of the Indiana coal mines is owned by railroad companies, and to what extent that ownership cripples the marketing facilities of competing mines.

The Indiana Railroad Commission has suspected for some time that the management of the Southern Indiana Railroad is heavily interested in coal mines in southern Indiana, and this fact accounts for the alleged discrimination in favor of these mines in the supply of cars to move the coal.

Careful and scientific tests are being made at the Indiana Penitentiary, at Jeffersonville, with a view of deciding, if possible, the relative standard of merit, as far as the uses of that and similar State institutions are concerned, between Pittsburg river and Indiana coal. The two coals are now being used in competition—the former at $1.97 and the latter at $1.45 a ton.

It is asserted by the advocates of the Pittsburg coal that the difference in price is more than counterbalanced by the superiority of the coal. The Indiana coal men dispute this, and a thorough test of the question is being made, with a careful record of results obtained with each class of coal. The State hopes to base future contracts for coal on the basis of the relative values ascertained by the tests.

Safety Devices

The first international exposition of safety devices is being held in the American Museum of National History, New York City, under the auspices of the American Institute of Social Service. The object of the exhibition is to promote social and industrial betterment by means of a museum of safety appliances.

The devices for reducing the possibility of accident, which are shown by their makers, include various kinds of safety-valves, car-couplings, fire extinguishers, emery-wheel protectors, engine-stop devices, window guards, non-explosive oil-cans, etc. Safety appliances directly applicable to the mining or metallurgical industries are conspicuous by their absence. One elevator or mine-cage safety-catch is shown and there are a few devices which might be used at a mine or smelter, but nearly all are more directly applicable to other industries. No miners' safety-lamp is on exhibition, with the exception of a portable electric lamp which the makers claim may be used in underground work.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

In ventilating an underground mine stable, it is generally advisable to have the return current from the stable pass through a regulator, so as to prevent any drafts that might injure the overhead mules brought in from work.

In arranging the drives from a line of shafting, it should be remembered that if the pulleys or sprockets are distributed equally along its length, and the power applied in the middle, the strength of the shaft need only be half as great as would be required if the application of the power were at one end.

Where a mine has two hoisting shafts, one for rock and timber, and one for coal, the underground arrangement of the tracks, etc., at the bottom, should be so planned that in case of injury to the main hoist the cars loaded with coal can be promptly switched to the other shaft and the hoisting continued without delay.

Great pressure on a coal seam, due to the heavy overlying strata, may be the cause of a serious mine fire. Such a result is more likely to occur when the coal bed is deep, and when the pillars are being robbed on the retreat. The pressure first breaks the coal, and then grinds it to a powder, which action is accompanied by considerable heat.

The idea seems to prevail that oak props will support a greater load than most any other kind of timber; this is not the case, for experiment has shown that black or yellow locust props will resist a greater crushing load than any other wood. Following locust, in their degree of strength, may be mentioned, Georgia pine, black or sugar maple, hickory and birch.

It is especially important in ventilating an inclined seam, to see that the intake air, which is generally cooler than the return, is conducted at once to the lowest portion of the workings, from which point it gradually absorbs heat and tends to ascend to the higher workings. This system creates a motive column which naturally assists the entire ventilation of the mine.

The principal result obtained in splitting an air-current is a reduction in the velocity of the air with the same pressure, and a consequent saving in power. The practical limit to splitting the air is readily determined by remembering that the velocity of the current must not fall below 200 ft. per min. in non-gaseous, and 300 ft. per min. in workings where gas is found. It is necessary therefore to always calculate first and see if the velocity of the air-current is far enough above the limit to permit a reduction by splitting.

Where a mine fire has occurred and the affected portions of the mine have been sealed up, much care must be exercised in again opening the workings. In performing this work, the return dam should be opened first. It is advisable to drill only a small hole through the stopping and then to insert a pipe having a spigot, or cap, attached. This arrangement will permit testing the air in the sealed workings; and if much gas is present behind the dam, it can be drawn off gradually into the return. It is also possible in this manner to tap and let off any water that is accumulated behind the stopping.

In a mine where the coal has both face and butt cleavage, the superintendent often determines his methods of working solely from the fact that the coal is easier to mine by driving either to the face or butt. Under such conditions, when the cleats in the coal are good, it is sometimes best to drive the entries and room at an angle of 45 deg. to the main line of cleavage. This method is often made more advisable from the fact that the joints in the roof frequently coincide with the cleats in the coal, and if the places are then driven to the face or butt, the roof is made dangerous, and much expense is incurred in timbering and cleaning up falls.

In an underground mine stable it has generally been advocated that the heavy plank floor for the stalls should be nailed to sills which are sufficiently raised to allow a space of 2 or 3 in. for the air to circulate between the concrete bottom and the planking. This practice is now abandoned at many mines; the concrete bottom is carefully graded, and the planking is laid flat on the floor. The reason for this action is based on the fact that some of the mules, constantly paw the floor until the planks are worn through, and if there is an open space under the wooden floor the mules' hoofs are liable to get caught, and an injury result. Further investigation also shows that the planks used for a bottom swell and the cracks become tight, so that no water leaks through and causes the timber to rot, nor is the stall more unsanitary.

In a mine where considerable timbering is necessary, and many props are used to support the roof, it is found advisable to taper the bottom end of a prop before setting. The pointed end of the prop is then set in a hole cut in the floor. The advantage of this method lies in the fact that the weakest point of the prop is near the floor, and consequently, when the weight of the roof comes on, the point of the prop crushes or spreads, instead of the timber breaking in the center. The prop can now be removed, and after cutting off the bottom, can be re-pointed and used where the seam is lower. It is well to remember, however, that tapered props cannot be used satisfactorily when the bottom is soft, since the pointed end instead of crushing, only sinks further into the strata. The only disadvantage of tapered props results from the difficulty experienced in withdrawing the timber.

At many anthracite mines, it is the practice to whitewash the stables and the sides and roof of all entries near the foot of the shaft. This not only looks better and is sanitary, but has the further advantage of lessening the imediate danger from dust. In this whitewashing, two men are employed; a tub full of whitewash is provided, and one man operates a hand air-compressor, keeping the pressure at about 100 lb., as shown by a dial indicator attached to the compressor. A suction pipe, with a screened end, draws the whitewash from the tub, while the other man holds the nozzle of a long pipe and sprays the sides and top of the entry. The arrangement is portable and can be carried by the two men. In outside work for painting fences, etc., a pressure of 175 lb. is used, as paint is thicker, and requires more pressure behind it than whitewash. Steam can be used instead of compressed air, but does not act as satisfactorily.

It is necessary to perform only rough experiments in order to show how important it is to properly lubricate surfaces that move in contact, and thus effect a material saving in the power expended. The coefficient of friction may be expressed either in pounds per ton, or as a decimal. A 200-lb. block, having a dry, plane surface, rested on another larger and stationary block, and in order to slide the former, it required 80 lb. pressure, the coefficient of friction in this case was then, 80/200 or 0.40. It has been proved in experiments of this kind, that when the surfaces of the two blocks are perfectly lubricated, the coefficient of friction is reduced to about 0.08. In a similar manner, the friction coefficient of wrought iron on wood, is reduced from 0.60 when dry to 0.09 when lubricated; also the friction of steel on cast iron, which is 0.20 when dry, is reduced one-half by lubrication. These figures go to prove how necessary to economy is proper lubrication of friction bearings in machinery and rolling stock.

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*Illustrated.

Inquiries as to Mines

We receive many inquiries as to mines and mining companies. In most cases, where the inquiries relate to investments, we urge always that information be sought from a mining engineer resident in the district. The professional directory published in the advertising pages of the JOURNAL gives names and addresses of many reliable engineers in all parts of North America who will for a fee commensurate with the service desired be glad to reply to reasonable inquiries.

Our function is to publish the news, and all that we are able to communicate is given in our columns. The mining news is classified in such a way that what is looked for may readily be found. Many who are not regular readers of the JOURNAL would find that, if they should subscribe and become regular readers, the information desired is to be found in its columns. If it should happen to be otherwise, as a further aid we will request our correspondents to communicate the latest available news as to any property inquired about, provided the inquiry states its location.

This is the most we can do. We cannot enter into any correspondence as to such inquiries, because the number is too large, and we cannot make searches through our back files, because the time required is too great. We do not spare efforts to provide the news and we urge all who desire such information to obtain it by a careful reading of the paper. Such a reading, to be valuable, should be continuous. We are frequently requested by inquirers to send a marked copy, or otherwise notify them, when something about a particular mine is published. We cannot agree to do it. They must read the paper.

The Statistical Work of the Geological Survey

With the publication of the "Mineral Resources of the United States" for 1905, which will shortly be ready, the Geological Survey will abandon a long practice in its statistical work in favor of a new plan. During the last 31 years the industrial and statistical reports incorporated in the "Mineral Resources" have been largely prepared by a corps of outside experts. Hereafter these reports will be made by members of the Survey proper. We do not venture to predict how the new departure will work out. There is much to be said in favor of each system. It will be admitted that the expert ought to be a more competent statistician in his particular line than the non-expert can ever hope to be. On the other hand, it may happen that the expert may perform his work in the perfunctory and unsatisfactory way that has many times led us to criticize the results of the Division of Mineral Statistics.

It is possible, indeed is to be expected, that the members of the staff of the Geological Survey will make themselves experts in the particular branches to which they are assigned. The excellent work of E. W. Parker, of the Survey, in collecting the statistics of the great coal industry has for several years been a prominent feature of the "Mineral Resources," and more recently the grand work of Mr. Lindgren on the gold and silver statistics is an excellent example of what may be done in this direction. If their standards are maintained in the other branches, the new departure of the Survey will be a success. However, it is questionable to what extent the geologists of the Survey may be employed in statistical work without detracting from their geological work. It would be a pity to see a system develop which would require a geologist like Mr. Lindgren to devote a large portion of his time merely to the collection of statistics.

The Federal and State Geological Surveys

One of the questions which will immediately come before the new director of the Geological Survey will be the relation between the Federal Survey and those of the various States, and the formulation of plans for harmonious work. Dissatisfaction as to the conditions which have existed for many years has recently excited a vigorous discussion. Dr. Walcott, the retiring director, was prompt to recognize, when the matter came to a head, that an improved policy could advantageously be adopted, and at his invitation a conference of State geologists was held at New York during the recent meeting of the Geological Society. The exchange of views that occurred then will be of general advantage and doubtless will lead to some plan for coöperation.

We have urged repeatedly that much of the work that has been undertaken by the

Federal Survey ought properly to have been left to the State surveys. It is proper that the Federal Survey engage itself in general geological problems, in the study of the mineral resources of the Territories, and in all matters which pertain to the national land. The development of the mineral resources of the States, where the nation has no direct interest, should be left to the States themselves, but the instances are many where the Federal Survey has carried on extensive work in States where there is no national land, and in some cases in more or less conflict with the State surveys.

It is gratifying to be able to believe that such unfortunate conditions are unlikely to continue to exist, as certainly they will not if conferences among the State geologists and the director of the United States Geological Survey are held according to the present plan, and a suitable working agreement be determined upon. It is the duty of every State which has mineral resources to provide a geological survey for their study and to lend assistance in their development. This has long been recognized by many of the States which have maintained geological organizations of high efficiency and correspondingly satisfactory results. Movements are now on foot to create geological surveys in Arkansas, Colorado and Wisconsin. This illustrates the increasing interest in the mineral resources of those States, and the recognition that the scientific work for the promotion of their development is something that the State itself ought to attend to. That view is correct. It is to be hoped that the States of Arkansas, Colorado and Wisconsin will provide sufficient appropriations not only to create geological surveys, but also to have thoroughly good ones, and having once inaugurated the work will see that it be carried on indefinitely. In modern practice, every big mining syndicate has found it necessary to employ a geologist. Certainly every State ought to have a corps of geologists, organized as a geological survey.

Copper Production in 1905

Considerable misunderstanding has resulted from the difference between our statistics of copper production in 1905 and those reported by Mr. Kirchhoff for the Geological Survey, which are adopted as the official statistics of the latter. Our report was 871,634,245 lb., which was the total of the reports made to us by all the producers in the United States, except in California, outside of Shasta county, for which we estimated the output, this being comparatively unimportant. Mr. Kirchhoff reported 901,907,843 lb.

Differences in statistical compilations do not necessarily imply inaccuracy on the part of the statisticians. They may be due, to some degree, to differences in the methods of compilation. However, in the case of the copper statistics, we believe that our method and that of the Geological Survey are substantially the same.

The difference between our statistics and those of Mr. Kirchhoff is partly in Michigan copper and partly in Western copper. As to the former, we believe that there can be no question as to who is correct. The Michigan commissioner of mineral statistics, to whom the companies make sworn statements, gives the production in 1905 as 217,762,382 lb., which is a little more than a million pounds less than we reported. As a check on the Western production, we now have the report of Waldemar Lindgren, of the Geological Survey, who in one of the most elaborate statistical investigations ever undertaken by the Survey reports the production of lead and copper in the Western States, together with the production of gold and silver. The three sets of statistics are summarized in the following table, in which for the purpose of comparison we have added to Mr. Lindgren's figures the report of Mr. Kirchhoff for the output in the Southern States and our own report for the output in Michigan.

State.	JOURNAL	Kirchhoff.	Lindgren
Alaska	4,700,000	4,800,896	[e] 4,805,248
Arizona	222,886,021	245,908,150	228,418,679
California	[a] 13,089,091	16,497,189	16,097,544
Colorado	9,854,176	9,404,580	9,404,830
Idaho	6,500,000	7,921,585	7,521,585
Montana	319,170,885	314,750,582	304,724,926
New Mexico	5,638,342	5,361,192	6,126,025
Utah	54,950,784	58,154,493	57,248,054
Wyoming	2,404,201	2,500,541	2,304,008
Other States	1,550,000	1,484,274	1,398,797
Western	637,729,510	676,481,891	[e] 638,558,286
Southern	11,907,982	15,141,060	[d] 15,141,060
Michigan	218,909,753	210,285,892	[e] 218,900,754
Total	871,634,245	901,907,843	872,692,999

[a] To be changed to 16,497,189.
[b] To be changed to 875,541,741.
[c] Total of figures reported by W. Lindgren.
[d] Figure reported by C. Kirchhoff.
[e] Figure reported by ENGINEERING AND MINING JOURNAL.

We think it is sufficient to call attention to the fact that the Geological Survey has two sets of figures, the later and more elaborate of which closely checks our own, which were published soon after the close of 1905. We believe that the figures given by Mr. Kirchhoff and Mr. Lindgren for the output in California, which is also the figure given by the State Mining Bureau of California, is more accurate than our own figure for that State. Consequently, in conformity with our usual practice of revising our statistics in the light of the latest authoritative information, we shall adopt 875,541,741 lb. as the output of copper in the United States in 1905. The differences among the figures for the various States is due in part to the difficulty in making the proper allocation of copper which goes from one State to another for smelting. We are satisfied as to the accuracy of our distribution.

Pig Iron Production

The statistics collected by the American Iron and Steel Association give the production of pig iron in the United States in 1906 at 25,307,191 long tons, the greatest output ever reported, and considerably more than that of Germany and Great Britain combined. This completed total, it may be noted, differs by only 0.8 per cent. from the estimate given in the JOURNAL for Jan. 5 last; the discrepancy being due chiefly to the blowing out of several furnaces in December, for necessary repairs.

The report gives the production of pig iron in the United States, for two years past, as follows, in long tons:

	1905. Tons.	Per Ct.	1906. Tons.	Per Ct.
Foundry & forge	5,847,174	25.4	5,714,492	22.6
Bessemer	12,407,116	54.0	13,840,518	54.7
Basic	4,105,179	17.9	5,018,674	19.8
Charcoal iron	352,928	1.5	433,007	1.7
Spiegel & ferro	289,983	1.2	300,500	1.2
Total	22,992,380	100.0	22,307,191	100.0

Foundry and forge iron showed a decrease last year of 122,682 tons. All other classes showed increases: bessemer, 1,433,402 tons; basic, 913,495; charcoal, 80,079; spiegel and ferro, 10,517 tons. The total gain was 2,314,811 tons, or 10.1 per cent. The most marked proportional change was in basic iron, which increased 22.3 per cent., while the gain in bessemer pig was 11.6 per cent. Foundry and forge irons lost 2.1 per cent.; while there were increases of 22.7 per cent. in charcoal pig and of 3.6 per cent. in spiegeleisen and ferromanganese.

The changes last year emphasize once more the steadily growing importance of the basic open-hearth process in this country. Nearly one-fifth of the pig iron made last year was basic iron, and this compares with less than 10 per cent. only five years ago. The classification, how-

open-hearth process, since no inconsiderable part of the bessemer pig—which in

[illegible] the fact that in [illegible] 1906 was 8,023,127 [illegible] consumption has grown quite as [illegible] the great output of last year it was necessary during the closing months of the year to import some iron to meet immediate require-

Mendeleef

Prof. Dimitri Ivanovitch Mendeleef died at St. Petersburg, Feb. 2. He was one of the world's most renowned chemists, and one of the few scientists who have had the distinction of discovering a great natural law. The name of Mendeleef will ever be associated with the periodic law. Others had previously suggested a relation among the elements, but it remained for Mendeleef to formulate the various, more or less vague, ideas in a logical, working hypothesis. The general truth of that hypothesis was early proved in a dramatic way, the story of which is one of the classics of chemical literature.

On the basis of his hypothesis, Mendeleef predicted the existence of three [illegible] and outlined their properties. It was not long before the three elements were discovered and isolated. They were what we know now as gallium, germanium, and scandium. Later discoveries in chemistry caused considerable revision of Mendeleef's original tabulation, but the principle remains unshaken and is regarded as one of the great fundamental laws of nature.

Prof. Mendeleef was born at Tobolsk, Siberia, in 1834, and in addition to being a distinguished chemist, was a geologist, philosopher and educationalist. He was the author of several important treatises on chemical subjects, and at the meeting of the Royal Society, last year, received the Cowley gold medal, esteemed among chemists as a high honor.

Production of Spelter in 1906

With their usual commendable promptness, Henry R. Merton & Co., Ltd., of London, have published their annual statistics of the production of spelter in the world. The figures, in tons of 2240 lb., for the last three years, are given in the following table:

	1904.	1905.	1906.
Belgium	145,780	144,500	150,000
Rhine	64,360	66,185	67,615
Holland	12,895	13,550	14,420
Great Britain	45,180	50,195	51,760
France-Spain	18,310	44,575	52,940
Silesia	124,095	127,895	134,180
Austria-Italy	1,100	9,210	10,610
Poland	19,440	7,920	9,460
Europe	452,070	467,360	491,045
Australia	[illegible]	[illegible]	1,000
America	163,290	180,460	196,245
Total	615,290	647,720	688,300

The figure for the United States, namely, 196,245 long tons, or 219,794 short tons, is somewhat lower than our report, Jan. 5, 1907, which was 225,395 tons, and we are of the opinion is too low. The United States showed the largest increase of any of the countries, but not enough to enable it to take the first place among the spelter producers. This is still held by Germany, which comprises the Rhine district and Silesia. Both Belgium and Silesia continued to show the large rate of increase which has been manifest for several years. Otherwise, the statistics disclose nothing of special interest. Poland regained its former position, the labor troubles which checked production in 1905 having been overcome. The increase in Great Britain was smaller than we had reason, a year ago, to expect, but that country will acquire a much more prominent position when the new works for the smelting of Australian ore, which are now being built, come into operation.

The Copper Bank

The organization of the National Copper Bank, which is talked of and probably will be consummated, ought to have an important effect on the copper-mining industry, especially in so far as investments and speculation in the stocks are concerned. The great reason for the prestige of Boston in those directions is the fact that the bankers there long ago became conversant with the value of many copper mines, and have been willing and anxious to accept their stock as collateral.

In New York it has been different. Loans on mining securities are made only under exceptional conditions. As a whole, the bankers, through ignorance, are unable to discriminate among the mining companies, and offers of their shares as security are looked at askance or refused flatly. Obviously, the National Copper Bank, which is to be backed by important mining capitalists, will be in a well-informed position. It ought to be, and doubtless will be, of benefit to the mining industry.

TASMANIA, like Utah, has its smelter-smoke question, a deputation of members of the town board of Queenstown having recently taken up the question of preventing or minimizing the escape of sulphurous gases from the Mt. Lyell furnaces. Mr. Sticht held out very little hope of an amelioration of the difficulty. This is one of the great metallurgical problems of the day, being of far more consequence now than formerly because of the immensely greater volumes of gas that are discharged by modern smelting works, which have been greatly increased in size. The problem is engaging the attention of the ablest metallurgists in several parts of the world.

HOW MANY OF the investing public know that in mining stock-jobbing, as in the patent-medicine business, the "sucker-list" plays an important part? The promoters, who look to the gullible for capital, income and profit, use a list of names of people known or supposed to be particularly susceptible to the blandishment of the get-rich-quick circular. This collection of names is treasured as a valuable asset and when it has been worked until it has brought in the last possible investor it is sold to the next promoter who has a scheme and a fine flow of language.

THE FIRST STATISTICS of the copper production in the world in 1906 come in the annual report of James Lewis & Son's, metal merchants, of Liverpool. Using the JOURNAL'S statistics for the production in the United States, this firm estimates the total production of the world in 1906 at about 730,000 long tons, against 708,000 tons in 1905, the increase being just about 3 per cent. There was an important increase in the production of Japan, Australia, and Spain, but some of the other countries showed decreases.

THE ABANDONMENT of the proposed consolidation of Lake Superior mining companies, which appears to have been due chiefly to failure to come to terms as to the value of the Copper Range property, is a cause for congratulation on several accounts. It checks a further step toward concentration of copper production and preserves to the Boston market some of its best mining securities.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

The Need of Field Work in the Study of Ore Genesis

In an article published by the Journal on Nov. 17, Messrs. Campbell and Knight have shown in an interesting way how the methods of metallography may be applied to the study of ores, using polished surfaces by reflected light instead of the thin sections generally used in petrography. For opaque substances the method supplements usefully the work of the petrographer, and, as they have shown for certain nickel ores and the complex silver ores of the Cobalt region,[1] gives the order of succession of the minerals now composing the ores. It should be kept in mind, however, that the new methods, like those of the older petrography, need to be constantly checked by the results of field work to prevent false conclusions.

Among other nickel ores those of the Sudbury region have been examined and the order of deposit of the minerals in ore from several of the mines has been worked out, no doubt correctly, for the specimens studied. When, however, they go on to suggest that the origin of these ores was by deposit from solution, and replacement of silicates in a shattered rock, it is evident that they are drawing widely reaching conclusions from very narrow premises.

In reality the present relationships of the different minerals may be due to secondary rearrangements and so may give very little information as to the original source of the ores. In my large collection of thin sections of Sudbury norites and pyrrhotite-norites there are some badly weathered specimens which might be interpreted as Messrs. Campbell and Knight have interpreted their polished specimens; but the freshest sections, from the Creighton and Murray mines, give evidence of quite an opposite kind. In them biotite and hypersthene often inclose sharply edged particles and rounded masses of pyrrhotite and chalcopyrite, and in two cases pyrrhotite was found inclosed in magnetite. As the silicates and magnetite are often perfectly fresh and unchanged, this strongly suggests that the sulphides were part of the original magma and associated themselves with the ferromagnesian minerals when consolidation took place.

There is no hint of rounding or replacement of the pyroxenes or plagioclases with which the ore comes in contact, and the rock-forming minerals in the sections containing sulphides are in quite as unshattered and normal a condition as in fresh norites free from ore. How little circulating water had to do with the distribution of these sulphides is shown by the freshness of the hypersthenes beside them or inclosing them.

Petrographers know how subject hypersthene is to rearrangement. It is a curious and suggestive fact that the freshest examples of norite were collected at or near three of the great mines, the Creighton, the Murray and the Blezard, while in most of the norites from other localities at a distance from orebodies the hypersthene has been completely transformed to uralite or hornblende.

The broad field relationships are, however, far more important in judging of the origin of these ores than the study of thin sections of fresh of weathered rock, and those who wish to see in detail the evidence for magmatic segregation of the nickel ores may find it in Dr. Barlow's able report on the main nickel range,[2] or the present writer's final report on the region as a whole.[3] It may not be amiss, however, to give an outline of the field results, so as to show how strong the evidence is in favor of the theory of magmatic segregation.

All the ore deposits are connected with a single great sheet of eruptive rock, consisting of norite beneath and micro-pigmatite above. The ores occur as parts of the basic lower edge or as offsets from it, and no ore is found where norite is absent. The largest ore deposits occupy bay-like depressions of the country rock or offsets from such bays, since the ore was heavier than the norite and sank into all the hollows and openings of the rock beneath. Both ore and norite grow finer grained against the country rock.

Marginal ore deposits, like the Creighton mine, pass gradually into norite, the sulphides containing first a few crystals of plagioclase or pyroxene, then more and more of the rock-forming silicates, until the two are equally mixed, forming pyrrhotite-norite. Still farther in, one finds rock with scattered blebs or particles of ore, which may continue sparsely for hundreds of yards from the orebody.

On the other hand, the sulphides are never evenly disseminated through the country rock, which may be granite, gneiss, greenstone or graywacke, without having any effect on the character of the ore. The sulphides often penetrate the country rock as small ramifying veins, and inclose blocks of it. The ores are remarkably uniform round the whole nickel basin, which is 36 miles long by 16 miles wide. They are as monotonous as the norite, with which they are associated.

In the great marginal orebodies, like the Creighton and Murray mines, there is scarcely a hint of water action except in a few tiny later veins with some quartz and calcite. There is no trace of banding or crustation, no concentric structure round inclosed fragments of rock. That there has been some later rearrangement is shown, however, by the thin films of chalcopyrite penetrating seams in diabase dikes cutting the orebodies.

In some of the offset deposits, such as the Copper Cliff, water action is more prominent, though the ore is everywhere accompanied by norite spotted with sulphides, as in the marginal mines. Small amounts of quartz and carbonates occur as gangue minerals and sometimes a few other sulphides are found. Probably hot fluids circulated from the edge of the eruptive during the slow cooling of the sheet and modified and rearranged the minerals the offsets to a greater degree than in the marginal mines.

From the outline of the field relationships just given it will be seen how easily the orebodies may be accounted for by magmatic segregation, aided by gravity, and what serious difficulties lie in the way of any hydrothermal theory of their origin. Why should circulating water deposit precisely the same ores all round a vast sheet of eruptive rock and nowhere else, always at outward bays of the margin of the sheet and never at the inward bends? Why should circulating water leave no important traces of its action in the way of banding of the ores or the presence of gangue minerals? And finally, why should circulating water, with no visible channels, disseminate blebs of pyrrhotite and chalcopyrite through cubic miles of fresh norite, and carefully avoid such action on granite or greenstone on the opposite side of the marginal orebodies?

Until such questions as these can be answered it will be wise to retain the theory of magmatic segregation as the cause of the Sudbury ore deposits at least

[1] *Economic Geology*, Vol. I, No. 3, pp. 247 etc.

[2] *Ann. Rep. Can.*, Part H, 1904.

[3] *Bur. Mines of Ontario*, Part III, 1905.

and Professor Vogt's accounts of the Norwegian nickel ores make the theory equally probable in their case.

In conclusion, it should be said that the writer has no wish to disparage the work of Messrs. Campbell and Knight, which is very useful in giving the order of succession of ores deposited by water, such as those of the Cobalt silver district. It must be kept in mind, however, that the method shows only the latest arrangement of the minerals studied, and may throw very little light on the original source of the ores. A. P. COLEMAN.

University of Toronto, Toronto, Canada.

Increase of Moisture in Coke Shipped in Sealed Cars

The following corespondence has been referred to the JOURNAL with the hope that it may bring out a discussion of an interesting and perplexing problem.

What is the source of the moisture which appears in and about fresh coke when shipped in sealed box-cars? Opinion seems to be unanimous that water does enter or form in some mysterious way, but how has not been explained to the satisfaction of everyone. The theory suggested rather than advanced as an adequate explanation in one of the letters is ingenious and invites further discussion. W. N. Page, Pres., Ansted, W. Va.

My dear Mr. Page—I have been with the Pocahontas Coke Company for the past fifteen months, and we have a very large trade in Mexico, shipping via Lamberts Point and water to Tampico, thence all rail inland. We have had considerable trouble with moisture in coke at destination; one of our customers, the Mining Smelting and Refining Company, of Monterey, advising that the coke runs "in some cases, as high as 12 per cent. moisture, and our experience, covering a period of many years, shows that the general average will be between 4 and 6 per cent."

Of course, we know that there is no such amount of moisture in the coke when it leaves the ovens here, or in fact when it starts on its ocean voyage, and while some of it is loaded on deck, the great bulk of it goes in the hold of the ship, and should be protected from any moisture while on the water. After the coke is discharged in Mexico, especially during the dry season, it would seem to us that it should go through to its destination through some unaccountable reason, in without acquiring any moisture at all, in fact it should be even drier than when it left the ovens here.

My undertsanding is that it is the practice of loading this coke in box-cars with closed doors at Tampico, and in talking the matter over a few days ago with our mutual friend, J. A. Renahan, I learned of a similar experience with moisture which you had years ago, in shipping Gauley Mountain coke to Dennis Long & Company, Louisville, and advised that box-cars with closed doors, the coke arrived in Louisville so moist that water would run on the floor of the car and out of the doors.

Mr. Renahan advised that you made a trip to Louisville to investigate the trouble, and found that it was due to some chemical action of the air on the coke when inclosed in practically air-tight cars, and that this caused the coke to absorb moisture from the air and of course resulted in complaints from consignees on account of excessive moisture.

It has since struck me that I might impose on your good nature by asking you to write me at your leisure, an explanation of what our trouble might be in Mexico, and if you will be good enough to do it, at the same time advising what might be the remedy, I will certainly be very much indebted to you. As you will note from the above quotation, the trouble here has been one of long standing, and if I can give our friends in Mexico a satisfactory explanation of it, I am sure they, as well as myself, will feel under many obligations to you.

T. F. FARRELL, General Manager
Pocahontas Coke Company.

Bluefield, W. Va., Jan. 15, 1907.

The reply to this request follows:

My dear Mr. Farrell—Referring to your troubles with coke shipments to Mexico, I can state positively that freshly drawn coke loaded in sealed box-cars, in hot weather, will accumulate moisture, which, I think, is due to chemical action, and not to the absorption of moisture from the atmosphere. In the case you refer to I supervised the loading of 10 box-cars with freshly drawn coke, still warm from the oven, and containing less than 1 per cent. moisture. When this coke reached Louisville it contained 12 per cent. moisture, and water was dripping from the bottom of the cars. The same coke, when saturated in water for 48 hours, absorbed only 10 per cent. of moisture, showing that the cells contained water which could not have been absorbed by saturation. I wrote the principal coke manufacturers of the Connellsville district, asking their experience and theory upon the subject, and they all replied admitting the fact that when their cars were sealed they had complaints of water, which they never had when the doors were left open. They had no theory, but recognized the fact.

I published an article upon the subject in the ENGINEERING AND MINING JOURNAL, hoping to draw out a discussion and lead to a scientific investigation, but without success.

My own theory is that in watering down the coke in the ovens, superheated steam passing through the cell structure of the coke finds enough iron to combine with the oxygen, leaving the hydrogen free, which is caught in the cells of the coke and partly sealed by the carbon glaze, and that later on this hydrogen is given off slowly. Two atoms of hydrogen and one of oxygen, as you probably know, make water (H_2O), but this chemical union is generally accompanied by an explosion. It is a well known fact in chemistry, however, that certain substances, such as platinum sponge and fresh carbon, will combine oxygen and hydrogen gases into water without an explosion, and when coke is sealed in a car, or hold of a vessel, it is reasonable to presume that, as the hydrogen is given off, it unites with the oxygen, in contact with the carbon of the coke.

My experience, however, is that this trouble is most marked in hot weather, with freshly drawn coke, and with cokes that have the most glaze, such as Gauley Mountain and Connellsville. It is possible, however, that you may have the same trouble with Pocahontas coke (which as a rule is not glazed) in the tight hold of the vessel. In your case I would be inclined to look for the trouble elsewhere, either from contact with water from the ocean or from rains. If, however, you find the water is due to chemical action, the only remedy I can suggest is to keep the coke exposed to the atmosphere long enough to permit the escape of the hydrogen before shipment.

For years I have had trouble with the Chesapeake & Ohio Railway officials in keeping the car doors open. Orders are frequently issued to close and seal the doors on our coke shipments, and whenever this has been done I have had complaints of water, and it is still necessary to go into long explanations with these officials whenever such orders are issued. In several cases I have had complaints of water, and found that the doors had been closed and sealed in transit.

WM. N. PAGE.

January 17, 1907.

Detonators and Explosives

My attention was called, a short time ago, to two statements under the heading "Metallics" in the JOURNAL of December 29, 1906. The first one reads:

"While fire or shock may explode powder under favorable conditions, the use of a detonator is necessary to obtain the most power from the explosive."

This statement appears to me so vague and general in its wording, that it might lead a casual reader to form wrong conclusions. For instance, black powder can be exploded by flame and not by shock. Straight dynamite and gelatine dynamite can be exploded by shock, and yet, frequently, small amounts of these explosives burn harmlessly without any explosion whatever. The English government inspectors of explosives in one of their annual reports say that with care high explosives can be burned without explosion in lots up to 600 pounds.

The second statement reads:

"Dynamite can be detonated with two

grains of fulminate, but it requires at least ten grains of fulminate to detonate guncotton."

While I do not doubt the accuracy of this statement as regards the action of fulminate with fresh dynamite, I think this statement is liable to lead some users of explosives to follow methods not in accordance with the best practice.

Modern practice with high explosives has shown that the best results are obtained by using very strong detonators. The use of powerful detonators is recommended by all the leading manufacturers of explosives. The weakest cap sold by the DuPont company has a charge of 7.7 grains, and with the gelatine dynamite no complaint will be entertained unless a cap or exploder equivalent to a DuPont quintuple strength is used

CHAS. M. BARTON.

Wilmington, Del., Jan. 29, 1907.

Volumetric Estimation of Tin

In James Darroch's reply to my criticisms in regard to his claims covering the volumetric estimation of tin he says that the article in question did not, nor did it pretend to, describe a "new volumetric" assay for tin, and he goes on to state that the essential part of the method described by him is the means adopted for getting the stannic oxide into solution.

Mr. Darroch admits that he claims no novelty for the use of ferric chloride and he says that the reaction has long been known and applied in the case of iron. This is quite true, the reaction between $FeCl_3$ and $SnCl_2$ has been known long enough. When, however, Mr. Darroch goes on to say that it has been used in the assay of tin ores as is shown in "Assaying and Metallurgical Analysis," by Rhead and Sexton, he is mistaken. The principle of the method described in the book he refers to is not the same as that of the ferric chloride titration. As Mr. Darroch says, in Rhead and Sexton's method excess of $FeCl_3$ is added and the excess estimated with $SnCl_2$, or the reduced $FeCl_2$ determined with bichromate.

I did not suggest that I was the first assayer to use the above reaction. I said I was responsible for most of its applications to tin materials, and I will add that I was the first to publish a proper description of those applications.

L. PARRY.

Huddersfield, Eng., Jan. 6.

Manganese Ore in Newfoundland

The statement that there is no reference to any deposit whatever of manganese ore in the publications of the Geological Survey of Newfoundland, is no doubt true. Nevertheless, manganese ore has been found and does exist at the town of Killegrews on Conception bay, about 16 miles west of the city of St. Johns, N. F. It underlies an area of about 4 sq. miles and is found in a stratum about 8 ft. thick.

I inclose an analysis made of the ore some four years ago by Professor Brunton of the Imperial Institute. It shows the ore to be fairly rich but it contains a somewhat large proportion of silica. This I am told can be got rid of, and the ore brought up to bessemer standard.

MANGANESE ORE FROM THE NEWFOUNDLAND DEPOSIT

Moisture	8.08	per cent.
Combined Water	8.40	per cent.
Silica	17.56	per cent.
Ferric Oxide	2.88	per cent.
Alumina	3.96	per cent.
Manganous Oxide	15.50	per cent.
Manganese Dioxide	41.13	per cent.
Lime	.28	per cent.
Magnesia	.41	per cent.
Baryta	Nil	
Cupric Oxide	.036	per cent.
Soda	.55	per cent.
Potash	.41	per cent.
Sulphur	.062	per cent.
Phosphorus	.109	per cent.
Carbon Dioxide	Trace	
Total Metallic Manganese	38.01	per cent.

J. J. WHITTLE.

New York, Dec. 20, 1906.

Potatoes as Quicksilver Retorts

To my friend Michael Gillon, an old miner and placer miner of Montana, I am indebted for the following practical idea. It is a retort for small amounts of amalgam such as the prospector, or the engineer, making test runs from prospect pits in placer ground, often has to deal with. The prospector who is perhaps far from his base of supplies does not care to pack any considerable quantity of "quick" and to him it is especially important to recover as much as possible, both for this reason and because of the value of the metal.

A "spud" with a good sound hide is selected the top taken off one end, and a small cavity hollowed out to receive the ball of amalgam. A hot iron plate (shovel, frying pan or other convenient piece) is pressed down over the cut end of the potato which is seared to the hot plate. The whole is then turned over and a bed of coals may be heaped over it. When the potato is thoroughly cooked it may be crumbled up into water. After removing the gold button, the quicksilver may be recovered by washing away the baked potato.

L. S. ROPES.

Basin, Mont. Jan. 25, 1907.

French Zinc White

Is French zinc white made in the United States? If so, where and by whom? For what purpose is it used, and what is its value as compared with ordinary American zinc white? J. F. B.

New York, Feb. 1, 1907.

French zinc white is made by the combustion of spelter, which is the method by which all of the zinc white made in Belgium (commonly known as French zinc white) is produced. It is made in the United States, at Florence, Penn., by one [illegible] Jersey Zinc Company. We know of no other manufacturer in the United States. This grade of zinc white is employed for the highest class of white painting, such as interior decoration, etc. Its value is from two to three cents per pound in excess of that of the ordinary oxide made directly from ore.

Le Roi Mining Company

This report deals with the operations during the fiscal year ended June 30, 1906, and the accounts show a balance in favor of the profit and loss account amounting to £37,138 from the year's transactions, to which is added a sum of £150,539, carried forward from the previous year, making a total of £187,077. Out of this, dividends amounting to 3½ per cent. for the year were disbursed. These were the first dividends paid by the company since 1899. A sum of £150,027 was carried forward to the accounts for the present year. The report briefly refers to the scheme of former directors for amalgamating the Le Roi with other mining and smelting interests in British Columbia, which through the energetic action of A. J. McMillan, the managing director in British Columbia, was rejected by a large majority vote of the shareholders. Mr. McMillan has succeeded in canceling the contract made between the former directors and the owners of the Trail smelters for dealing with all the Le Roi ore on terms which were reported to be against the best interests of the company. The cancelation was based on the consideration of the company supplying the smelter with a total of 170,000 tons of ore at a stipulated figure, in place of the total export of the mine for the next three years. The company's smelter at Northport is again in commission, and when the balance of the ore is supplied to the Trail smelter, all the company's ore will again be sent to Northport.

During the year reviewed, 110,042 tons of ore were mined, the average metal contents being 0.80 oz. gold; 0.54 oz. silver, and 1.16 per cent. copper, equal to an average value of $12.37 per ton. The cost of mining and delivering the ore to cars on railroad amounted to $2.84 per ton.

The development work amounted to 7180 ft., comprising 262 ft. of rising, costing $33 per ft.; 152 ft. of winzes, costing $42 per ft.; 2245 ft. of crosscutting, costing $16 per ft.; and 4522 ft. of drifting, costing $16 per ft. In addition 303 ft. of diamond drilling was done, and as the results were highly satisfactory, it was determined to commence prospecting by drilling from the 800-ft. level.

The managing director concludes his report by expressing the opinion that the mine looks better today than he has ever seen it previously, and, unless unforseen circumstances intervene, the present year promises to be a very satisfactory one for the shareholders.

New Publications

The book departments of THE ENGINEERING AND MINING JOURNAL, *Power* and the *American Machinist* have been consolidated, and the business will hereafter be transacted under the name of the Hill Publishing Company, Book Department. The company will publish scientific books of all kinds, but will pay particular attention to those which come within the fields of the three papers mentioned above. Authors, or prospective authors, of books on mining, metallurgical, chemical and mechanical engineering, industrial chemistry, economic geology and general technical subjects are requested to correspond with the Hill Publishing Company with a view to their publication.

"Illustriertes Handlexikon." By Karl Selbach. Pp. 160; illustrated. 7x11 in.; paper, 6 marks. Leipzig, 1906: Carl Scholtze.

"Punches, Dies and Tools for Manufacturing in Presses." By Joseph V. Woodworth. Pp. 483; illustrated. 6x9 in.; cloth, $4. New York, 1906: Norman W. Henley Publishing Company.

"The Yukon-Tanana Region, Alaska. Description of Circle Quadrangle." By L. M. Prindle. U. S. Geological Survey, Bulletin No. 295. Pp. 27; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Geology and Gold Deposits of the Cripple Creek District, Colorado." By Waldemar Lindgren and Frederick Leslie Ransome. U. S. Geological Survey, Professional Paper No. 54. Pp. 516; illustrated. 9x11½ in.; paper. Washington, 1906: Government Printing Office.

"Electrical Wiring and Construction Tables." By Henry C. Horstmann and Victor H. Tousley. Pp. 118; illustrated. 4x6 in.; leather, $1.50. Chicago, 1907: Frederick J Drake & Co.

Contents. Direct current wiring tables. Alternating current wiring tables. Economy of conductors. Miscellaneous. Calculation of materials. Conduits and wires. Tables of carrying capacities.

"Practical Metal Turning. A Handbook for Machinists, Technical Students and Amateurs." By Joseph G. Horner. Pp. 404; illustrated. 5½x8 in.; cloth, $3.50. New York, 1906: Norman W. Henley Publishing Company.

Contents. The lathe, its work and the tools. Turning between centers. Work supported at one end. Internal work. Screw cutting and turret work. Miscellaneous matters.

"Manufacture of Metallic Objects Electrolytically. Electro-Engraving." By W. Pfanhauser. Authorized English Translation by Joseph W. Richards. Pp. 162; illustrated. 6x9 in.; cloth, $1.25. Easton, Penn., 1906: Chemical Publishing Company.

Contents. Historical review. Baths for copper galvanoplasty. Physical properties of the copper deposit. Behavior of copper anodes. Constants of the bath and calculation of the amount of deposit. Industrial plants. Particular devices for special purposes. Production of uniform deposits. Manufacture of metallic powders and the like. Manufacture of metallic foil. Production of wire, etc. Manufacture of bodies of large size. Manufacture of parabolic mirrors. Manufacture of tubes. Electrolytic etching. Electrolytic engraving. Appendix.

"Modern Milling Machines, Their Design, Construction and Working. A Handbook for Practical Men and Engineering Students." By Joseph G. Horner. Pp. 304; illustrated. 6x8½ in.; cloth, $4. New York, 1906: Norman W. Henley Publishing Company. London: Crosby, Lockwood & Son.

Contents. The leading elements of milling machine design and construction. Plain and universal machines. Attachments and bracings. Vertical spindle machines. Piano-millers or slabbing machines. Special machines. Cutters. Milling operations. Indexing, spiral work, and worm, spur and bevel gears, etc. Spur and bevel gears. Feeds and speeds.

Patents Relating to Mining and Metallurgy

UNITED STATES

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Jan. 15, 1907.

GAS-PRODUCER—Cyril J. Atkinson, Milwaukee, Wis., assignor to International Harvester Company. No. 841,100. Filed May 7, 1906.

PROCESS OF TREATING ORES—Charles E. Baker and Arthur W. Burwell, Cleveland, Ohio. No. 841,103. Filed Mar. 1, 1905. Renewed July 5, 1906.

GAS-PRODUCER—Henry K. Cowen, Chicago, Ill., assignor to International Harvester Company. No. 841,123. Filed May 7, 1906.

ROCK-DRILL—Arthur H. Gibson, Easton, Pa., assignor to The Ingersoll-Sergeant Drill Company, New York, N. Y. No. 841,139. Filed July 28, 1905.

EXPLOSIVE—August L. Nienstadt, Newark, N. J., assignor of one-half to George H. Rosenblatt, New York, N. Y. No. 841,172. Filed Jan. 30, 1906.

PROCESS OF MIXING METALS—John D. Prince, New York, N. Y., and Howard S. Rodgers, Covington, Ky. No. 841,178. Filed April 16 1904.

COMBINED GAS-GENERATOR AND SMELTER—William H. Adams and Frederick Powell, Portland, Oregon, assignors of twenty-five one-hundredths to said Adams, fifteen one-hundredths to said Powell, and sixty one-hundredths to The Ladd Metals Company, Portland, Oregon. No. 841,212. Filed July 16, 1904.

WELL-DRILLING APPARATUS—George D. Loomis Tiffin, Ohio. No. 841,259. Filed May 12, 1906.

MINE-CAR BRAKE-SHOE—Daniel S. Miller and John M. Landfair, Black Lick Station, Pa. No. 841,264. Filed Sept. 26, 1906.

ART OF CASTING METAL—Charles S. Sanders, Sr., New York, N. Y., assignor to Metal Moulds Corporation, New Jersey. No. 841,279. Filed Dec. 14, 1903. Renewed Apr. 25, 1906.

MOLD FOR CASTING CHILLED ROLLS—Ralph H. West, Sharpsville, Pa. No. 841,293. Filed May 3, 1906.

PIGMENT AND PROCESS OF MAKING SAME—William J. Armbruster, St. Louis, Mo. No. 841,303. Filed Nov. 8, 1902. Renewed June 3, 1905.

ORE CHLORINATION—Wintworth V. Lander, Newton, Mass. No. 841,328. Filed April 27, 1906.

CHLORINATING APPARATUS—Wintworth V. Lander, Newton, Mass. No. 841,329. Filed Apr. 27, 1906.

ORE-CYANIDING—Wintworth V. Lander, Newton, Mass. No. 841,330. Filed Apr. 27, 1906.

CYANIDING APPARATUS—Wintworth V. Lander, Newton, Mass. No. 841,331. Filed April 27, 1906.

COAL-WASHER—William M. Duncan, Alton, Ill. No. 841,382. Filed Sept. 4, 1906.

MINE-SHAFT—Josef Mika, Bottrop, Germany. No. 841,416. Filed Apr. 4, 1906.

ASSAY-BALANCE—Robert G. Ainsworth, Denver, Colo. No. 841,477. Filed May 8, 1905.

PROCESS OF MANUFACTURING POWER-GAS—Emil Fleischer, Dresden-Strehlen, Germany, assignor to Jakob Eduard Goldschmid, Frankfort-on-the-Main, Germany. No. 841,499. Filed Nov. 30, 1904.

SULPHUR-BURNER—Charles E. Savage, Groveton, N. H. No. 841,576. Filed Oct. 24, 1906.

AERIAL SYSTEM FOR MINING PURPOSES—George G. Schroeder, Washington, D. C., assignor to Industrial Transportation Company. No. 841,582. Filed Oct. 10, 1904. Renewed June 25, 1906.

MINING-MACHINE—William B. Chapman, Wilburton, Ind. Ter. No. 841,625. Filed June 27, 1905.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Jan. 19, 1907.

MUFFLE FURNACE—W. F. L. Frith and C. G. Grist, London. Improved furnaces or muffles for heating steel articles to a very high temperature in an atmosphere of mercury. No. 26,578 of 1905.

PULVERIZER—W. R. Mackay, London. Improvements in pulverizing machines in which rotating arms beat round close to the periphery which is made with corrugations, or other unevenness. No. 27,080 of 1905.

METHOD FOR ELECTROLYSIS—E. Hermite, Paris, France. In electrolytic processes, means for keeping the electrolyte constantly in a saturated form. No. 2466 of 1906.

MINE DOOR ATTACHMENT—J. Mika and A. Nowrotok, Dellwig, Germany. Method of controlling the opening and shutting of mine doors. No. 3635 of 1906.

TANTALUM FILAMENTS—J. Lux, Vienna, Austria. Improved method of manufacturing tantalum filaments for use in electric lamps. No. 7803 of 1906.

NODULIZING FINE ORE—T. C. King, New York, U. S. A. Method of forming porous nodules of fine ores in suitable shape for smelting, by partially fusing the fine ores. No. 9687 of 1906.

ELECTRIC FURNACE—N. A. Wallin, Berlin, Germany. In electric smelting furnaces using induced currents, arranging the parts in such a way that the currents shall pass through the unsmelted ores instead of continuously following the reduced metal. No. 12,395 of 1906.

THERMITE—J. Buchel, Vorarlberg, Austria. Method of binding thermite into briquettes. No. 13,764 of 1906.

ELECTRIC FURNACE—K. Kaiser, Berlin, Germany. In electric furnaces such as are intended for reducing zinc from zinkiferous pyrites, using a blast of reducing gas instead of adding carbon to the charge. No. 15,818 of 1906.

AIR-DRILL—H. Flottmann, Herne, Germany. A method of rotating the drill in air drills. No. 17,828 of 1906.

JAW CRUSHER—A. James, London. In jaw breakers improved arrangements of the toggle bars and plates. No. 18,492 of 1906.

METALLURGICAL PROCESS—Rheinisch Nassauische Company, W. Borchers and A. Graumann, Aachen, Germany. Improvements in the process for extracting zinc from sulphide by the reaction of metallic iron. No. 24,096 of 1906.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. C. Haas, of Spokane, Wash., has gone East for six weeks.

C. S. Herzig, mining engineer, London, England, is in Spain on professional business.

A. J. Smith, of Central City, Colo., has returned from a visit of inspection to mining property in New Mexico.

T. R. Cudahy, of Central City, Colo., has returned from an examination of mines in the Ely district, Nevada.

F. C. Burnham, of Denver, who is heavily interested in Gilpin county, Colo., has gone east on mining business.

W. W. Degge, a Boulder county, Colo., operator, has returned from a visit to mining interests in the Nevada camps.

Robert S. Botsford, of London, left England, Jan. 17, for Buenos Aires, to take an appointment in Argentina.

F. E. Himrod, of New York, has been in Clear Creek and Gilpin counties, Colorado, looking after mining interests.

Louis D. McCall, of Chicago, has been spending a week in Gilpin county, Colo., while looking after mining interests.

W. E. Wilson, of Boulder, Colo., is paying a visit to property in which he is interested at Silver City, New Mexico.

C. L. Schellenger, a mining operator of Eldora, Boulder county, Colo., has returned from a business visit to the East.

George E. Wynne has been appointed acting general manager of the Lake Superior Corporation, at Sault Ste. Marie, Ontario.

W. M. Cooper, manager of the Capitol Prize Mining Company, of Georgetown, Colo., has returned from a business visit to Pittsburg.

George W. Teagarden, of the Ramsdell Mining Company, operating at Georgetown, Colo., has left on a business visit to eastern points.

Frank G. Carpenter left Denver recently for the Black Hills and expects to proceed thence to Bolivia, South America, on a professional trip.

Eugene Coste, of Toronto, Ont., is superintending oil-well boring operations at Langham on the Saskatchewan river, northwestern Canada.

Thomas Cornish, of Denver, has been looking at mining property in the Georgetown and Silver Plume districts, Clear Creek county, Colorado.

H. C. Hoover, of London, England, sailed last week for Australia for his perodical visit to all the properties of Bewick, Moreing & Company.

Robert R. Hedley has resigned his position as manager of the smelter of the Hall Mining and Smelting Company, Ltd., at Nelson, British Columbia.

J. H. Crawford, manager of the Scotia Mines Company, operating at Silver Plume, Colo., has returned from a visit to Kansas City, Missouri.

James A. Gilmour, of Central City, Colo., left last week for the Shoshone reservation, Wyoming, to examine mining properties for Chicago people.

Dan and Watson MacMasters, of the Grand Central Mining Company, operating at Central City, Colo., are making a business visit to New England.

J. A. McDonald has been appointed superintendent of the Ohio Steel Works and of the blast furnaces of the Carnegie Steel Company at Youngstown, Ohio.

E. A. Ritter, of Colorado Springs, Colo., is making an examination of properties in the Pine Creek district, Gilpin county, in the interest of Eastern investors.

Guy R. Johnson has been elected vice-president and general manager of the Alabama Consolidated Coal and Iron Company, with headquarters in Birmingham, Alabama.

A. J. Trone, of Thibodaux, La., has been making a visit to Clear Creek county, Colo., to look at newly acquired interests, in connection with other Louisiana capitalists.

H. C. Bellinger has resigned the management of the Britannia Smelting Company's smelting works at Crofton, Vancouver island, B. C., and has been succeeded by S. S. Raymond.

J. B. Tomlinson and B. M. Norton, of El Paso, Texas, have opened a branch office as consulting engineers, in Douglas, Arizona. In connection they have established a laboratory and assay office.

Alexander Faulds has been appointed mine superintendent for the Nicola Valley Coal and Coke Company, recently organized to open up a coal property in the Nicola district of British Columbia.

Robert W. Hunt & Co., of Chicago, have been appointed consulting engineers to the receivers of the Union Traction Company, Chicago, and placed in direct charge of the lowering of the car tunnels under the Chicago river.

B. C. Yates, J. A. Spargo, Richard Blackstone and W. S. O'Brien, officials of the Homestake Company, in South Dakota, have been visiting the Idaho Springs section of Clear Creek county, Colo., inspecting the Newhouse tunnel.

N. O. Lawton, formerly mining in Michigan and later in Newfoundland, has been appointed manager of the mines in northern British Columbia and southeast Alaska of the Brown-Alaska Company, of New York, in place of J. L. Parker.

Charles E. Coxe, mining engineer, has left Chalchihuites, Zacatecas, and is now with La Mona Mining Company at La Mona de San Pantaleon, which is about 15 miles from Sombrerete, Zacatecas, Mexico, the nearest post-office.

O. E. S. Whiteside, manager of the West Canadian Collieries, Ltd., owning coal mines in the Blairmore-Frank district, southwest Alberta, has returned to Blairmore from an extended business trip in the East.

Jeffries White has resigned his position as general superintendent of the Oaxaca Exploration Company and has accepted the position of general manager of the Providencia San Carlos Mining Company, at Taviche, Oaxaca, Mexico.

C. T. Alden has been placed in charge of the recently organized electrical department of W. S. Barstow & Co., New York and Portland, Oregon. He has been with the American Locomotive Company, the General Electric Company, and the Bath Iron Works.

W. G. Devereux, of the firm of W. B. Devereux & Sons, New York, is at present engaged in professional work in Panama; and W. B. Devereux, Jr., will be engaged in professional work during the months of February and March in southern California and Nevada.

Henry F. Lefevre returned to New York last week after spending nine months in making a thorough investigation of the mineral resources of Honduras and Nicaragua. He sails this week for Peru, on professional business, and expects to be absent until May next.

J. E. McAllister, manager for the British Columbia Copper Company, is in New York for expert medical advice, illness preventing his performing his duties. In his absence G. F. Beardsley, of West Somers, N. Y., is in charge of the company's smelting works at Greenwood, Boundary district of British Columbia.

G. M. Gouyard returned to Denver recently and left for Arizona and Mexico on professional business. He has just been appointed consulting engineer for the Bonanza Belt Copper Company, of Johnson, Arizona. Walter L. Ehrich has been appointed superintendent of that company.

P. L. Williams, Jr., has resigned the position of superintendent of the Utah Consolidated at Bingham, Utah, and has accepted the position of general superintendent of the mines under the general management of Ernest Bamberger and associates of Salt Lake. Mr. Williams has been succeeded by M. Rhiney, of Butte, Montana.

W. E. Zwicky, of Kaslo, B. C., manager of the Rambler-Cariboo Company's mine in McGuigan basin, and the Krao mine at Ainsworth, both in the Slocan district, has been appointed by the Supreme Court of British Columbia to do certain work deemed necessary to supply further evidence in the extra-lateral rights case of the Star Mining Company vs. the Byron White Company.

Obituary

H. C. Weber, superintendent of the Weber Gas Engine Company, of Kansas City, Mo., died Jan. 21, in Phœnix, Ari-

Captain T. F. Singiser died at Sioux City, Iowa, last week. He was president of the American Flag Mining Company, operating at Park City, Utah. He was formerly engaged in mining in Idaho, and served that commonwealth as delegate in Congress before it became a State.

John Osgood died at his home in New York, Jan. 31, aged 88 years. He was born in Canada, but passed most of his life in this country. He was for many years engaged in the making of iron in the northern part of New York, being one of the pioneers in the industry in that section.

Samuel T. C. Dodd died at Pinehurst, N. C., Jan. 30, aged 71 years. He was born and brought up in Franklin, Penn., and began to practice law in that town about the time of the first discovery of petroleum in the neighborhood. In the earlier contests between the Rockefeller interests and the independent producers, he took a prominent part on the independent side; but in 1881 he was appointed general solicitor of the Standard Oil Company, and held that position for 24 years, then retiring from active work, but retaining the title of general counsel.

Henry C. Sergeant died at his home, in Westfield, N. J., Jan. 30, aged 72 years. He was known all over the world as an inventor who did much to forward the mining industry by his work in connection with the rock drill and air compressor. The original power drill and many later improvements; quarrying and channeling machines; coal-cutting machinery, and air compressors, were all included in his activities. He was for many years prominent in the management of the Ingersoll-Sergeant Company. When that company and the Rand Drill Company were consolidated, a short time ago, as the Ingersoll-Rand Company, he retired from active work, on account of his health, though retaining a large interest in the new company.

Societies and Technical Schools

Iron and Steel Institute—The annual general meeting will be held in London, England, May 9 and 10 next.

Engineers' Club of Philadelphia—At the annual meeting in Philadelphia, Jan. 19, the following officers were chosen: President, Henry H. Quimby; vice-president, W. P. Dallett; secretary, Walter Loring Webb; treasurer, George T. Gwilliam; directors, J. W. Ledoux, John T. Loomis, and Emile G. Perrot.

American Institute of Mining Engineers—A circular from the secretary's office says that the ninety-second meeting of the institute for the reading and discussion of professional papers will be held in New York City, beginning probably April 18, 1907. Further particulars will be given in a later circular. By reason of the overwhelming work entailed by the London meeting, and the confusion and distraction involved in the removal of the executive offices of the institute to the new building, requiring the constant presence of its officers in this city, it was found impracticable to make arrangements for any meeting during the winter, away from New York. On the other hand, a meeting of the institute in New York, before the formal dedication of the new building, was, for obvious reasons, inadvisable. It was therefore decided to hold the next meeting in this city, immediately after the said formal dedication, the ceremonies of which are expected to take place April 16 and 17.

The annual business meeting of the corporation will be held at the office of the institute, 29 West Thirty-ninth street, New York City, on the third Tuesday in February (Feb. 19, 1907.) At this meeting, members and associates present in person or by proxy will elect three directors of the corporation, and the officers and members of the council, as required by the constitution. The following list comprises all the nominations received for officers of the council: For president of the council, John Hays Hammond, New York City; for vice-presidents of the council, Samuel B. Christy, Berkeley, Cal.; John A. Church, New York City, and Persifor Frazer, Philadelphia, Penn.; for councilors, B. F. Fackenthal, Jr., Easton, Penn.; H. O. Hofman, Boston, Mass., and Walter R. Ingalls, New York City; for secretary of the council, R. W. Raymond New York City.

Industrial

The Link-Belt Company has recently opened a new branch office in the Ellicott Square building, Buffalo, N. Y., under charge of H. C. Minier. Also one in the New York block, Seattle, Wash., in charge of A. C. Brabrook.

The Lehigh Portland Cement Company, at Allentown, Penn., has removed from its cement-manufacturing plants the cement-burning apparatus embodying the natural-draft system, which necessitates the use of high stacks in order to get the necessary draft. Compressed-air apparatus made under the Hurry & Seaman patents is being installed in place of the former system.

The Pompton Steel Works, Pompton, N. J., it is announced, will be removed to Watervliet, N. Y., where a site of about 30 acres along the tracks of the Delaware & Hudson will be occupied. The destruction of Pompton lake by a flood about three years ago, making it difficult to secure adequate water power, forced the move. The Pompton works have been in operation since Revolutionary days.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Buffalo Forge Company, Buffalo, N. Y. Catalog No. 77. Buffalo Blacksmith Tools. Pp. 37, illustrated, paper, 3½x6½ in.; 1907.

Keuffel & Esser Company, 127 Fulton street, New York City. Federal Blue Printing Machine; Reckoning Machines. Pp. 4, illustrated, paper, 6x9 in.

Construction News

Idaho Springs, Colorado—Heavy machinery is planned for the Specie Payment mine. C. Wells, Idaho Springs, Colo., is manager.

Eldora, Colorado—The Alton Mining Company will install shaft and tunnel machinery during the coming spring. H. F. McClellan, Cardinal, Colo., is manager.

Breckenridge, Colorado—The Jessie Consolidated Mines Company is going to enlarge its stamp mill, and add a cyanide plant. Charles F. Gilbert, Breckenridge, Colo., is superintendent.

Masontown, West Virginia—The Preston County Coke Company is preparing to open and develop mines, and will need machinery. Fred C. Keighley, Uniontown, Penn., is vice-president and general manager.

Chrome, New Jersey—The United States Smelting, Refining and Mining Company expects to enlarge its refining and smelting plants, before long, nearly doubling their capacity. The main office is at 50 Congress street, Boston.

Hahns Peak, Colorado—Reduction works, with a daily capacity of 100 tons, are planned for next season by the Hahns Peak Mining, Milling and Refining Company, on Willow creek, as well as the installation of an electric-power plant.

Cumberland, Maryland—The Cumberland Basin Coal Company proposes to enlarge operations and will need hoisting and other machinery, also material for a spur railroad about three miles long. The office is at 44 South street, Baltimore. W. de L. Walbridge, No. 1 Broadway, New York, is largely interested.

Georgetown, Colorado—A mill is planned for the spring by the Key West Mining Company, operating on Leavenworth mountain. New machinery is planned for tunnel driving by the Bi-Metallic Company, of which J. W. Boughton, Georgetown, Colo., is manager. A large plant of machinery is to be installed during the early spring by the Krupps Mining Company, of which J. Tucker, Georgetown, Colo., is manager.

Special Correspondence

San Francisco Jan. 30

The jury in the Champion-Home suit at Nevada City, has rendered a verdict in favor of the Champion Company for $5,000, although the total amount sued for was $83,000. This is an important case, and was the most important ever tried in the county. The Home Company, the defendant, was granted a stay of execution for 20 days, during which time an appeal will doubtless be prepared. The case has been on trial since November 1st, and numbers of expert witnesses have testified in it. The underground workings of the two mines came together beneath the surface holdings of the Champion. Both companies claimed the orebodies. The Home Company had removed hundreds of tons of rock from the disputed ground before the underground workings came together, and suit was brought to recover the value of this ore. The defense of the Home Company was that the disputed orebodies were a part of a mineralized zone that extended through its workings. The Champion Company claimed that no such zone existed and that the workings involved in the case were part of its ledge. The Champion Company, which won the suit, was represented by Attorney W. H. Metson, of San Francisco, while Judge C. H. Lindley represented the Home Company. Another suit is pending to determine the ownership of the disputed workings, which may be called up at any time. The case has been watched carefully by mining men, as it involves many interesting points of mining law. The litigation had caused the virtual closing of both mines for about two years in Nevada City district.

It is thought that the trouble between the Anti-Débris Association and the dredge miners may be settled without litigation. The dredging men were taken somewhat by surprise when they heard of the proposed suits against them, and deny most emphatically that material from their mines is being carried to the river. None of the dredges, they assert, discharges its water directly into the river. It percolates through piles of dredge tailings and all the material that could do damage is deposited before the water reaches the river. The dredging men acknowledge that the water is badly discolored. They account for this, however, by the fact that the water carries a solution of fine silt, which coming from the red soil badly discolors it, but is too fine to do any damage. It is so fine, they assert, that when water is bottled it will take a week for it to settle. On the other hand, the Anti-Débris people aver that the objection raised as to operation of the dredges is not to the discolored water seeping through the tailings, but that during periods of high water the river forces its way into dredging ponds of the river boats, carrying out with it a load of gravel and sand that is later deposited as the stream makes its way through the valley. The association desires that the dredging companies build restraining dams. To this the dredge men never have objected.

According to the statement of Lewis T. Wright, general manager of the Mountain Copper Company, two of the five furnaces at Keswick, Shasta county, will shortly be started up again. The smelter has been closed for two years, during which time the town of Keswick has lost three-fourths of its inhabitants. The smelter had five furnaces in operation at one time. Only two of these are to be put in commission, one of them to be kept running all the time and the other held in reserve. Ore from the Hornet mine, as well as from the Iron Mountain mine, will be smelted and reduced to a low-grade matte that will be shipped to the Martinez plant for further treatment. The branch railroad from the Iron Mountain narrow-gage leading to the smelter will be completed by the time the furnaces are ready to be blown in. The work of repairing the smelter will be completed in about two months. When the company changed its base of smelting operations to Martinez, much of the machinery in the Keswick plant was moved. It is not expected that the smelter at Keswick will ever again be run up to its full capacity, as the new plant near Martinez is of greater extent and capacity. The Mountain Copper Company was so harassed by suits against it about smelter fumes that it virtually abandoned Shasta county as a smelting locality.

The sale of the property of the bankrupt Copper King Company, of Fresno county, takes place in this city, Jan. 31. Many of the liens against the property have been paid off by George W. Ade, the receiver, who has worked the mine a year or more for the benefit of the creditors and shipped the ore to Everett, Washington, for reduction. The mine is mainly owned by residents of Glasgow, Scotland.

The continuous storms of late have done considerable damage to mining properties not in operation by filling shafts with water, causing caves, etc. Numbers of mines in the higher mountains have had to close down owing to the great depth of snow, throwing many miners out of work. However, this is not an unmixed evil, as there is a heavy storage of snow in the mountains, insuring a large supply of water in the streams the coming summer.

Salt Lake City Feb. 1

The ore and bullion settlements reported through Salt Lake banks during the past week amounted to $577,200.

The appeal in the "smelter smoke" cases, which were tried in the Federal court here and brought forth a drastic decision from Judge John A. Marshall in favor of the farmers who instituted the suits, has been filed in the United States Court of Appeals at St. Louis. Judge Marshall rendered his decision on Nov. 12 last and permanently restrained the Utah Consolidated, United States, Bingham Consolidated and American Smelting and Refining companies from continuing to smelt ores carrying over 10 per cent. sulphur in any form or combination at their smelting plants. The complainants are James Godfrey and 408 owners of property aggregating 9000 acres of land near Salt Lake City. Notwithstanding the appeal has been taken, at least two of the defendant smelting companies have decided to move out of the Salt Lake valley. The Utah Consolidated has selected a site in Tooele county, and it is practically a certainty that the Bingham Consolidated will go there, too.

The American Consolidated Copper Company has been formed here to operate in the Big Cottonwood, Utah, district. J. C. Barnard is president; H. C. Edwards, vice-president; F. O. Frick, secretary and treasurer, with offices in the McCornick Bank building, Salt Lake City.

The management of the Ohio-Kentucky Mining Company, operating at Pioche, Nev., has reported the strike of a high-grade body of lead-silver ore in the Susan Duster shaft at a depth from the surface of 170 ft. Samuel Newhouse recently became president of the company. It is said that a reorganization will shortly be effected and operations conducted there upon a very large scale.

At the annual meeting of the Silver King Mining Company the old board of directors was elected. The only change made was in the secretaryship; John A. Malia tendered his resignation and was succeeded by Peter Tallon, of Park City. David Keith, of Salt Lake, is president and Thomas Kearns manager.

The ore-transportation situation in Bingham will be much improved from now on through the opening to regular traffic of the new branch line built into the camp by the Rio Grande Western and known as the "skyline." For several months the facilities afforded by the Copper Belt Railroad have been inadequate to meet the demands of mine operators and much complaint from the latter has been the result. The output of the camp will now be materially increased. It is still somewhat of a question among Bingham producers about the Rio Grande being able to take care of the traffic to and from the camp after the beginning of mill operations of the Utah Copper and Boston Consolidated at Garfield.

Duluth Feb. 2

Stripping operations on the Mesabi have been impeded somewhat by the intense cold of the past week or two, but in general are continuing steadily, and will be maintained through the winter. The Steel Corporation is preparing for a very large

business this year at its Hull-Rust mines, at Hibbing; and at its new Hartley, which is to be stripped for an area of 80 acres and will be one of the immense producers in a year or two. The Hartley has made records the past season for extent of stripping and low costs of this work.

G. H. St. Clair, who has been exploring the lands of the old Mesabi Iron Company, in 60-12 and 60-11, has cut ore in a number of flat veins and seams, and hopes to find considerable quantities of merchantable material. What he has cut so far has been mostly hard hematite, and quite high in iron, but in thin strata. He is hoping for soft-ore deposits, and thinks he will find them in time. This was the original development of the Mesabi range, indeed of the Minnesota region, as far back as the early 60s, and has been explored and examined many times.

Corrigan, McKinney & Co. are sinking a shaft on the eastern Mesabi, in section 3-58-15, where they have a considerable body of ore under lease. They expect to make shipments this year, but if they have the same character of ground to pass before reaching ore as their neighbors had, they will be fortunate if they hoist in 1908. The mines of Pickands, Mather & Co. in that vicinity have been especially unfortunate, and the operations of sinking shafts have been taken over by Eastern concerns especially skilled in the manipulation of deep quicksands.

Scranton Feb. 4

President John Mitchell, of the United Mine Workers, is dissatisfied with the condition of the organization in the anthracite region. He stated to National Organizer Fallon that he is unable to account for the apathy shown and will send a special staff of organizers to work up the sentiment. It is no secret that the mine workers are weaker now than at any time since the organization was first in operation in the anthracite region. Expenses have been cut down with a ruthless hand, and where some locals had a thousand members they have now less than one hundred. In fact, it is openly stated that the organization in the anthracite region is fast approaching the disappearing point. Months ago, when it was known that many had seceded, there was great dissatisfaction and members who had paid their dues regularly for years stopped payment, claiming that, as others who had benefited by the union had stopped making payment, they could not see why they should carry the full load. There is also some internal strife in the three districts, and so serious was that in the Hazleton district that President Dettery refused to stand for re-election and with him all the other officers retired. While the contending factions are fighting each other, the bulk of the members have become apathetic and suspended payment of their dues, so that the officers could not draw their salaries and were compelled to seek other employment. It is said that some of the locals are practically dead, owing to the failure to secure a quorum at the meetings. So long as there are no meetings there are no dues collected. It seems at this time as if the union will soon be a thing of the past in the anthracite region.

The consolidated annual returns to the State department of mines for the year 1906 show that 557 mine workers were killed in the anthracite region. Of these 206 deaths resulted from falls of coal and 77 from explosions. The fatal accidents for 1905 numbered 644.

Two grievances have been referred to Umpire Neill, one being from the Lehigh Valley Coal Company's miners at Duryea, protesting against excessive toppage of cars; and one from the employees of the Delaware & Hudson at Grassy island, complaining of discrimination in the distribution of cars.

A delegation of mine inspectors appeared before the committee on mining at the State capitol to oppose the Garner bill which makes mine foremen, who have a certificate of qualification, eligible to be candidates for mine inspector. The inspectors claim that foremen should not be permitted to become candidates for inspectors until after they have passed an examination before the board of examiners.

Toronto, Ont. Feb. 2

The provincial legislature of Ontario was opened Jan. 24. The speech of Lieut.-Gov. Clark contained the following reference to the policy of the Government in regard to the mining industry: "The great value of the mineral deposits in the Cobalt district is becoming more and more evident, and the future is full of promise, both to the investor in mining properties and to the people of the Province. The rights of the Province in these deposits have been kept steadily in view by my ministers, and accordingly a measure providing for the taxation of mining properties will be submitted to you for consideration."

A similar measure was promised last session, but dropped, and in view of the increased importance and influence of the mining interests it is very doubtful whether political exigencies will admit of its adoption this year.

Shipments of ore from Cobalt by the Timiskaming & Northern Ontario Railway, for the week ending Jan. 19 were as follows, in pounds:

Nipissing	236,940
O'Brien	125,600
Buffalo	140,000
La Rose	123,500
Foster	43,600
Total	669,640

In future, reports of shipments will be published weekly instead of monthly.

Great confusion has for some time prevailed owing to the similarity of the names of some of the Cobalt mining companies. Owing to complaints on this ground the provincial secretary has directed the Lawson Cobalt and the Kerr Lake Lawson companies to adopt new names.

A statement of claim in the action brought by the Florence Mining Company in the high court against the recently organized Cobalt Lake Mining Company was filed this week. A general outline of the facts of the claim has already been given, but as the case is likely to be a notable one as regards its bearing on mining law, and the question of titles to mineral property, some further points may be noted. The property embraces 20 acres of the 46 acres covered by the bed of Cobalt lake recently granted to the syndicate which organized the Cobalt Lake Mining Company, and is stated to include the only part known to be valuable. The Florence Company claims as assignee of the rights of W. J. Green as original discoverer, and asks that the grant to the Cobalt Lake Company be set aside as infringing on the statutory right acquired by Green, and as being contrary to legislation limiting the area of locations to 20 acres. The defense is that at the time of the alleged discovery by Green, the area was not open to prospectors. Cobalt lake, with other areas, was withdrawn from location by the Government on Aug. 14, 1905. On Aug. 28 following, the township of Coleman was also withdrawn. On Oct. 30 the township of Coleman was again thrown open. In January, 1906, Green applied to the Government and obtained a map and regulations showing the areas open for prospecting, which included Cobalt lake. The plaintiff's contention is that Cobalt lake, being within the boundaries of Coleman township, was thrown open with the township, and that having acted in accordance with the information issued by the Government Green obtained a statutory right to the location, which cannot be set aside by a subsequently made grant. It appears that—contrary to statements frequently made of late that no action can be taken to upset a Government grant without obtaining a fiat giving the consent of the attorney general—no such fiat is necessary unless the ground of the action is fraud or misrepresentation on the part of the holder in obtaining the grant. Where the claim, as in the present case, alleges a right existing prior to the grant, an action will lie without the consent of the Government.

Cobalt, Ont. Feb. 2

A company has been organized here recently for the operation of a sampling plant. Under present conditions producers are delayed from one to three months in marketing ore, and should the new sampling works have the confidence of all

parties, and proper financial standing, it should be successful.

The Orford Copper Company, whose works are at Copper Cliff, Ont., is arranging for steady shipment from some of the mines in the district. This company expresses a desire for high-grade ore solely. Heretofore, most of the ore has been shipped to the American Smelting and Refining Company, Perth Amboy, N. J., or the Balbach works, at Newark, N. J.

A movement is on foot for providing better transportation facilities from Toronto. At present the train leaving Toronto at 11:30 p.m. arrives in Cobalt at 2:20 p.m., or later, the next day, although the distance is but little over 300 miles. Travel is so large and increasing so rapidly that more expeditious service is most desirable.

It is announced that grading for construction of the Kerr lake branch of the Timiskaming & Northern Ontario Railroad is about to begin. This will facilitate the operation of the Kerr Lake group of mines, consisting of the Foster, University, Lawson, Jacobs, Drummond, and other mines to the south and east.

The Upper Montreal river and the Lady Evelyn sections west of Cobalt are attracting attention, and many prospectors will go in that direction. There is active mining now going on in both districts.

London Jan. 26

The Zinc Corporation has been suffering from an attack by bears this last week, for rumors have been assiduously circulated to the effect that the Potter plant, for floating the sulphides from the zinc tailings at Broken Hill, has proved a failure. Three months ago I referred to the results obtained by A. L. Queneau, in his tests of this plant; and as Mr. Queneau expressed himself satisfied with the process, it was hardly likely that it should afterward become a failure. The rumors were persistent, and the market for the shares became depressed. There is, of course, usually some grain of truth in rumors of this sort, so on inquiry as to the source of these rumors it was not surprising to hear that there had been a slight hitch, due to the use of unsuitable pumps for circulating the acid liquors. It was originally arranged to use the air-lift for these liquors, but the delivery was slow and the engineers were impatient, so they installed ordinary cast-iron centrifugal pumps as a temporary makeshift. Naturally these pumps gave out almost immediately, and the operation of the plant has had to be suspended until the air-lifts arrive. This hitch has nothing whatever to do with the eventual success of the process, though it served the bears as a base of operations.

During the copper boom in 1899 the Einasleigh Freehold Copper Mines, Ltd., was floated in London, to take over the mines of that name in North Queensland. It was soon found that the absence of railway transport militated against the success of the company, and operations were eventually suspended until such time as the means of transport were provided. The Queensland Government six months ago gave authorization to the scheme of the Chillagoe Copper Company, to extend the railway to Etheridge, by way of Einasleigh; and as this railway is now on hand, it has been thought advisable to revive the Einasleigh company. Accordingly, a new company, called the New Einasleigh Copper Mines, Ltd., has been formed. The capital is £200,000 in ordinary shares, and there are £32,000 in debentures. Of this the whole of the debentures and £72,000 in shares go to the old company as purchase price, and the new company will start with about £60,000 working capital, which has already been guaranteed. There are large bodies of ore developed and ready for shipment as soon as the railway is completed. The old company erected a smelter, which is still available, but it is not proposed to work it at present, for better terms can be obtained by shipping the ores to the Chillagoe works.

The Lloyd Copper Company, Ltd., operating at Burraga, Bathurst, New South Wales, continues to make ends meet only. During the twelve months ended June 30 last, the company treated 59,641 tons of ore and produced 970 tons of fine copper, which makes the extraction work out at 1.62 per cent. The mining, smelting and refining cost £56,323, and the sales produced an income of £75,155. Debenture interest, directors' fees, office expenses, freight, insurance, etc., amounted to about £10,000, and £4000 was written off for depreciation, leaving a balance of profit of over £4000. The company has a debenture debt of £50,000, and there are loans from the bank outstanding amounting to £35,500 secured on the copper shipments, and by metal and ore on hand. The property of the company has been extended during the year by the acquirement of an adjoining lease, which has considerably increased the ore reserves. There does not appear to be any very great promise for the future of the company, for the contents of the ore are low, and the cost of smelting must necessarily be high. In fact, if it were not for the present high price of copper, the operations could hardly be continued. The policy of the company is to keep on working vigorously as long as it can, in the hope of finding more valuable ores.

Another new Spanish copper and pyrites company has been floated in London this week. The name is the Anglo-Spanish Copper Company, Ltd., and the properties to be acquired are the San Vicente, Fronteriza and others, situated about half-way between the Tharsis mine in Spain and the San Domingos belonging to Mason & Barry, just over the border in Portugal. The orebodies are very similar to others in the same district, being of considerable width and containing 48 per cent. of sulphur, with copper contents varying from nothing to 15 per cent.

A company called Carters Deep Leads, Ltd., has been introduced to the notice of the public this week. The company has been formed to acquire leases of deep-lead properties in Victoria, Australia, especially the Lillicur. Other properties are also included.

Johannesburg Dec. 26

One of the most important letters on the labor controversy that has yet been written appeared in the local press a few days ago. It was from Mr. Raine, manager of the Village Main Reef. On this mine Mr. Creswell, the predecessor of Mr. Raine, tried the now celebrated white labor experiments. Mr. Creswell's idea was to employ the maximum number of white men. For a long time he has been telling the public here and in England, what a great success the white labor experiment was. Mr. Raine's letter completely upsets Mr. Creswell's doctrines, and proves the impossibility of using white labor for unskilled work under present conditions.

Under Mr. Creswell's management the skilled white miner's pay was cut down to a bare living wage, varying from £15 14s. 11d. to £11 12s. 4d. per month. At the present time, under Mr. Raine's management, the average wage earned by the skilled artisans is about £28 per month. As regards cost per ton mined, with a greater number of white men under Mr. Creswell, the costs varied from 25s. 4d. to 26s. 7d. per ton. Mr. Raine employs far less white men, but pays them good wages, so that his cost per ton mined is below 17s. 7d. This discussion proves the fallacy of Mr. Creswell's method of making this a white man's country. True he gave employment to a larger number of white men than any other mine, but the men were all discontented with the meager wage, and left the mine whenever they found an opening elsewhere. Consequently he was left with a band of inefficients, which probably accounts for his high costs. Mr. Raine has completely reversed his predecessor's policy. He employs far more Kafirs and less white men, but his skilled men earn good wages and are contented. Hence the great reduction of costs he has brought about.

This is probably the most certificated country in the world. No one is allowed to blast without a certificate; the manager of a mine must be the holder of a certificate; the mine surveyor must hold a government certificate; the mine overseer passes an examination for a certificate. The government has decided to certificate another class of men, and in the future the mechanical engineers of mines must hold government certificates. This certificating business certainly protects men on the Rand and handicaps the new comer in getting a position.

General Mining News

Lackawanna Steel Company—This company [illegible] shows receipts from all sources of $29,872,279. Charges were: Operating expenses, $23,802,022; general expenses, depreciation, etc., $2,050,002; total, $26,513,314, leaving a balance of $3,358,065. The payments for new construction during the year were $2,754,488. In view of further payments for new construction, and the need of working capital, it has been deemed best to declare no dividend.

United States Smelting, Refining and Mining Company—This company is making large additions to its plant at Chrome, N. J., formerly known as the De Lamar refining plant. The addition to the refining plant, now nearly completed, will give it a total capacity of over 10,000,000 lb. per month. A converter plant is being added to the smelter. This is to be used chiefly on imported ores and mattes.

ALASKA

[illegible]

[illegible] Bay Mining Company—This company, operating at Galena bay, is preparing for active work. A dam is to be built in the spring, and machinery has been ordered for a power plant, from which electric power will be transmitted 11,000 ft. to the mine. A wire tramway 17,000 ft. long has been ordered from the A. Leschen & Sons Company, of St. Louis. The company owns several claims, including the Mullen, on Copper creek; the Warner & McClellan, on Rock creek, Kotsina; and the Nicolai. These claims all show outcrops of copper ore.

Crown Copper Company—This company has been organized to develop copper claims on Knight's island. T. D. Bradford is manager.

[illegible] Island Consolidated—This company has a force at work on its copper claims, doing development work. It has bought drills and electric machinery, and is building a wharf on Dryer bay, near the mines. W. B. Hancock is manager.

Rothkrantz—On this property, Knight's island, Louis Rothkrantz, the owner, has [illegible] long drift opening work.

ARIZONA

YAVAPAI COUNTY

Arizona Smelting Company—This company is keeping its smelting plant at Humboldt in continuous operation and is not able to keep up with the large amount of ore delivered to it.

Climax—A new strike is reported by the manager of this company, ex-Gov. Geo. Wolfley; it is said to be on the No. 5 tunnel level and 2 ft. of sulphide ore is reported uncovered, assaying well in gold.

Gold Basis Group—T. J. Laird, manager of this group of mines, reports the opening of a ledge of oxide ore 30 in. in width, assaying $40 per ton in gold. The mines are situated six miles south of Prescott.

Logan Copper Company—This company reports that its new working shaft has attained a depth of 40 ft. and is all in ore of a good grade, the chief value being copper, although carrying some gold.

Pick & Drill Mining Company—This company is installing two 75-h.p. boilers, a 90-h.p. Corliss engine, a 6000-gal. Worthington pump, ore-feeders and crusher in its mill near Dewey.

[illegible] Queen Copper Company—This company has been compelled to discontinue work at its mines for a few days [illegible] account of the breaking down of its pumping plant.

YAVAPAI COUNTY

Colonial Mining Company—The following statement is furnished through the courtesy of Louis S. Judd, manager of this company's mines, at Cinnabar, near Ehrenberg:

Our working shaft is now down 350 ft., is single compartment, with ladderway large enough for pump column and air-pipe, vertical and in the vein all the way, still sinking. No. 1 level is in 165 ft. on the vein 75 ft. below collar of shaft; at 150 ft. No. 2 level is in 270 ft. from shaft; at 250 ft. No. 3 level is in 215 ft.; all the above drifts are run to the east. A short drift was run some 65 ft. on the third level to the west. Good ore was encountered 30 ft. from shaft, but as considerable water was being developed, work was discontinued until such time as we were able to handle water economically. At 300 ft. No. 4 level is in 165 ft., also to the east, as a short drift on this level to the west showed that here also the water would cause trouble.

All levels are connected by upraises, finished as mill openings and ladderways. The vein averages about 4 ft. in width, and outcrops for something over a mile; country rock is schist. In No. 1 level same ore is encountered as shown in out crop, carrying 7 per cent. copper, 150 oz. silver, and 30 per cent. mercury; this shoot seems continuous, same ore being cut in each level, but increasing values in silver with depth. The lower-grade ore in the vein shows little silver, and no copper, but holds fair values in cinnabar.

We have a 25-h.p. Witte gasolene hoist, 4-h.p. Witte gasolene engine driving a No. 4 Sturtevant blower, and are about to install a pump. A contract has been let to Robert Scott for a 30-ton Scott furnace, which should be in operation soon.

CALIFORNIA

AMADOR COUNTY

Central Eureka—This mine last month yielded $12,439 from 2900 tons of ore, the mill only being operated 21 days. The dividend was passed for the month, the profit being small.

Bunker Hill—From 2646 tons of ore crushed in December the yield was $18,145, or a little less than $7 a ton. The net earnings were $11,500.

Zeila—The repairs to the shaft of this mine at Jackson have been completed and the mill has started up. The mine yields 6 tons of sulphurets daily, which are handled in the chlorination works.

South Eureka—Henry Mallock, of San Francisco, has succeeded M. J. McGee as president, having purchased his interest in the mine, as well as the mineral rights in the Toman ranch property.

CALAVERAS COUNTY

Swiss Mines—At these mines, five miles from Railroad Flat, A. T. Merrell, manager, the new shaft is 210 ft. deep and a hoist is being erected. The ledge at the bottom of the shaft is 5 ft. wide and averages $6 per ton. The mines are owned by the Live Oak Mining Company.

INYO COUNTY

Montezuma—At this mine, Big Pine, F. S. Gordon, superintendent, over 2000 ft. of development work has recently been done. An air compressor and hoist will shortly be installed.

Greenwater Copper Company—This company owns the Blackbird group of copper claims, seven in number. A 200-ft. shaft is to be sunk to develop one of the ledges.

Red Boy and Saratoga—The shafts on these mines are 100 ft. deep and gasolene hoists have been put up.

Copper—Deposits of copper ore have been discovered in the southern end of the county in the Argus range, between Shepherds and Revenue cañons, north and east of Millspaugh. A number of locations have been made and some claims have been sold.

PLACER COUNTY

American and Swasey—Both these mines near Penryn have been sold to Eastern men, who will commence work upon them shortly.

Iron Mine Company—L. C. Van Trent, who sold the Dairy Farm mine to the Guggenheims, has purchased the lands of this company, embracing 1500 acres northeast of Clipper Gap and extending across Bear river into Nevada county. There is a very large body of iron ore on the land.

RIVERSIDE COUNTY

Gem Mines—The Garnet, Abrasive and Gem Company, of Los Angeles, has purchased mines in the San Jacinto mountains and is mining tourmaline, aquamarine, beryl, topaz, rose quartz, kunzite and hyalite. The mines are about 20 miles from Hemet near Lake Hemet.

SACRAMENTO COUNTY

Ellery-Laird—This mine, near Folsom, which has been closed down a few months,

is to resume operations. It is worked by a hydraulic elevator

SAN BERNARDINO COUNTY

Kennedy Mining Company—In this property, near Oro Grande, a small vein of rich ore has been struck, which has renewed the mining activity in that section.

Allie—This mine, in Ivanpah valley, once a large producer of silver, has been sold to President Greening of the Rock Springs Castle Company and Mr. Wrenberg, by Wm. McFarlane. The mine has not been worked for many years.

Ibex District—At the new camp of Hartoun in this district, 7 miles west of Needles, a number of copper claims are being opened. The district has been virtually abandoned for some time, but the discovery of good ore in the Caprum mine by the O'Meara Company, of Salt Lake, has brought about a renewal of activity and prosperity.

Seal of Gold Mining Company—New officers have been elected for this company, which has mines in Dale district, and owns a 20-stamp mill. The new directors are H. A. Landwehr (president), A. N. Younglove (vice-president), P. T. Evans (treasurer), G. H. Moore, Edgar Sharpe, C. H. Huse and Alex. Strachan. Los Angeles interests now have control of the company.

Mining Locations—Over 350 mining locations have been recently recorded in the county, among them claims locating 42,000 acres of placer ground on the northeastern edge near the Inyo county line and in the vicinity of Greenwater district.

SHASTA COUNTY

Trinity Copper Company—At the Shasta King mine, seven miles west of Kennett, owned by this company, there is much activity. An aërial tramway is under construction from the mine to connect with the aërial tramway from the Balaklala mine to the Coram smelter.

SISKIYOU COUNTY

Dredge—A new dredging company has bonded the property along Oro Fino creek from Scott river, and will at once begin borings to test the ground.

SIERRA COUNTY

Buttes Saddle—This mine at Sierra City has been bonded by Richard Phelan to San Francisco men, who will begin work upon it at an early date.

TULARE COUNTY

Hyde Hill—On this hill, north of Porterville, are deposits of asbestos, and these have been bonded by Los Angeles men, who will work the property.

TUOLUMNE COUNTY

Harvard—The crew at this mine has been increased to 60 men, and 30 stamps are dropping.

Dulcek—The company formed to work this mine is making arrangements for a resumption of operations.

COLORADO

The production of coal in Colorado in 1906 is reported as follows, in short tons: Anthracite, 68,343; bituminous, 7,548,769; semi-bituminous, 911,265; lignite, 1,670,044; small mines, 110,000; total, 10,308,421 tons. This is an increase of 1,318,790 tons, or 14.7 per cent., over the previous year. The production of coke was 1,113,643 tons; there were 3376 coke ovens in operation, and 1076 men employed in coke plants.

The total number of men employed in and about the coal mines was 12,030. The number of casualties during the year was:

	Number	Per 1000 Employed
Fatal	85	7.06
Non-fatal	160	13.30
Total	245	20.36

The average coal mined per employee at the mines last year was 857 tons.

Victor Fuel Company—This company's statement for the half-year ending Dec. 31 is as follows: Gross receipts, including miscellaneous, $1,242,620. Charges were for operating expenses, $914,569; depreciation, etc., $67,685; taxes and fixed charges, $72,143; total, $1,054,397, leaving a surplus of $188,223. The coal mined was 839,518 tons, an increase of 133,116 tons over the previous half-year. The coke made was 41,638 tons, a decrease of 7165 tons.

BOULDER COUNTY

Blue Bird—W. Smith Jennings, of New York, has purchased this silver property, near Nederland. A. H. Kidney, Nederland, Colo., is superintendent.

Golden Age—John L. Gordon, of Denver, and associates, have purchased this mine at Jamestown, and have also taken over the Standard mill, on Jim creek, near Springdale, which is to be remodeled. J. V. Sybrandt, Jamestown, is superintendent

Enterprise—At the annual meeting held at Boulder, Howard H. Carpenter was elected president and general manager, and J. E. Carpenter, secretary and treasurer. Property is located at Eldora.

CLEAR CREEK COUNTY

Annie May—This group in Georgetown district has been sold to Denver people by Grubb & Jones for $15,000. Machinery is to be installed. E. E. Grubb, Georgetown, Colo., is manager.

Stemwinder—Manager J. M. Shaller, of Georgetown, has taken a lease on the Kavergne mill, near Dumont, Colo., and will run it on Stemwinder ores as soon as machinery is installed.

Colorado Quito—Pittsburg, Penn., people have taken over the Quito group; new machinery is being installed and buildings erected. C. M. De Camp, Idaho Springs, is manager.

Bellevue-Hudson—John A. Holmberg, of Denver, has secured under lease and bond this group, near Georgetown, option calling for $100,000 within three years.

Banner Consolidated—A deal has been made, involving $250,000, whereby Louisiana capitalists have acquired interests in the Banner properties. Heavy developments are planned. F. H. Nye, Idaho Springs, is manager of the property in Freeland district.

ELKO COUNTY

Next President—Henry J. Stephens, of Denver, has purchased this property in Gregory district, the consideration being reported as $50,000. English people were the owners.

Federal—Eastern people have taken a lease and bond in the sum of $22,500 on this mine, in Russell district. W. E. Campbell, Russell Gulch, is manager.

Fifty Gold Mines Corporation—The annual election, held in Denver, resulted as follows: President, G. A. Lewis, Naugatuck, Conn.; secretary, F. N. Totman, Central City, Colo.; general manager, O. B. Thompson, Black Hawk, Colorado.

O Be Joyful—Denver and Eastern people are interested in a lease and bond, and will install machinery. Louis Roy, Central City, Colo., is superintendent.

LAKE COUNTY—LEADVILLE

New Monarch—The Winnie shaft is making a record for itself that bids fair to be a first-class second to the famous Little Jonny mine. Last summer in a body of low-grade ore 20 ft. wide, a streak 10 in. wide was opened in a stope to the east, and since then work has been carried on steadily, developing it, and from this work, on an average, 1½ carloads have been shipped monthly, giving net returns of $10,000 to the car. Development work has been carried on to the north in a large porphyry dike, and shortly after the new year a body of ore 5 ft. wide was opened that gave smelter returns of 36 oz. gold, 77 oz. silver, and 8 per cent. copper. Sufficient work has been done on the ore channel to prove it in place. The ore is an oxide, and in color is a dirty brown. The Cleveland shaft lies to the north of the Winnie, and is down 500 ft. In a drift at the north end of the shaft a body of ore 11 ft. wide was opened recently that runs 1½ oz. gold, 25 to 30 oz. silver, and 10 per cent. lead. Sinking was started on this shaft at the beginning of the week, and another lift of 125 ft. will be done, when drifting will be started to catch the ore-shoot of the Winnie.

Mammoth—A year ago the striking of mineral in this property, Big Evans gulch, created some excitement among local men on account of it being virgin territory and outside of the regular ore zone. At a little over 550 ft. a body of iron was encoun-

sulphide running high in silver was opened, and with it a heavy flow of water which the company was not prepared to handle; after a temporary close-down to admit of heavier pumps being installed, work of sinking was again resumed, and after going a few feet dolomite sand was struck to such an extent that it clogged the valves of the pumps, and the shaft was again lost; to obviate this a ring was cut around the shaft to hold the sand, but it was only a partial success, and after several attempts to sink, the company closed down to permit of heavier machinery being installed. After dickering for a number of months to raise sufficient money to carry on the work, the company lost its lease. Practical mining men consider the ground valuable, so James A. Shinn succeeded in securing an option on the ground and interested Boulder capital in taking hold. Work has again been resumed on the claim.

Eclipse—This property, south of Empire gulch, is located outside of the regular mineral zone, but this fact has not kept the lessees from opening a good body of ore in the shaft. The ore was first struck a little below 100 ft., and as the shaft went down the orebody widened until today it is 6 ft. wide at the bottom of the shaft; sinking will continue until the bottom of the ore is reached. The average value of the ore is about $30 per ton, and enough of it is being taken out in sinking to meet the running expenses.

Mansfield Shaft—Twenty years ago this shaft, Iowa gulch, was sunk to a depth of 700 ft., but the inflow of water was so heavy that the company abandoned work, and the shaft is now full of water to within 20 ft. of the surface. The Keystone Mining Company, at present working the Helena, in the same section, has secured a lease on the Mansfield, and work has been started.

ROUTT COUNTY

Steamboat Springs Commercial Club—This club has been organized for the legitimate advertising of that section of Routt county, and with the following officers: President, M. E. Houston; secretary, C. E. Mitchell; treasurer, R. G. Pupke.

Hahns Peak—Montreal, Canada, people are interested with E. A. Hewitt, of Denver, and have taken an option on a group of copper mines on Farwell mountain, near Hahns peak. They have taken up a reservoir site, proposing to furnish electric power to various enterprises. It is reported that the company proposes to erect reduction works of 100 tons daily capacity.

SUMMIT COUNTY

Colorado Consolidated Electric Company—This company, which last year took over all of the mining and power property of the Gold Pan Company, has now given an option on all of its holdings to Ben [illegible] operator. The option covers all water rights, ditches, flumes, pipe lines, manufacturing plant, electric power, lighting plant and machine shops. It is Mr. Revett's intention to supply his dredge on the Reliance property, in French gulch, with electric power, and also to operate the proposed new dredges on the Blue and Swan rivers by electricity.

Blue Flag—Robert A. Niles, who has had charge of this company's affairs since its organization, has resigned his position as superintendent, and is succeeded by Charles M. McGrew. President Krisman has paid a visit of inspection to the property and has given instructions to confine all efforts to the further development of the mine for the balance of the winter.

Wonder—Work on this mine is being carried on under the supervision of M. M. Howe, manager, and a force of twenty miners is busy taking out ore and piling it ready for shipping in the spring.

Wonderful London—This property under the same management is being well developed at depth. A force of 15 men is employed here and the main shaft is now 500 ft. down.

Puzzle Gold Dust—This property has resumed active operations. W. A. Walker of Mt. Pleasant, Ohio, has been installed as manager, and has with him as superintendent John B. Nelson, an old-time Summit county foreman who knows the property thoroughly. A body of lead-zinc ore has been struck in the upraise above the main tunnel level.

Wellington Mines Company—This company is employing a force of 25 men in the mine breaking ore.

Maize—This company is doing vigorous work on Rock creek, north of Dillon, on the Boss and other lode claims. The main tunnel has now intersected the old Boss vein at a depth and a body of silver ore has been opened up.

INDIANA

GIBSON COUNTY

Coal Land Development—Willam Howe and Joseph Martin, of Chicago, who recently bought 500 acres of coal land near Bicknell, have sunk a shaft which penetrates a vein of good bituminous coal 6 ft. 10 in. thick. Options are being taken on 4000 acres of coal lands adjoining.

SULLIVAN COUNTY

Fatal Explosion — Ten miners were killed in a mine explosion near Clinton, Jan. 14. There is a difference of opinion as to the cause of the explosion and a committee from the legislature has been appointed to make an investigation. There have been 21 miners killed in Indiana mines during the present year.

VIGO COUNTY

Southern Lead and Coal Mining Company—This company has incorporated at Terre Haute to mine coal in Indiana and lead in Illinois. The company will build coking ovens also.

INDIAN TERRITORY

CHOCTAW NATION

The Missouri, Kansas & Texas Railway is making survey for an extension of the spur from the Wilburton branch to the McAlester Coal and Mining Company's mines at Buck, southeast past another new slope now being opened, through the J. F. McMurray lease, where the Indian Coal and Mining Company is opening a slope, and to a new slope opened by the Milby & Dow Coal Company. A branch is also being surveyed east from this line through the Central Coal and Coke Company's two leases, where it is prospecting with the expectation of opening a mine or two.

Wilburton Oil and Gas Company—This stock company, composed of Wilburton citizens, is drilling for gas at Boiling Springs, on Gaines creek, on the Wilburton branch of the Missouri, Kansas & Texas, about six miles west of Wilburton. Alexander Anderson, of Krebs, I. T., who has the drill contract, states that the well is now down 1000 ft., and has a strong flow of gas. He expects to strike the sand he is after at 1500 ft. depth.

MARYLAND

ALLEGHANY COUNTY

Cumberland Basin Coal Company—New York capitalists, represented by W. De L. Walbridge, president of the American Coal Company, have acquired control of this company. The purchasers intend to reorganize the company and thoroughly develop the properties, which comprise about 10,000 acres of land about 20 miles from Cumberland, Md. The lands are said to contain from 4,000,000 to 5,000,000 tons of the famous Big-Vein coal and a large area of the smaller vein. The new owners propose to construct a branch railway four miles long to connect the mines with the George's Creek & Cumberland Railroad in order to provide direct transportation to tidewater at Baltimore. The Cumberland Basin Coal Company has common stock of $1,000,000 and first mortgage 5 per cent. bonds for $500,000. In reorganizing it is stated there will be issued $500,000 of 6 per cent. preferred stock (cumulative after two years) and $500,000 of common stock. Baltimore capitalists interested in the company are expected to retain a large interest in the new bonds.

MICHIGAN

HOUGHTON COUNTY—COPPER

La Salle Copper Company—The organization of this company has been completed, with the election of the following directors: Alexander Agassiz, Rodolphe

L. Agassiz, C. C. Douglas, F. W. Hunnewell, Thomas L. Livermore, James McNaughton and Quincy A. Shaw, Jr. The transfer of the Caldwell property [illegible] completed by the issue of La Salle stock in exchange for that of the Caldwell. That property was formed of lands owned by the St. Mary's Mineral Land Company, the Shelden-Douglas interests and a few small blocks of land owned by the Calumet & Hecla Company. The new company will also take over the Tecumseh, as soon as the exchange of stock can be completed.

The Tecumseh property will henceforth be under the direction of James McNaughton, superintendent of the Calumet & Hecla, but R. D. Edwards, who has been in charge of Tecumseh, and who is directly responsible for the successful opening of the Kearsarge lode, will remain in actual charge of the operating end.

ONTONAGON COUNTY—COPPER

Victoria—Additional mill facilities now being installed should enable 400 tons of rock to be treated daily, which would mean in the neighborhood of 2,000,000 lb. of copper annually. Lack of labor has handicapped development, but with a recently acquired force of men a shaft will be sunk 3500 ft. east of the present one, and a crosscut will be driven from the 19 level south to intercept at depth a promising-looking vein. It is expected that this crosscut will pass through five distinct veins and if any of them show signs of value extensive drifting will be done. Instead of restricting work to one vein the management, now that conditions permit, will make an intelligent examination of the company's resources. The veins of Ontonagon county are not so distinctly defined or clearly mapped out as those of Houghton county, and it is quite possible that the Victoria will, with its 2200 acres, be found to have values as yet unsuspected. With the completion of the addition to its crushing equipment the company should be able to extend its prospecting work and increase its production materially.

IRON—MARQUETTE RANGE

Cleveland Cliffs—This company has just bought the lands of the Deer Lake Company, in Marquette county, some of which lie on the iron-ore formation of the Marquette range, and will be explored. The Deer Lake Company was one of the first to engage in pig-iron making on the Upper Peninsula, and its lands were originally covered with timber. The Cleveland Cliffs Iron Company is securing large tracts in northern Michigan, and is by far the chief landholder in that region, much of its acreage being in the district where iron may be looked for. It is certain that these lands will be developed as the company has opportunity, and it is probable that some of these developments will result as favorably as those which it has carried out during the past year or two near Princeton.

MINNESOTA

IRON—MESABI RANGE

Mesabi Iron and Steel Company—[illegible] company has recently bought three new properties on the Mesabi range—the Onondaga, from the Onondaga Iron Company, of which G. G. Hartley and C. A. Congdon, of Duluth, are the principal stockholders; the Mariska, from the Mariska Iron Company, and the Monica, from the Monica Iron Company. The principal stockholders of the two companies are A. B. Coates, of Virginia and A. M. Miller, Jr., of Duluth. The description of the Onondaga mine is the westerly 25 acres of the N. ½ of the S. W. ¼ of Sec. 4-58-17; the Mariska mine is the W. ½ of the S. E. ¼ of Sec. 24-58-17, and the Monica mine the N. E. ¼ of the N. W. ¼ of Sec. 9-58-16. Each of these three properties contains approximately 500,000 tons of bessemer ore, and they are all underground propositions. The royalty on the Onondaga property is 75c. per ton, and the royalty on the other two properties is 55c. per ton. Shaft sinking on each of these three properties will be started inside of 30 days, and the company expects to ship from each of them at least 25,000 tons next season. Shipments from the Onondaga mine will be over the Duluth, Missabe & Northern, and from the Monica and Mariska mines over the Duluth & Iron Range.

IRON—VERMILION RANGE

Shagawa—Developments at this mine—the famous section 30-63-11, Vermillion range—have not been satisfactory, and the shaft, which is now down about 500 ft., has revealed practically nothing more than was known through earliest drill explorations, conducted for the Clergue interests four years ago. The shaft has been designed to go to the depth of about 1500 ft., where drills showed a soft formation that seemed to promise ore, but it is now in very hard formation and progress is exceptionally slow and costly. What the result of the present situation may be is hard to say.

MONTANA

The reports of the United States Assay Office in Helena for the year 1906 show a gratifying increase over those of the year preceding. For the year 1906 the total receipts of the office were $2,431,755 as against $2,391,279 for 1905. For the last year the receipts from Montana were: Gold, $2,176,434 against $2,103,342, for the preceding year.

BUTTE DISTRICT

Boston & Montana—The company is cutting a station at the 1700-ft. mark in its West Colusa mine, and will resume sinking to the 2000 as soon as the station set is placed. It is sinking the new shaft on the Leonard to the 1400, and is 60 ft. below the 1200. Since the first of the month it has been hampered by a shortage of coal, coke and railroad cars, with the result that its ore production will be about 20,000 tons less than that of December.

Coalition—The company expects to finish its 710-ft. tunnel between the collar of the Tramway shaft and the Rarus shaft, in a short time. The opening will strike the Rarus 210 ft. below the mouth. All ore hoisted through Rarus will be run through the tunnel, which will save hill work for locomotives, and all timbers used in the mine will be sent through this opening. Electric motors will be used in the tunnel. The shaft on the Minnie Healey is 1200 ft. deep, and is going deeper. Ore shipments from the property aggregate about 1100 tons a day.

Davis-Daly Estates—So far this company has not extracted a pound of ore, but is rapidly developing some of its claims. It is crosscutting south of the 500-ft. station in the Smokehouse, sinking on the Colorado, Silver King and Mt. Moriah, and driving the crosscut south of the 1800-ft. station of the Original. The face of the latter is about 1300 ft. from the station, and is supposed to be nearing the Thomas veir. The Colorado shaft is about 660 ft. deep, and that on the Mt. Moriah 400. The one on the Silver King is a misfit on an incline, and will never do for extensive operation.

Butte Milwaukee—Butte, New York, [illegible] the holding company of Butte-Milwaukee, and is composed principally of New York men, Leo Schlessinger, Harry Mittenthal and W. L. Moyer among them. The company has bought the Narrow Gauge mine, which has a record as a producer, and is sinking a deep shaft on the Colonel Sellers with a view of developing this claim and the Bird, which adjoins it on the east. Options on several other claims in the immediate vicinity of the old group have been secured. The company is mining the Pollock, one of its assets, and is extracting considerable silver ore from it.

LEWIS & CLARKE COUNTY

Ruby Gulch—A. W. Martin, of Helena, has secured an option on the Ruby Gulch properties in the Zortman district for $7,500,000. There is an immense deposit of cyanide ore, with a 300-ton mill on the property. An 18-day run of this mill returned over $60,000, the entire run averaging $15 per ton. It is understood that an Eastern syndicate has the property under consideration and has sent an expert to make a thorough examination. There are two large parallel veins from 60 to 150 ft. wide, from which ore can be mined at small expense.

Eglanol Company—This company, composed of Helena and Boston capitalists, which for three years has been running a drainage tunnel 6300 ft. long in its placer grounds near Lincoln, has just completed the work and made tests. The tunnel goes under the gravel bed to a depth of about 55 ft. and taps the rich ground that has been surface worked. The ground tested at the mouth of the tunnel is rich, and

worked to depth through this tunnel.

Spring Hill—A notable discovery has been made in the Spring Hill properties, three miles south of Helena. These properties are located on the contact between lime and granite, which is well defined, running for 20 miles east and west. The present strike in these properties, owned by the Pittsburg & Montana Company, is a vein of free gold milling ore 30 ft. wide, which from smelter tests averages $17, and in many portions has run higher. This property was purchased about two years ago by the Pittsburg Company, and was developed and worked for the iron ore desired for flux for the company's smelter at Butte. The presence of free-milling ore was not suspected until it was discovered by a lessee a short time ago. The Spring Hill is directly west of the Whitlach-Union mine, from which over $5,000,000 was taken years ago above the 400-ft. level. This mine was purchased two years ago by the Whitlach Company and developed to greater depth. General Manager Frank L. Sizer, of the Whitlach, has secured an option on the Spring Hill properties, and it is expected that the Whitlach Company will take over the properties and increase the capacity of its mill to work the Spring Hill ores with those of the Whitlach. A tunnel now under way by the Whitlach will be continued so as to strike the Spring Hill vein at a depth of 300 ft., the two properties being on opposite sides of the hill separating Grizzly and Oro Fino gulches.

NEVADA

[illegible] COUNTY—GOLDFIELD

Hayes-Monnette—M. J. Monnette states that his lease on the Mohawk yielded $4,400,000. Its extent was a third of a claim, measuring 700 ft. in length and 373 ft. in width. The largest daily output was $60,000 and the largest monthly yield was in October last, when the sum of $1,300,000 was received from the smelters. The ore averaged $400 per carload. The lease was owned by G. H. Hayes, J. W. Smith, Harry Benedict and M. J. Monnette, and each of them netted over $900,000. They have all invested largely in other mines in the field and have already been successful in making good strikes in the Esmeralda and Goldfield-Columbia mines.

Mohawk—The Goldfield Consolidated Mines Company, owner of the Mohawk, has taken possession from the lessees and is preparing a site for an immense ore-house. Surveys are also being made for spur tracks from the railroad. The Mohawk shaft is being re-timbered and fitted up for a long campaign of hard work. When these operations are completed a large force of miners will be set to work taking out ore.

Frances-Mohawk—This lease on the Jumbo Extension mine is rapidly improving in prospects. A 300-ft. shaft, which has reached a depth of 175 ft., is being rapidly sent down. A 60-h.p. hoist is being erected and preparations are progressing for a compressor and drill equipment.

Nevada Goldfield—A fresh oreshoot has been struck on the 500-ft. level. The ledge is 10 ft. in width and averages from $20 to $30 per ton. The ore is free milling.

NYE COUNTY—MANHATTAN

Butler—A body of milling ore has been cut in the main tunnel which averages $30 per ton for a width of 6 ft. It has been drifted on for a distance of 60 ft. The ore is of the same character all the way and can all be profitably mined and milled. The manager is preparing to sink a winze on the ledge, so as to be able to start extraction on a large scale with as short a delay as possible.

Kewanas—A main shaft has been started to develop the ledges cut in the surface-prospecting shafts. The shaft is situated close to what is believed to be a continuation of the famous Combination vein. Sinking is progressing at the rate of 4 ft. per day and will be continued to 200 ft. before cross-cutting to the ledge is undertaken.

Wolftone Extension—The recent stormy weather has interfered with surface operations, but sinking is being pursued as rapidly as possible, with the view of picking up the rich Wolftone vein, which gives every indication of extending into this mine.

Indian Camp—The shaft has been sunk a distance of 208 ft. and is now in a calcareous schist formation, which is believed to be the hanging wall of the ledge.

Toquima Copper—A fresh contract has been let for the sinking of the shaft to a depth of 250 ft. Copper values are improving as sinking progresses. A well defined orebody has been cut in a crosscut at the water level and it is proposed to open out on it from the 250-ft. level.

NYE COUNTY—REVEILLE

Nevada Smelting and Mines Corporation—This company is installing two hoists of 25 h.p. on its property at Reveille and is preparing to operate its claims on an extensive scale. The ground is being developed by means of two vertical shafts about 700 ft. apart. One of these shafts is down 150 ft. and the other has attained a depth of about 75 ft. Both shafts will be sunk to a depth of 400 or 500 ft. before crosscutting is begun. The Reveille property contains large bodies of high-grade silver-lead ore.

NYE COUNTY—CHLORIDE

There has recently been a rush to Chloride, which was formerly known as the Danville silver camp, and was first prospected in 1867. The Chloride field is about 25 miles square, stretching from Dibbin's Summit on the north to Glover creek, on the south, from the Morey mountains, on the east, to the crest of the Monitor range on the west, facing Fish Springs valley. The camp itself is 75 miles northeast of Tonopah. A large number of locations have been made during the past month, and there is every prospect that many of the old producers will be reopened. Railroad facilities will probably be provided during the current year.

NEW JERSEY

MORRIS COUNTY

Richard—The head house of No. 5 shaft on this mine, near Dover, was destroyed by fire Jan. 31, damaging the hoist and pumps badly. There were 150 men at work, but all escaped through other shafts. The mine is owned by the Thomas Iron Company.

OREGON

BAKER COUNTY

Bonanza—The new owners of this old mine are preparing to begin work on the property. Albert Geiser, formerly in charge of the mine, has been made manager. The mine is in the Blue mountains above Sumpter, 30 miles west of Baker City.

Oregon Placer and Power Company—This company has been incorporated with $350,000 capital, to operate placers and build a power plant. The incorporators are N. Berkeley, James A. Howard and J. J. O'Dair. The office is in Baker City.

JOSEPHINE COUNTY

Harms Mining Company—A company by this name has bought several mining properties, and promises to work them on a considerable scale. G. R. Harms, of Cincinnati, O., is president; E. N. Wilson, 20 Broad street, New York, secretary. The mines office is at Ashland, Oregon.

LAKE COUNTY

There is some excitement over a discovery of gold at Windy Hollow, near Warner lake. The country is volcanic, and the gold values are said to have been found in rhyolite dikes. A number of claims have already been taken up.

PENNSYLVANIA

ANTHRACITE COAL

Lehigh Valley—This company has rebuilt the Exeter breaker, near Pittston, which was destroyed by a windstorm.

Erie—The Avoca breaker of this company was destroyed by fire last week within 24 hours after it had been ordered shut down by Mine Inspector Johnson, for repairs. The washery also caught fire and was destroyed, the total loss being about $100,000.

Mount Jessup Coal Company—The breaker of this company at Jessup, nine miles north of Scranton, was destroyed by fire, Jan. 28. It prepared the coal from three separate operations, and until a new breaker is built about 900 men and boys will be idle. The breaker was valued at

$75,000 and was built about eight years ago. It is thought that the fire was due to the carelessness of the night gang. The directors decided this week to rebuild.

Pennsylvania & Reading Coal and Iron Company—This company, having stripped sufficient surface on the 12-acre Mammoth vein tract secured near Ellangowan last year, will begin blasting and hoisting out the coal with steam shovels. The Mammoth vein varies in thickness from 30 to 100 ft., and it is the best quality of anthracite. Twelve acres of surface earth have been scooped away to an average depth of 20 ft., thus laying bare the vein. The work of excavating has been in progress about two years, and the job having been nearly finished, the work of taking out coal will be commenced this week. An advantage in this sort of mining is that there is but little or no waste, as no pillars need be left standing to support the surface as in underground mining. The coal will be transported in mine cars to the Ellangowan colliery breaker and there prepared for market. Another extensive coal stripping belonging to this company is at Turkey Run, and a still more extensive one will soon be begun on the hillside south of the Pennsylvania railroad, near Shenandoah.

BITUMINOUS COAL

Pittsburg Coal Company—It has been understood for some time that there was considerable friction in the management of this company. It is now reported that Francis L. Robbins will resign as president, and will be succeeded by William Flinn, of Pittsburg. It his not been possible, however, to secure either confirmation or denial of the report.

SOUTH DAKOTA

The annual report of N. Treweek, State mine inspector, for 1906, states that 3720 men were employed in the mines during the year, not including placer miners and prospectors. The number of accidents was as follows:

	Number	Per 1000 Employees
Fatal	7	1.88
Non fatal	14	3.76
Total	21	5.64

The non-fatal accidents include only those of a serious nature.

LAWRENCE COUNTY

Branch Mint—The eight-hour day has been granted at this property, which lies in and near the camp of Galena. Change went into effect Feb. 1, and the announcement met with much enthusiasm. About 40 men in all are employed, some of them working on the cyanide annex of the stamp mill and others opening up ore reserves. Last week a new ledge running $10 to the ton and better was encountered in the 300-ft. level.

Homestake—The semi-annual report of this company is now out and shows excellent conditions. Total receipts for the six months were $2,791,215 and the operating expenses were $1,993,609. Of the net earnings $665,200 were paid in dividends and the remaining $142,352 was added to the surplus. One charge to operating expenses was $201,850, expended on the construction of the slime plant. The average value of the ore at this time is a little better than it has been, $3.82, and the number of tons of ore milled during the six months 720,216.

TUNNING TON COUNTY

Dakota-Calumet — This company is working over 60 men at the property, east of Hill City, and has opened up a body of copper ore, increasing in value with depth. It is the intention of the company so to develop the ground that it will be possible to operate the large smelter some time this spring. A. C. Overpeck, of Hill City, is superintendent.

Bengal Tiger—After a lapse of more than 20 years, work on this once famous ground s to be resumed. Hoist, whim and pumps have been leased, lumber has been ordered for the shaft-house and men are at work cleaning up the works.

Aarondale Wolfram—This company has just been organized, with Gus Miller, of Pittsburg, as president, Josephine Aaron, secretary, and R. J. Truax, manager. The company owns eght claims, has ordered a hoist and will proceed to develop the deposits of wolframite.

UTAH

IRON COUNTY

Jennie Gold Mining Company—This company is operating at Gold Springs and has in process of erection a mill of 40 tons daily capacity. Some large orebodies have been developed during the past year. A shipment taken from 5 ft. of the best portion of a 12-ft. vein gave returns of 25 oz. in silver and $60.60 in gold.

JUAB COUNTY

Annandale—A new compressor is being installed at this property, which was secured recently under an option by F. Augustus Heinze.

Colorado—This company has cut an important orebody near the side-lines of the Beck Tunnel Consolidated. The find was made on the 250 level. The mine is controlled by Jesse Knight, of Provo, Utah.

Tintic Ore Shipments—Last week shipments amounted to 162 carloads, the contributing mines being: Ajax, 3; Beck Tunnel, 7; Bullion Beck, 8; Centennial Eureka, 56; Eagle & Blue Bell, 4; Eureka Hill, 12; Gemini, 5; Godiva, 6; Grand Central, 4; May Day, 7; Mammoth, 20; Ridge Valley, 4; Scranton, 6; South Swansea, 1; Swansea, 3; Tintic Iron, 9; United Sunbeam, 1; Victoria, 4; Yankee Consolidated, 3 cars.

Lower Mammoth—The two electric hoists ordered for this mine some time ago are being installed. Equipment has been provided to handle a daily output of 100 tons of ore.

SUMMIT COUNTY

Park City Shipments—The output of ore from Park City mines last week amounted to 2,659,100 lb., the contributing mines being: Daly Judge, 1,212,000; Little Bell, 75,300; Silver King, 947,000; Daly West, 400,000; Crescent, 24,800 pounds.

WEST VIRGINIA

[illegible]

Stuart—An explosion of gas occurred in this mine, near Thurmond, owned by the White Oak Fuel Company, on the afternoon of Jan. 29. The shaft-house was badly wrecked, and the fans stopped, so that it was some time before rescue work could be started, and it was then found impossible for men to descend any distance. On the fourth day after the accident details of the explosion were still lacking. Owing to the fumes of gas in the mine a full investigation has not been possible, but there seems no doubt that 20 or more bodies await recovery, while 61 have already been recovered. This will put the death list above any previous mine explosion in the history of West Virginia. The investigations of the State authorities, coroner, and of the mine officials, are proceeding indepeadently without waiting for the completion of the rescue work, which is being pushed vigorously.

PRESTON COUNTY

Preston County Coke Company—This company has recently been incorporated with a capital stock of $200,000 and contemplates developing coal lands and manufacturing coke. The property to be developed comprises about 6000 acres. It is proposed to construct 100 coke ovens, to be ready for operation by July 1, and to enlarge the plant later by the construction of 200 additional ovens, developing its capacity to about 700 tons per day. The coal production is expected to be about 1200 tons per day. Approximately $100,000 will be expended during the coming summer for construction work and equipment, and an additional $100,000 will be expended when the coke plant is enlarged. The main office of the company will be at Uniontown, Penn., and a branch office at Masontown, W. Va. Officers of the company are H. C. Greer, Newcastle, Penn., president; F. C. Keighley, vice-president; I. W. Semans, treasurer; L. W. Fogg, secretary, all of Uniontown, Pennsylvania.

TUCKER COUNTY

Davis Coal and Coke Company—A despatch dated Feb. 4 says: Thirty-five or 40 miners, the majority of them foreigners, are supposed to be dead in an explosion today at mine No. 25 of the Davis Coal and Coke Company at Thomas. Five miners who were just entering the mine when the explosion occurred were taken out dead, so it is believed all the miners already in the mine have been killed.

Coal Trade Review

NEW YORK, Feb. 6

measurably dependent on the railroads. There is a great deal of complaint still about transportation conditions, and in some of the larger markets stocks on hand are being used up, so that supplies depend on daily deliveries. Bad weather has tended to make the conditions worse, especially in the Northwest.

In the East cold and snow have tended to make the trade more active, on the one hand, and to interfere with deliveries, on the other. A heavy snow, extending over nearly all the Eastern territory, closes the week, and will make trouble for the railroads. The demand for steam coal continues heavy everywhere.

The Dominion Coal Company has closed a new contract with the New England Gas and Coke Company for the delivery of 25,000 tons of slack coal per month, for three and one-half years, at a price substantially above that of the last contract. Shipments will continue, as heretofore, from the mines at Sydney, Cape Breton, to the coke plant at Revere, near Boston.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Jan. 26 were as follows, in short tons:

			Changes
			17,477
			40,467
			1,040
			57,984

The increase so far this year has been 0.7 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to Feb. 2 were 99,606 tons.

Coal shipments over the roads in the Ohio Coal Traffic Association for the 11 months ending Nov. 30 were, in short tons:

	1905.	1906.
		3,[illegible]
		1,57,405
		1,[illegible]
		11,440
		1,995,708
		1,[illegible]
Toledo Division, Penna. Co.....	1,080,912	2,044,072
[illegible]	[illegible]	[illegible]
Marietta, Col. & Cleve.....	.....	18,460
		14,[illegible]

The total increase in 1906 was 535,463 tons, or 3.7 per cent.

Receipts of coal and coke at Chicago, with shipments from the city to interior points, were as follows for the 11 months ending Nov. 30, in short tons:

Anthracite			
Bituminous			
Coke			

The balance represents approximately the consumption in the city. Bituminous receipts were made up as follows: Pennsylvania, 818,172 tons; Ohio, 767,600; West Virginia, 833,050; Indiana, 2,618,552; Illinois, 4,461,345 tons.

New York

Feb. 4

ANTHRACITE

The blizzard which is at present raging throughout the East has to a considerable extent congested traffic and made deliveries somewhat uncertain. The demand for coal has been fairly active and supplies of domestic sizes have been quite good, with the exception possibly of chestnut Cars have been in fair supply; during the last day or so the railroads have taken the men from the coal docks to work on removing snow, and this has made local shipments difficult. Small steam sizes still remain practically out of the market. Prices remain unchanged at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are quoted nominally at $3 for pea, $2.25@2.50 for buckwheat $1.50 for rice, $1.40 for barley; all f.o.b New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade shows little activity, although it is anticipated that the present storm will strengthen the market slightly by interfering with deliveries. Prices are quoted for fair grades of steam coal at $2.65@2.70, f.o.b. New York harbor shipping ports. There is some talk with regard to contracts and some little business is claimed to have been closed up but this is probably only skirmishing before the real contracting time begins, as it is a question whether the through-freight rates, on which the principal prices are based, have as yet been definitely decided upon.

Trade in the far East is absorbing considerable coal. Trade along the Sound is fairly active, and Sound barges are at present more available. New York harbor trade is dull, but it is not apparent that there are any large quantities of coal standing at tidewater ports. All-rail trade is fairly active. Transportation from mines to tide is slow and irregular. Car supply is poor and the improvement which was noted in the early part of January on cars from West Virginia seems to have ceased. In the coastwise vessel market there is talk of some ice in the Chesapeake and Delaware, which will interfere with vessels. Freight rates are quoted from Philadelphia to Boston, $1 and discharge, and to the Sound 85c. and discharge; both include the loading and discharging clause.

Birmingham

Feb. 4

Coal operations are still halted only by the transportation facilities. Mine operators are still clamoring for better service by the railroads.

State Mine Inspector J. M. Gray reports that, with a few of the larger concerns yet to be heard from, the production for the past year will show a decrease as compared with 1905. Railroad conditions during the latter part of the year were worse than anticipated, reducing the coal production.

Edward Flynn, former president of the United Mine Workers of America, in Alabama, has taken up his new work as assistant State mine inspector, succeeding M. M. Kuffner, resigned. J. R. Kennamer has been elected Mr. Flynn's successor in the miners' organization.

Chicago

Feb. 4

Continued cold weather has benefited both bituminous and anthracite business. Illinois and Indiana mines have curtailed shipments to Chicago greatly to the benefit of the trade. In consequence of this condition and the increased demand the market is firmer for Western bituminous.

Illinois and Indiana prepared sizes are strongest; lump and egg bring $2.25@3.50; run-of-mine sells at $1.75@2.25, and screenings are somewhat weak at $1.30@1.60.

Coals from east of Indiana are firmer, owing to restricted supply. Smokeless run-of-mine is still strong at $3.40; smokeless lump and egg are weak, the standard price of $4.30 being cut to $4.05. Hocking is recovering from the slump and brings $3.25@3.50. Youghiogheny is improving and sells for $3@3.15.

The anthracite market is active for both city and country business. Chestnut continues in great demand; small sizes, egg and stove are in good supply.

Cleveland

Feb. 5

The stocks of coal on hand have about been exhausted, and this territory is now relying principally upon shipments direct from the mines. The demand for mine run steam coal is increasing with the continuance of the cold weather. The price of Ohio is now about $1.25 at mines. Pennsylvania coal of the same quality is selling on the basis of $1.15 at mines. Ohio slack has moved up to $1.20 at mines, due, largely, to the short supply. In Pennsylvania slack some of the dealers are quoting $1.10 at mines, but this looks like an extreme price. The market is probably at 95c.@$1 at the mines. Strictly domestic coal has held steady at $2.30 at the mines, Massillon, for selected lump.

The coke market has been strong all through. There has been an improved demand for spot shipment. The market for foundry is holding about steady at $4@4.25 at the oven for 72-hour, but furnace coke is in strong demand, and some of the ovens quote $3.75 as the minimum, with a very slight difference between that and foundry coke.

Some of the smaller lake shippers have taken boats for 1907, paying the old rates of 30c. to the head of the lakes, and 40c. to Lake Michigan. This fixes the rates for the bigger shippers. The latter are holding off until the railroads have decided whether they are going to raise the rail rates from mines to lake ports.

Pittsburg

Feb. 5

Coal—There is a good supply of coal cars, but weather conditions have interfered with transportation and prices are firmer, sales being made on a basis of $1.15@$1.20 for mine-run coal at the mine. A good barge-stage during the past few days permitted shipments to the Cincinnati and Louisville markets. The tonnage was not large, as the rivers have been [illegible] during the past six or eight weeks. Only four large tows got out with a trifle less than 1,000,000 bush. The pools and harbor are crowded with empty coal boats, barges and flats.

Coke—Deliveries have been bad during the past week or two, due to the severe weather, and as a result spot prices of standard Connellsville coke are higher. Furnace coke for February is quoted at $3.65@3.75, and for the first six months at $3.10@3.25. For deliveries extending through the year contracts may be made at $3@3.15. Foundry coke for spot shipment brings $4.25@4.50, and for the first six months, $4@4.25 is quoted.

Foreign Coal Trade

Feb. 6

Exports of coal and coke from the United States for the full year are reported by the Bureau of Statistics as follows:

	1905.	1906.	Changes.
Anthracite	2,229,083	2,215,069	D. 14,014
Bituminous	6,959,265	7,704,850	I. 745,585
Total coal	9,189,248	9,921,819	I. 732,571
Coke	340,254	505,190	I. 165,037
Total	9,529,502	10,427,009	I. 897,507

The exports do not include coal bunkered, or sold to steamships engaged in foreign trade. For 11 months of 1906 this coal was 4,712,087 tons; the December figures are not yet ascertained.

The coke exported went chiefly to Mexico and eastern Canada; the distribution of the coal was as follows:

	1905.	1906.	Changes.
Canada	6,964,630	7,533,346	I. 568,716
Mexico	927,170	1,084,319	I. 157,149
Cuba	564,885	687,830	I. 122,945
Other W. Indies	300,776	319,839	I. 19,063
Europe	101,277	81,754	D. 19,523
Other countries	331,010	212,748	D. 118,262
Total	9,189,248	9,921,819	I. 732,571

The exports to Europe were chiefly to Italy; those to other countries, to South America. The exports to Canada—70.5 per cent. of the total in 1906—were, in detail, as follows:

	1905.	1906.	Changes.
Anthracite	2,187,450	2,176,312	D. 11,138
Bituminous	4,777,180	5,357,004	I. 579,824
Total	6,964,630	7,533,316	I. 568,716

There was a small decrease in anthracite, but a considerable gain in bituminous coal.

Imports of coal and coke into the United States for the year are reported as follows, in tons:

	1905.	1906.	Changes.
Great Britain	91,914	149,311	I. 57,397
Canada	1,661,042	1,442,461	D. 218,581
Japan	11,266	11,266	
Australia	181,145	193,578	I. 12,433
Other countries	2,9	4,861	I. 1,858
Total coal	1,948,367	1,801,477	D. 146,890
Coke	50,091	128,161	I. 78,070
Total	1,998,458	1,929,638	D. 68,820

Of the coal imported in 1906 there were 32,357 tons classed as anthracite. Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal are on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Iron Trade Review

No. 6

There is little change from last week in the iron and steel markets. New business is still rather quiet, but specifications on contracts are being pressed and the mills are all fully occupied. A good deal of business in structural material is being held back, owing to difficulty in arranging for deliveries. In certain lines, especially plates and rails, premiums are being offered to secure material during the first half of the year.

The severe storms of the present week will probably interfere with the railroads to some extent, and delay deliveries of material that is much wanted.

Pig-Iron Production—The completed figures for pig-iron production given by the American Iron and Steel Association for the past two years are as follows, in long tons:

	1906.	1905.	Changes.
Foundry & forge	5,837,174	5,714,492	D. 122,682
Bessemer pig	12,407,116	13,840,518	I. 1,433,402
Basic pig	4,105,179	5,018,674	I. 913,495
Charcoal iron	352,928	433,007	I. 80,079
Spiegel & ferro	289,983	300,500	I. 10,517
Total	22,992,380	25,307,191	I. 2,314,811

The total increase was 10.1 per cent. Some comment on these figures will be found on another page.

Iron and Steel Imports—Imports of iron and steel, and of machinery, from the United States for the full year are valued by the Bureau of Statistics of the Department of Commerce and Labor as follows:

	1905.	1906.	Changes.
December	$13,986,261	$14,800,508	I. $ 814,247
Year	142,930,514	172,555,588	I. 29,625,074

The increase for December was 5.8 per cent.; for the year it was 20.7 per cent. The leading items of export for the year were as follows, in long tons:

	1905.	1906.	Changes.
Pig iron	69,251	58,287	D. 11,000
Billets, ingots & blooms	247,738	192,616	I. 54,878
Bars	51,870	87,655	I. 35,785
Rails	295,023	328,036	I. 33,013
Sheets and plates	75,096	110,654	I. 35,558
Structural steel	84,234	112,555	I. 28,321
Wire	142,000	172,570	I. 30,570
Nails and spikes	47,165	59,492	I. 12,327

The larger exports of rails in 1906 were 122,348 tons to South America; 65,937 tons to Canada; 33,136 tons to the West Indies; 26,878 tons to Mexico.

Imports of pig iron, iron ore, and steel, including machinery, into the United States for the full year are valued by the Bureau of Statistics as below:

	1905.	1906.	Changes.
Pig iron	1,000,000	1,000,000	I. 1,000,000
Iron ore	1,000,000	1,000,000	I. 1,000,000

The increase for December was 60.2 per cent.; for the year, 31.9 per cent. The more important items of the imports for the year were, in long tons:

	1905.	1906.	Changes.
Pig iron	212,466	379,828	I. 167,364
Scrap	8,000	8,000	
Ingots, blooms, etc	14,642	21,837	I. 6,695
Bars	500	500	
Wire rods	500	500	
Tin plate	500	500	

The increase in pig iron was 78.3 per cent.; but the total quantity was still small, as compared with total production here.

Iron Ore Movement—Exports and imports of iron ore in the United States for the full year are reported as below, in long tons:

	1905.	1906.	Changes.
Exports	98,000	85,000	D. 13,000
Imports	1,000,000	1,000,000	I. 500,000

Most of the exports were to Canada. The greater part of the imports came from Cuba.

Imports of manganese ore for the year were 257,033 tons in 1905, and 221,260 tons in 1906; a decrease of 35,773 tons. The imports were chiefly from Russia, India and Brazil.

Baltimore

Feb. 5

Imports of spiegeleisen for the week were 996 tons; of ferro-manganese, 1068 tons; of ferrosilicon, 321 casks. One cargo of manganese ore, 6250 tons, arrived from India. Receipts of iron ore were two cargoes, 10,000 tons, from Cuba. Other receipts included two cargoes of iron pyrites, 6600 tons, from Spain.

Birmingham

Feb. 4

The announcement that the railroads handling the pig iron and kindred traffic in the southern territory, had applied for a postponement of the date for putting on the advance of 25c. per ton on freight rates from this district to the Ohio river, and that the Interstate Commerce Commission had granted the same, gives relief to manufacturers. The advance was to have gone into effect Feb. 1. There is nearly 60,000 tons of iron still in the yards, as the result of the railroads being unable to handle promptly traffic offered. The railroads are doing a little better in the way of handling tonnage. It is expected, therefore, that a large portion of the accumulated iron will have been moved by the end of the month.

Some excellent orders for iron are still being received. The aggregate business handled during January just passed was very good. Prices are still firm. Even with delivery stipulated toward the last of the year, no iron is selling in the Birmingham district under $18 [illegible]

to improvement in production. Some contracts were made recently by iron companies for ore supplies during the entire year. In other instances, further development was started looking to a better supply of ore, coal, coke, and limestone.

Chicago Feb. 4

The iron market continues steady, with no important change in conditions or prices. Sales of contract iron for the last half are abating somewhat. Spot sales are increasing, though not rapidly, and they are not so large in comparison to contract sales as they were a month ago. Northern iron is more in demand and greater in supply for quick-delivery lots, and Southern shows signs of easing in price for such lots, despite the advance in the freight rate.

Coke is in fairly good supply, with the price holding up firmly for prompt deliveries and a little easier on contracts.

Cleveland Feb. 5

Iron Ore—The situation, in the main, has not changed during the week. Some extensive improvements are to be made in Lake Superior dock equipment, that the ore may be handled more speedily. Another change is the intention of the American Ship Building Company to erect a large dry dock at the head of the lakes. This will reduce the delay to vessels damaged in the upper lake region. Few sales of ore have been made and these have been at ruling prices. No further chartering of boats has been reported.

Pig Iron—The pig-iron trade has not changed much, except there is a little heavier buying of Southern iron by consumers in this territory for second-half delivery. It is apparent, too, there is more iron coming out both from Northern and Southern furnaces than was anticipated would be the case. These lots range from 100 to 200 tons and have been frequent enough to take care of the urgent needs of many consumers. It seems a good deal of iron is to be forthcoming from these sources and will be available during the second quarter. At the same time it is apparent second-quarter material is in good demand. Southern foundry No. 2 is being sold at $18.50@19 Birmingham, to which is added the new freight rate of $4.35 to make up the Cleveland price. Northern No. 2 is selling at $22@23 for second-half delivery and at $25.50@26 for immediate shipment.

Finished Material—The shortage of scrap is being felt in this territory both in the pig-iron trade and in the bar-iron trade. The supply of the latter is comparatively short and the demand is good. Consumers are shifting to bar steel, wherever this can be done. The supply of billets has been rather light, for immediate shipment, but the future market shows an easier tendency and the trade is considerably relieved. The demand for the staples, plates, shapes and bars is still good and there is some buying in quantity for delivery during the last half of the year. Sheets are also strong.

Philadelphia Feb. 6

Pig Iron—The pig-iron market is still in an unsettled condition, partly because of the fact that offers from buyers for large deliveries for the third quarter of the year have not yet been definitely acted upon. The rumor is current in this market that we are approaching safer conditions as to pig iron and that if buyers will only have patience and keep cool they will be able to obtain as much iron as they will need for the second- and third-quarter delivery. But little spot iron is called for, nearly everything relating to late summer delivery. Those furnaces which have forge iron for summer delivery are refusing to sell at anything but present figures. The storm has upset shipments and considerable trouble may be anticipated, as a good many customers are about out of iron. Quotations for No. 2 X foundry are given at about $27, though prices vary. Gray forge is quoted at $23; basic at $25.50 and English No. 3 at $23; Scotch on dock at $25.

Steel Billets—Some business is being done in steel billets at $34 and negotiations are said to be pending for deliveries on a basis of $33. Forging steel has sold at $37.

Bars—Delivery of bar iron is held up everywhere. The stores are pretty well supplied with bars and no immediate trouble will arise from that source. Quotations for best refined iron are 1.93½; steel bars sell at about the same, but are quoted at 1.83½, but this means nothing.

Sheets—Most of the sheet selling is at premium prices and card rates are nominal. About the only buyers heard of are the smaller ones, who want sheet as fast as they can get it.

Pipes and Tubes—The consumption of pipes and tubes continues heavy and the mills are reported as far oversold.

Plates—While plates have not nominally advanced, premium prices control all business. The necessities of large consumers are such that it is not a question of price but of accommodation.

Structural Material—There will be a rush for structural material very soon, if some current rumors mean anything. No change in prices is announced.

Steel Rails—The mills of this State are quietly booking orders, but they are for the most part from buyers who need only small quantities.

Scrap—The scrap market is dead for the week. Nothing can be moved. Prices are working a little in favor of buyers. No. 1 steel scrap is nominally $18.50; No. 1 yard scrap $20, machinery scrap $22, wrought-iron pipe $16; old iron rails are $27, nominally.

Pittsburg Feb. 5

Careful scrutiny of the situation proves that the bearish views being circulated as to the future of the iron and steel market have no foundation in fact. These ideas can be traced to Wall street, where the inability of the railroads to command funds at their own pleasure has caused disquiet. The stability of the iron and steel market for the next nine months or more does not depend upon such factors. It is quite true that there is a considerable tonnage of business on the books of steel companies, and assumed to be actual business, which would be canceled, or fail to bring specifications at the proper time, but the percentage of the total business reported, upon which actual orders and specifications have been received, is larger than ever before.

With the last advance, one point, merchant steel pipe is five points, or about $10 per net ton, above the market in the early part of October.

Pig Iron—Transactions are rather light, as there is much bearish talk going the rounds. In some districts, particularly in the East, and possibly to some extent in southern Ohio, prices for prompt iron are easier, but in no case have second-half prices shown any easier tone, and the reduction in the spread between prompt and late delivery would make the situation sounder. The Bessemer Furnace Association, comprising the majority of the Valley furnaces making bessemer pig iron, outside of the Snyder interest, reports that it has disposed of 80 per cent. of its output for the current year. A portion of this is on long-time contracts, subject to special price adjustment from time to time, the balance being in outright sales. For second-half delivery the association and the other large interest are firm on the quotation of $21.50, Valley, for bessemer, basic being about 25c. less. No. 2 foundry for second half is held at $21.50@22, Valley, while prompt remains at $25@25.50. A line of 1000 tons was closed out in various lots at $25, Valley, and since then sales of carload and larger lots, have been made at $25.50. Gray forge is quoted at $20.85@22.85, Pittsburg, according to delivery. Southern iron for second half remains firm at $18.50, Birmingham, equal to $23.35, Pittsburg.

Steel—Deliveries are fairly good on old contracts, and there is some steel being offered, but not by local mills. The Pittsburg basis can still be quoted at $29.50 for bessemer, and $32 for open-hearth, but it is possible that $29 for bessemer and $30 or $31 might be done, f.o.b. some Ohio mills. Plates are firm at 1.70c., and merchant steel bars at 1.60c.

Ferro-Manganese—The market continues weak, but the opinion is expressed in some quarters that the weakness is due to manipulation. Prompt ferro brings $73 to $74, while for delivery beginning in July, as low as $70 has been quoted

Brussels, Belgium Jan. 20

Pig-iron production in Belgium for the full year was as follows, in metric tons:

	[illegible]	[illegible]	Changes
Foundry iron	[illegible]	[illegible]	[illegible]
Forge iron	[illegible]	[illegible]	[illegible]
Bessemer, basic, etc.	[illegible]	[illegible]	[illegible]
Total	1,[illegible]	1,[illegible]	[illegible]

At the close of the year there were 42 blast furnaces in Belgium, of which 38 were in blast and two idle. The average number in blast during the year was 37, showing an output of 38,088 tons per furnace in blast for last year.

Dusseldorf, Germany Jan. 20

The Stahlwerks Verband—the German Steel Syndicate—reports the shipments from the various works in the combination for the full year as follows, in metric tons:

	1906.	1905.	Changes.
Billets, blooms, etc.	1,[illegible]	1,[illegible]	D. 48,710
Rails and fastenings	1,611,[illegible]	1,[illegible]	I. [illegible]
Shapes, etc.	1,653,[illegible]	1,[illegible]	I. [illegible]
Total	[illegible]	[illegible]	[illegible]

The total increase last year was 9.9 per cent. The export shipments are not yet made public.

Cartagena, Spain Jan. 10

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report for the week: Shipments were five cargoes, 10,290 tons dry ore, to Great Britain; two cargoes, 9350 tons dry ore, to Rotterdam; one cargo, 4225 tons dry ore, to Philadelphia; 23,865 tons in all. There is nothing fresh to report in local iron-ore market. Shipments have been very active. We are unable to quote any prices, having no ore disposable.

Metal Market

NEW YORK, Feb. 6

Gold and Silver Exports and Imports.
At all United States Ports in December and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1906...	$1,729,194	$ 7,588,623	Imp. $5,859,429
" 1905 .	2,668 532	4,028,881	" 1,360,349
Year 1906..	46,560,397	155,550,766	" 108,990,369
" 1905..	46,794,467	50,293,405	" 3,498,938
Silver:			
Dec. 1906...	5,486,094	4,122,324	Exp 1,363,770
1905 ..	8,196,149	4,692 746	" 3,503,403
1906 ..	59,036,340	44,350,896	" 14,685,444
1905 ..	57,518,102	35,939,135	" 21,573,967

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.
For week ending Feb. 2 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 1 000	$ 65,740	$108,538	$ 41,170
1907.....	1,345,585	418,439	2,014,053	311,534
1906	1,053,873	188,770	9,478,003	171,023
1906.....	23,897,883	349,885	3,480,103	78,605

Exports of gold for the week were to the West Indies; of silver to London. Imports both gold and silver, for the week were from Mexico and South America.

The joint statement of all the banks in the New York Clearing House for the week ending Feb. 2 shows loans $1,097,837,500, an increase of $11,852,100; deposits, $1,076,720,000, an increase of $9,708,400, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie.....	$192,492,100	$197,800,300
Legal tenders	[illegible]	[illegible]
Total	[illegible]	[illegible]
Surplus	$11,[illegible]	$1,[illegible]

The surplus over legal requirements shows a decrease of $2,928,700, as compared with the previous week.

Specie holdings of the leading banks of the world on Feb. 2 are reported as below, in dollars:

	Gold.	Silver.	Total.
Asstd New York	[illegible]	[illegible]	[illegible]
England..	$171,247,180	....	171,247,180
France....	529,[illegible]	$[illegible]	[illegible]
Germany.....	162,660,000	54,220,000	216,880,000
Spain.....	77,025,000	122,170,000	199,195,000
Netherlands....	57,[illegible]	28,800,000	86,[illegible]
Belgium.....	16,[illegible]	8,[illegible]	[illegible]
Italy.....	160,880,000	23,800,000	184,680,000
Russia.....	590,255,000	23,675,000	613,930,000
Aust.-Hungary.	232,950 000	60,220,000	293,170,000
Sweden.....	19,[illegible]	.....	19,[illegible]

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Jan. 24.:

	1905.	1906.	Changes.
India.....	£ 1,615,700	£ 296,510	D. £ 1,319,190
China.....	.....	.....	.....
Straits..	.....	.....	.....
Total.....	£ 1,615,700	£ 296,510	D. £ 1,319,190

Receipts for the week were £2000 from New Zealand, £14,500 from Australia and £152,000 from New York; a total of £168,500. Exports were £72,500 to India.

Indian exchange has been a little easier, but the Council bills offered in London were all taken at an average of 16.09d. per rupee. Considerable purchases of gold in Australia on Indian account are reported.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	$0.53	$0.55
Peruvian soles and Chilean.....	0.48	0.49
Victoria sovereigns.....	4.85½	4.87½
Twenty francs.....	3.86	3.89
Spanish 25 pesetas.....	4.78	4.80

SILVER AND STERLING EXCHANGE.

Jan.-Feb.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.	February	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.
31	4.84¼	68	31½	4	4.84¼	69	31⅛
1	4.84¼	68	31½	5	4.84½	68½	31⅛
2	4.84½	69	31⅛	6	4.84½	68½	31⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

Day.	Copper. Lake, cts. per lb.	Copper. Electrolytic, cts. per lb.	Copper. Casting, cts. per lb.	Tin. cts. per lb.	Lead. cts. per lb.	Spelter. New York, cts. per lb.	Spelter. St. Louis, cts. per lb.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.70	6.55
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.00	@6.80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.70	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.00	@6.80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.55
[illegible]	@25	[illegible]	[illegible]	[illegible]	6.00	@6.80	@6.65
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.00	@6.80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.70	[illegible]
[illegible]	@25	107	42	[illegible]	[illegible]	@6.80	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	6.70	[illegible]
[illegible]	@25	[illegible]	[illegible]	[illegible]	6.00	@6.80	[illegible]

London quotations are per long ton (2240 lb.) standard copper, which is most the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—The market has ruled extremely quiet, and no transactions of any consequence were reported. Nevertheless the undertone remains very strong, and prices at the close are quoted 25@25¾ for Lake copper; 24¾@25c. for electrolytic in ingots, cakes and wire bars; 24¼@24½ for casting copper.

The favorable statistical position of standard, which shows a decrease for the second half of January of 3500 tons, had the effect of strengthening the London standard market considerably, and the close is cabled as £107 13s. 9d. for spot, £108 13s. 9d. for three months'.

Refined and manufactured sorts we quote: English tough, £110; best selected, £114 10s.; strong sheets, £123 10s.@£125.

Exports of copper from New York for the week were 663 long tons. Our special correspondent reports the exports from Baltimore at 1311 long tons.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Copper Sheets—The base price of copper sheets is 30c. per pound.

Tin has somewhat recovered from its recent depression, and at the close the quotations are cabled from London as £129 15s. for spot, £192 for three months'. Spot supplies in this market are rather scarce, and command a premium, 42¾ being asked at the close, while more distant deliveries can be gotten at about 42c.

Statistics for the month of January show an increase in the visible supplies of 1700 tons.

Lead—The quotation remains unchanged at 6c., New York.

The London market for lead has remained rather steady, the quotations during the entire week being £19 12s. 6d. for Spanish lead, £19 15s. for English lead.

Commission Company telegraphs on Feb.

Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 19, that the price of pig lead has been 97 reales per quintal, silver being paid for at 13.50 reales per ounce; exchange 27.17 pesetas to £1. On current exchange the price of lead was equal to £18 14s. per long ton, f.o.b. Cartagena. Exports of desilverized were 30 tons to Hamburg, 300 tons Amsterdam and 65 tons to Marseilles; of argentiferous lead, 623 tons to London and 347 tons to Marseilles.

Spelter—The scarcity of near-by spelter still continues and buyers have to pay a premium for such delivery. Although a fair business has been done for future months, prices remain unchanged and close at 6.70@6.80 New York, 6.55@6.65c. St. Louis.

The foreign spelter market was very much depressed owing to large offerings, and it closes weak at £25 17s. 6d. for good ordinaries, £26 2s. 6d. for specials.

Messrs. Barrington & Holt report from Cartagena, Spain, under date of Jan. 19, that exports for the week were 3100 tons blende to Bordeaux, 800 tons blende to Antwerp, and 500 tons calamine to Stettin.

Zinc Sheets—The base price is $8.40 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—Although the foreign market does not show any signs of weakening, efforts have been made in this market to depress prices, however, without much success. Still, the numerous offers from so many sides have had the effect of scaring off buyers, so that the market at the moment is utterly lifeless. Quotations are nominal at 23¼@24c. for outside

for Cookson's.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at $38 per oz. For good scrap $31.50@32 is paid.

Quicksilver—There is no change. New York prices are $40.50@42 per flask of 75 lb., according to size and conditions of order. San Francisco prices are $39@40 per flask for domestic orders, and $37@38 for export trade. The London quotation is £7 per flask, with £6 18s. 6d. asked by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Imports and Exports of Metals

Copper Imports and Exports—Exports of copper from the United States for the [illegible] year as reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each:

	1905.	1906.	Changes.
Great Britain	25,208	24,597	D. 2,611
Belgium	2,241	2,891	I. 650
France	30,105	36,028	I. 5,723
Italy	7,054	8,829	I. 1,775
Germany and Holland	105,023	110,839	I. 5,816
Russia	3,225	1,252	D. 3,971
Other Europe	11,285	11,277	D. 8
Canada	1,418	1,864	I. 446
China	35,088	2,202	D. 32,886
Other countries	7,433	235	D. 7,198
Total metal	248,748	204,014	D. 45,784
In ores and matte	5,845	5,419	D. 510
Total	244,593	208,233	D. 36,360

The total decrease was 14.8 per cent. If, however, we omit the shipments to China in both years, the decrease was only 2814 tons in 1906. The actual quantities of ore and matte exported in 1906 were 47,619 tons, of which 36,700 tons went to Canada, 10,600 tons to Mexico, and 319 tons to other countries. Contents are estimated on the basis of values.

Imports into the United States of copper and copper material for the full year, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico	58,212	14,147	72,359
Canada	1,791	1,612	18,403
Great Britain	10,097	.....	10,097
Japan	6,025	.....	6,025
South America	.....	1,960	1,960
Other countries	13,723	1,283	15,006
Total imports	89,848	19,002	140,850
Re-exports	699	83	782
Net imports	78,129	21,919	100,041
Net imports 1905	70,428	22,968	93,396

The total increase in the net imports in 1906 was 6735 tons, or 7.3 per cent. The actual tonnage of ores and matte imported from Mexico this year was 97,770 tons; from Canada and Newfoundland, 75,115; from South America, 10,715 tons.

The exports and the net imports compare as follows:

	1905.	1906.	Changes.
Exports	44,666	68,366	I. 23,700
Net imports	93,396	100,041	I. 6,745
Excess, exports	151,327	108,292	D. 43,035

This shows for 1906, as compared with the previous year, a decrease of 28.4 per cent. in the excess of exports.

Tin Imports—Imports of tin into the United States for the full year were as follows, in long tons:

	1905.	1906.	Changes.
Straits	18,503	15,452	D. 3,051
Australia	601	937	I. 336
London	19,399	26,424	I. 7,025
Holland	458	553	I. 95
Other Europe	820	1,486	I. 666
Other countries	53	250	I. 197
Total	39,834	45,102	I. 5,268

The increase in 1906 over the preceding year was 13.2 per cent. Most of the tin received from Great Britain was Straits tin.

Lead Imports and Exports—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the full year, in short tons, of 2000 lb. each:

	1905.	1906.	Changes.
Lead, metallic	5,720	11,763	I. 6,043
Lead in ores and base bullion	92,657	72,371	D. 20,286
Total imports	98,377	84,134	D. 14,243
Re-exports	59,456	47,247	D. 12,209
Net imports	38,921	36,887	D. 2,034

Of the total imports in 1906, there were 66,756 tons from Mexico, 9257 tons from Canada and 7890 tons from Europe. Exports of domestic lead were 285 tons in 1905, and 326 tons in 1906; an increase of 41 tons.

Spelter Exports and Imports—Exports of spelter from the United States for the full year were 5516 short tons in 1905, and 4670 tons in 1906; a decrease of 846 tons. Exports of zinc dross in 1906 were 15,887 short tons; this article was not reported separately in 1905. Exports of zinc ore were 27,630 tons in 1905, and 24,750 tons in 1906; a decrease of 2880 tons.

Imports of spelter were 521 tons in 1905, and 2204 tons in 1906; an increase of 1683 tons.

Antimony Imports—Imports of antimony into the United States for the full year were as follows, in pounds:

	1905.	1906.	Changes.
Metal and regulus	5,737,891	7,900,194	I. 2,162,303
Antimony ore	1,976,694	2,247,141	I. 270,437

The increase in metal and regulus last year was 37.7 per cent.; in ore, 13.7 per cent.

Nickel Imports and Exports—Imports of nickel ore and matte into the United States for the full year were 13,451 tons in 1905, and 15,156 tons in 1906; an increase of 1705 tons.

Exports of nickel, nickel oxide and nickel matte for the year were 9,550,918 lb. in 1905, and 10,620,410 lb. in 1906; an increase of 1,069,492 lb. last year.

Platinum Imports—Imports of platinum into the United States for the full year were 7145 lb in 1905, and 11,463 lb. in 1906; an increase of 4318 lb. last year.

Quicksilver Exports—Exports of quicksilver from the United States for the full year were 1,009,446 lb. in 1905, and 484,151 lb. in 1906; a decrease of 525,295 lb. last year.

Aluminum Exports—Exports of aluminum and manufactures thereof from the United States for the full year were valued at $290,777 in 1905, and $364,251 in 1906, an increase of $73,474 last year.

Missouri Ore Market

The highest price paid for zinc was $52.50 per ton, but the assay-basis price only reached $47@49 per ton of 60 per cent. zinc, prices for the extra choice bins of concentrate being made without regard to an assay basis. The average price, all grades, is $45.78, a decrease on account of heavier shipments of silicate concentrate.

The highest price reported paid for lead concentrate was $88 per ton, on a basis of $85 per ton of 80 per cent. lead. The average price was $84.44, on account of increased shipments of lower grades.

A peculiar feature of the week's market was that a basis price of $49 per ton was paid for zinc concentrate carrying a heavy iron penalty. This brings up the fact that a deduction of $1 per ton for each unit in excess of 1 per cent. is preposterous, and brings to mind the further fact that this inequality was originated by the first organization of mine owners.

Following are the shipments of zinc and lead concentrate for the week ending to-

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,450,500	700,510	$[illegible]
Joplin	2,187,560	292,240	70,171
Aya-Neck City	1,300,000	[illegible]	[illegible]
Galena-Empire	1,158,020	160,580	31,500
Duenweg	1,[illegible]8,[illegible]80	148,[illegible]10	25,730
Badger	993,090	17,970	25,[illegible]52
Oronogo	6[illegible],500	7,450	16,[illegible]6
Alba	584,[illegible]10	[illegible]	14,[illegible]2
Spurgeon	409,300	49,[illegible]0	10,[illegible]52
Prosperity	2[illegible],[illegible]00	2[illegible],[illegible]40	[illegible],157
Granby	2[illegible],000	57,000	[illegible],452
Carthage	234,[illegible]10	148,[illegible]10	[illegible],[illegible]5
Sherwood	140,780	14,[illegible]0	[illegible],[illegible]45
Baxter Springs	[illegible]2,[illegible]50	[illegible]3,[illegible]50	[illegible],[illegible]78
Springfield	[illegible],[illegible]5[illegible]	[illegible]	[illegible],554
[illegible]	87,[illegible]50	[illegible]	[illegible],[illegible]40
Zincite	46,650	[illegible],[illegible]50	[illegible],[illegible]48
Diamond	34,000	[illegible]	[illegible],[illegible]92
Totals	13,465,620	1,622,040	$[illegible],[illegible]28
Five weeks	[illegible],[illegible]85,[illegible]70	[illegible],[illegible]20,[illegible]30	$[illegible],[illegible]14,[illegible]48
Increase over last week	[illegible],[illegible]42,[illegible]80	[illegible],[illegible]97,[illegible]80	[illegible],[illegible]87,[illegible]00
Zinc value, the week, $[illegible]8,[illegible]27; five weeks, $[illegible],[illegible]84,[illegible]61			
Lead value, the week, $[illegible]5,[illegible]92; five weeks, $[illegible],[illegible]14,[illegible]77			

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.[illegible]	45.[illegible]	January	75.[illegible]	[illegible].[illegible]
February	47.37		February	72.[illegible]	
March	42.68		March	74.[illegible]	
April	44.[illegible]		April	79.[illegible]	
May	[illegible].[illegible]		May	78.[illegible]	
June	45.[illegible]		June	80.[illegible]	
July	44.[illegible]		July	74.31	
August	45.[illegible]		August	[illegible].[illegible]	
September	45.[illegible]		September	[illegible].[illegible]	
October	[illegible].[illegible]		October	[illegible].[illegible]	
November	44.[illegible]		November	[illegible].[illegible]	
December	45.[illegible]		December	[illegible].[illegible]	
Year	45.24		Year	[illegible].40	

Wisconsin Ore Market

PLATTEVILLE, Feb. 2

The month of January ended with the price of zinc ore on the rise. Buyers were out early this week. Sixty per cent. zinc was sold at $49@50; the highest price paid for zinc ore during the week, as far as reported, was $54.50. The tonnage produced was one of the largest in the history of the camp, running nearly 3,000,000 lb. The increase was noticeable all over the district, but mostly in the southern portion.

The camps of the district loaded ore for the week ending Feb. 2, as follows:

Camps.	Zinc, lb.	Lead, lb.	Sulphur, lb.
Platteville	799,100	[illegible]	[illegible]
Linden	323,170	[illegible]	[illegible]
Benton	319,640	[illegible]	[illegible]
Cuba City	178,400	[illegible]	[illegible]
Highland	[illegible],000	[illegible]	[illegible]
Mineral Point	96,080	[illegible]	47,480
Rewey	61,000	[illegible]	[illegible]
Livingston	48,000	[illegible]	[illegible]
Galena	44,000	[illegible]	[illegible]
Total for week	2,001,390	60,000	47,480
Year to Feb. 2	7,[illegible]1,165	[illegible],[illegible]80	95,480

A considerable part of the ore sold was not loaded, owing to bad weather and shortage of cars.

Chemicals

NEW YORK, Feb. 6

Copper Sulphate—The market remains steady and unchanged. Prices remain as last week, $7.25 per 100 lb. for carload lots, and $7.50 for smaller parcels.

Exports of copper sulphate from the United States for the full year were 19,367,179 lb. in 1905, and 18,732,159 lb. in 1906; a decrease of 635,020 lb. last year.

Nitrate of Soda—Messrs. Mortimer & Wisner, of New York, give the following statistics of nitrate for the United States, as of date Feb. 1, in long tons:

	1906.	1907.	Changes.
Stocks, Jan. 1	13,100	13,050	D. 50
Imports, January	20,000	21,000	I. 1,000
Total supplies	33,100	35,[illegible]0	I. [illegible],950
Deliveries, January	17,000	30,551	I. 2,551
In store, Feb. 1	11,[illegible]0	4,[illegible]9	D. 7,[illegible]1
Afloat for U. S.	[illegible],[illegible]0	79,500	D. [illegible],[illegible]0

Tonnage afloat includes all cargoes due to arrive by May 15 next. Current quotations for 95 per cent. are $2.40 per 100 lb.; $2.45@2.47½ being paid for 96 per cent. nitrate.

Heavy Chemicals—Imports of heavy chemicals into the United States for the full year were, in pounds:

	1905.	1906.	Changes.
Bleaching powder	104,919,462	105,221,371	I. 301,909
Potash salts	[illegible],[illegible]7,[illegible]14	[illegible],[illegible]21,[illegible]20	[illegible],[illegible]03,[illegible]06
Soda salts	[illegible],[illegible]8,[illegible]17	[illegible],[illegible]2,[illegible]70	D. [illegible],[illegible]47

Exports of acetate of lime for the year were 70,816,382 lb. in 1905, and 72,154,382 lb. in 1906; an increase of 1,338,000 lb. last year.

[illegible] from the United States for the full year were, in long tons:

	1905.	1906.	Changes.
Crude	934,940	904,214	D. 30,726
All other	22,805	[illegible],000	I. [illegible],[illegible]95
Total	[illegible],[illegible]07,[illegible]45	[illegible],[illegible]29,[illegible]14	I. 21,[illegible]69

The larger exports in 1906 were 272,785 tons to Germany; 149,489 tons to Great [illegible] tons to Italy.

Sulphur—Imports of sulphur and pyrites into the United States for the full year were, in long tons:

	[illegible]	[illegible]	[illegible]
Sulphur	[illegible],[illegible]0[illegible]	[illegible],[illegible]0[illegible]	I. [illegible],[illegible]0[illegible]
Pyrites	[illegible],[illegible]0[illegible]	[illegible],[illegible]0[illegible]	I. [illegible],[illegible]0[illegible]

Estimating sulphur contents of pyrites at the usual figure, the total sulphur imported was 289,489 tons in 1905, and 311,498 tons in 1906; an increase of 22,009 tons.

Mining Stocks

NEW YORK, Feb. 6

The general stock market is still rather weak and halting, with a good deal of liquidation going on. It is soft and rather narrow. Mining stocks, especially coppers, have been brighter and more active than any other class of securities. The prices, while not advancing, have been generally steady.

Boston Feb. 5

After a lull and a short period of depression mining shares show a better tone. The banks are better disposed toward this class of securities in their loans, recognizing that brokers' business is largely in mining stocks. This may be due, in part, to the formation of the Copper bank, in New York. The increase in the Quincy mining dividend will also tend to stimulate trading, although the street is slow to recognize this fact. Quincy stock has been the feature in local speculation. On Thursday last week it jumped from $121.50 to $132.50, and today it bounded to $145. The declaration of a $4.50 dividend is at the rate of $18 for the year, and the stock is now below $150 per share. The Boston interests wanted $5, and the rate declared was a compromise with the New York interests, who wanted $4. Trinity has been more normal in fluctuations, although active. It varied from $39 to $37, during the week, closing above $38. Utah spurted $3 to $74, on New York buying, reacting to $72. Osceola and Tamarack have been quiet. The former closes about the same as a week back, at $166, and Tamarack is up $6 to $150.

Allouez and Centennial spurted late last week on light trading, showing that the market is bare of these stocks. Isle Royale broke sharply, touching $27.50. Subsequently it rose to $33, with the final today $1.50 below this. This company has purchased additional territory near its No. 6 shaft. Franklin moved up sharply today, touching $28.50. There is a vague report that the La Salle is looking to take over this company and to exchange some of its treasury stock for Franklin. Calumet & Hecla has bought additional property with a view, it is said, to provide a mill site for the La Salle.

N. L. Amster has floated a new Montana property with 80,000 shares, par $5.

Colorado Springs Feb. 1

[illegible] cal exchange has shown more activity and better prices this week. The output from the mines in the Cripple Creek district exceeds $1,000,000 for January. Gold Sovereign, Portland and Work, each made a substantial advance during the week, but Work dropped back on today's call. The remainder of the list has held its own fairly well. A new stock on the mines list that is receiving some notice, is Index, which has several thousand shares to its credit for the week. The annual meetings of the Isabella and Portland companies, which are to be held on Feb. 4, are probably affecting the price of these stocks.

STOCK QUOTATIONS

NEW YORK. Feb.	
Name of Comp.	Clg.
Alaska Mine	[illegible]
Am. Nev. M. & P. Co.	[illegible]
Cash Consolidated	11
Standard	25
Goldfield	1 [illegible]
British Col. Cop.	1 [illegible]
Buffalo Cobalt	[illegible]
Caribou Cobalt	[illegible]
Butte Coalition	[illegible]
Butte-Duluth	[illegible]
Cobalt Contact	[illegible]
Colonial Silver	[illegible]
Cum. Ely Mining	12
Davis-Daly	1 [illegible]
Dominion Cop.	[illegible]
El Rey	6
Foster Cobalt	2
Furnace Creek	[illegible]
Giroux Mines	[illegible]
Gold Hill	4
Greene Gold	2
Greene G. & S.	2
Greene C. & D. Val.	1 [illegible]
Guanajuato	1 [illegible]
Guggen. Exp.	290
Hanapai	[illegible]
McKinley Tom	2
Mexican	6
Mines Co. of Am.	2 [illegible]
Mitchell Mining	[illegible]
Mont. Shoshone	12
New Utah M. & S.	[illegible]
Newhouse M. & S.	18
Nipissing Mines	11
Old Hundred	[illegible]
Silver Queen	2
Stewart	2
Tennessee Copper	1 [illegible]
Union Copper	[illegible]
Utah Apex	[illegible]
West Columbus	17

N. Y. INDUSTRIAL	
Am. Agri. Chem.	[illegible]
Am. Smelt. & Ref.	1 [illegible]
Am. Sm. & Ref. pf	11 [illegible]
Bethlehem Steel	[illegible]
Colo. Fuel & Iron	4 [illegible]
Federal M. & S. pf	9 [illegible]
Inter. Salt	1 [illegible]
National Lead	1 [illegible]
National Lead, pf.	1 [illegible]
Pittsburg Coal	[illegible]
Republic I. & S.	[illegible]
Republic I. & S. pf	[illegible]
Sloss-Sheffield	[illegible]
Standard Oil	[illegible]
Tenn. C. & I.	[illegible]
U. S. Red. & Ref.	[illegible]
U. S. Steel	4
U. S. Steel pf	[illegible]
U. S. Rubber	[illegible]
U. S. Rubber 1st pf.	[illegible]

N. Y. CURB	
Name of Comp.	Clg.
Bonanza Creek	[illegible]
Stratton's Ind.	0 [illegible]
Camp Bird	1 [illegible]
Esperanza	2 [illegible]
Tonopah	2 [illegible]
El Oro	1 [illegible]
Mexican	[illegible]
Tonopah Extension	[illegible]
Tonopah Mining	[illegible]
Tonopah Midway	[illegible]
West End Consol.	[illegible]
Jim Butler	[illegible]

BOSTON	Feb.
Name of Comp.	Clg.
Adventure	5
Arcadian	[illegible]
Atlantic	1 [illegible]
Bingham	[illegible]
Boston Con.	[illegible]
Calumet & Arizona	[illegible]
Calumet & Hecla	[illegible]
Centennial	[illegible]
Con. Mercur	[illegible]
Copper Range	[illegible]
Daly West	[illegible]
Franklin	[illegible]
Granby*, New	[illegible]
Greene Con.	[illegible]
Isle Royal	[illegible]
Mass.	[illegible]
Michigan	[illegible]
Mohawk	[illegible]
Mont. C. & C. (new)	[illegible]
Nevada	[illegible]
North Butte	[illegible]
Old Colony	[illegible]
Old Dominion	[illegible]
Osceola*	[illegible]
Parrot	[illegible]
Phoenix	[illegible]
Quincy	[illegible]
Rhode Island	[illegible]
Santa Fe	[illegible]
Shannon	[illegible]
Tamarack*	[illegible]
Tecumseh	[illegible]
Trinity	[illegible]
United Cop., com.	[illegible]
U. S. Oil	[illegible]
U. S. Smg. & Ref.	[illegible]
U.S.Sm. & Re., pf.*	[illegible]
Utah Copper*	[illegible]
Victoria	[illegible]
Washington	[illegible]
Winona	[illegible]
Wolverine	[illegible]
Wyandotte	[illegible]

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Chemung	[illegible]
Ariz. Com.	[illegible]
Black Mt.	[illegible]
Cananea Cent.	[illegible]
East Butte	[illegible]
Hancock Con.	[illegible]
Keweenaw	[illegible]
Majestic	[illegible]
Raven	[illegible]
Shawmut	[illegible]
Superior	[illegible]
Superior & Pitts.	[illegible]
Troy Man.	[illegible]

LONDON	Feb.
Name of Comp.	Clg.
Tonopah	£1 [illegible]
Stratton's Ind.	0 [illegible]
Camp Bird	1 [illegible]
Esperanza	2 [illegible]
Tonopah	2 [illegible]
El Oro	1 [illegible]
Mexican	1 [illegible]
Tonopah Extension	[illegible]
Tonopah Midway	[illegible]
West End Consol.	[illegible]
Jim Butler	[illegible]

N. of Com.	High.	Low.
Adams	10	2
Am. Nettie	08	0
Center Cr'k	2 40	2 25
Con. C. & C.	2 50	2 [illegible]
C.C. & C pd.	[illegible]	[illegible]
Cent. Oil	[illegible]	[illegible]
Columbia	[illegible]	[illegible]
Con. Coal	[illegible]	[illegible]
Doe Run	[illegible]	[illegible]
Gra. Bimet	10	22
[illegible]	[illegible]	[illegible]

S. FRANCISCO Jan. 30	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	40
Best & Belcher	1.35
Caledonia	[illegible]
Challar	16
Con. Cal. & Va.	94
Crown Point	14
Exchequer	[illegible]
Gold & Curry	83
Hale & Norcross	[illegible]
Mexican	45
Ophir	[illegible]
Overman	[illegible]
Potosi	19
Savage	90
Sierra Nevada	90
Union	4
Utah	05
Yellow Jacket	90
TONOPAH STOCKS	
Golden Anchor	11
Mi-Namara	65
Montana-Tonopah	24
North Star	11
Rescue	20
GOLDFIELD STOCKS	
Black Ants	15
Blue Bull	55
Columbia Mt.	1.15
Comb. Frac.	5.50
Conqueror	70
Daisy	2.00
Florence	[illegible]
Frances-Mohawk	80
Goldfield Con.	9.00
Grandma	31
Great Bend	1.25
Red Hills	35
St. Ives	1.15
BULLFROG STOCKS	
Amethyst	55
Bonnie Claire	15
Mayflower Con.	55
Montgomery Mt.	11
Original	20
MANHATTAN STOCKS	
Gold Wedge	18
Manhattan Mg.	18
Pine Nut	.26
Ruby Wonder	32
Yellow Horse	09

NEVADA Feb. 6 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tonopah Mines of N.	17.50
Tonopah Exten.	4.87
Montana Tonop'h	3.90
Belmont	5.87½
Tonopah Midway	2.07
West End Con.	1.75
Jim Butler	1.17
GOLDFIELD STOCKS	
Sandstorm	.74
Kendall	.57
Red Top	3.95
Jumbo	3.95
Goldfield Mining	1.35
Diamondfield B. B. C.	.50
Atlanta	.85
Mohawk	17.00
Silver Pick	1.40
Laguna	1.38
BULLFROG STOCKS	
Montgomery Shoshone C.	12.00
Tramps Con.	1.70
Gold Bar	1.31
Bullfrog Mining	.28
Bullfrog Nat. B.	.55
Homestake Con.	1.35
MANHATTAN STOCKS	
Manhattan Con.	.90
Manhat'n Dexter	.60
Jumping Jack	[illegible]
Stray Dog	[illegible]
Indian Camp	[illegible]

COLO. SPRINGS Feb. 2	
Name of Comp.	Clg.
Acacia	12
Black Bell	3
C. C. Con.	[illegible]
Dante	53
Doctor Jack Pot	8
Elkton	61
El Paso	55½
Findley	66
Gold Dollar	74
Gold Sovereign	74
Isabella	21
Index	7
Jennie Sample	78
Jerry Johnson	6
Mary McKinney	63
Pharmacist	65
Portland	1.22
Un. Gold Mines	94
Vindicator	96
Work	14

New Dividends

Company.	Payable.	Rate.	Amt.
Alaska Mexican	Jan. 28	$1 00	$200,000
Alaska Treadwell	Jan. 28	0 50	90,000
Alaska United	Jan. 28	0 50	90,000
Amalgamated Copper	Feb. 25	2 00	3,160,886
Consolidation Coal	Feb. 1	3 50	358,750
Dolores	Feb. 25	0 15	49,500
Dominion Coal, pfd.	Feb. 1	3 50	105,000
Fairmont Coal	Feb. 1	3 00	360,000
General Chemical	Mar. 1	2 00	148,206
International Nickel, pfd.	Feb. 1	1 50	133 659
Kendall Mont.	Jan. 23	0 03	75,000
Mary McKinney, Colo.	Jan. 24	0 03	39,128
Mexican Co. M. & S.	Feb. 25	0 50	120,000
Philadelphia Co., pfd.	Mar. 1	1 25	143,620
Pocahontas Collieries, pfd.	Feb. 1	1 50	22,500
Snowstorm, Idaho	Feb. 1	0 03	45,000
Tennessee C., I. & R. R.	Feb. 1	1 00	225,536
Tennessee C., I. & R. R., pfd.	Feb. 1	2 00	4,960
Union Copper, Land & Ny.	Jan. 31	2 00	[illegible]
U. S. Steel Corporation	Mar. 30	0 50	5,511,535
U. S. Steel Corp., pfd.	Feb. 28	1 75	6,304,919
U. S. Cast Iron Pipe	Mar. 1	1 00	150,000
U. S. Cast Iron Pipe, pfd.	Mar. 1	1 75	262,500
U. S. Smelt., Ref. & Mg.	Apr. 1	0 87½	1,312,500

Assessments

Company.	Delinq.	Sale.	Amt.
Belmont Idaho	Feb. 7	Mar. 7	$0.002
Black Diamond, U.	Feb. 13	Mar. 6	0.01
Bullion, Nev.	Feb. 11	Mar. 8	0.05
Crown Point, Nev.	Feb. 5	Feb. 26	0.10
Deer Lodge, Utah	Feb. 18	Mar. 11	0.00½
Forty-nine Placer, U.	Feb. 8	Feb. 27	0.01
Golden Gate, Cal.	Jan. 7	Feb. 6	0.01
Mexican, Nev.	Jan. 10	Jan. 31	0.15
Naildriver, Utah	Dec. 22	Jan. 10	0.05
Nevada Superior	Jan. 21	Feb. 9	0.10
New Stockton, Utah	Feb. 18	Mar. 11	0.02½
Scottish Chief	Feb. 6	Feb. 25	0.02
Star Con., Utah	Dec. 29	Jan. 7	0.03
Tetro, Utah	Feb. 6	Mar. 11	0.03
Union Con., Nev.	Feb. 11	Mar. 4	0.10
Wabash, Utah	Jan. 12	Feb. 2	0.05

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	....	30.464	....
March	64.597	....	29.854	....
April	64.765	....	29.984	....
May	66.976	....	30.968	....
June	65.394	....	30.185	....
July	65.105	....	30.113	....
August	65.949	....	30.529	....
September	67.927	....	31.483	....
October	69.523	....	32.148	....
November	70.813	....	32.671	....
December	69.050	....	32.003	....
Year	66.791	....	30.868	....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	....	18.116	....	78.147	....
March	18.361	....	18.641	....	81.111	....
April	18.375	....	18.705	....	80.793	....
May	18.475	....	18.724	....	84.867	....
June	18.442	....	18.719	....	83.994	....
July	18.190	....	18.585	....	81.167	....
August	18.380	....	18.706	....	83.864	....
Septemb'r	19.033	....	19.328	....	87.831	....
October	21.203	....	21.722	....	97.269	....
November	24.850	....	22.398	....	100.270	....
December	22.885	....	23.350	....	105.226	....
Year	19.278	....	19.616	....	87.282	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	....
February	36.403	....	August	40.606	....
March	36.662	....	September	40.516	....
April	38.900	....	October	42.852	....
May	43.313	....	November	42.906	....
June	39.260	....	December	42.750	....
			Av. year	39.819	....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	....	16.031	....
March	5.350	....	15.922	....
April	5.304	....	15.959	....
May	5.685	....	16.725	....
June	5.750	....	16.813	....
July	5.750	....	16.525	....
August	5.750	....	17.109	....
September	5.750	....	18.266	....
October	5.750	....	19.350	....
November	5.750	....	19.281	....
December	5.900	....	19.609	....
Year	5.657	....	17.370	....

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	....	5.924	....	25.844	....
March	6.209	....	6.056	....	24.563	....
April	6.078	....	5.931	....	25.781	....
May	5.997	....	5.846	....	27.000	....
June	6.096	....	5.948	....	27.728	....
July	6.006	....	5.856	....	26.800	....
August	6.027	....	5.878	....	26.938	....
September	6.216	....	6.056	....	27.563	....
October	6.222	....	6.070	....	28.075	....
November	6.375	....	6.225	....	27.781	....
December	6.593	....	6.443	....	27.938	....
Year	6.198	....	6.048	....	27.020	....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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ORE DRESSING AT BROKEN HILL*

Equipment for Crushing, Concentrating and Preparing Ores for Smelting

BY G. D. DELPRAT†

The treatment of the Broken Hill ores has undergone many changes during the last 10 years. The want of absolute uniformity in the treatment among the various mines at the Barrier does not prove that some are working on wrong lines, for the ore is not exactly the same along the whole line of lode; this necessitates a variation in treatment, although generally only in detail.

At the Proprietary mine the ore is all mined by contract; the miners are paid so so as to be paid for as large a tonnage as possible. Clean ore is easily distinguishable from clean gangue, but most lumps are a mixture of clean ore and gangue in varying proportions. The miner will naturally throw into his heap pieces which he considers still good enough, while the management may consider these pieces just a trifle too poor; consequently a check must be kept on this.

This necessitates the first operation to which the ore is submitted. The trucks (tare 5¾ cwt., average load 21 cwt.), as they are loaded underground, have a ticket attached showing to which contract they belong; on arrival at the top of the shaft they are passed over a weighbridge; so on. Generally, one out of every 40 trucks is taken and thus examined. If it is found that any party of men continually loads waste into the trucks, such party is called to account; but this is seldom necessary.

On leaving the weighbridge, the trucks are hitched to an endless traveling steel rope, ⅝ in. diameter; the distance of the trucks from one another on this rope is about 40 ft. The rope takes them to the tipping cradles, but before reaching these cradles they are automatically disengaged from the rope.

As there is a fall from the brace to the tipping cradles of about 9 ft. in a distance of 360 ft., there is very little motive power

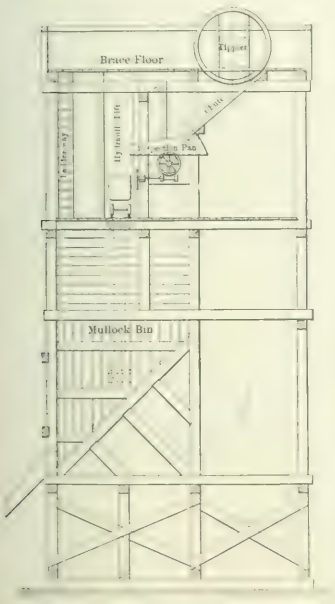

FIG. 1. METHOD OF ORE INSPECTION

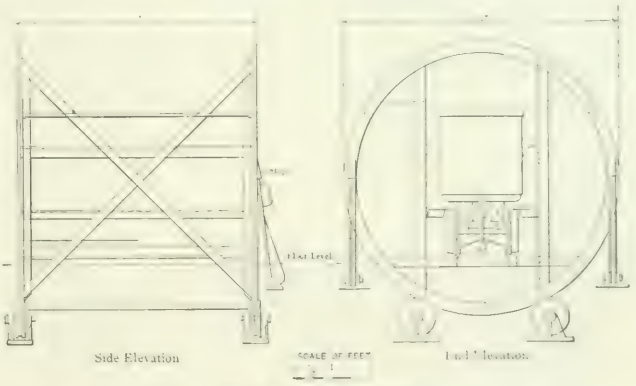

FIG. 2. REVOLVING TIPPLER

much per ton for clean ore. The ore in the mine in most stopes is mixed with gangue, and the inclination of the miners is, of course, to mix gangue with the ore, the weight is entered in a book against the corresponding contract by the company's weigher, checked by a check-weigher appointed and paid by the men; this arrangement avoids all disputes. As the trucks leave the weighbridge, one is selected haphazard, tipped on a short inclined plate, where the ore lies in full view (see Fig. 1). A special man, called an "ore inspector," sorts this truck load; he separates the waste from the ore; the ore is then allowed to fall through a chute into the same truck, which is raised by a hydraulic lift to the original level, and, after being reweighed, rejoins the other trucks on their ordinary course to the mill; the result of the second weighing is that which is booked to the party. As soon as this truck is done with, another is taken, and required to keep the rope in motion; in fact, when the work is fairly regular so that an equal number of fulls are on the down grade as there are empties on the up grade, no power is required at all; power is practically only required on account of want of absolute uniformity in the work. The largest number of trucks disposed of in this manner for one shift of eight hours is 1636, but the average per shift is about 1000.

CRUSHING AND HANDLING

The tipping cradles (see Fig. 2) are placed above the ore bins. The ore falls over grizzlies of tapered manganese steel. The life of these steel bars is about 12 months. The ore bins hold about 800 tons, and command five Gates crushers,

*Portion of a paper, read as presidential address, before the Australasian Institute of Mining Engineers and published in its *Proceedings* for September, 1906. The second part of the paper describing smelting operations at Port Pirie will appear in a later issue of the JOURNAL.

†General manager, Broken Hill Proprietary Company, Broken Hill, N. S. W.

No. 5, having openings of 10x30 in. in the spider. The crushers break the ore to 2-in. pieces. The cast-iron cones of these Gates breakers are covered with a removable mantle of toughened steel, and the outside shell of the mortar is lined with manganese steel. It is found that if the liners and mantles were both of manganese steel, the surfaces would wear too smooth, and the ore would not be gripped properly; one requires to be soft for gripping, and the other hard for crushing. The life of the mantles is about 1350 hours, and that of the manganese-steel liners 2700 hours. Many other combinations were tried, such as cast iron with steel, and different kinds of steel, but the above gave the most economical results.

The crushed ore and the smalls then pass together into bins, which in their turn discharge into one-ton trucks. These are raised, two at a time, by means of a hydraulic lift to the original level on the top bins (see Fig. 3). The hydraulic elevator has two crushers on one side and three on the other, and the whole of this crushing plant stands between the two concentrating mills (Fig. 3). When the trucks with crushed ore and smalls reach the top level they are alternately sent to the right and to the left—i.e., to the one mill or the other—each mill having a capacity of about 6000 tons of ore per six working days.

The new mill is the most up-to-date. The course of the ore through the various appliances is shown in Figs. 4 and 5.

The broken ore is tipped from the trucks into bins which command a set of three fast-running rolls 36 in. diameter, 15 in. wide, ⅜ in. to ½ in. apart, with steel shells, and making 37 r.p.m. It is found that the shells which answer the purpose best are those of toughened steel; the thickness of these shells is 4⅛ in., and the life, taken over a good many shells, is approximately 3000 hours. The shells are not turned up, but their surface kept smooth by shifting them sideways occasionally, so that the relative position of the shells opposite one another is not always the same.

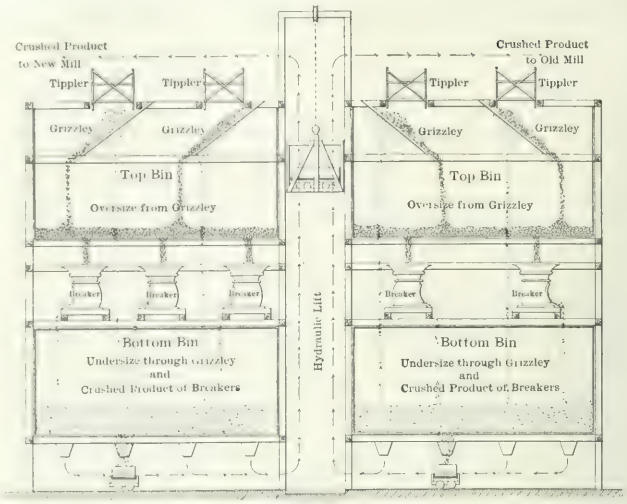

FIG. 3. ORE-BREAKING PLANT

SAMPLING MILL

The sampling of the ore going to the mill is done on the passage from the bins to the crushing rolls; a man goes around every hour and takes a scoop sample from the chutes that lead into the crushers; a sample is made up for every eight-hour shift; the total weight taken during the eight hours is 700 lb. approximately.

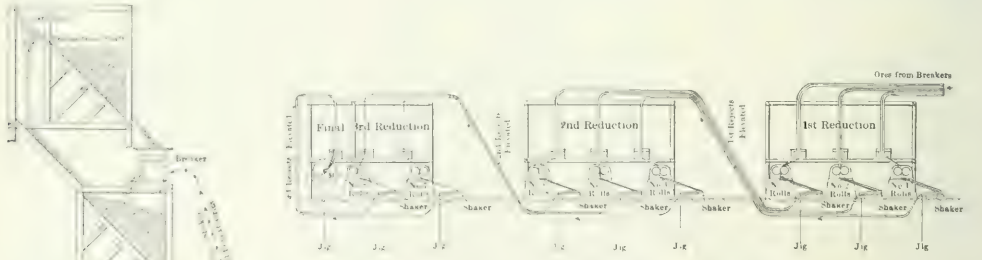

FIG. 5. SYSTEM OF GRADUAL ORE REDUCTION

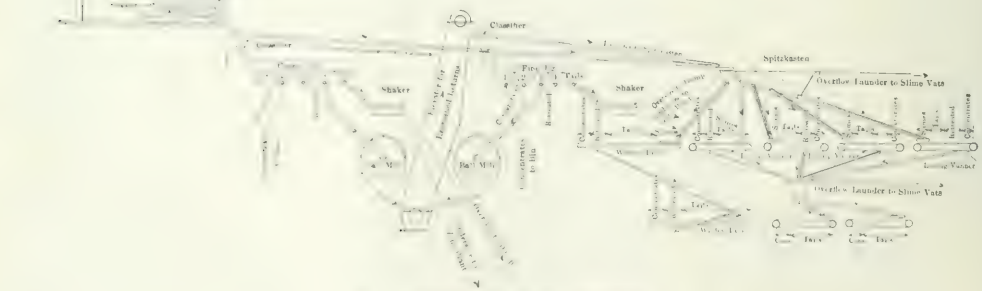

FIG. 4. DISTRIBUTION OF MILL PRODUCTS

This sample goes to the sample mill, which is arranged on the usual pattern—i.e., the ore is crushed fine and mechanically divided and subdivided until a sample is obtained not too large for the assay office. A doubt arose whether or not the sample thus taken could be considered a fair sample. In order to test this, another man was put on to take an independent duplicate sample every hour, but half an hour after the first man. This was done for a period of six weeks; at the end of the six weeks it was found that the first sample assayed 16.46 per cent. lead and the second 16.57 per cent., showing that the method of taking the samples was fairly reliable.

PREPARATION FOR CONCENTRATION

The ore (about 1½ in. to 2 in. in size) is fed automatically into the rolls by means of a roll feeder (see Fig. 6), assisted by a jet of water. On leaving the rolls it passes over a rocking screen (see Fig. 7) with 3/32-in. holes. The through ore goes to the concentrating plant, and the over-size falls on a traveling Balata belt, which discharges into the boot of an elevator, which elevator returns it to the orginal top level, and discharges it into a second set of bins commanding a second set of three rolls, similar to the first set, but grinding finer and revolving at 45 r.p.m., and ⅛ in. to 3/16 in. apart. Here, again, the ore is fed in automatically and follows the same process; i.e., the through ore goes to the concentrating department and the over-size falls on a traveling belt similar to the previous one, and is again raised to the original level and discharged into a third bin. The third bin commands another set of rolls in the same way, which rotate at 78 r.p.m., and 1/16 in. apart; the over-size is raised in the same way into a bin, and from here into the last crusher, which is a No. 5 Krupp ball mill, specially constructed for wet grinding; in this last mill the grinding reaches finality, as no ore can escape the ball mill before it is crushed to a sufficient fineness to pass the screens.

Material which has once passed a set of rolls never comes back to the same rolls, but goes on to another set adjusted differently. In the old mill the usual method is followed of returning the oversize of screens to the same set of rolls. The advantages of the new method are that a much smaller proportion of slimes is made, and that the gradual reduction effects at the same time a gradual concentration. That is to say, that the material fed into the first set of rolls is the richest. After crushing and screening, the over-size which goes to the second set of rolls is poorer, as the portion not crushed fine enough to pass the screen is the hardest and therefore contains most of the gangue. The same selection takes place in the second set of rolls, and so on. The assay value of the feed into the first set of rolls is about 15 per cent. lead, while the feed into the last set of rolls or ball mill is only about 10 per cent. It is found that this automatic selection gives an advantage in the working of the jigs and in the recovery.

The principle of never returning any ore to a machine through which it has once passed, but passing it on to another machine differently set, has been carried out as far as possible all through the mill. It seems right to conclude that a machine which allows material to go through without effecting its purpose should not be called upon once more to do it; the operation should be done in one differently set.

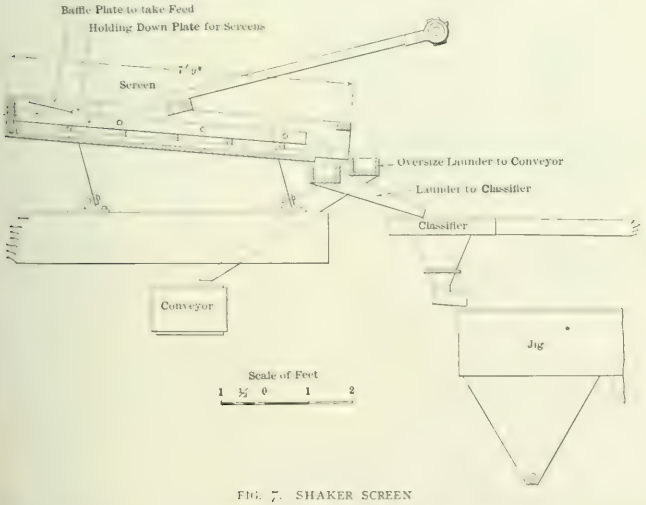

FIG. 7. SHAKER SCREEN

SCREENING

Instead of shaking screens trommels were used at first, but it was found on experimenting with shaking screens that these did much more effective work than the trommels. The trommels only passed through 58 per cent. of the material that was fine enough to go through, while the shaking screen passed through 70 per cent. Other advantages of the shaking screen over a trommel are: (1) less initial cost; (2) less water required for screening; (3) repairs can be done so much more quickly, as it only takes about 10 minutes to replace a screen plate, while in a trommel it takes hours; (4) the screen plate lasts longer in the shaker than in the trommel; the screening area of a shaker is 21 sq.ft., and lasts six weeks; (5) the shaking screen takes up much less room than a trommel, and is much more easily accessible for cleaning while in motion.

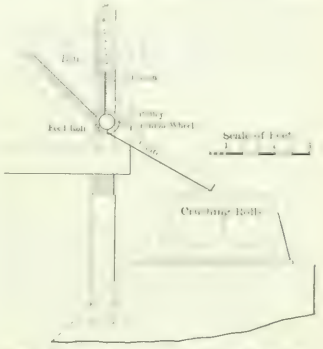

FIG. 6. ARRANGEMENT OF FEED ROLLS

The ore is now all fine enough for the coarse jigs, i.e., it will all pass through a 3/32-in. hole. On its way to the jigs (May plunger jigs with five compartments, see Fig. 8), the crushed material passes through a slime separator—an inverted cone with an inflow of water at the bottom, and an overflow which carries the water charged with all the slimes (see Fig. 9). The coarse part of the material goes to the jigs, and the overflow slimes to the slime department. In the first two compartments of the jigs, concentrates of about 60 per cent. lead are obtained; in the third and fourth compartments a product assaying about 10 per cent. lead, 19 per cent. zinc, and 10 oz. silver; and in the last compartment tailings assaying from 3 to 4 per cent. lead.

The discharge from these jigs is through a spigot at the bottom, and is continuous. The concentrates run through launders into bins above the railway line, where they are drained of water, and when dry enough run into railway trucks. The tailings are also run into bins, from which they are trucked to the tailings heap. The middle product is discharged into a No. 4 ball mill with slotted screens, 1/32-in. slots; the resulting pulp is raised by means of a bucket elevator into the fine jigs of four compartments, but on its way to these jigs it passes through a slime separator similar to the previous one, so as to remove the slimes, which again go to the

concentrates assaying 40 per cent. lead, 13 per cent. zinc, and 22 oz. silver; a middle product assaying about 9 per cent. lead, 18 per cent. zinc, and 10 oz. silver; and tail- [illegible] 18 per cent. zinc, and 8 oz. silver. The concentrates and tailings are disposed of in the same way as with the coarse jigs, and the middle product passes into another ball mill with screens with slotted holes 1/45 in. wide, and the resulting pulp is raised

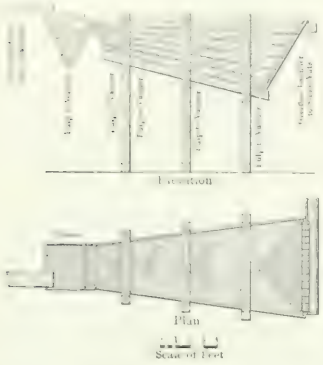

FIG. 10. SPITZKASTEN

up to the slime separator belonging to the fine jigs. No handling of material takes place; every product finds its way automatically to its destination right through the process.

CONCENTRATING PLANT

The slimes coming from the various slime separators pass into "V" boxes (see Fig. 10), where they are classified into coarser and finer slimes. The coarser slimes go to Wilfley tables, and the middlings from these over a second set of Wilfley tables at a lower level, the concentrates finding their way to the concentrate bins, and the tailings to another set of bins, from which they are removed to the zinc-treatment plant. The finer tailings classified into four sizes go to the Luhrig vanners, upper and lower set, the same as the Wilfley, and the concentrates and tailings are disposed of in the same way.

During the crushing and subsequent grinding a fine slime is formed, which settles with great difficulty in the circulating water and runs past all the concentrating appliances. These slimes contain about 18 per cent. lead and 18 oz. silver and form a very substantial portion of the total ore treated. At one time these slimes were allowed to run away mixed with the tailings as untreatable, but now the circulating water is settled in a number of large tanks and the resulting slimes (about 1500 tons weekly, or about 12 per cent. of the total ore treated) are collected and further treated by means of the sintering process, which will be described later on.

The recovery of lead in coarse jigs is 47.5 per cent.; in fine jigs, 13.5 per cent.; on Wilfley tables, 3.15 per cent.; on Luhrig vanners, 3.15 per cent. The quantity put through coarse jigs, double, per hour is about 5¾ tons; fine jigs, double, 2¾ tons; Wilfley tables, ¾ ton; Luhrig vanners, single belt, 1/6 ton.

From the former operations four products are obtained:

Lead concentrates, averaging 55 per cent. Pb, 10 per cent. Zn, 26 oz. Ag.
Coarse tailings, averaging 1 per cent. Pb, 12 per cent. Zn, 5 oz. Ag.
Fine tailings, averaging 5 per cent. Pb, 17 per cent. Zn, 8 oz. Ag.
Slimes, averaging 18 per cent. Pb, 17 per cent. Zn, 17 oz. Ag.

The total quantity of ore put through the two mills is about 12,000 tons per week.

It will be noticed that sizing the broken ore previous to jigging is not done. At one time it was thought that sizing the ore—as is the practice in most concentrating mills—might be an advantage, but exhaustive trials made in this direction proved that with the Broken Hill ore there was no advantage in doing this. This may be due to the fact that the mixture of ore and gangue is so intimate that before any concentrates can be obtained crushing through a 3/32-in. mesh is necessary, and to size material smaller than this would be a cumbersome operation when dealing with such large quantities. However this may be, sizing did not give any higher recovery, nor was it more economical, and the idea was abandoned.

DISPOSAL OF THE PRODUCTS

(1) The slimes go to the sintering works; (2) the coarse tailings (3500 tons per week) are transported by means of electric motors to the tailing dump and will be treated later on for zinc; (3) the fine tailings go to the zinc-concentrating department direct; (4) the lead concentrates (2200 tons per week), after draining, are automatically discharged from the bins into railway trucks and sent to the smelting works at Port Pirie.

The two products, lead concentrates and slimes, which are sent away from Broken Hill (the first direct to the smelters and the latter first to the sintering works and subsequently to the smelters) contain about 80.5 per cent. of the total lead contained in the original ore; this is an average taken over about three years.

During the operations in the mill, especially in the jigs, a voluminous scum is formed on the surface of the water; the air and gas freed from the water float sulphides to the surface and there form this scum. The gas shows a selective action, as the gangue is not thus floated. An assay of this material proved that the sulphides thus floated were very much richer in silver; the ordinary concentrates assay from 25 to 30 oz. to the ton, but these concentrates assayed from 60 to 80 oz. At one time, as far back as 1899, this scum used to be collected and bagged separately, and sent to the smelters direct.

The four products from the ore-dressing mills are dealt with as follows:

SINTERING OF SLIMES

The fine slimes which are settled in large iron settling tanks are run in a semi-fluid condition over the ground alongside the railway in a layer of about 9 to 12 in. thick; here they are allowed to dry; after a couple of days, according to the weather, they are, when still very plastic, cut up with spades into blocks like peat, about 4 to 6 in. across; these blocks are allowed to dry for a few days more, and when hard enough to handle (after four days in summer and longer in winter) they are loaded into trucks and railed along the Silverton tramway to the sintering works, about five miles out of Broken Hill. Here the blocks are built into heaps

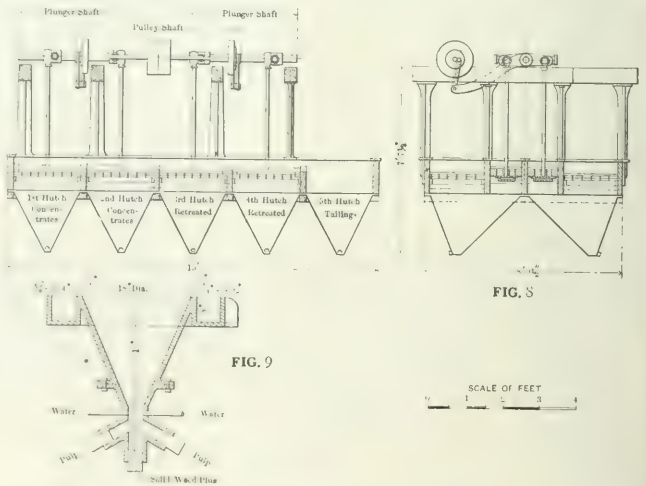

FIG. 9

FIG. 8

COMPOUND JIG AND HYDRAULIC CLASSIFIER

with brick air channels at the bottom; the sides of the heaps are plastered over with wet fine slimes, a space being left open at the top for fumes to escape. The heaps are about 20 to 22 ft. wide, 6 ft. 6 in. high, and 200 to 250 ft. long, and hold about 1000 to 1500 tons each. A small wood fire is kindled at the entrance of the air channels, and kept burning for a day or two, by which time the whole of the heap is generally burning right through and is red hot inside. About 1½ per cent. of wood is used to kindle these heaps. The heaps take about 10 to 15 days to burn, according to the strength of the wind and the dryness of the lumps, and give off a large quantity of SO_2 gas. After burning, they cool down gradually until cool enough to be handled. The outside lining is then taken off, mixed with water, and used for plastering over new heaps. The inside is then found to have run together in hard, porous lumps, which require considerable hammering to break up into pieces of manageable size. A great part of the sulphur has been driven off, and a good percentage of the zinc. The assay of the slimes before burning is 17 per cent. lead, 17.5 oz. silver, 16 per cent. zinc, and 12.5 per cent. sulphur. After burning, the sintered slimes contain 14.5 per cent. lead, 15.8 oz. silver, 12.5 per cent. zinc, and 7.1 per cent. sulphur.

The loss of lead is considerable, and in this respect the process is a crude and imperfect one. At the same time, the cheapness and simplicity of the operation, coupled with the absence of any plant, to a great extent make up for this. Seeing that about 100,000 tons of slimes are treated in this way every year, it is clear that any roasting plant capable of dealing with this quantity would require to be very large, and, taking all these things into consideration, it seems that the present imperfect process is likely to hold its own for a long time to come. The resulting product—sintered slimes—is particularly well suited for the smelters, as the lumps are hard and porous, and as much as 500 tons a day has been run through the smelters.

THE JIG TAILINGS

The jig tailings, previous to being trucked out on to the dumps, are passed over shaking screens in order to separate all that material which is already fine enough for the zinc plant. About 30 per cent. of the total passes through the 40-mesh screens, and is sent direct to the zinc plant; the remainder is sent to the dumps for future grinding and treatment at some later date.

THE FLOTATION PLANT

The fine tailings are loaded into bottom hopper trucks, holding about eight tons each, and are taken to the zinc plant. This plant is made up as follows (see Fig. 11):

An elevated railway takes the material (fine tailings from the mill) into bins. From these bins it is fed automatically into vats, where the separation takes place. These vats are inverted wooden pyramids (see Fig. 12) lined with sheet lead. It will be noticed on the sketch that these vats have two pockets at the bottom—one without an outlet, and one with an outlet. Iron pipes introduce the solution into the vat, close to the bottom; one of these pipes discharges into the blind pocket, and the other into the pocket with an outlet.

The operation is as follows: Solution is introduced into the vat, but, as the quantity introduced is more than can run out through the bottom outlet, a large quantity overflows at the top over an overflow specially arranged for this purpose. The tailings are then fed mechanically from the bin into the vat, above the blind pocket. This blind pocket collects all heavy stones, bolts, nails, etc., which otherwise would obstruct the outlet. As the material falls into the blind pocket, it is washed over the partition which separates the two pockets, and passes out through the outlet. On its way down the vat, however, the solution acts on the carbonates contained in the ore, and produces bubbles of CO_2 gas. This gas shows a selective action; it adheres to the particles of blende and galena, but not to the particles of gangue, chiefly quartz and rhodonite. The bubbles of gas cause the particles of blende and galena to float; they come to the surface, and are washed away through the overflow.

The overflows of all the vats join together in one launder, which discharges into a set of wooden tanks, where the particles of blende and galena lose their bubble of gas, fall to the bottom, and fill the tank. When the tank is full, another tank is filled, while the full one is being drained, washed with clean water to remove any trace of chemicals, drained again, and when dry enough discharged and loaded into railway trucks.

It is found that each vat—of which there are six—can treat from 10 to 12 tons of material per hour. The speed depends greatly on the fineness of the material. Each tank—of which there are also six—holds about 50 tons of concentrates. About 240 tons of concentrates is the daily production, but as much as 300 tons per 24 hours has been produced.

The bottom outflow from the vats carries all the gangue with it. The solution and gangue together fall on a 3-ft. india-rubber traveling belt, with side rollers to make it into a trough. The belt runs up hill, which causes the solution to run into a sump, while the solids settle on the belt, are carried up hill, draining all the time, until at the end pulley of the belt they are sufficiently dry to be used as filling underground. The belt discharges on to a narrower flat belt which in its turn discharges the waste into the open cut, from where it is distributed into the various mullock chutes.

The solution used in the vats is a solution of $NaHSO_4$ (a by-product in the manufacture of nitric acid). The temperature most suitable is about 180 deg. F.; in order to reach this temperature, superheated steam of 500 deg. F. is introduced into the solution vats, which stand on a high enough level to command the whole plant. Air jets return the spent solution into this solution vat.

As there are no moving parts in the plant, except the mechanical feeders and traveling belt, the bill for repairs is a very light one. Two engines of 10 h.p. each supply all the power required, except that for the air jets.

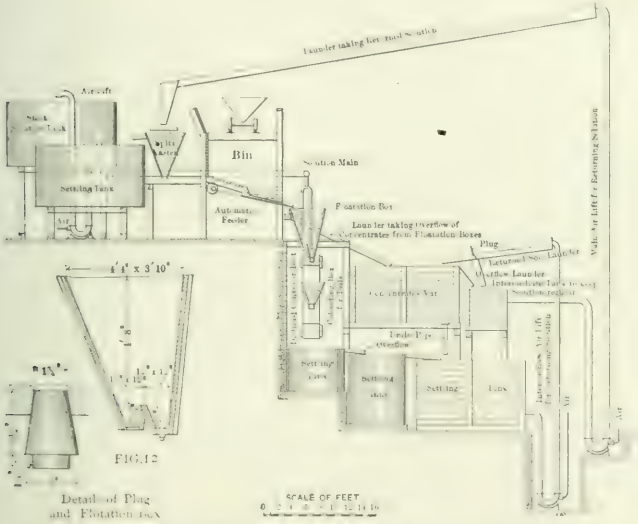

FIG. 11. CROSS SECTION OF 6000-TON ZINC PLANT

DEEP MINING IN THE LAKE SUPERIOR COPPER DISTRICT*

Methods of Hoisting—Difficulties of Surveying—Concrete Bed for Inclined Track

BY F. W. McNAIR†

The copper mines of the Lake Superior district are essentially low grade. Their profitable operation is made possible by the great extent of the lodes, their comparative uniformity of character and the investment of great sums of money to maintain operations on a vast scale over a long period of years.

With but one important exception the lodes are the vesicular tops of ancient lava flows which subsequent to solidification have had the cavities wholly or partly filled by the deposition of various minerals, among which is native copper. They dip at angles varying from 38 to 70 degrees.

METHODS OF HOISTING

The modern shafts through which the rock is hoisted are either inclined, following the plane of the lode, or are vertical. The inclined shafts are of dimensions such as to provide for two railroads of approximately standard gage on which run the skips, which are operated in balance. In addition there is room for the ladder way and air pipes, usually at one side. The vertical shafts have compartments providing usually for cages and pipe and ladder way. Several of the inclined shafts are over 5000 ft. long. One has a length of 8100 ft. Of the vertical shafts the three deepest are respectively about 5200, 5000 and 4900 ft. deep.

LIMIT OF POSSIBLE WORKING DEPTH

Long before such depths were actually reached there arose the question as to a possible limit set by the ultimate crushing strength of the rock which is penetrated. Manifestly mining cannot go to a depth such that the weight on walls of drifts and stopes will exceed the ultimate strength of the material of which they are composed. There is a widespread impression that the lake mines are approaching such a limit. There are current statements to the effect that pieces of rock occasionally snap off the rock faces because of the great strain, and are violently projected as if propelled by an explosive.

In this connection a few figures will be of interest. The average density of the rock of the copper-bearing series is not far from 2.87, that is, a cu.ft. weighs about 179.3 lb. Therefore a horizontal sq.ft. of area at 5000 ft. from the surface has above it a column of rock weighing 448 tons. The ultimate crushing strength of the average rock is not well known, but since it is mostly trap this may be safely assumed as at least 1200 tons per sq.ft. If, therefore, the sq.ft. above defined carries the entire column above it, it is loaded to much less than half the crushing strength and only at nearly three times the assumed depth will the load reach its crushing limit. At a dip of 38 deg., the pressure normal to the plane of the lode at 5000 ft. from surface is only 354 tons per sq.ft. It is in this direction that the crushing forces are mostly called into play. As the dip increases this normal pressure of course diminishes. At 52 deg. it is 278 tons, and at 70 deg. it is 152 tons per square foot.

WEIGHT UPON PILLARS

However, the matter does not end here. The removal of large portions of the copper zone leaves considerable areas of the roof or hanging wall to be supported by the pillars which are left for the purpose, or by the walls of the opening, or by both. The weight on pillars and walls is thus increased and may easily approach the crushing limit. Take for example a long pillar 50 ft. wide having on either side an open space of 150 ft. Suppose it to be a lode dipping at 38 deg. Allowing for neither rigidity nor arching, and supposing the weight on the pillar evenly distributed, at 5000 ft. depth it would be subjected to a pressure of 1239 tons per sq.ft., a pressure under which it would fail.

As a matter of fact in such a case the rigidity of the rock mass distributes a large part of the load out over the rock beyond the walls of the opening. That this rigidity may be considerable is illustrated in several cases where areas of hanging as wide as 200 ft. or more have no support between walls, and yet have stood up for several years. They are not, however, at maximum depth.

HOW PILLARS FAIL

In such an area a pillar when first cut out may have to carry but little more than its previous load. As the hanging wall slowly bends, the pillar must take up more and more of the extra weight. This is not applied uniformly. As the rock between pillars and walls bends downward the tendency is to concentrate the load at the edge or face of the pillar, or wall, much as a beam does when supported in like manner. The outer parts of the pillar may thus become overloaded and here it will fail.

It does so by the splitting off of pieces of rock much as may sometimes be observed with a specimen in the testing machine, though on a much greater scale These pieces break from the base as well as the top, and, as a rule, like any hard rock under a crushing load, the pillar fails suddenly. Small pieces of rock may fly a considerable distance, and such occurrences have undoubtedly given rise to the exaggerated impression of the compressive stress to which the rock is subjected in the lowest levels.

READJUSTMENT OF THE WEIGHT

The hanging rock mass moves of course when the pillar crushes, and the vibration due to the sudden though slight displacement is often conveyed to the surface. The result is a miniature but perfectly genuine earthquake which may be felt over a distance several times that of the pillar from the surface. With the crushing of the pillar and the movement of the hanging, a re-adjustment of the weight takes place, and the process begins over again. Instead of the process being repeated in exactly the same manner, it is possible for the hanging to break in such a manner that the arching effect may protect this pillar and place the load on others. Eventually at great depths the hanging and fort must come together, and in one mine the final steps in the process came so rapidly as to completely wreck it.

The pressure normal to the plane of the lode is not the only stress which may become manifest. The pillars are not as a rule separate from either foot or hanging. They are parts of the same rock mass, and it is not possible for the hanging to slide over the pillar. In consequence the readjustments which take place when a pillar fails as above described sometimes put an enormous longitudinal thrust on the foot, and in places its surface portion has buckled up under such stress. Also, at points where shaft pillars have been weak, shafts have been pinched and twisted under the same conditions so as to interfere with their operation.

IMPOSSIBILITY OF SUPPORTING HANGING ROCK PERMANENTLY

Experience seems to have shown that at the great depths recently reached it is useless to expect to hold up the hanging rock mass for a long time by any scheme of pillars unless far too much of the lode is left in place, and that the only feasible method is to cut away the entire lode and permit the hanging to cave as rapidly as it will to the point where the broken rock again fills the whole space, and redistributes the weight over the footwall. Following this plan stoping begins at the point farthest from the shaft and progresses toward it. With a wide shaft pillar, or with the shaft in the footwall, and with some such general method which avoids concentration of pressure where it can do harm, there seems no reason to anticipate serious difficulties due to crushing

*From the vice-presidential address read before Section D, Mechanical Science and Engineering, of the American Association for the Advancement of Science, at the New York meeting, Dec. 28, 1906.

†Professor Michigan College of Mines, Houghton, Mich.

for a further depth at least as great as that already attained.

DIFFICULTY OF SURVEYING DEEP SHAFTS

The difficulties of surveying the mine are not markedly increased by depth, except in the case of vertical shafts. When these are deep, and it becomes necessary to carry down an azimuth from the surface by means of two plumb lines hung in the shaft, there is presented a problem of considerable difficulty. It is almost impossible to free the lines entirely from disturbing influences which displace them from their normal positions. If either lines or plumb bobs are of magnetic material the presence of iron pipes in the shaft may result in seriously disturbing them. Falling water may be in such quantity, and so directed as also to affect the position of the lines.

However, the air currents, which cannot be wholly eliminated whatever the precautions taken, are the most serious cause of disturbance. The temperature at the bottom of the shaft is higher than that at the top, and in consequence convection currents are formed. The heat supplied from the surrounding rock keeps them up. Indeed, with moderately steady temperature at the surface and with the shaft idle, a remarkably stable condition of these air currents may come about. Elsewhere observations have been published by the writer[1] showing that their effect on a plumb line may remain sensibly constant for hours at a time while deflecting the line from its vertical position. The stability of the currents is made possible by the large cross section of the vertical shafts, 10x22 ft. to 10x30 ft. outside of timbers, thus giving a large air body, and the constancy of the rock temperatures, and the supply of heat through the shaft walls. When we take account of the fact that a force equivalent to a horizontal pressure of 10 grains on a 60-lb. plumb bob suspended by a line 4000 ft. long will displace the bob 1/10 ft. from its normal position, it is easy to see how apparently slight causes may produce appreciable error in azimuth.

DIVERGENCE OF LONG PLUMB LINES

General attention was first attracted to this problem by the very noticeable divergence of two long plumb lines hung in shaft No. 5 of the Tamarack mine. Of course, divergence alone would not affect azimuth, but the question confronting the surveyor is whether the divergence may not be due to some cause which may also displace one or both of the lines in a direction perpendicular to their plane. In the case mentioned it required a great deal of investigation and experiment to fasten the responsibility on the currents of air.

It is remarkable how many persons are ready to accept as an explanation of such divergence the statement that there is an excess of gravitation on each bob horizontally toward the end wall nearest which it hangs. All are familiar with the picture in the text-books of the plumb line hanging near the face of a precipice being deflected from the vertical by the attraction of the mountain mass. The idea so strikingly conveyed by this picture while qualitatively correct seems in most minds to be quantitatively wrong. There is an excess of attraction on the bobs, as stated, but its amount is far too insignificant to account for any observed divergence. At Tamarack No. 5 it could account for no more than one-thousandth of a foot. The convergence of vertical lines in that instance is over three times this amount.

EXPENSE OF HOISTING FROM GREAT DEPTHS

Increased depth tends to lessen the output of a given shaft, and in the effort to prevent this, and also to reduce hoisting charges, loads have grown larger, likewise the speed at which they are hoisted. Loads of nearly 7 tons are being raised on some of the inclines at speeds up to 40 miles per hour.

A considerable item in the hoisting charges is the cost of maintenance of the skip road, the expense per ton for this purpose increasing with the length of the shaft. The usual skip road is carried on heavy timbers which are placed transversely along the foot, and support large stringers to which the rails are spiked. The expense of maintenance of this road for great depths is such that some of the mines are substituting for it a road consisting of a rail attached to a concrete stringer which is borne directly on the rock of the footwall.

CONCRETE STRINGERS

The stringer proper is about 13½ in. wide by 14 in. high. Beneath it and supporting it is a mass of concrete 16 to 18 in. wide, extending to the rock. The depth of this supporting mass varies considerably, depending on the irregularities of the rock face to which it is attached. It ranges all the way from 4 in. to 2½ ft., and there is no reason why these limits might not occasionally be exceeded. The stringer and supporting mass are structurally one piece, being molded together. The stringer portion is reinforced by means of a 1⅛-in. steel cable passing longitudinally through its interior. The rail is attached by bolts, which are spaced 3 ft. apart, and hold it by means of clips which grasp the rail flange. The bolts pass through the stringer into a rectangular opening about 3x4 in. in section, which passes quite through the concrete and affords access to the lower end of bolt.

In building the road, a form of plank is constructed, having the cross-section of the stringer and a length of 15 ft. To its lower side are nailed the cores for the bolt openings just mentioned. The top is left open. From one to three of these forms are supported in place underground by suitable means, and to the sides are nailed boards extending downward to the rock. These make the form for the supporting part underneath the stringer proper. When all is firmly secured, the rock face is thoroughly washed and the concrete is filled in, beginning at the lower end. The mixture used is 1 part portland cement, 3 of sand and 5 of crushed rock, and it is tightly rammed in place. As the filling proceeds, the top of the form, or the cover, is completed by nailing on short pieces of plank. In the roads which have been built at a slope of 70 deg. the structure is anchored to the footwall by heavy bolts spaced 8 ft. apart. When the concrete has hardened sufficiently, the form is removed and the rail is bolted in place. The road is then complete.

The first of these roads has been operating about three years and has proved so satisfactory that the construction of others has followed. Expectations regarding cost of maintenance have been fully realized. In addition, it has been found that the original cost of the road is less than that of wooden construction. Its disadvantages seem to be confined to the fact that, due to the unyielding nature of the support, the effect of a blow must be absorbed between wheels and rail, resulting in a perceptibly greater deterioration of both. However, this is far more than compensated by the decreased cost in other directions and the fireproof character of the road.

ECONOMICAL GENERATION OF POWER

In the effort to counteract the increased costs due to great depth the economical generation, distribution and use of power have naturally received large attention. The long period of operation necessary makes it worth while to expend large amounts of money in installing machinery of large capacity and high economy. The extreme in the direction of high-duty engines is represented at present in the Nordberg quadruple expansion two-stage air compressor operating at the Champion mine. The engine is equipped with Nordberg's regenerative feed-water heating system. It holds the world's record for minimum consumption of heat per foot-pound of work delivered, having shown a duty of 195,000,000 foot-pounds, being about 9 per cent. in advance of its nearest competitor.[1]

A bill has been introduced in the Prussian Diet providing that no concessions for coal mining or for potash salt works shall in future be given to private individuals or companies in Prussia. Those holding such mining rights will not be interfered with; but it is the intention of the Government to reserve all such rights in respect to coal and salts to itself for the future.

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[1] ENGINEERING AND MINING JOURNAL, April 26, 1902; *Electrical World*, April 26, 1902.

[1] "A High Duty Air Compressor," by Prof. O. P. Hood. *Transactions* American Society of Mechanical Engineers, 1906.

THE WALLAROO SMELTING WORKS*

Copper Smelting in South Australia—Ores, Methods and Products

BY T. C. CLOUD†

The Wallaroo Smelting Works are situated in South Australia, on the foreshore of Wallaroo bay, on the west coast of Yorke's peninsula and within three-quarters of a mile of the Government jetty. The land upon which they are built is partly reclaimed from the foreshore and partly high-lying ground forming the original shore. The block of land altogether comprises 70 acres, part of which is occupied by the slag dump. The works are so situated and laid out that, while the furnaces occupy the lowest level, the ore

The ore yards are provided with railway lines connecting directly with the Government railway, which latter communicates with the Wallaroo and Moonta mines and the Government jetty at Wallaroo, as well as with all parts of the colony and the Broken Hill district of New South Wales. Ore from over sea, from any part of the colony, or from the district of Broken Hill, can thus be discharged directly in the yards.

The yards are suitably provided with ore bins, ore sheds, sampling floors, etc. There is a crushing plant in connection with the yards for crushing ores, slags, etc., consisting of a stone-breaker, Cornish rolls, screens, etc. An overhead tramway stage leads from the crusher and commands the whole length of the ore yard. The copper-smelting department and the gold and silver ore-smelting department are quite separate, each having its own ore yard, furnaces, flues and chimneys.

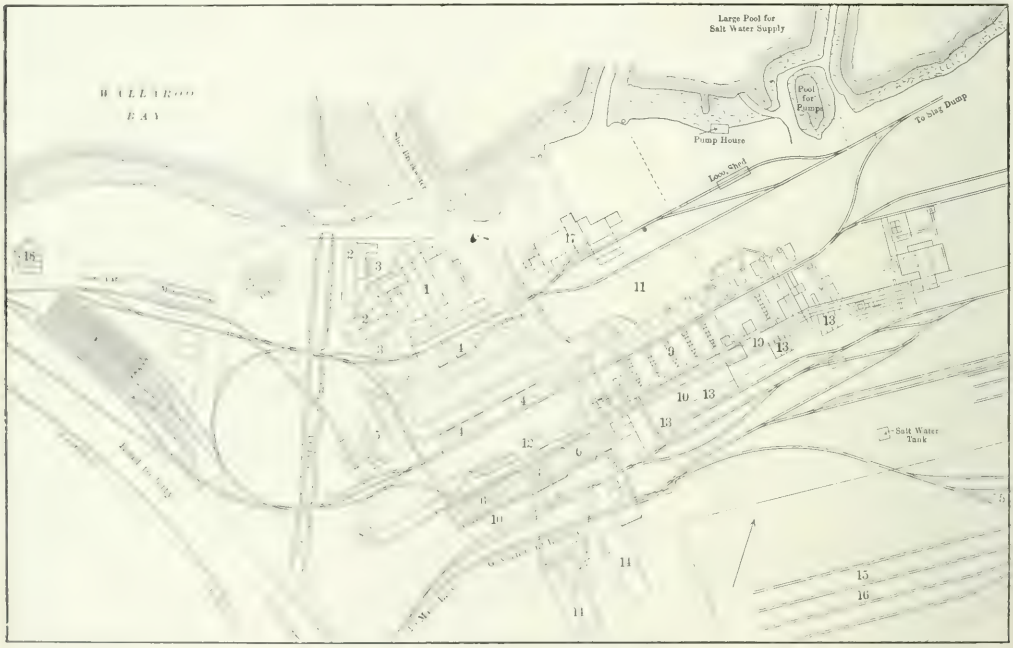
Although the chief work carried on is the smelting of copper ores, there are other subsidiary departments which have grown up of late years, but brief mention only will be made of these here.

The departments referred to are as follows: Copper sulphate works, capable of turning out about 500 to 600 tons of sulphate per annum; sulphuric acid works, with an output of about 5000 tons of chamber acid per annum; a department for the smelting of refractory gold ores, using copper as a collecting material, and, combined with this, an electrolytic depositing plant turning out about 12 tons of copper per week; also an electrolytic plant for parting gold and silver.

THE ORES TREATED

The following are the classes of copper ore which are received for treatment: Ores containing sufficient gold or silver, or both, for profitable extraction; ores containing impurities in larger proportion than occurs in the average ore received from the company's own mines; ores raised at the Moonta mine and the Wallaroo mine, both the property of the company; ores purchased in the immediate district and elsewhere in Australia, which are as free from impurities as the average ores raised at the two mines belonging to the company.

At the period to which the following description particularly refers (1902-03), the ores from the Moonta and Wallaroo mines consisted for the most part of chalcopyrite



PLAN OF THE WALLAROO SMELTING WORKS

1. Engine rooms.
2. Copper sulphate houses.
3. [illegible]
4. Roasters.
5. [illegible]
6. [illegible]
7. Coal storage ground.
8. Firebrick works.
9. Ore calciners.
10. Copper ore yard
11. Reducer furnaces slag floor
12. Roaster slag floor.
13. Ore sheds.
14. Sulphuric acid works.
15. Phosphate works.
16. Storage ground for phosphate.
17. Blacksmith and carpenter shops.
18. Assay office and laboratory.

*[illegible] read before the Institution of Mining and Metallurgy, Nov. 15, 1906; with illustrations and with additions and alterations by the author.

†Consulting metallurgical engineer, London, England; formerly manager of Wallaroo works.

mixed with varying proportions of ores.

A small proportion of the ore from the Moonta mines consisted of bornite, and occasional parcels consisting chiefly of copper glance were received. Generally speaking, the ore from the Wallaroo mine carried a larger proportion of pyrite than that from the Moonta mine. The chief minerals forming the gangue of the ore are quartz, feldspar, biotite, hornblende, ankerite and calcite, while apatite, fluorite and scheelite also occur in small quantities. The other metallic minerals which occur in small quantities with the ores are sphalerite, galenite, molybdenite, cobaltite, martite, native gold and pyrrhotite. The ore as received at the works is either hand-picked and broken to about 2½ in. gage, or jigged concentrates or slimes and fines, the proportions being about 13 to 20.

The ores purchased in various parts of Australia are oxidized copper ores consisting of green carbonate and cuprite, with occasional parcels containing a large proportion of the copper in the form of atacamite and ores consisting chiefly of bornite and copper pyrites, comparatively free from iron pyrites. The oxidized ores here referred to come to hand for the most part as hand-picked ore broken to about 2½ in. gage, while the sulphide ores mentioned reach the works as jigged concentrates and slimes. Hand-picking or dressing is done at the mines, and the figures given below, representing the composition of the ore, refer to the dressed ore as received at the works.

The average composition of the ore received from the two mines belonging to the company is approximately as follows:

COMPOSITION OF ORE FROM WALLAROO AND MOONTA MINES

	Wallaroo Mine.		Moonta Mine.	
Copper	13 00 per cent.		19 60 per cent	
Iron	26 10		25 26	
Sulphur	22 15		17 82	
Silver	0 0023	15 dwt. per ton	0 0020	13 dwt. per ton
Gold	0 0002	1 dwt. 7 gr. per ton	0 0002	1 dwt. 7 gr. per ton
Lead	0 25		0 05	
Nickel	0 109		0 08	
Zinc	0 74		0 041	
Arsenic	0 011		0 004	
Bismuth	0 0012		0 001	
Tellurium	0 001		0 001	
Silica	25 19		27 03	
Alumina	2 77		2 66	
Lime	3 34		0 78	
Magnesia	3 17		1 04	
Undetermined				
Alkalies, Manganese, Oxide, Phosphoric Acid, Fluorine, CO_2, etc.	3 1153		6 2308	
	100 0000		100 0000	

WEIGHING AND SAMPLING

All the ore received at the works is weighed on beam scales in 2-cwt. drafts; the ore from the company's own mines in parcels of 50 to 100 tons, and purchased ores in parcels according to quantity, but not larger than 50 tons.

In the former case the sample is obtained by placing each twentieth barrow on a paved floor to form the sample pile; this, when completed, is turned over, trenched, and from the sides of the trench about 5 cwt. of ore are removed, and, after mixing, about 1 cwt. is taken from this and passed on to the sampling room.

In the case of purchased ores, which, for the most part, arrive as hand-picked ore broken to about 2½ in. gage, the sampling is performed at a special automatic sampling plant. This plant is so arranged that the feeding takes place at the ore-yard level; the sample is delivered at the bottom of the plant, which is 20 ft. below the ore yard, and all rejects are elevated and delivered into trams running on a tramway above and extending the full length of the yard and bins, so that ore, after sampling, can be delivered to any part of the yard.

The proportion of the parcel taken to the sampling plant is such that about 5 tons are actually put through; thus, if the parcel is about 10 tons, every second barrow passes to the sampler; if it is about 20 tons, every fourth barrow passes, and so on.

The barrows are tipped in regular rotation into a hopper feeding a stone-breaker set to reduce down to about ¾ in. to 1 in. gage. The discharge from the stone-breaker is received in a small tumbling hopper, so arranged that it passes equal weights to the fine crusher and reject elevator alternately. The portion passing on goes through a Marsden fine crusher and a ¼-in. screen, and from this it feeds into a large Clarkson's divider which is set to remove one-tenth and reject nine-tenths; the one-tenth portion passes to a small Clarkson divider which rejects four-fifths and delivers the one-fifth portion, weighing about 1 cwt., into a suitable receptacle, from which it is taken to the sampling room to be completed.

THE SAMPLING ROOM

In this room there are two Fraser & Chalmer's power-driven sample grinders, one grooved for coarse grinding, and the other smooth for fine grinding. Let into the floor is a smooth cast-iron plate about 8 ft. square, and under this is a shallow brick chamber into which live steam can be admitted, so that damp samples, while being worked on the plate, can at the same time be dried and the sifting thus facilitated. The room is also provided with a small rock-breaker for rough special samples and with drying stoves for water-weight determinations.

On being brought into this room the sample is put through the first of the two sample grinders until it passes an eight hole sieve, the sifting being done by hand on the cast-iron plate referred to. After being thoroughly mixed with the shovels, the chief sampler and his assistant working together, the pile is quartered in the usual manner, and the sample portion again put through the grinder. This operation of grinding, sifting, mixing and quartering is continued, a finer sieve being used each time, until the sample finally passes a 60-hole sieve.

In this condition it is divided into five or six pulp samples with a small Clarkson's sample divider, and each of these is then sealed up; one is forwarded to the assay department, one is handed to the seller's representative, and the others are placed in the storeroom for future use, if required. The works accounts are all based on the ton of 2240 lb. and the wet assay. The method employed for the determination of the moisture was as follows: At frequent intervals during the weighing of a pile, about a shovelful of the ore was taken from the face where shoveling was taking place. The ore thus taken was stored in an ore bag kept buried just below the surface of the pile of ore being operated on. On the weighing being finished for the day, the sample thus taken was removed to the sampling room, where it was crushed, if necessary, to about ¼ in. gage in a small crusher, rapidly mixed with shovels on the iron floor, and quartered down to about 4 lb. From this a portion weighing exactly 1 lb. was taken and dried at a low temperature in pans placed on a hot plate. When no more moisture was given off, as indicated by the dulling of a cold piece of glass held near the surface of the ore in the pan, the ore was allowed to cool somewhat and transferred to the scale pan, the loss in weight thus obtained being entered as moisture. In the case of a pile of ore requiring more than one day for weighing off, there would be in this way a moisture determination for each day's weighing and the results thus obtained would be taken into consideration when making up the water weight for the whole pile.

ASSAY OFFICE AND LABORATORIES

These departments are included in a separate building and comprise one assay room and three laboratories, one for general work, one fitted specially for electrolytic copper determinations, and the other reserved for the analysis of refined copper and any special work. There is also one room serving as a balance room and library. Included in this building are also a storeroom, a room for the small grinding appliances and another room containing the wire-drawing plant.

The assay room is provided with melting and muffle furnaces. The chief points of interest about these are that the ash pits open to the outside of the building and are there provided with air-tight doors which are kept closed except for

cleaning-out purposes. A small opening on the room side, fitted with a slide, provides for the necessary air regulation. By this arrangement the dust and mess which usually accompany the removal of the ashes are avoided. The muffle furnaces are coal fired, and in these not only are the ash pits fitted up similarly to those of the smelting furnaces, but the firing is also done from outside the building.

One peculiarity of the assay department is worthy of note, that though all settlements for ore are made on the basis of the electrolytic assay, a modified Cornish assay is also made on all the ores except those which are received from the Moonta and Wallaroo mines.

The modification consists in so conducting the assay as to produce a "coarse copper" button not so coarse as is usual in working the process, and the fracture of this copper button at once indicates if impurities are present to an extent which brings the ore into the impure class, without the necessity for a more careful analysis. If the button does not show the presence of these impurities, then only is the ore subjected to a careful analysis in the laboratory.

The laboratories are provided with the usual appliances and high- and low-vacuum apparatus for filtration. Steam is supplied from a small low-pressure boiler for heating and evaporating and for making distilled water. The electrolytic determinations are made with platinum cylinders of the usual type, and the current is supplied by sets of Meidinger batteries.

As no coal gas is available, all the gas for heating purposes is supplied by air charged with gasolene vapor, made by a machine set up in a cool cellar in another part of the building, and supplied to the laboratory benches in the same manner as ordinary gas. The lighting is by electric current drawn from the works' generating plant.

On an average the ores treated contain too much sulphur for economical smelting, and a selection has therefore to be made of those which are most suitable for calcining, while the richer classes of ore, those containing the larger percentage of copper and smallest proportion of iron pyrites, are reserved for admixture with the smelting charge, without previous calcination. Oxidized ores with siliceous gangue are treated direct in the roasting furnaces with the matte.

SMELTING PLANT

For calcining the ore two essentially different plants are in use; one for calcining the rough ore and the other for calcining the jigged concentrates and fines. The rough ore so treated contains approximately 10 to 12 per cent. copper, 10 per cent. sulphur, and 30 per cent. silica.

It is treated in burners which are somewhat similar to the ordinary pyrites burners used by sulphuric acid works; they are so designed as to yield a gas containing about 7.5 per cent. by volume of SO_2, which is conveyed by underground flues to the sulphuric acid plant. There are two sets of these burners, each consisting of twelve cells, built back to back, with a central flue for carrying off the gases.

The ore is discharged from railway trucks into two underground bins, and from these it is drawn off into trams, which are hauled by a winch to the top of the burners and discharged into the hoppers placed over each cell. From these it is discharged into the burners by opening a suitable valve.

The calcined ore, containing on an average 5.5 per cent. sulphur, is drawn off at the bottom of the burner and allowed to fall into bins to cool; from these it is removed in trams to the crushing plant. Each cell receives a charge of about 10 cwt. twice in 24 hours. The burners described are capable of treating about 165 tons per week. The labor of charging and working the burners is performed by a man and lad working eight-hour shifts. There are two such shifts in 24 hours, and two periods of four hours each when the burners are left to themselves.

The removal of the burnt ore from the cooling bins below the burners is performed by lads allocated to the crushing plant. After calcination in these burners, the ore passes through a pair of Cornish rolls, set rather wide, so as to crush it to about 1 in. gage, and from the crushing plant it is trammed to the mixing yard, where it is dumped.

MECHANICAL CALCINERS

The jigged concentrates and fines are calcined in mechanical calciners of the Oxland and Hocking type. The revolving tube of these furnaces is 40 ft. long, and 6 ft. in diameter, fitted with a 9-in. firebrick lining and six rows of fire-clay tiles. It is supported on three pairs of friction rolls with a slight decline toward the fire-place end, and is driven by worm gearing so that it makes one revolution in about five minutes. A nest of five of these is erected at a lower level and at right angles to the mixing yard.

Each of these furnaces is fitted with two bins built alongside and discharging on the same level as the furnaces themselves. The ore to be calcined is weighed off into one of the bins, and a suitable mixture of raw ore, calcined ore from the burners and roughly crushed roaster slag, from the second smelting operation, is weighed off into the other.

The calciner tube discharges the calcined ore into a small elevator pit and the mixture of raw ore, calcined crushed rough ore and slag is conveyed from the bin containing it by a traveling belt, which discharges into the same elevator pit which receives the ore from the calciner tube. From this pit the mixture of ores and slag is elevated and discharged into a pair of large hoppers placed on a traveling carriage running on a slightly inclined tramway down to and over the smelting furnaces.

VIEW OF THE SMELTING WORKS

The whole work of moving the ore into the calciner tube from the bin and from the other bin to the traveling belt is performed automatically by suitable feeders. When the smelting furnace is ready for its charge, the hoppers are lowered by means of a winch down the slightly inclined tramway over the smelting furnace, and there discharged into the furnace through suitable openings in the roof. When empty they are hauled back by the winch to their position under the elevator. By this arrangement the ore is discharged hot into the smelting furnace, without any manual labor. There is one such calcining furnace with its accompanying pair of bins to each of five smelting furnaces. They are all driven from one main shaft operated by a pair of electric motors.

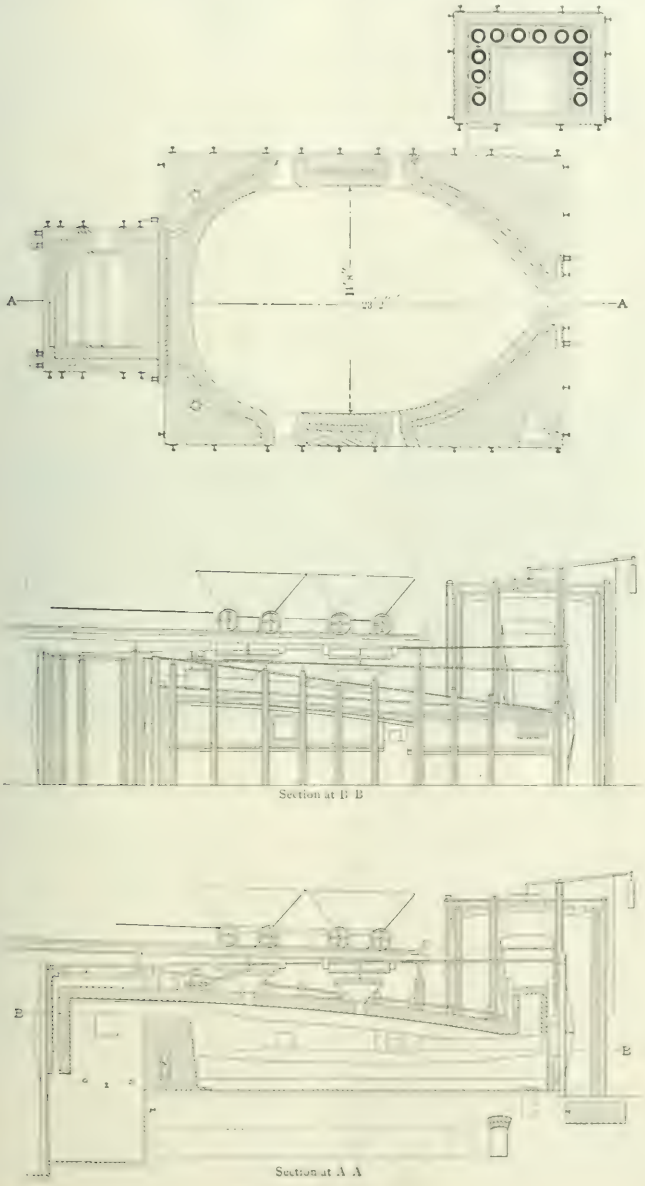
RESULTS OBTAINED

The ore treated in these calcining furnaces contains about 15 per cent. copper

and 20 per cent sulphur acid by calcination the sulphur is reduced to about 7 per cent. The coal used averages 7 per cent., calculated on the weight of the ore put through; this includes the coal required for the power, each furnace with its gear absorbing about 2½ brake horse-power.

One man working a 12-hours shift attends to each calcining furnace. The work is exceedingly light as there is but a small amount of firing to do, and the other duties consist only in attending to the necessary lubrication of the moving parts. Some little experience, however, is required in order to regulate the heat of the furnace properly.

These furnaces, working continuously day and night with practically no stop, run for nine months, at the end of which period they are put out to enable the masons to make any repairs to the grates and tiles which may be necessary, and the opportunity is then taken to overhaul the machinery and moving parts. The lining, with trifling renewals, lasts about seven years.



Section at B B

Section at A A

ORE-SMELTING FURNACE

The furnaces employed for smelting the mixture of calcined and raw ore are of the reverberatory type, the beds being 23 ft. 3 in. x 14 ft. 9 in. They are provided with two skimming doors, one at the side and one in front, and with a system of flues under the bed and cast-iron pipes in the downtake for heating the air, which is admitted partly under the ash pit, of which the grate is closed by iron doors, and partly through openings in the roof over the fire bridge.

There are six smelting furnaces of the dimensions named, and one half that size. Five of the large furnaces are coupled up direct to the mechanical calcining furnaces. The other large furnace and the small one take their charge direct from the mixing yard.

In the case of these two furnaces the hoppers themselves are hauled by wire rope up a slightly inclined tramway to the mixing yard, where they pass into a trench, so that they are easily filled by wheelbarrows from the various heaps of ore, to form a suitable smelting mixture. The calcined ore for these charges is derived from the burners working on lump ore.

When the hoppers are filled they are lowered down the incline to their position over the charging holes in the roofs of the furnace, and when the furnace is ready, the ore is dropped into it from the hopper. The charge for all the large furnaces is about 8 tons, and for the small one half that quantity. They smelt three charges in 24 hours and consume about 0.38 ton of coal per ton of ore smelted; the large furnaces are worked by two smelters and a laborer in each shift of 12 hours. The ore smelted contains 14 per cent. copper.

The slag produced is of the following average composition:

	Per Cent.
Silica	40.0
Ferrous oxide	42.5
Alumina	6.5
Lime	5.0
Magnesia	3.0
Copper	0.3
Lead	0.11
Nickel and Cobalt	0.18
Zinc	0.20
Phosphoric acid	0.9
Manganese oxide, sulphur, etc., by difference	1.31
	100.00

The chief constituents of the matte are as follows:

	Per Cent.
Copper	31.5
Iron	21
Sulphur	28

The slag and matte as they run from the furnace are received in sand molds. The slag, when cold, is broken up and removed to the slag dump, while the pigs of matte are passed on to the roasting department.

ROASTING

This department is provided with two revolving calcining furnaces, three large

roasting furnaces, the beds of which are [illegible] smaller furnaces. One calcining furnace serves the three large roasters and the second calcining furnace is connected with the smaller ones.

The method of working here adopted is to charge the roaster furnaces with about one-third raw matte and two-thirds calcined matte. About one-fourth of the matte from the matting furnaces is conveyed direct to the roasting furnaces, while about three-fourths of it is delivered to the calcining furnaces. Each of these is provided with a small crushing plant consisting of jaw breakers and rolls, elevators, screen and small storage bin.

The matte is here crushed to about ¼ in. gage and elevated from the storage bin to the calcining furnace. After passing through the calcining furnace it is elevated, together with a small proportion of oxidized ore, to a storage hopper, from which it is automatically fed into and conveyed by a traveling hopper, which carries it above the row of smelting furnaces and discharges the calcined matte, etc., into hoppers placed over the furnaces.

The whole of the work, therefore, from the time the matte is thrown into the jaw breaker to the time it is distributed to the hoppers over the smelting furnaces, is performed automatically. These matte-calcining furnaces are similar to those used for calcining the ore, except that they have fewer projecting tiles fitted to them.

Each of the calcining furnaces is managed by two men, working in two 12-hour shifts, with the assistance of a lad during the day, working an 8-hour shift. The crushing plant is attended to by three lads, each working 8-hour shifts in succession.

The power required is about 3¼ h.p., which includes that absorbed by the crushing plant, and that needed for moving the calcined matte to the smelting furnaces. About 16 tons of matte are calcined [illegible] consumption of about 1 ton of coal; the sulphur is reduced to about 12 per cent.

METHOD OF OPERATION

When the roasting furnaces are ready for their charge, a proportion of raw matte is first put upon the bed through the side door, with a small quantity of refinery slag, roaster-flue deposit and low-grade precipitate copper, and the charge of calcined matte is dropped from the hopper above the furnace through an opening in the roof.

Originally, the roaster furnaces were entirely charged with raw matte, and when these mechanical calcining furnaces were first introduced, in 1885, with a view to shortening the roasting process, a trial was made for some time with the object of obtaining the copper by what is known as the "direct process," i.e., the regulus was calcined to such an extent that, when melted down, it produced at once metallic copper.

After an extended trial, however, it was found that the time required to smelt the charge and produce metallic copper in this way was considerably greater than when a portion of raw regulus was added to the charge. In this latter case, when the charge was smelted it was in the condition known as white metal, and had then to be blown to produce copper. But, in spite of this, the time required to produce the copper was shorter, as stated above.

The explanation of this seeming anomaly is that the fine calcined matte lies dead on the furnace bottom and the heat does not readily penetrate through it, whereas when some raw regulus is placed on the bed of the furnace it melts easily and floats the calcined fines to the surface, and the heat is better able to penetrate through the mass.

The products of this process are roaster slag, containing about 6.5 per cent. copper, which goes back to the matting furnaces, and "rough copper" with about 98 per cent copper, which passes to the refinery. Both of these products are cast in sand molds.

The small furnaces work off five charges of 6 tons each per week, consuming 1.5 ton of coal per ton of matte; and the large furnaces five charges of 8 tons each per week, consuming 0.7 ton of coal per ton of matte. In both cases this includes the coal used by the calcining furnace. The small furnaces are worked by one furnace man and a laborer in each shift of 12 hours, and the large furnaces by the same number with extra assistance when charging.

TREATMENT OF BOTTOMS

In this department a certain amount of bottoming is done, one or two furnaces being set apart for this work. The quantity of matte so treated is regulated by the known composition of the ores coming forward, the object being to remove a certain amount of the total impurities present, so that the rough copper delivered to the refinery shall be, as far as possible, of uniform quality.

The gold removed by the bottoms is sufficient to pay for the cost of this additional work. These bottoms are transferred to the gold and silver department, and the bottomed regulus to the other roaster furnaces. The proportion of bottoms aimed at is 5 per cent. of the total copper in the charge. The gold in the bottoms varies from 2 to 6 oz. per ton of bottoms. As the removal of impurities by bottoming is interesting, particulars of a week's work, during which the products were weighed and sampled, are given below. In this case the proportion of copper in the bottoms was 7½ per cent. of the total copper present.

	Matte Charged.	Selected Regulus Produced.	Bottoms Produced.
Copper	51.2 per ct.	80.25 per ct.	98.1 per ct.
Nickel	0.25 per ct.	0.17 per ct.	0.52 per ct.
Zinc	0.39 per ct.	0.03 per ct.	0.06 per ct.
Arsenic	0.008	0.008	0.01 per ct.
Gold	0.25 oz. p. t.	6 gr. per t.	3.8 oz. per t.
Silver	1.7 oz. per t.	0.9 oz. per t.	3.0 oz. per t.

COAL STORAGE GROUND

Calculating the impurities on 100 parts copper in each case, we have:

	Matte Charged.	Selected Regulus Produced.	Bottoms Produced.
Copper	100	100	100
Nickel	0.4882	0.2118	0.5300
Zinc	0.7616	0.0374	0.0611
Arsenic	0.0117	0.0037	0.0122

REFINING

The refinery department is furnished with three refining furnaces, two of which are kept at work with the third in reserve. The charge of "rough copper" is about 12 tons and the coal consumed 0.4 ton per ton of refined copper produced. The work is conducted in the manner usual in a plant of this size, the copper being ladled into the molds by hand. The only special point to which attention should be called is that the copper cathodes from the electrolytic

refined in reverberatory furnaces, and stored in the casting department ready for the barge.

The following are the most usual forms in which the refined copper is cast: Ingots, weighing 14 lb.; "medium cakes," weighing about 40 lb., made specially for the Indian mints at Calcutta and Bombay, and for the Cossipore shell foundry; and "cakes" weighing one hundredweight.

As a check on the work of the refinery, the chief chemist makes an electric conductivity test of each furnace charge, and unless this is satisfactory, the charge, after ladling, is put on one side, and an analysis of the copper is then made to determine whether the defect is due to an excess or deficiency of oxygen, or the presence of too high a proportion of nickel. If the latter is found to be the cause of the low conductivity, the copper is sent back to the roasting furnaces, and put through again in small quantities at a time with the other charges.

If the examination shows that the fault lies in the quantity of oxygen present, the charge is passed through the refining furnace a second time. It is, however, not often that the copper is thus condemned. The management has prided itself on keeping the quality of the copper as uniform as possible, and any charge which departs from this uniformity is treated in the manner described.

For the electric conductivity test during the second or third round of the ladling a special test piece is cast, and this is carefully drawn down by the smith to a short rod about 9 in. long by ¼ in. diameter. One-half of this is then drawn down on a wire-drawing bench, with occasional annealing, finishing through a sapphire die to a wire about 0.025 in. diameter. After a final annealing and cleaning the electrical conductivity is carefully determined against a standard coil. The second half of the rod is kept in that form after being labeled and is available for future reference. The electric conductivity of Wallaroo copper is kept at about 88 per cent.; if it falls below 86 per cent., it is not passed.

The following may be taken as a representative analysis of Wallaroo copper:

	Wallaroo.	Quincy.	Mansfield.
	Per Cent.	Per Cent.	Per Cent.
Copper	99.6648	99.7975	99.6382
Iron	.0054	.0031	.0049
Sulphur	.0005	.0005	.0039
Silver	.0065	.0092	.0228
Gold	.0013	.00002	Nil
Oxygen	.0307	.0852	.1327
Lead	.0215	.0038	.0312
Nickel	.1754	.1106	.1180
Zinc	.0134	.0023	.0125
Arsenic	.0124	.0258	.0118
Tellurium	.0030	Nil	Nil
Bismuth	.0018	.0001	.0003
Insoluble residue	.0038	.0029	.0060
Totals	100.0000	100.00002	100.0000

The electrical conductivity of this copper was 88.63 per cent. The results obtained by the same method of analysis for two well known brands are appended for the sake of comparison.

CHIMNEY AND FLUE

The ore-smelting furnaces are for the most part connected by an underground flue to a chimney 100 ft. high above the ground line by 7 ft. 6 in. square inside at the top, while a few of them have each a separate chimney 60 ft. high by 3 ft. 8 in. square at the top. The roasting and refining furnaces and the matte-calcining furnaces work into an underground flue connected with a chimney 15 ft. square at the top, which is 120 ft. above the level of the furnace floor.

The flue connecting the furnaces with the chimney is about 1100 ft. long and has a cross area of 60 sq.ft. The advantage of long and large culverts in collecting flue dust is shown by the following figures, which give the weights, assays and total copper recovered from these flues in the course of a year.

COMPOSITION OF DUST FROM FURNACE FLUES.

	Weight of Deposit.			Average Percentage of Copper.	Total Flue Copper			
	Tons.	Cwt.	Qr.	Per Cent.	Tons.	Cwt.	Qr.	Lb.
Ore-smelting furnaces	35	1	3	6.04	2	2	1	15
Roasters, main culvert and chimney	518	4	0	36.00	186	16	1	25
Refinery culvert	67	4	2	59.10	40	7	3	27
Totals	620	10	1	36.96	229	6	3	11

It will be noted that the copper in the flue dust from the ore furnaces in comparatively unimportant, but the quantity obtained from the culvert into which the roasting and refining furnace work is considerable.

The total recovery of copper, based on the wet assay of the ores, is 95 per cent.

FUEL

The total coal consumed, including that required for locomotives and crushing plant, is 0.87 ton per ton of ore smelted. The coal used is "small" coal obtained from what is known as the northern coal field of New South Wales, the pits being near Newcastle, from which port the coal is shipped to Wallaroo. A representative analysis of the coal used is as follows:

	Per Cent.
Moisture	2.5
Volatile hydro-carbons	34.5
Fixed carbons	52.0
Ash	11.0
	100.0

As the consumption for all departments at the works is about 1000 tons per week, provision has to be made for storing a considerable quantity, and for taking delivery rapidly as it is discharged from the steamers, which usually carry cargoes of about 2000 tons.

For the purpose of storage a piece of ground has been laid out and is served by a gantry of 80 ft. span. The coal is brought from the ship's side to this storage ground in railway trucks, each of which has two iron-bound square wooden boxes placed upon it, each containing 2 tons 13½ cwt. of coal. A train of trucks is hauled up a slight incline and there left, the locomotive returning with empties to the ship's side. The trucks are moved one by one down the incline until they come under the gantry. The lifting gear is then attached to trunnions on the sides of each box, which is lifted off the truck, hoisted, and traversed at the same time, until the spot is reached over the heap at which it is desired to empty it. On pulling a trigger, the box revolves on the trunnions and discharges the coal, after which it rights itself automatically and is replaced empty on the truck. The plant is capable of unloading 80 tons of coal per hour. As the heap of coal increases in length, the gantry is moved forward. All the motions are electrically driven by current derived from the work's mains.

The gantry is worked by one man, who controls all the movements, with a laborer and lad to handle the trucks and boxes, the cost of this is ½d. per ton, which includes cost of current, but not depreciation.

During the time a vessel is discharging, the furnaces are supplied direct from the ship's side, and at other times by reloading into trucks running on lines laid permanently on the yard floor upon which the coal is stored. The average cost of coal placed alongside furnaces is 13s. 6d. per ton.

LIGHTING AND POWER

Lighting and power for all the machinery except the crushing plant is provided by an electric installation on the 3-wire system, deriving direct current from a central station in the works. For this purpose the generating plant consists of two Westinghouse 56¼-kw. dynamos suitably connected, so as to generate current at 420 volts on the outside wires and 210 on the neutral wire.

The current is conveyed through the works by overhead bare copper conductors, insulated cables only being used on branch leads passing into the buildings or sheds. Current is also supplied in bulk from this station to the town of Wallaroo for lighting purposes. The cost per B.t.u., including 10 per cent. on the capital outlay, is 1.2d.

FIRE BRICKS AND REFRACTORY MATERIALS

Two classes of brick are used, silica and clay respectively. These are partly made at the works from material obtained in the State and partly imported. For some purposes the locally made bricks of both classes, which are very much cheaper, are

[illegible] [illegible] [illegible] [

CENTRIFUGAL PUMPS

Their Theory, Design and Performance

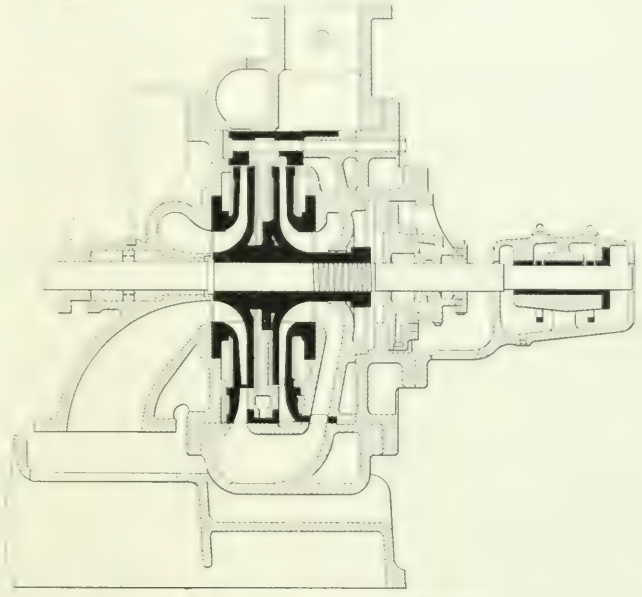
BY RICHARD C. WILLIAMS.*

The principle of reversibility of the hydraulic turbine, the application of its theory to a design in which work would be put in instead of being taken out, the construction of the actual machine in which water flows up instead of down, being almost an exact reversal of design of the turbine, has taken many years to perfect and has been the Waterloo not only of many individual inventors but of many large engineering companies.

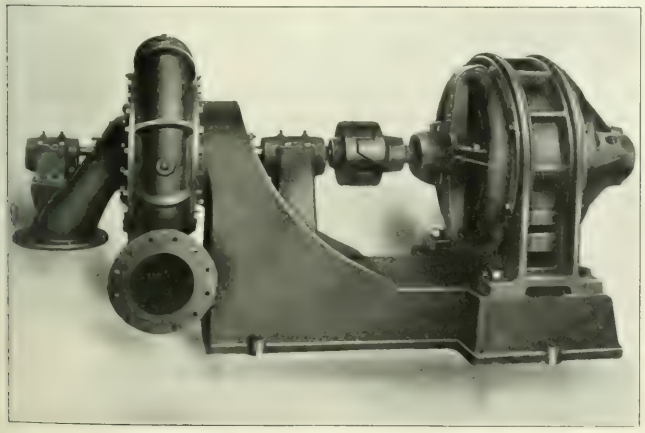
Contemporary with the commencement of the development of the centrifugal pump into a machine which would be held in respect when pumping units were under consideration, came the introduction of electric motors, direct connected to every kind of machinery where convenience was of importance. Though with the earlier types of slow-speed reciprocating pumps motors were used, the gearing was a source of constant annoyance and repair. With the design of high-speed reciprocating pumps abroad, with valves actuated by positive mechanism, this condition was improved somewhat, but its introduction in this country, for mine drainage at least, has for several reasons, which will be mentioned later, not yet come about. These high-speed reciprocating pumps have been successfully operated from 160 to 300 r.p.m., according to the size and head, and when under test showed remarkable efficiency as to power consumption.

For moving large quantities of water against considerable head the high-lift turbine pumps, and particularly those of the multi-stage type, where a culminative pressure is provided without prohibitive rotative speeds, are being extensively used. For mine drainage in particular they bespeak good recommendations, for the cost of foundation and excavating room for them is less than for a reciprocating pump of similar capacity, because the turbine pumps operate at a very much higher speed, and hence the pumping unit is of a correspondingly smaller size. Also, since the flow is continuous and uninterrupted, there is no water hammering in the pipes and no cumbersome air vessels are required.

*Mechanical engineer, Buffalo, N. Y.



SECTION OF BUFFALO TWO-STAGE TURBINE PUMP.



SINGLE-STAGE, ACID-RESISTANCE, CENTRIFUGAL PUMP.

COMPARISON OF RECIPROCATING AND CENTRIFUGAL PUMPS.

To further draw a comparison between reciprocating, direct-acting and centrifugal pumps, we may note three chief variables—head, volume and speed. For any given constant head the volume and speed are proportional, though not as simple functions. A direct-acting pump, however, has a capacity or volume proportional directly to the number of revolutions. For any constant volume the speed required to operate the pump is a function of the square root of the head, this being deduced from the formulas for centrifugal action and $V = \sqrt{2gH}$, or the law of falling bodies. If we consider the speed constant and note the effect of changing volume and speed, we find that the relation, though similar to that occurring with constant head, a greater change takes place in the volume for a change of head, and also that the variations are in the opposite direction. While the formulas are readily developed mathematically, the coefficient must be experimentally determined for a maker's particular design of pump.

If u_2 = peripheral speed of runner in feet per second;

H = head and V = velocity in feet;

$u_2 = \sqrt{bH + aV^2}$, where a and b are constants;

and also,

$$[illegible]$$

[illegible] and [illegible] the angle of the blade at the circumference of the impeller.

One of the most important considerations limiting the speed of the pump is the quality of the water being handled, i. e., if the water be gritty or contain solid matter of any nature, we cannot select a moderate speed owing to the excessive wear which would result if the pump were running at as high speed as possible with clear water. While a relation between the capacity and head for most efficient operations is hard to express in a general way, it has been stated that at ordinary speeds the best results are secured when the number of gallons per minute handled is equal to the feet head pumped against. Where quantity only needs to be changed to obtain the best efficiency, the outlet may be partially closed.

[illegible] OF CENTRIFUGAL PUMPS

Two distinct types of pumps are in general use, the more common or volute type, being for the lower heads, and where maximum efficiency is not essential; the second or turbine type, is used wherever high heads and maximum efficiency are required. In general, it may be said that the turbine pump will require about 10 per cent. less horse-power for a given head and water quantity than the volute pump under the same conditions. Either type of pump may be built to compound two or more stages, but it is an almost universal practice to use only the turbine type for compounding since this design, aside from giving somewhat higher efficiency, lends itself most readily to a compact and mechanical arrangement.

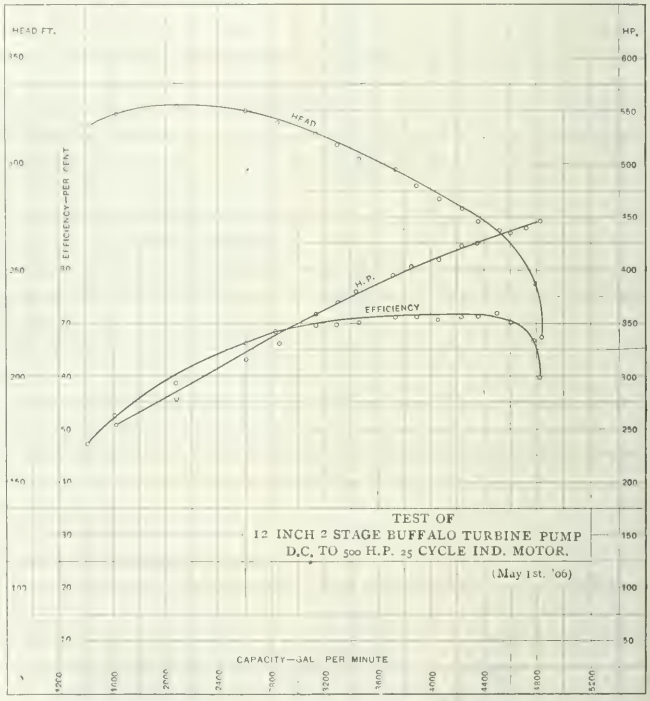
All types of centrifugal pumps possess two essential elements: First, a rotating waterway or impeller; second, a stationary waterway contained in the outer shell. The water enters the impeller at the center, passes between radial vanes, and is discharged at the periphery of the impeller. The energy imparted to the water in its passage through the runner is in two forms, potential and kinetic, i.e., pressure and velocity. The pressure is due to the action of the centrifugal force of the rotating column of water contained between the vanes, and the velocity is practically equal to the peripheral travel of the runner.

If the water were discharged from the impeller directly into a large chamber, the efficiency of the pump would be very low, as the kinetic energy or velocity would be entirely lost. To utilize the greater portion of this kinetic energy or velocity, a throat and volute, or a diffusion ring, is used. These form the essential features of the stationary waterway. In the volute pump the kinetic energy is converted into static, that is, from velocity to pressure by the use of a throat or expanding passageway, leading into a volute shell, which has a cross-section increasing in an arithmetic ratio up to the full area of the pump discharge. In some designs the throat is omitted water discharging directly from the impeller into the volute. However, it has been found that a considerable increase of efficiency is secured by the use of a throat, and that the form of the throat is of great importance. In the turbine pump this conversion is accomplished by the use of a diffusion ring, which consists really of a series of inverted nozzles, which provide a gradually expanding area at a correspondingly decreasing velocity and increasing pressure.

DESIGN OF RUNNER

Two types of runners are used, the open and the closed. In the open runner one or both sides of the waterway are formed by the stationary side plates of the pump. This type of runner is open to the objection of excessive friction and slippage between the vanes of the impeller and the stationary side plates, and is little used in modern pump design. The closed runner has the waterway entirely inclosed between the sides of the rotating impeller. Slippage between the discharge and suction is prevented by a collar on the impeller, fitting into a sleeve on the side plate.

As the water enters the runner through the inlet at a very low velocity, and is rapidly accelerated to a very high velocity, it is evident that the entrance must be very carefully designed; otherwise there will be a serious loss in efficiency due to shock. On this account the area of the waterway and the angle of the blades at the inlet are very carefully proportioned for every speed of rotation and water quantity, the angle of the blades being such that there shall be a minimum shock at entrance to the impeller. The form and curvature of the blades are not so material after the water has passed the inlet. However, it is usual to so design the curvature with respect to the area of the waterway as to secure a nearly constant acceleration from the point of inlet to the periphery. The blades may either be curved forward or backward at the periphery, and at any practicable angle. This curvature, when the waterways are properly proportioned, does not greatly affect the efficiency, but alters greatly the characteristics of pump performance with respect to head and capacity. For example, it is possible to so design the curvature of the blades that there will be a constant or even increasing head with increasing capacities, or on the other hand we can secure a rapid decrease of head with increase of capacity and a nearly constant or even decreasing power consumption with increased capacity.



THEORY OF PERFORMANCE

Without going into the complicated derivation we will merely state the general formula covering the action of centrifugal pumps.

The diagram on page 332 shows the velocities entering into the theoretical formula for centrifugal-pump performance.

u_1 is the linear velocity in ft. per sec. at the heel of the runner blade or at the inlet, i.e., $u_1 = \pi d_1 n$ where d is the diameter of the inlet opening in the runner, and n is the number of revolutions per sec.

u_2 is the peripheral velocity of the runner in ft. per sec.

v_1 is the radial component of the velocity of the water at entrance to runner in ft. per sec.

v_2 is the radial component of the velocity at the periphery in ft. per sec.

w_2 is the actual velocity of the water in ft. per sec. as it leaves the periphery of the impeller.

α_1 is the angle of the blade at the inlet.

α_2 is the angle of the blade at the periphery.

The formula for a head given by a theoretically perfect pump is

$$H = \frac{u^2_2}{2g} + \frac{(u_2 - v_2 \cot \alpha_2)^2}{2g} + \frac{v^2_2}{2g}.$$

This formula is easily simplified to give

$$H = \frac{(u^2_2 - u_2 v_2 \cot \alpha_2)}{g}.$$

The theoretical head, however, is reduced from several causes, the chief of these being:

First, loss by shock on entrance to the runner;

and the theoretical head is usually expressed by the coefficient e which is termed the manometric efficiency. This is found to remain nearly constant through the ordinary range of pump performance. Thus, we have the formula for the actual head given by a pump

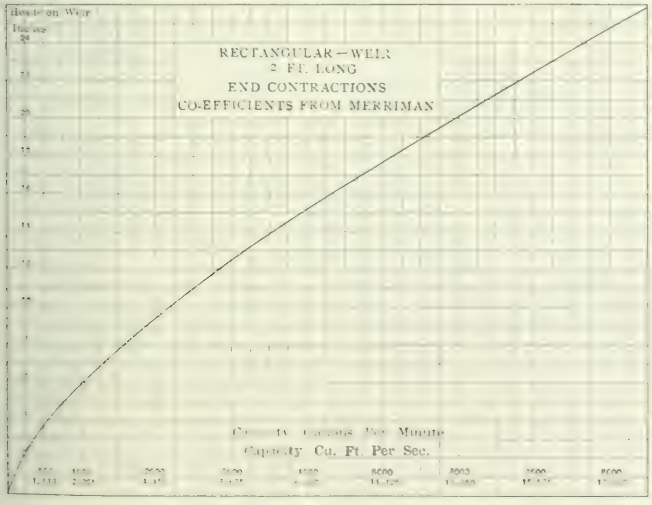
$$H = \frac{e}{g} (u^2_2 - u_2 v_2 \cot \alpha_2)$$

The coefficient e may vary from 50 per cent. in a small or poorly designed pump to 75 per cent. in the best designs.

MECHANICAL EFFICIENCY

The mechanical efficiency of a centrifugal pump theoretically should be less

ANGLE α_2. LARGE CIRCLE SHOWS DIAMETER OF RUNNER. SMALL CIRCLE SHOWS DIAMETER OF INLET



RESULTS OF TEST—HALF-MINUTE READINGS

Second, friction within the runner passages;

Third, loss by shock and imperfect diffusion on leaving the impeller.

Fourth, friction in the shell and stationary water passages.

These losses must be determined experimentally for every design of pump.

The relation between the actual head and the theoretical head is usually expressed by the coefficient e which is termed the manometric efficiency. This is found to remain nearly constant through the ordinary range of pump performance. Thus, we have the formula for the actual head given by a pump

$$H = \frac{e}{g} (u^2_2 - u_2 v_2 \cot \alpha_2)$$

The coefficient e may vary from 50 per cent. in a small or poorly designed pump to 75 per cent. in the best designs.

MECHANICAL EFFICIENCY

The mechanical efficiency of a centrifugal pump theoretically should be less than the manometric efficiency, since aside from the internal losses there are the external losses due to friction of the water on the outside of the runner and friction of the stuffing boxes and bearings. This efficiency, like the manometric efficiency, can only be determined by actual test.

The test of a centrifugal pump direct connected to an electric motor at the works of the Buffalo Steam Pump Company is simple in that but a small amount of time is required to set up the portable weir used for the service, connect the motor with the switchboard and attach pressure gages.

In the test herewith given of a Buffalo 12-in. 2-stage turbine pump direct connected to 500-h.p. 25-cycle induction motor, all instruments used were carefully calibrated and were in perfect condition. The results plotted to give the curve are averages of half-minute readings. The gage used to measure head pumped against was made by the Standard Gage Company, and was equipped with a 12-in. dial graduated to read in feet head.

Calibration of this gage with a Crosby dead-weight tester revealed the fact that there was a positive constant error of 6 ft. in the head indicated, i.e., the gage indicated 6 ft. or 2.6 lb. too much.

The power used was taken on a Thompson recording wattmeter, which had been standardized by the Cataract Power and Conduit Company, and was found to have a formula

$$\text{h.p.} = \frac{720 \times R}{S},$$

in which R equals revolutions of dial; S, seconds time; and 720, coefficient of calibration.

The head pumped against was regulated by means of a valve on the discharge pipe of the pump.

The volume of water pumped was measured by means of the portable weir mentioned. In this there is located a set of baffle plates to bring the surface of the water passing over the weir to a smooth condition, and to the same level across the crest. The computation for quantity was made by Francis' formula allowing for the coefficient of end contraction for a rectangular weir 2 ft. long, which Merriman gives.

The whole pumping unit, i.e., motor, pump and bed-plate, weighed 22 tons.

The Rotary Cement Kiln in England

A London correspondent of the *Cement Age*, says:

"Referring to the rotary process, it may be interesting to record the advance in this direction to date. By the end of this year 93 rotary kilns will have been erected, about half of which are German make, and which are, as yet, generally considered the best. These are mostly 98 ft. in length by 6 ft. 7 in. diameter, and turn out of the wet process over 2500 bbl. per week of 168 hours, on a consumption of 25 to 30 per cent. of fuel. Some English makers, at last, however, are coming to the front with kilns to their own designs, 130 ft. long by 7 ft. 6 in. diameter, with which they expect to get 3000 bbl. under the same conditions.

FIRES IN COAL MINES*

The Warrior Run Fire—Causes and Methods of Attack

BY R. V. NORRIS†

Run collieries of the Lehigh Valley Coal Company. Along the line of the up-throw on the surface, there were a number of houses; a woman went into the cellar of one of these to get provision, and was killed by an explosion of fire-damp, the resulting fire destroying the dwelling. In the mine a pump man was found dead in the tunnel. (See Fig. 3.) The colliery had always been non-gaseous, and a very severe general squeeze was in progress; a concussion had been felt, and it was believed that an explosion of gas had occurred.

In the course of a few days they began to smell smoke, and finally determined that there was a fire somewhere in this territory, and started to investigate. The examination had been made as far as the door in the third left tunnel; no one had been through that door, the ventilation had been upset somewhat by the squeeze, and there was a large amount of fire-damp in the colliery. When a consultation was called of all the officials of the company, the mine officials were satisfied that the fire was on the third left, near where the man had been killed, and that he must have met and fired the gas when he went through the door. While local mine officials held to this view, the higher officials could not see it from that standpoint; they argued that the fire in a week would certainly have been out to the fan shaft in the main return.

[illegible] analysis of the gases that there was not enough carbon dioxide for the fire to be in this location. The mine foreman was extremely anxious to pull down the door in the third left, and go in for an examination to see if there had been an explosion. We all felt that such a cause was suicidal, for if the fire was in the third left, access of air would surely increase it, and it was eventually decided to seal up the mine, as shown in Fig. 3. The tunnels from the back basin were first closed, and then the air shaft was sealed off at the fan.

A partial record of the readings and analyses made in connection with this fire are given in the following table:

In this case we analyzed the gases taken from close to the fan with an Orsat apparatus. A very clever Jap assistant, Mr. Hachita, made all the analyses.

ACTION OF THE GASES

We sealed off the mine at 11:14 a.m. on the 15th. The CO_2 ran up slowly at first and then jumped to a maximum hight within a few hours. The carbon monoxide analysis was interesting, as we never found over 0.4 per cent., and from this fact I am satisfied that the fire was in the lower part of these workings, and cut off by the squeeze.

Another great surprise was the way the marsh gas CH_4 ran up to 43 per cent. Of course that might be accounted for by its very light specific gravity. The oxygen ran down to 1.2 per cent. The normal mine air in the region is as follows: CO_2, 1/10 to 4/10 per cent.; CO, 2/10 per cent.; CH_4, 2/10 per cent.; O, 20.3 per cent. We felt that when this oxygen got down to nearly 1 per cent. we had the fire out. During the time the mine was closed the lower levels were flooded by sending water into a bore hole, the water level finally reaching the point indicated.

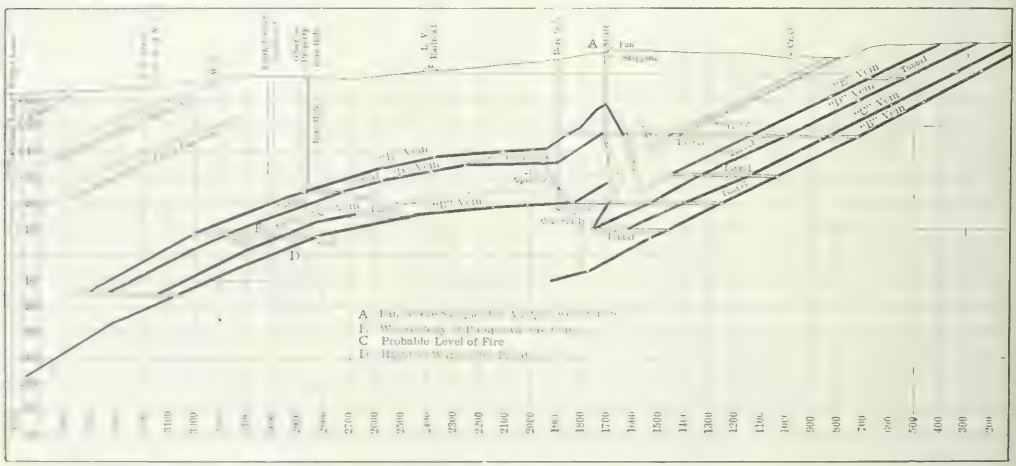
The mine was only kept closed until December 7 below the third left tunnel. At that time the workings were opened and the fire found entirely extinguished. On reopening, the tunnel between the E and F, veins were found tightly blocked by falls; the F seam showed evidence of a gas fire—great heat and very little ash. This fire broke out again with access of air, and it seems probable, in view of this fact, that the explosion was actually in the F vein on the third lift, but that the products of combustion only reached the return by passing downward through crevices in the separating rock, as the tunnel was securely closed. There may also have been a second and deeper fire which supplied the wood smoke noticed, but that cannot be determined until the water is pumped out. It was evident that the pump man could not have fired the gas, and he was probably killed by the concussion and by the fall of the door under which his body was found.

Near where the pump man's body was found the rock of the tunnel showed traces of fire; there were no such traces in the coal anywhere around there, so it seems possible that there was a feeder of gas on fire in the rock at that point.

The temperature was never excessive. Eighty-six was the highest record we had, and it was 83 when we took our last measurements.

WATER-GAGE READINGS

The normal water-gage, you will note, was 1.48 in.; when the fan was stopped and the mine sealed, the water-gage was



CROSS SECTION OF COAL MEASURES, WARRIOR RUN, PENN.

[illegible] and then ran up with [illegible] to [illegible] afterward [illegible] normal ½ inch.

A fact in this connection which [illegible] someone can explain is this: The water-gage at the top of the fan shaft remained plus ½ in.; the water-gage in the stopping in the lower tunnel from the back basin persisted in remaining minus ½ in., showing that the air would, if permitted, flow in through this stopping. The only explanation that I can make is that the cooling of the air in the mine made a partial vacuum below, while the hot gases gave a pressure at the fan.

In opening the mine we were up against a very awkward problem, as there was 40 per cent. of fire-damp in the air at the fan. The fan stopping was first opened [illegible] By drawing [illegible] shaft and stopping the water hoist we were able to raise the normal water of the colliery sufficiently to run into this slope; it was flooded up to about 100 ft. vertically above the known elevation of the fire, and the water was left in for four months.

The examination to determine whether enough water was in was a delicate one: We had to ferry from the foot of the shaft, because to raise the water over the head of the slope it had been necessary to erect a dam at the shaft which continued to an underlying seam, and then got in to the slope. We feared an explosion at any moment, because for several days there had been a series of explosions from the fire, though none for a week previous to the examination. On the way into the

GAS ANALYSIS—WARRIOR RUN MAIN RETURN.

August.	Time.	CO_2	O_2	CO	CH_4	Shaw $CH_4 + CO$.	Calc. N.		Temperature. Outside.	Temperature. In Shaft.
1	5:00 P.M.	2.0	16.2	0.3	"	3.5	69.7	In Fan.		
5	3:00 P.M.	2.3	15.8	0.2	"	"	69.2	In Fan.		
7	5:00 A.M.	2.3	15.5	0.2	3.4	"	68.0	In Fan.		
7	5:00 P.M.	2.9	15.3	0.2	3.5	3.7	69.5	In Shaft.		
7	5:00 P.M.	2.4	16.0	0.2	3.9	0.4	70.3	In Fan.		
9	9:00 A.M.	3.0	15.6	0.2	3.2	3.2	71.1	In Shaft.		
9	11:00 A.M.	3.5	14.9	0.4	2.8	3.7	70.7	No. 4 Return.		
9	2:00 P.M.	5.5	11.6	0.2	3.5	"	65.4	No. 3 West.		
10	12:00 M.	Inside slope sealed below No. 5 and air turned in No. 3 tunnel.								
10	2:00 P.M.	3.4	15.4	0.2	2.1	3.0	71.8	In Shaft.	73°	81
12	8:20 A.M.	2.8	16.1	0.3	2.3	3.2	73.4	In Shaft.	73°	81
13	1:20 P.M.	Fan reduced from 79 to 50 r.p.m., water-gage 1.48 to 0.58 in.							79	81°
13	4:30 P.M.	3.1	16.0	0.1	2.7	4.2	72.8	In Shaft.	84	86
14	4:50 P.M.	3.8	14.8	0.2	2.6	3.7	71.1	In Shaft.	82	85°
15	10:50 A.M.	Intake sealed, water-gage 0.82 at 54 r.p.m. of fan.								
15	11:10 A.M.	3.3	15.8	0.1	2.6	4.0	73.0			85°
15	11:14 A.M.	Fan stopped, upcast sealed.								
15	12:15 P.M.	5.8	10.7	trac.	11.6	"	60.4			
16	8:30 P.M.	6.4	6.3	0.3	12.5	"	48.8			"
								Water-Gage.		
17	9:00 A.M.	6.2	5.1	0.1	14.2	"	43.1	0.4 in.		84°
17	12:00 M.	6.6	5.1	0.2	16.8	"	44.8	0.5 in.		78°
17	10:00 A.M.	5.4	1.9	0.0	24.0	"	27.7	0.7 in.		
18	8:00 A.M.	5.0	1.6	0.0	31.7	33.3	25.8	0.75 in.		
20	8:00 A.M.	3.9	1.4	0.0	33.4	37.4	30.1	1.0 in.		
SEPT.										
1	8:00 A.M.	4.1	2.8	0.6	41.0	42.8	26.2	0.75 in.		82°
10	9:00 A.M.	4.2	3.8	0.0	36.3	"	30.4	0.85 in.	72°	83°
22	8:00 A.M.	4.2	2.4	"	30.2	"	25.1	0.5 in.	76°	83.5°
December 1, opened upcast and restored ventilation.										

very bad fire in the Red Ash seam of the Avondale colliery. This was up near the crop far above water level in old workings where the seam was about 18 ft. thick, and the fire got a very good start. It covered eventually some ten acres of the workings, and all efforts to put it out (there was no water) were unavailing; finally the Lackawanna authorities opened all around the fire and filled the space solidly with clay, actually inclosing the fire with a clay wall and leaving it there. No trouble has been experienced since then.

Another means of attacking a fire that has been used quite frequently is to put a bore hole into the workings and flush the finest culm or sand into the mine and around the fire.

This method was used by the Lehigh Valley Coal Company where a fire in abandoned connecting workings was threatening one of their collieries; they put a series of holes down into the seam, which was on a considerable dip, and flushed the workings full of waste culm, thus cutting off the affected section, and allowing the fire to gradually burn out.

Pig Iron in Canada

The American Iron and Steel Association has received direct from the manufacturers the statistics of the production of all kinds of pig iron in Canada in the calendar year 1906. The total amounted to 541,957 long tons; of which 525,716 tons were made with coke, 16,021 tons with charcoal, and 220 tons with electricity.

The iron made is classed as below:

	1905.	1906.	Changes.
Foundry and forge	146,438	179,474	Inc. 33,036
Bessemer pig	149,363	165,640	Inc. 16,277
Basic pig	172,102	246,228	Inc. 74,126
Total	468,003	541,957	Inc. 73,954

The total increase was 15.8 per cent. Canada has not made spiegeleisen or ferro-manganese since 1899.

On Dec. 31, 1906, Canada had 15 completed blast furnaces, of which 8 were in blast and 7 were idle. Of the total 12 usually use coke for fuel and 3 use charcoal. In addition one furnace, to use coke, was being built and 3 coke furnaces were partly erected on Dec. 31. Work on the partly erected furnaces was, however, suspended some time ago.

The French consul at Kharkoff reports that the production of manganese ore in that district in 1905 was 31,000,000 poods. The ore comes principally from two deposits in southern Russia, one in the district of Charopanski and the other in the Douetz region of the Nikapol district. The manganese ore coming from the Nikopol district is sold to Silesian smelters. The manganese ores of southern Russia also find a ready sale, nearly the whole of the production being secured by contract for native or foreign consumers for several years in advance.

and the upper layer of fire-damp run off gradually. As the engineer of the company put it, he skimmed off the top of this, and then opened the air tunnel so that the natural circulation started up the fan shaft; this was done with great care as any spark at that time would have meant destruction. When the fan was started, the marsh-gas percentage was down below the explosion point.

This fire is, I believe, the only one that has ever been followed closely with analyses of the gases, so made as to show the results of cutting off all access of air.

It is always very difficult to know when a fire is out. In one case in the Luke Fidler colliery, Shamokin, which was flooded, the fire occurred in the last breast from the gangway in the lowest lift of a long inside slope, from the level of the bottom of the shaft. There were, I think, four lifts on the slope, and on the lowest the breasts were only up a short distance and not holed through to the slope men were left within shouting distance of each other, in case of accident.

We got to the head of this slope, and then lowered down a mine car, until the engineer said he could feel it strike water, measured the rope as it was hoisted back, and found the car wet for about half its length, showing from the map the elevation of the water, afterward verified by going down to it.

We left the fire in there entirely closed off, and under this water for some four months, and when the water was pumped out at the end of that time, the fire was there just the same; it started up again, and was sealed in with a clay and timber battery. It does very little good to flood and compress air against fire. It will smolder for months.

OTHER METHODS OF ATTACK

Another method of fighting fire was used by the Delaware, Lackawanna & Western Railroad Company; they had a

COAL MINING IN EASTERN ILLINOIS

Details of Equipment and Methods Employed by The Dering Coal Company

BY F. W. PARSONS

The coal beds of Illinois form the most extensive bituminous field that is found in any State, and until the past year, when labor troubles in this district permitted West Virginia to surpass it in production, the Illinois output was only exceeded by that of Pennsylvania. Outside of Pennsylvania and Virginia, the Illinois deposits were our earliest coal discoveries, having been mentioned by French missionaries in the middle of the seventeenth century. The first authentic record of production shows that, in 1832, less than 5000 tons of coal were mined, and shipped by flat-boat down the Mississippi. Since 1896 the Illinois production has doubled, which indicates that if the present rate of development is carried on for ten more years, the coal output will reach 80,000,000 tons per year.

TIPPLE AND POWER PLANT AT MINE NO. 1, DERING COAL COMPANY

Of the many districts throughout the State, the Springfield region produces the largest tonnage, while the second greatest output comes from Belleville and Williamson counties. The Vermillion county district is the third largest producer, and is the seat of operation of the Dering Coal Company. Danville is the most important town in this region, and in large part, owes its rapid development to the many coal operations here surrounding.

Most of the mines in this locality can be reached by some line of the Interurban trolley system, while the tonnage from the mines is shipped over the Chicago & Eastern Illinois, and is used principally for steel making by the Illinois Steel Company, and other similar concerns.

One of the most modern operations in the Danville district is that known as the Dering No. 2 mine. The coal seam at this property lies practically horizontal, and is reached by a shaft 222 ft. deep. The boiler plant consists of five return tubular, 500x60-in. boilers. A pair of hoisting engines drive a conical drum, which latter varies in diameter from 5½ to 7 ft. For ventilating the workings, a Crawford & McCrimmon 20-ft. blower fan is used. The fan is run at 40 r.p.m., and at this rate forces 70,000 cu.ft. of air per min. If desired, the fan will make 120,000 cu.ft. at 80 r.p.m.

For handling the coal on the main haulways, four Westinghouse 5-ton motors are used. These locomotives are equipped with a self-coiling reel, so that when desired, they can be used as gathering motors. On the main entry, nothing less than 30-lb. rails is used. In the more remote workings and for gathering from rooms, 26 mules are employed. The underground stable, where these animals are kept, is sanitarily arranged, and is ventilated by sending a split from the main intake current through the stable and immediately into the return, thus preventing the contaminated air from the stable to pass on into the mine and affect the workmen.

TIPPLE AT MINE NO. 2, DERING COAL COMPANY

METHOD OF MINING

The general plan of development may be seen by examining the accompanying mine map. As is the custom in most Illinois and Indiana mines, the coal is shot from the solid, and an effort is made to secure as large a tonnage as possible on the advance work, and attempt to get practically nothing by robbing on the retreat. It has always been claimed by operators in most parts of Illinois that a successful method of robbing cannot be here carried on, because of the nature of the roof and overlying strata. For this reason it is the practice to drive all rooms as wide as possible, leaving only large enough pillars to support the roof and prevent a squeeze. As a general rule, the entries are driven 9 ft. wide and rooms 26 ft. in width. Room centers are 32 ft. apart, which leaves only a six-foot pillar between.

The room necks are 18 ft. long and 9 ft. wide. The main entry is separated from the first room by a 40-ft. barrier pillar, while only a 20-ft. pillar separates the main entry and its air course.

One of the heaviest items of expense in mining this Illinois coal is from the necessity of having to timber heavily to support the roof. Occasional faults and rolls are encountered, but such irregularities in the seam are generally local and have not afforded much trouble. It was formerly the practice to mine part of the coal by machines, but this method has been abandoned, as it was found impossible to get clean coal where machines were employed, and the consumers who wanted the coal for steel manufacture demanded that no dirty coal be shipped.

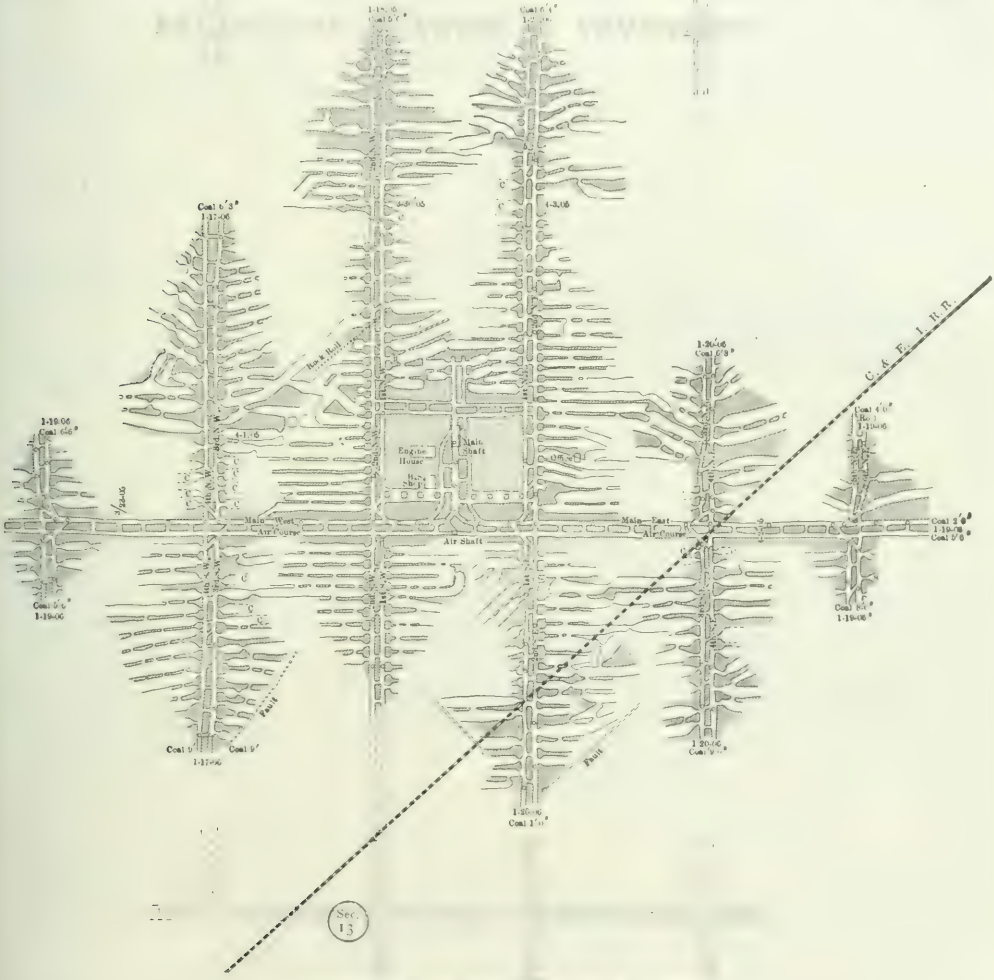
A unique arrangement is shown in the accompanying drawing for disposing of the empty cars that return from the surface after being dumped. For hoisting the product, two self-dumping cages are used; as each cage reaches the bottom, a full car is dropped down the loaded track, which is on a slight incline; this loaded car bumps the empty tub, causing it to run off the cage and down a light grade to a swag; here it is caught by the

dogs on an endless chain and hoisted up a short 30-deg. incline. At this point the car is again released and runs by gravity through a spring-latch switch, striking a buffer block, which causes it to run back and follow the empty track, down a slight grade, to a parting where the empties are collected and hauled by a motor to the working places. This arrangement is most efficient, and although not uncommon in a tipple or other surface plant, is seldom found in an underground installation. The entire arrangement, including the sprockets, chain and engine is plainly shown in the drawing. The place where such an installation as the one just described would be most efficient is in a mine where the shaft has been located close to the boundary of the property, and as a consequence, the space available for switching and collecting empties is limited. Such a plan also concentrates the haulage system and reduces the number of men necessary.

HOISTING AND SCREENING

The Dering No. 2 mine has a daily output of 2000 tons, and a maximum capacity of 2500 tons per day. The cages are of the self-dumping style, and are so arranged that when the top of the hoist is reached and the cage is momentarily resting on an incline, a man standing at the top operates a hanger rod which releases the end of the car and allows it to swing open, permitting the coal to slide into the weigh basket. This latter is of the general style found in the region, but possesses one unique feature, in that it can open at either end and thus load run-of-mine on the front, or screened coal on the rear; this change can be effected without removing or substituting any of the plates.

The screens that are used are of the shaker type, and designed to produce all of the different sizes. One difficulty resulting from the use of such screens is the harmful vibration that the tipple building must endure. This constant shaking strains the timbers and makes the entire structure unstable. For this reason, it is now thought advisable to have the timbers supporting a shaker screen separate and independent from the floor and sides of the building.



HORIZONTAL PLAN OF WORKINGS, DERING NO. 2 MINE.

CHARACTER OF THE COAL

The Illinois coal field contains seven distinct seams; of this series, however, two veins are not now considered commercially valuable. The seam known as No. 6 ranges in thickness from 6 to 8 ft., and

is the largest source of production. Although this bed is principally confined to the central portion of the State, an important district exists in Vermillion county, south of Danville.

In this locality, as before stated, the seam lies more than 200 ft. below the surface. The coal bed known as the Danville seam is 110 ft. above the No. 6 coal, which latter bed in this district is called the Grape Creek vein. The Danville seam is 40 in. thick, and is covered by 40 ft. of soapstone, while above that is 60 ft. of clay. On an average, the Grape Creek vein here worked is 7 ft. thick, and will run about 7 per cent. ash; 8 per cent. moisture; 34 per cent. volatile matter; and 51 per cent. fixed carbon. Although many panies have passed into strong consolidations, it is probable that one of the larger concerns will experiment and endeavor to develop a suitable method where the pillars will be robbed and a larger percentage of coal safely secured.

The Gordon Drill

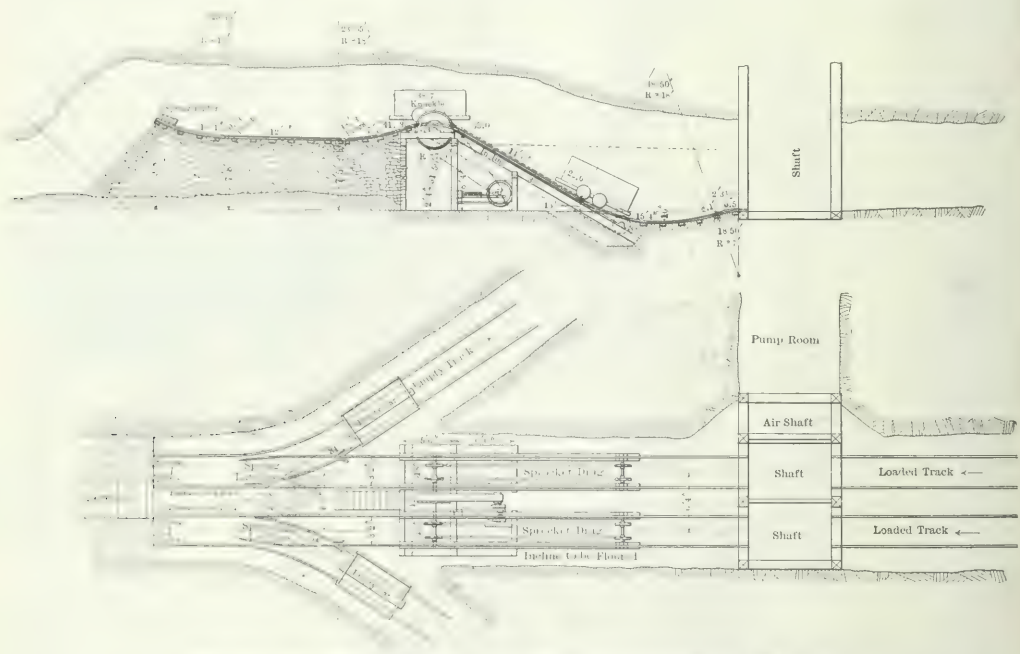
An extended series of tests of the Gordon drill, manufactured by the Ingersoll-Sergeant Company, has been conducted at the Robinson mine, Witwatersrand, S. A., according to the London *Mining Journal* of Jan. 12, 1907.

Briefly, it is an air hammer mounted on the usual rock-drill column or bar and has

It is claimed the drill is fool proof and can be easily worked by Kafirs; the results at the Robinson mine show that three drills, employing four Kafirs, are doing the work of 25 Kafirs, and doing it better. The experiment has been carried out on a reef under 24 in. wide, the stopes being kept at 30 in. instead of 48 in. with larger machines in the same stope; this means that the grade of the ore is considerably increased, as only 6 in. of waste is mined and hauled, as against 24 in. with the ordinary drill.

These machines require only 25 per cent. of the air required to run a 3¼-in. drill, and the following table shows that the average footage per shift is 14.12 ft.

The accompanying is a record of the



THE BLACK JOE EMPIRE COAL MINING COMPANY NO. 2 MINE

coals with a composition similar to this will produce a good quality of coke, it is true, however, that the coals in Illinois have not yet been successfully coked.

This is but another verification of the general statement that the coking properties of a coal cannot be accurately determined from its chemical composition.

The most serious problem in Illinois coal mining is to select a method of operation that will secure a larger percentage of the coal seam, and still deal effectively with the bad roof which prevails. The panel system of working which is successfully carried on throughout West Virginia and Pennsylvania, has so far met with little success in Illinois; however, now that many of the independent com-

the appearance of a piece of 3-in. pipe; attached to it is the usual crank handle for the screw feed; in this case, however, the handle serves to rotate the drill only. The piston strikes the drill instead of being part of the striker, the consequence being that it has only to be rotated, being kept up to its work by air pressure, and not being drawn in and out as in the ordinary drill.

The drill steel is hollow, so as to enable a water jet to be used, and the bits used are the ordinary star, a special machine having been introduced to sharpen them. The whole outfit weighs 115 lb. (the drill 55 lb. and the column and the bar 60 lb.). There are no nuts or screws, wedges being used to attach the drill to the arm.

work done by the Gordon drill at the Robinson mine between Oct. 27 and Nov. 26, 1906:

Machines used	11
Machine shifts	281
Holes drilled	1,249
Footage drilled	3,968
Average per hole	3.18
Average holes per machine shift	4.44
Average feet drilled per machine shift	14.12
Total fathoms	78.5
Fathoms per shift	.27
Fathoms per hole	.062
Average holes per fathom	16.00
Number of native shifts	374
Holes per native shift	3.34
Fathoms per native shift	.22
Number of working days	78
Cost per fathom	69s. 8d.

Copper is mined at Chouichia in Tunis, where the ore is smelted to a matte, assaying 35 to 50 per cent. copper, which is exported.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

In prospecting it should be remembered that all sandstones of Carboniferous measures are gray, while those sandstones above and below the coal measures are usually red.

When a coal seam is faulted and folded, it is sometimes possible to distinguish the roof of the seam from the bottom by the presence of fern leaves, which, if they are present at all, will generally be found in the top of the seam.

It is generally unknown that on the continent of Europe coal has not only been found but has also been mined in Silurian formations. A variety of seaweed, the only plant known in this age, is thought to have formed the coal.

The various coal fields of the United States, located east of the Mississippi river, have a combined area of about 110,000 square miles. The coal area west of the Mississippi is more than twice as large as that of the eastern territory.

Generally speaking, pillars with their longest sides parallel to the pitch of the seam are the strongest. If in this connection, the "face" and "butt" cleats in the coal also run to the dip or to the strike, the conditions are more nearly ideal, and the pillars will not only sustain the maximum weight, but the seam can be mined more easily and in better blocks with less fine coal.

To find the tonnage per acre, multiply 62.355 (the weight of 1 cu.ft. of water) by the specific gravity of the coal, which gives its weight per cubic foot. This result, multiplied by 43,560 (the number of square feet in one acre), and again multiplied by the thickness of the seam in feet, gives the number of pounds of coal in one acre. If this last result is divided by 2240, the quotient expresses the number of long tons per acre.

At the mines of the Delaware, Lackawanna & Western Coal Company, in Pennsylvania, one of the precautions taken to prevent serious mine fires is to establish a system of pipe lines along the main entries in gaseous workings. The total length of piping in six collieries is approximately 15 miles; the cost of material and installation was about $14,500, and the average yearly cost of maintenance at each colliery is about $1000.

At many mines too little care is exercised in selecting a site for the culm and waste piles, and an insufficient amount of calculation and study relative to the size of the pillars necessary to sustain this added weight is devoted to this subject. It is not unusual to find a superintendent carefully providing for the protection of a shaft, power-house or other surface building and neglecting a pile of culm or waste many times the weight of any mine building.

In shipping coal from the anthracite fields to New York and other points of storage and consumption it has been found that, after being loaded in the cars, there is practically no breakage whatever due to transit or other similar causes. Neither is there any accumulation of dirt or fine coal in the bottom of the gondolas, unless it was dumped there in loading. This statement applies entirely to anthracite coal and not to any soft and friable bituminous product.

Considerable caution must be exercised in drawing any conclusion as to the thickness and dip of a coal seam when only slight prospecting has been done at the crop. When the seam outcrops on a hillside there is often a confusion of strata, caused by a landslide or other dislocation of the surface. In such cases the apparent dip may not only be misleading, but the seam may be so squeezed and folded that a correct idea of its true thickness can only be obtained by driving a tunnel in far enough to get away from surface disturbances.

Under no circumstances, in a gaseous face, should any miner be allowed to shoot down more coal each day than can be cleaned up and loaded out by him before leaving at night. If serious mine fires are to be eliminated, this rule must be carefully observed, for in case of a feeder left burning, or other cause that might start a fire in the face, the flames would not burn so fast nor get under headway so quickly if there were no loose coal near by. Coal in the solid requires much time before forming an extensive fire hard to control.

In sinking an exploratory shaft to test a coal seam it has been found that a square shaft is best adapted for loose, treacherous ground, and has the further advantage of being easy to timber. When the pit is not more than 20 ft. deep the earth can be shoveled to a staging, from which it is thrown from the pit. If the shaft is more than 20 ft. deep, a windlass becomes necessary. It is advisable to have the timber girths not more than 4 or 5 ft. apart. If the shaft is less than 50 ft. deep, a 5x5-ft. hole is large enough to give proper working room.

A study of the vegetation and conditions that prevailed during the Carboniferous age, when our coal beds were being formed, indicates that the climate of that period was uniformly warm, with much moisture and an absence of strong winds or currents of air. There was also a large quantity of carbonic acid present in the atmosphere, which was drawn upon and aided materially in furnishing material for our coal deposits. This highly carbonated condition of the atmosphere, while increasing the luxuriance of the vegetation, was unfavorable to animal life.

In a serious mine fire, where the burning portion must be isolated from the air by special stoppings, expert opinion now favors the method of closing the return-air side first and sealing the intake opening last. The reason for this is that the gases liberated by the fire are dammed in and drive back the fresh air, the preponderance of gas and lack of sufficient fresh air acting to prevent an explosion. After all the stoppings have been built and the fire is thought extinguished, the work of opening the workings must proceed with caution and in reverse order to the method adopted in sealing; that is, the stopping at the intake end is first opened, and the return-air side is opened last.

Experiments show that there is a limit beyond which there is no advantage in attempting to re-screen and further prepare anthracite and bituminous coal. In one instance, where a ton of hand-picked coal was used, the process of screening furnished 3 per cent. undersize which went through the screen, while a still larger percentage of undersize formed by the handling went over the screen and was held by the coal. In repeating the operation, another 3 per cent. of undersize was caught, while the coal again held a proportion of undersize, similar to that previously found. It was believed that the process might be repeated indefinitely without materially benefiting the grade or separation of the coal.

In determining the load that can be safely held by a rectangular wooden beam, supported at both ends and loaded in the middle, a simple method is to multiply the square of the depth of the beam in inches, by the breadth in inches, and then divide this product by the distance in feet between the supports; this quotient is multiplied by the constant given as the breaking load (600 for oak, and 500 for pine). The result of this operation should always be divided by three to get the safe working load; and furthermore, if the timber is green, this last result must again be divided by two. In calculating for a cylindrical beam, the above operation is followed, except that instead of using the breadth and depth, the cube of the diameter is taken.

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The Zinc Ore Question

In the matter of the protests of various smelters against an order fixing a duty on zinc ore a decision was made, Feb. 5, by the Board of General Appraisers. By an order of the Secretary of the Treasury, Feb. 10, 1906, it was held that the term "calamine" in the Dingley Tariff referred only to the hydrous silicate of zinc, and that sulphide and carbonate ores were dutiable at the rate of 20 per cent. *ad valorem*. The Board of General Appraisers has completely reversed the Treasury interpretation of the law, its conclusion being that the carbonates and silicates of zinc are included within the meaning of the term calamine, as used in the Dingley Act, and consequently are free of duty, while the sulphide of zinc is also free under paragraph 614 as a crude mineral not advanced in value by any process of manufacture, subject to the qualification that any lead contents of these ores are dutiable at the rate of 1.5c. per lb., as prescribed in paragraph 181.

The decision as to calamine was a foregone conclusion, inasmuch as anything different would have violated the accepted commercial and metallurgical practice of a century, as was done ignorantly in the Treasury order of Feb. 10, 1906. The fact that mineralogists had a more recent and more restricted meaning for this term, or rather some mineralogists, because among mineralogists there were confusion and difference over the matter, could not rationally be allowed to supersede the preemption of the term by metallurgists, who had never abandoned it from their common usage or lost their understanding of it. The surprising thing is that the Government should have considered it had any ground for contest on this point.

Commercially this is the more important part of the recent decision, inasmuch as the bulk of the importations heretofore have been of calamine, but the more remarkable part is that which relates to blende. It is to be admitted that when the Dingley Law was enacted no one thought that in a few years the United States would be importing zinc blende, and when such importations were begun there was ground for the belief that blende fell under the "catch-all" paragraph, providing that "metallic mineral substances" in a crude state, not elsewhere specified, should be dutiable at 20 per cent. *ad valorem*, as the Secretary of the Treasury ordered. Now the Board of General Appraisers, guided by a decision of the circuit court of appeals in what is considered to be a parallel case, holds that the phrase "metallic mineral substances" applies only to that class of mineral substances in which metal appears in a free state, such as the ores of gold, silver and copper. Inasmuch as the only ores of the above character which are of commercial importance are those of gold, silver and copper, and they are specifically on the free list, this clause in the Dingley Act under the recent decision becomes meaningless. Literally this interpretation of the adjective "metallic" is doubtless correct, but if that adjective be limited in this way we shall need something to take its place in every-day usage. The chemical compounds which occur ready formed in nature are called minerals; and the minerals from which the metals are extracted for practical purposes are called ores. Ore is commonly defined as a metallic mineral substance. Now we are told that this is incorrect. But if not metallic, what? Certainly not metalliferous—metal bearing—which is far broader than metallic, including every mineral which contains a metallic element, whether commercially extractable or not.

However, the whole of the recent decision is certainly in line with the spirit of the existing tariff law. In the tariff of 1792 calamine, under the name of *lapis calaminaris*, was specifically put on the free list, and it has so remained in every tariff act except those of 1846 and 1857. In 1792 all of the oxidized ores of zinc were known as calamine, the difference between the anhydrous carbonate and the hydrous silicate being unknown until their true composition was determined by Smithson, in 1803. For many hundred years, however, these ores had been employed as a source of zinc for the manufacture of brass by the cementation process, long before it was known how to reduce them to spelter. When Congress put calamine on the free list, in 1792, it was undoubtedly for the purpose of encouraging this industry in the United States; we have read that brass was actually made by the cementation process in the United States in the early part of the nineteenth century. Obviously the continuance of calamine on the free list was intentional, and it is equally obvious that the Congress which passed the Dingley Act did not have any intention of making the more easily smelted ore of zinc

free, and the more difficultly smelted ore dutiable. The recent decision may be regarded therefore as an escape of the innocent blende from the jaws of the "catch-all" clause rather than as a quibbling defeat of the purpose of the framers of the law.

We think it unlikely that there will be any appeal from this decision, inasmuch as the zinc-ore producers who have been urging the exclusion of the foreign ore appear to have lost interest in the matter. The importations have continued under bond since the Treasury order at a greatly increased rate over 1905; yet the price for zinc ore has continued at a high enough level to satisfy everyone. The fact is that many of the foreign producers require high prices just as much as the domestic. An important effect of the decision will be the reopening of the American market to the producers of British Columbia, their product being entirely blende. This will be no cause for regret. The sound commercial policy is to let our smelters have all the supply of free raw material they need. The Canadian and Mexican ores will find a market anyway. American smelters, rather than European, should have the smelting of it, and if there be any surplus let it be spelter to be exported, not ore

The Mining Fraud Question

The suppression of mining frauds is one of the live questions of the day. It is not a simple question. If we should provide the means really to suppress them we should come to State or national control of the mining industry. Even then we should not be safe, as witness many scandals in the post-office department, the public lands, and the administration of public works. And why should there be all this clamor about mining frauds, as if there were no gold-out-of-sea water frauds, Keeley motor frauds, ship-building frauds, and the watering of the stocks of industrial companies of all kinds? It belittles the great mining industry to single it out as one which especially is guilty. Yet it is a fact that because of the attractiveness of the mining industry, the possibility of hitting upon great bonanzas which may centuple the investment, and the general ignorance of the public as to its conditions, it has been selected by sharpers as a fruitful, perhaps the most fruitful, field. It is to be admitted frankly that the sore exists.

All that the Federal Government or the States can do in such matters, whether they pertain to the marketing of stocks of corporations or individuals, is to exercise their police functions. They can run down and punish a crime committed; they cannot prevent the commission of the crime except by making it so dangerous to be criminal that no one will risk being otherwise than good. At present there are plenty of laws for the punishment of crime. In this case the difficulty is in proving the crime. The States do not know how to exercise their proper police functions.

The fraudulent promoters may be divided into several classes:

1. The deliberately dishonest. His trade is the selling of lithographed paper. He ranks with the sharper who advertised a sewing machine for a dollar and sent his victims a needle. When subscriptions for his "stock" come in freely he speaks of business as being good. He does not concern himself about any mine development; usually he is wise enough to provide himself with a patent, a mine, or some alleged asset. Patents can often be secured for $5 or $10 apiece, and a mine may be a claim anywhere.

2. The semi-dishonest. Those who acquire real property which they capitalize and sell to the public at an exorbitant valuation, unjustified by any actual conditions and unbelieved in by themselves.

3. The honest, but ignorant. Those who deceive themselves and with no wrong intentions deceive other people who listen to them.

4. The visionary. Exemplified by Col Sellers

There is only one of these classes which is easily subject to the attention of the police, district attorneys, or the post-office inspectors. This is class 1. They are frequently run down and punished, as for example Letson Balliet, Alfred Goslin and Dr. Flower. The schemings of the gentry of their class make good newspaper stories, add considerably to the general hilarity, but after all do not cause the loss of very much money in the aggregate, although in individual cases they produce the same anguish as the hayseed feels after he has bought a gold brick.

It is classes 2, 3 and 4 which are the dangerous ones, but it is seldom that they can be tripped, although we may feel positive that the public to whom they appeal for money is being misled. It is only occasionally that one of them makes the palpably false statements that the promoters of the Clover Creek Quicksilver Company did a year or two ago and thus becomes subject to a post-office fraud order.

One of our correspondents proposes a State inspection of mines, but how could such be carried out in any safe way? When our great mining syndicates, employing the best engineers, make the mistakes which they do; when the property of the Greene Consolidated was originally condemned by good engineers, and the company was brought out by full-page newspaper advertisements, just like many at present; what would the opinion and dictum of a district engineer lead us to? Simply to this: Promoters would advertise that their property had been passed by the State, just as the Black Sand & Gold Recovery Company now brings the names of the U. S. Geological Survey and the Federal Government into its literature. This would be an evil worse than any we have now. The present mineral-land law requires discovery of mineral to be made as preliminary to location, and the inability of the Government to enforce that apparently simple provision is proof enough of the inability of the State to regulate mine valuations by inspections.

The only remedy for mining and other frauds is an improved morality on all sides; greater reluctance among promoters to father undertakings that they have not properly investigated; carefulness among the newspapers about accepting advertisements which look suspicious (the newspaper not being bound to print anything it does not see fit to); education of the public to exercise of the same caution which it displays in investments in familiar lines; publicity in corporate affairs. In the last connection we believe that a Federal corporation law, supplemented by State laws, modeled after the British, would be decidedly advantageous. But even the latter does not prevent Whitaker Wright scandals and it must be recognized that even the best and most stringent laws cannot keep everyone honest.

ADMIRAL ROBLEY D. EVANS, in the *North American Review*, proposes that our Government acquire and hold the entire anthracite coal field of Pennsylvania to furnish a smokeless fuel for use in the U. S. Navy. An invisible navy would be a great advantage in an emergency, but there are other considerations which to the landsman seem to be of some importance.

The Stuart Colliery Disaster

The attention of coal-mining men, if [illegible] West Virginia, where the alarming loss of life caused by mine explosions continues to occur.

On Jan. 20, one of the worst explosions the State has ever witnessed took place at the Stuart mine. This property is located in the heart of the New River field, which district seems destined to suffer repeatedly from such disasters. The coal dust in this region is probably more readily inflammable than that of any other field, and as a consequence the explosions that occur are never local, but rapidly spread to all parts of the mine, increasing in force as they travel, and leaving but little hope that any men present in the workings will survive. One characteristic of these explosions is that the greater force is nearly always spent on the intake airway, proving conclusively the preponderant influence of dust.

The Sewall seam which is here worked is somewhat gaseous, but when compared with many seams in the anthracite field, the gas content becomes most insignificant. The point, however, that seems to be here emphasized, is the fact that a serious explosion only requires enough gas to cause the initial concussion and project flame into the dust that is raised.

[illegible]

The Stuart mine is one of the newer operations, being located on the higher plateau back from New river, and shipping its product over the Chesapeake & Ohio Railroad, connecting with the Loop Creek branch, near Glen Jean. The company owns the miners' houses and operates a department store which furnishes all the necessities to the workmen and their families.

[illegible]

The seam here mined is known as the Sewall vein, and is undoubtedly the best coal for steam, domestic and general fuel purposes in the world, not excepting the best grades of Cardiff coal from southern Wales. The dip of the coal bed in this region is generally in a northwest direction, while the strike of the seam bears [illegible] does the seam have an inclination of more than 3 per cent., so that the problems of mining are not difficult. Few faults occur, and practically no partings in the coal bed are found. Roughly speaking, the Sewall coal occurs 340 ft. above the Fire Creek seam, and varies in thickness from 2 to 6 ft. In passing eastward from Stuart, where the coal is 4 to 5 ft. thick, the seam decreases in thickness until at Hawk's Nest, the bed is but 2 ft. 6 in. thick.

The average composition of the Sewall coal at the Stuart mine is about as follows: Moisture, 0.70; volatile matter, 21.66; fixed carbon, 72.01; ash, 5.75; sulphur, 0.71. [illegible] The coal has a heating value of 15,200 B.t.u.

METHOD OF OPERATION

The Stuart mine operates a shaft 568 ft. in depth. The method of development is on the double-entry system, with cross entries at right angles to the main entry and rooms driven from these cross entries. The coal, being of such exceptional purity, is neither washed nor picked, and furthermore, has been generally shipped as run-of-mine. In the accompanying illustration is shown the tipple, head frame, boiler-house, power-house and fan-house.

CONCLUSION

Such occurrences as that which the Stuart mine has just experienced are most deplorable, and stringent measures must be taken by the State authorities, if these accidents are to be eliminated. The class of labor in West Virginia is as intelligent as is found in other States, and the men in charge of the mining operations are equal in ability to those who direct operations in other districts. In drawing a conclusion therefore it is only fair to say that the mines of the New River district are particularly dangerous because of the greater inflammability of the dust, and this means that stricter rules and increased precautions must be observed. Much dust should be removed, pipe lines installed along the main and cross entries, with the size of pipe varying from 3½ in. in diameter near the pit mouth, to ¾ in. at the working face. At intervals of 150 ft., taps could be provided, so that short lengths of light hose might be readily attached by the man who does the watering. The spraying can be done by compressing the end of the hose with the finger or thumb, so as to obtain a scattered jet. This should be repeated as often as necessary to prevent the dust from drying. As a further remedy, the operators should send a greater current of air into the mines, and see that this air is not short circuited and lost through faultily constructed brattices. It is a fact that 100,000 cu.ft. of air per min. in the main intake does not often mean one-twentieth this amount at dangerous faces. West Virginia operators have not exerted themselves as they will have to do if further disastrous accidents are to be prevented.

THE STUART MINE IN WEST VIRGINIA, SCENE OF THE RECENT DISASTER

The Cornwall Iron Ore Mines

The Cornwall mines, in Lebanon county, Pennsylvania, were one of the first deposits of iron ore opened in this country, mining having been begun there in 1740. They passed through various ownerships; for 42 years, since 1864, the mines have been owned and worked by the Cornwall Ore Bank Company. The output of these mines has been as follows, in long tons:

From 1740 to 1790	300,000
From 1790 to 1818	700,000
From 1818 to 1864	1,524,907
From 1864 to 1906	19,662,992
Total, to end of 1906	22,187,899

These mines are not exhausted; a proof of which is that the production in 1906 was 763,788 tons, the largest yearly output ever made, with one exception—769,020 tons in 1889. The record of 166 years' working cannot be equaled by any other mine in the United States.

Consul General Guenther, of Frankfort, describes a new alloy of aluminum and zinc known as "alzen." This alloy consists of two parts of aluminum to one of zinc, and is said to equal cast iron in strength and to be much more elastic. The new alloy is capable of filling out the most delicate lines and figures of forms in castings and takes a high polish.

A Virginia Gold Mine

In the midst of the general stagnation which has overcome the Virginia half of the Virgilina copper belt, which was described in the JOURNAL of Dec. 1, 1906, one mine is actively producing gold in a field where other mines are in search of copper. It is the Goldbank mine and is owned by residents of Virgilina, the company being incorporated under the name of Virgilina Mining Company, of New York. The operators of this mine are proceeding with the sane idea of paying expenses as they go, and to this fact probably more than to any other is due their present ability to run and make a profit, while nearly every other mine in the district is dormant or overwhelmed with capitalization.

The mine is situated about six miles directly north of the town of Virgilina. Its vein is parallel to and exactly similar to the other numerous veins of the copper belt, except that, besides a little copper, its chief value is in gold. The vein material is quartz, and the country rock is a highly altered andesite, in appearance almost resembling sedimentary slate. The vein strikes north and south and is nearly vertical. The gold, in an exceedingly fine state of division, is contained both in the quartz filling and in the contiguous altered country rock. Across the 6 ft. of its width the value of the vein is said to average $8 per ton. Copper sulphides are present in subordinate amounts, and no effort is now made to save them.

A vertical shaft has been sunk 160 ft. deep and on this level drifts have been run along the vein for a distance of 100 ft. to the north and 300 ft. to the south, taking out the whole width of the vein. The drifts are advanced by hand-drilling and maintain a hight of about 10 ft. A low heading is first advanced along the roof of the drift and the subsequent bench is then taken down behind. The broken-down ore is shoveled into wheelbarrows and wheeled on planks to the foot of the shaft, dumped on the ground and then shoveled into the wooden hoisting bucket. A steam hoist raises the bucket to a point above the surface, when the trap doors of the shaft are closed, a chain is hooked into the ring at the bottom of the bucket, the engine brake released, and the bucket dumped on the ground. The ore is then shoveled into a wheelbarrow and wheeled to the mill, about 100 ft. distant, where it is again dumped on the floor and shoveled into the crushers. Before condemning this apparently uneconomical employment of labor, it must be remembered that the wages of negro workmen in this district is not more than 75c. per day, and that, with the comparatively small scale of operations, more extensive equipment for the handling of material is not warranted. If the mine prospers, such facilities will doubtless be introduced.

The mill is driven by steam and has two batteries of five stamps each, besides a crusher and two automatic feeders. Two more batteries are contemplated. The mortars are made by the Mecklenburg Iron Works, of Charlotte, N. C. The stamps weigh 750 lb. apiece, the shoes and the dies weighing 80 lb. apiece. Both chrome-steel and cast-iron shoes are used, the former lasting 18 weeks and the latter only six weeks. The stamp stems are of steel. The stamps have a drop of 6 in. and are crushing one ton per 24 hours apiece, through 60-mesh screen. Inside amalgamation plates are not used. The outside plates are 10 ft. long and are broken at intervals of 3 ft. to assist in catching the gold. Between 3 and 4 lb. of mercury are fed into the mortars per week.

No attempt is made to save or to treat the tailings, which are known to be rich in gold. The plates are scraped once a week and a general clean-up occurs once a month. Before going to the stamps the rock is put through a Farrel crusher and is then shoveled into Hendy feeders. Except for the battery attendant and the hoisting engineer, all the laborers are negroes.

The Cassel Process at the Stratton's Independence Mine

At the eighth ordinary, general meeting of Stratton's Independence, Ltd., held in London recently and reported in the *Mining Journal*, the chairman, the Right Hon. the Earl of Chesterfield, P. C., submitted a report of the action of the directors in regard to the treatment of the company's dumps and low-grade ores.

The possibility of treating the waste dump and low-grade ore at a profit was first brought to the directors' notice by H. R. Cassel, in 1903. The directors put themselves into communication with John Hays Hammond, who was then the company's consulting engineer, with the result that after some correspondence Mr. Cassell went out to the mine to make some small experiments in the presence of Professor Huntoon, selected by Mr. Hammond, to watch the tests of the process. Unfortunately, according to a report made by the manager, Mr. Becker, it appears that the plant at the disposal of Mr. Cassel and Professor Huntoon at the time was very crude and poorly arranged, so that the best results could not be expected.

As a matter of fact, Professor Huntoon's conclusions were of an indefinite character, but his report showed the process to have some merit, and though there was a low extraction, the cost of treatment was estimated by Professor Huntoon as 90c. per ton on a 500-ton plant. The mine manager at the time suggested that a small 10-ton experimental plant should be erected and experiments conducted systematically. This was confirmed by Mr. Hammond, who thought that the vital importance of a process for a cheaper and more efficient treatment of the dump and low-grade ore was so great that a further expenditure, not to exceed £2000, should be authorized to carry out experiments on the lines suggested by Mr. Cassel. Mr. Hammond's assistant, Mr. Beatty, also strongly recommended this policy.

Godfrey Doveton, of Denver, conducted the experiments in 10-ton lots of $3 ore, eleven of them in all, and in June, 1905, he made a very full report on the work. At the end of the report Mr. Doveton summed up the process under four heads. Dealing with the first head, crushing of dump ores, he found that from results of tests crushing to 20-mesh classification of sand from slime, concentration of sands, slime, and sulphurets by cyanidation would yield a maximum extraction. Under the second head, treatment of sands, he found that 78 per cent. of sand would be produced, yielding on treatment 40 per cent. of the value. In the third operation, treatment of slime, 20 per cent. of slime would be produced, having a value of $5 per ton. This would yield on treatment $3.5 per ton of slime. Finally, under the fourth head, treatment of sulphurets, 2 per cent. of sulphurets would be produced, having a value of $5 per ton, leaving a net return of $41.325, if treated on the ground per ton of sulphurets. On the experimental samples of 110 tons, in all of an average of $3 the extraction per ton of original ore was a little over $2, the cost of treatment a little under $1, and the estimated net profit a little over $1 per ton.

With regard to the Cassel filter, G. Doveton stated that, although working under rather adverse conditions, it did excellent work; that it is peculiarly adapted to the treatment of the slimes of the dump of the Stratton's Independence mine. He also gave the opinion that a vacuum system like that of the Cassel process is cheaper in installation, vastly cheaper in operation and more effective than filter pressing. The directors came to the conclusion that the value of the Cassel process and filter had been undeniably demonstrated.

After a series of negotiations concerning the erection of a mill and the making of further experiments with the Cassel process, Philip Argall was chosen to carry on the work, and was given free hand with regard to the treatment. It was stipulated that if the directors consider it necessary Mr. Cassel's assistant should be present during any further experimental trials that Mr. Argall may deem advisable.

The shipments of zinc and lead ore from Tunis in 1906 amounted to about 50,000 metric tons.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

Theories Concerning the Flotation Process

The oldest theory concerning the flotation process was that a dilute solution of H_2SO_4 acting on the sulphides contained in an ore set free H_2S, which gas drew the metallic sulphides to the surface. The action of CO_2 was not taken into consideration.

Later when the method was used on other ores, especially those containing carbonates, conceptions concerning the working of the process changed. At the present time the belief that CO_2 has a direct action in the flotation seems to be fairly general, and the theory that other unknown physical and chemical phenomena are the causes is probably still more generally held.

If carbon dioxide were the active gas the carbonates ought to be the first particles drawn to the surface because they are the source of the gas. The specific weight of carbon dioxide is so great that the gas cannot carry particles to the surface unless it occurs in large quantities, or in large bubbles. There is no reason why CO_2 should occur more abundantly on sulphides than on other mineral particles. I have come to the conclusion that the old theory, that H_2S is the gas that causes flotation is the correct one, modified in some cases when applied to ores containing carbonates.

Carbon dioxide possesses so much greater solution pressure than H_2S that it drives the hydrogen sulphide out of solution, and also hinders H_2S from going into solution. Hence if a sulphide ore containing carbonates is treated with a dilute solution of H_2SO_4, and this solution is warmed, the first gas to be generated is CO_2; but the sulphides are also acted upon by H_2SO_4 and H_2S is set free. Now the CO_2 hinders H_2S from going into solution, and the latter becomes isolated and collecting on the sulphides forces the particles to the surface. As H_2S is a gas of low specific weight a very small amount of it collecting on the mineral particles is enough to draw them to the surface.

The practical conclusions based upon my theory are, therefore, that it is always advisable to have a carbonate present in order to use the flotation process for sulphide ores. But an amount of carbonates in excess of that needed to give the solution a sufficient amount of CO_2 must be excess of carbonate causes too violent a generation of gas which carries away tailings and light particles during concentration. Too large an excess of carbonate may make the process entirely useless for practical purposes.

If there is no carbonate present in the ore the process is not as effective as it otherwise would be, for it is advisable always to have enough CO_2 present to keep the solution saturated. Flotation may, however, take place without the presence of CO_2, for at a higher temperature H_2S goes into solution with difficulty and the larger portion of the separated gas gathers on the particles and carries them to the surface.

The amount of H_2SO_4, and also the temperature of the solution must vary for different ores, and must be determined by experiment. That the practical arrangements as well as the methods of procedure also play an important part need hardly be mentioned. G. HAGLUND.

Fredericktown, Mo., Jan. 28, 1907.

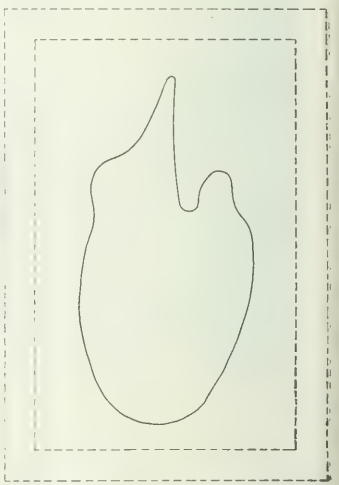
Patching a Steel Water Jacket

With proper treatment a steel or wrought-iron water jacket should never need patching, but furnaces do not always receive proper treatment and accidents are bound to happen. When the leak appears in a solitary little furnace in the wilderness far from railroads and bases of supply, one is not disposed to sneer at any plan which promises to stop the flow of water even temporarily. The patch which I mean to describe had every appearance of permanency. To my knowledge it did good service for three months, and there is no reason why that jacket should not be in commission today.

It was in the mountains of Mexico, at the end of a long and tortuous burro trail We were trying to smelt the most villainous mixture of sulphides ever assembled in uncertain pockets. The ore contained quantities of zinc, arsenic and pyrites, very little lead and not enough copper to make a coherent matte. The men from foreman to slag sorter on the dump were all natives, mostly Indians as innocent of any knowledge of mechanics as the goats upon the surrounding hills. The plant was a small, round lead furnace with an adobe reverberatory roaster much too short for the job. When I add that we used a poor quality of charcoal because the least expensive coke cost $36 per ton at the charging floor, no other excuse for the damaged jacket will be necessary.

One morning the astonished tapper drew water instead of the usual sluggish stream of slag, and a chilled lead-well put an end to another abbreviated campaign. We removed the damaged section and prepared to fill the gap with brick, adobe, clay or whatever might answer the purpose. The jacket was thrown aside as "done for." There was a ragged, oval hole, about 3x5 in. directly above the tuyere opening.

The man who looked after the machinery of the place was a big, good-natured Slav. He had come to the mine with a consignment of Krupp concentrating ma-

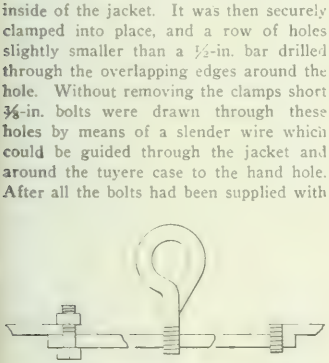


LEAK IN JACKET AND OUTLINE OF TRIMMED HOLE AND PATCH

chinery, and had remained as a generally useful appendage. He spoke all the languages of the twelve Danube provinces, usually mixed with a few English words, and was a veritable Yankee for ingenuity. He dragged the damaged shell away to the shade of a pepper tree—it was February, but the thermometer registered between 100 and 105 deg. F. in the shade—and presently asked and promptly received permission to "compone" that jacket. He found a piece of ¼-in. plate in the scrap heap, and with the aid of a fragment of chalk made the native blacksmith and his helper understand what they were to do. Then he seated himself comfortably upon the handle of a slag pot, rolled a cigarette and superintended operations.

The various steps in the process are shown in the accompanying sketches. The metal about the hole was cut away so as to form a rectangular opening about 4 in wide and 8 in. long. The edges were given an easy bevel by means of a file. The piece of plate from the scrap pile was trimmed to form a corresponding rectangle about 2 in. wider and longer than the hole. To apply this patch to the outside of the jacket face was out of the question, for any projection would interfere with the descent of the charge. The space between the walls of the shell was too narrow for the use of tools from within; besides the only access lay through the hand hole below the tuyere casing. All the work must be done from the face.

The blacksmith cut a threaded hole in the center of the plate, which was to serve as a patch and screwed into that a strong eye made at the forge of a ½-in. bar. This served as a handle and as an anchor for clamping. The patch was then heated and carefully fitted to the surface surrounding the hole. By manipulation the patch was easily made to lie against the inside of the jacket. It was then securely clamped into place, and a row of holes slightly smaller than a ½-in. bar drilled through the overlapping edges around the hole. Without removing the clamps short ¾-in. bolts were drawn through these holes by means of a slender wire which could be guided through the jacket and around the tuyere case to the hand hole. After all the bolts had been supplied with



PATCH IN PLACE

nuts the clamps were removed, and the patch loosened enough to admit a thick coat of luting between the overlapping edges. The nuts were then drawn down securely, leaving the patch in place, and a row of protruding bolts around the edge. These bolts were then removed, one at a time, a thread with a strong taper cut in each hole, and a plug, prepared by threading the end of the ½-in. bar, inserted. The plugs were driven in hard with a pipe wrench. The plugs which held the patch securely in place were finally cut off flush with the surface, and also the eye in the center of the patch. After the surface had been trimmed with file and emery cloth the job was complete. An offer to insert a piece of trimmed plate exactly to fill the depression was declined as unnecessary. Although the jacket was kept under observation for three months no adhesion of any kind was ever detected. The furnace was out of commission less than 24 hours. BROMIDE.

Denver, Colo., Jan. 15, 1907.

Increase of Moisture in Coke Shipped in Sealed Cars

I am greatly interested in the question discussed in the correspondence on "Increase of Moisture in Coke Shipped in Sealed Cars," in the JOURNAL of Feb. 9. Mr. Page's theory of the slow combustion of hydrogen is extremely ingenious, and since it has no rival, I suppose it has the field to itself. No doubt we should be duly thankful to its author, for it is an explanation of a mystery which has bothered many.

Yet, a number of us here are from Missouri, and if Mr. Page has no objections we shall reserve full acceptance until we have asked a few questions:

In the test described, how was the coke sampled for moisture before and after shipment?

What method for the estimation of moisture was employed?

How was the coke dried after quenching?

Is an excess of water commonly used in quenching? Theoretically, we presume, the evaporation of the water abstracts the heat from the coke, but after 212 deg. F. has been reached, this effect is no longer obtained, and the cooling water is likely to remain, even though the coke feels warm.

How much water will coke hold and still look dry? Charcoal, in appearance perfectly dry, will retain enormous quantities of moisture. STEEL.

Chicago, Feb. 12, 1907.

British-American Copper Mines and Smelter Company

A British Columbia mine manager has sent me from Montreal, Quebec, a copy of the New York *World* of Sunday, Jan. 20, with a half-page advertisement marked for my notice. Today an official of the Provincial Government informed me that the lieutenant-governor had received an inquiry concerning the alleged mining company, to which the advertisement invites public subscription for its stock. The advertisement is too long for me to deal with its details *seriatim*, at present, but I shall be glad to have you favor me with space in the JOURNAL for a few comments on its more glaring mis-statements.

The company concerned is advertised as "The British-American Copper Mines and Smelter Company," and its "copper property" is described as being "situated in the Golden division of the East Kootenay mining district, Province of British Columbia." I note some of the misrepresentations, as under:

"The richest copper district in the world."

The total value of the copper output of the whole of the adjoining mining divisions of Golden and Windermere for five years, 1901-5, is shown in the "Annual Reports of the Minister of Mines for British Columbia," to have been, at New York yearly average market prices, $4179. Of this amount $1654 was for 1905. The returns for 1906 have not yet been received by the Bureau of Mines, but they are not expected by the officials to show any increase worth noting.

"This mine will begin shipping ore at once." "All that we need to do to bring this mine into the producing class is to finish the construction of three miles of a ten-mile wagon road. . . . " "This will give us a splendid outlet to the Kootenay Central Railway."

The Kootenay Central Railway is not yet in existence, save only that some ten miles of grading has been done, but not within 50 miles of the mineral claims in question. Nor is there any reasonable probability of construction being shortly proceeded with. No operating railway passes within say 100 miles of these claims.

"The Granby Company, a neighbor of ours, is paying 24 per cent. yearly on a capitalization of $15,000,000."

The mines of the Granby Company are situated nearly 200 miles away in an air line. By ordinary transportation routes it would take about three days' travel by train and lake steamer to reach the Granby mines from this part of Golden district.

E. JACOBS.

Editor *B. C. Mining Record.*

Victoria, British Columbia, Jan. 29, 1907.

Brazilian Manganese Ore

On page 437 of Volume XIV, 1905, of THE MINERAL INDUSTRY under the heading "Analysis of the World's Manganese Ore," there is a reference to my manganese ore which is not correct. This mine is the only one situated in the district of Miguel Burnier which exports manganese ore to Europe and United States. I enclose an analysis of the ore.

	Per cent.
Silica	1.30
Peroxide of Manganese	71.79
Protoxide of Manganese	5.96
Peroxide of Iron	6.20
Alumina	2.37
Lime	Trace
Magnesia	0.67
Baryta	2.51
Phosphoric acid	0.075
Arsenic acid	0.046
Sulphuric Acid	0.050
Oxide of Copper	nil.
Oxide of Cobalt	0.050
Carbonic Acid	nil.
Combined Water	1.10
Alkali Potash and Soda	1.70
Phosphoric Acid	0.075
Phosphorus	0.033
Arsenic	0.030
Sulphur	0.050
Metallic Manganese per cent.	51.90
Metallic Iron per cent	4.34
Silica	1.30
Moisture	16.33

CARLOS W[illegible]

Rio de Janeiro, Dec. 17, 1906.

A discovery of wolfram in the northern territory of Australia is reported in the [illegible] *land*. The wolfram is said to be associated with copper.

New Publications

[illegible] By Paul Goerens. Pp. 185; illustrated. 7x10½ in.; paper, 10 marks. Halle a. S., 1906: [illegible]

"The Treatment of Storage Batteries." By R. W. Vicarey. Pp. 60; illustrated. 8½x11 in.; paper. 2s. 6d. net. London, [illegible]

[illegible] By L. Parry. Second Edition. Pp. 49; illustrated. 5½x8½ in.; cloth, 3s. 6d. net. [illegible]

"The Cretaceous Flora of Southern New York and New England." By Arthur Hollick. Pp. 219; illustrated. 9x12 in.; cloth. Washington, 1906: Government Printing Office.

"Die Bekämpfung der Wassersand-(Schwimmsand-) Gefahr beim Braunkohlenbergbau." By Hermann Niess. Pp. 104; illustrated. 6½x10 in.; paper. Freiberg in Sachsen, 1907: Craz & Gerlach.

"Die elektrischen Oefen. Erzeugung von Wärme aus elektrischer Energie und Bau elektrischer Oefen." By Wilhelm Borchers. Pp. 168; illustrated. 7x10½ in.; paper, 7 marks. Halle a. S., 1907: Wilhelm Knapp.

"Geographic Dictionary of Alaska." By Marcus Baker. Second Edition. Prepared by James McCormick. U. S. Geological Survey, Bull. No. 299. Pp. 690. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"A Review of Mining Operations in the State of South Australia during the Year Ended June 30, 1906." Issued by T. Duffield, Secretary for Mines. Pp. 24; illustrated. 6x9½ in.; paper. Adelaide, 1906: C. E. Bristow, Government Printer.

"Twenty-seventh Annual Report of the Director of the United States Geological Survey to the Secretary of the Interior, 1905-6." By Charles D. Walcott, Director. Pp. 104; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Graphite in Queensland, with Special Reference to the Mount Bopple Graphite Deposits." By B. Dunstan. Publication No. 203 of the Geological Survey of Queensland. Pp. 20; illustrated. 6x9½ in.; paper. Brisbane, 1906: George Arthur Vaughn, Government Printer.

"After Earthquake and Fire." Edited by T. A. Rickard. Pp. 194; illustrated. 6x9 inches, cloth. San Francisco, 1906: Mining and Scientific Press.

This little book is a reprint of the articles and editorial comment appearing in the *Mining and Scientific Press* immediately after the disaster at San Francisco, April 18, 1906. In a graphic way it portrays how our contemporary ably surmounted the difficulties following the great catastrophe. As such it is a highly interesting editorial record. The various papers which make up the bulk of the book are a collection which will have a permanent scientific value. Prepared by the competent hands of its well known editor, the book is not only an interesting record, but also is interesting reading.

Patents Relating to Mining and Metallurgy

UNITED STATES

The following is a list of patents relating to mining and metallurgy and kindred subjects issued by the United States Patent office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Jan. 22, 1907.

PROCESS OF TREATING REFRACTORY ORES.—Leslie V. Atkinson, Carshalton, England. No. 841,657. Filed Mar. 26, 1906.

RECUPERATIVE FURNACE—Frederick Bredel, Milwaukee, Wis. Nos. 841,663, 841,664. Filed Oct. 11, 1905.

APPARATUS FOR GRINDING AND SEPARATING FINE MATERIALS—Thomas A. Edison, Llewellyn Park, Orange, N. J. No. 841,677. Filed Jan. 29, 1903.

BRIQUET AND PROCESS OF MAKING THE SAME—Jacob S. Robeson, Camden, N. J., assignor to Robeson Process Company, Camden, N. J. No. 841,718. Filed June 9, 1906.

ELECTROLYTIC APPARATUS—John H. Ryan, Portland, Oreg. No. 841,720. Filed May 1, 1906.

PROCESS OF TREATING ORES—John H. Ryan, Portland, Oreg. No. 841,721. Filed Mar. 1, 1906.

PRODUCTION OF ALKALI METALS.—Geo. O. Seward and Franz Von Kügelgen, Holcombs Rock, Va. No. 841,724. Filed Apr. 23, 1906.

CINDER-MILL—William W. Sly, Cleveland, O., assignor to The W. W. Sly Manufacturing Company, Cleveland, O. No. 841,728. Filed Mar. 21, 1905.

KILN—Gustav Larson, Los Angeles, Cal., assignor to Los Angeles Pressed Brick Company, Los Angeles, Cal. No. 841,789. Filed Feb. 21, 1906.

TUBULAR BALL MILL.—Max F. Abbé, New York, N. Y. No. 841,841. Filed Sept. 21, 1906.

KILN—Paul Chmelewski, Helsingfors, Russia, assignor to Anna Mathilda Chmelewski, Helsingfors, Finland, Russia. No. 841,847. Filed Aug. 23, 1906.

HOISTING APPARATUS.—Charles H. Hunt, New York, N. Y. No. 841,870. Filed July 24, 1906.

MANUFACTURE OF NITROGLYCERIN—Frederic L. Nathan, James M. Thomson, William Rintoul, and Andrew Scott, Waltham Abbey, England. No. 841,886. Filed June 5, 1906.

PEBBLE-MILL—Max F. Abbé, New York, N. Y. No. 841,913. Filed May 2, 1906.

COMBINED PULVERIZER AND SAMPLER—Oscar C. Beach and Arthur L. Buzzell, Los Angeles, Cal., assignors, by mesne assignments, to Frederick W. Braun, Los Angeles, Cal. No. 841,921. Filed Mar. 21, 1906.

MULTIPLE RIFFLE SAMPLER.—Evans W. Buskett, Coffeyville, Kans. No. 841,928. Filed July 20, 1906.

DESICCATING PLANT—Ernst W. Cooke, New York, N. Y., assignor, by mesne assignments, to the Cokel Company. No. 841,939. Filed May 20, 1904.

PROCESS OF TREATING GOLD AND GOLD-SILVER ORES—John A. Just, Syracuse, N. Y., assignor to the Just Mining and Extraction Company, Syracuse, N. Y. No. 841,983. Filed Jan. 27, 1906.

AMALGAMATOR.—Henry L. Lightner, San Francisco, Cal., assignor of one-third to William Priest and one-third to Henry Feige, San Francisco, Cal. No. 841,990. Filed Feb. 23, 1906.

DUMPING-CAR.—Francis Peteler, Minneapolis, Minn. No. 842,008. Filed Sept. 29, 1906.

ELECTRIC MELTING OR REDUCING FURNACE—Gilbert C. Landis, Carlisle, Pa., assignor to American Phosphorous Company, Camden, N. J. No. 842,099. Filed Sept. 21, 1904.

METHOD OF TREATING ORES—Charles A. Diehl and William Koehler, Cleveland, O. No. 842,139. Filed Mar. 28, 1906.

Published Week Ended Jan. 29, 1907.

HYDROCARBON ROCK-DRILL—John V. Rice, Jr., Bordentown, N. J. No. 842,246. Filed May 27, 1904.

PROCESS OF CONCENTRATING ORES—Alfred Schwarz, New York, N. Y., assignor to Schwartz Ore Treating Company, Phoenix, Ariz. No. 842,255. Filed July 19, 1905.

INGOT-STRIPPER—Clarence L. Taylor, Alliance, Ohio, assignor to The Morgan Engineering Company, Alliance, Ohio. No. 842,266. Filed Apr. 18, 1906.

PROCESS OF REDUCING COMPOUNDS—Frank J. Tone, Niagara Falls, N. Y. No. 842,273. Filed Dec. 16, 1905.

DREDGE—James L. White, Milwaukee, Wis., assignor of one-half to Edward L. Leser, Milwaukee, Wis. No. 842,364. Filed Oct. 4, 1905.

GOLD-DREDGE—Horace J. Clark, Boise, Idaho, assignor to The Clark Dredging Company, Chicago, Ill. No. 842,383. Filed Apr. 9, 1906.

TAILINGS-TRIMMER—Horace J. Clark, Chicago, Ill., assignor to The Clark Dredging Company, Chicago, Ill. No. 842,384. Filed Sept. 15, 1906.

MAGNETIC ALLOY.—Robert A. Hadfield, Sheffield, England. No. 842,403. Filed Nov. 8, 1906.

GAS-FURNACE—Henry A. Schnelbach, Pittsburg, Pa., assignor to Macbeth-Evans Glass Company, Pittsburg, Pa. No. 842,427. Filed Aug. 6, 1906.

PULVERIZER—Peter L. Simpson, Chicago, Ill., assignor to Herbert S. Simpson, Chicago, Ill. No. 842,430. Filed July 24, 1905.

COAL-MINE TIPPLE AND SCREEN PLANT—William R. Wilson, Toronto, Ontario, Canada. No. 842,439. Filed June 23, 1905.

PROCESS OF MAKING FERROUS CARBONATE.—Adolf Elügge, Hanover, Germany. No. 842,452. Filed Nov. 15, 1906.

PROCESS OF MANUFACTURING SODIUM PERBORATE.—Otto Liebknecht, Frankfort-on-the-Main, Germany, assignor to The Roessler & Hasslacher Chemical Company, New York, N. Y. No. 842,470. Filed Feb. 7, 1906.

PROCESS OF MAKING ALKALI PERBORATES.—Otto Liebknecht, Frankfort on the Main, Germany, assignor to The Roessler & Hasslacher Chemical Company, New York, N. Y. Nos. 842,471; 842,472; 842,473. Original application filed Feb 7, 1906. Divided and this application filed Oct. 26, 1906.

ART OF CONSTRUCTING RETAINING-WALLS.—George W. Jackson, Chicago, Ill. No. 842,552. Filed June 12, 1906.

MAGNETIC SEPARATOR—Charles J. Reed, Philadelphia, Pa. No. 842,583. Filed Aug. 15, 1902.

DEVICE FOR USE WITH ROCK-DRILLING MACHINES—Eustace M. Weston, Johannesburg, Transvaal. No. 842,598. Filed Oct. 30, 1905.

CONVEYER—John H. Bell, Haddonfield, N. J. No. 842,611. Filed Oct. 1, 1906.

APPARATUS FOR SEPARATING MATERIALS—Talmadge Blass, Lebanon, Pa. No. 842,614. Filed Oct. 28, 1905.

MOUNTING FOR ROCK-DRILLS—Martin Hardsocg, Ottumwa, Iowa. No. 842,654. Filed July 12, 1904.

BLAST-FURNACE—Hiram W. Hixon, Victoria Mines, Ontario, Canada. No. 842,663. Filed Aug. 1, 1906.

AUTOMATIC MINE-CAR SWITCH—Maurice O. Horning, Broughton, Pa. No. 842,667. Filed Nov. 1, 1906.

MINE-CAR—Charles A. Keller, Rosedale, Ind. No. 842,670. Filed Apr. 11, 1906.

COB BREAKER OR CRUSHER—George H. Mayne, Springfield, Ohio, assignor to The Foos Manufacturing Company, Springfield, Ohio. No. 842,681. Filed Mar. 19, 1904.

ORE HEATING AND DRYING DEVICE FOR FURNACES—Utley Wedge, Ardmore, Pa. No. 842,736. Filed Feb. 14, 1906.

PROCESS FOR COOLING COKE—Charles E. Arnold, Wilmington, Del., assignor of one-fourth to William Coyne, Wilmington, Del. No. 842,747. Filed Aug. 30, 1906.

MANUFACTURE OF STEEL.—José de Moya, Paris, France, assignor to La Société de Moya et Cie., Paris, France. No. 842,802. Filed Feb. 7, 1905.

IDLER FOR BELT CONVEYERS—John J. Ridgway, Rosebank, N. Y. No. 842,813. Filed Apr. 3, 1906.

PROCESS OF BURNING CEMENT—Charles A. Matcham, Allentown, Pa. No. 842,848. Filed Dec. 28, 1906.

Personal

Mining and metallurgical engineers are requested to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

E. A. Hitchcock is again at Bisbee, Ariz., having returned from the east.

F. H. Summeril, of Denver, is making examinations in Summit county, Colorado.

Bert McFarland, of Pittsburg, Penn., is in Gilpin county, Colo., looking after mining interests.

S. A. Weston, of Idaho Springs, Colo., has gone to Boston, Mass., to attend to mining business.

G. E. Alexander returned to Denver, Colo., recently, from a professional trip to California and Arizona.

Charles Stevens, of Boise, Idaho, has been making a visit to Clear Creek and Gilpin counties, Colorado.

H. F. A. Riebling has completed his testing work in northern Texas and has returned to Colorado Springs.

Leslie A. E. Swinney left London on Jan. 19 on his way to join the staff of the Broomassie mine, West Africa.

Col. A. G. Brownlee, of the Stanley mines in Clear Creek county, Colo., is making a visit to eastern points.

W. L. Cobb, of Sansalito, Cal., is at present engaged in making some mine examinations in Durango, Mexico.

James W. Neill, of Pasadena, Cal., consulting engineer for the East Butte Company, is visiting Butte, Montana.

David H. Lawrance, of Denver, is visiting several properties in Summit county, Colo., of which he is consulting engineer.

H. T. Keltie, of Joliet, Ill., president of the Washington-Joliet Company, is in Breckenridge, Colo., visiting the property.

J. Parke Channing, of the Tennessee Copper Company, and expert for the Lewisohns, is in Butte, Mon., on business.

F. J. Pope, a graduate of the Kingston School of Mines, has gone to Chile to examine a mine for the Guggenheim interests.

H. Hohman, of Milwaukee, Wis., has been looking over mining interests in the Eldora district, Boulder county, Colo., recently.

Clarence Beall, of Idaho Springs, Colo., has gone to southern California on a two months' trip to look at some copper properties.

A. J. Mueller, of Pittsburg, Penn., has returned east after a visit to Idaho Springs, Colo., to look after mining interests.

Robert Callow, Jr., of Idaho Springs, Colo., has left for Hillsboro, N. M., where he will assume charge of some mining property.

Foster Hewett, of Pittsburg, Penn., is on his way to Mexico, to do some professional work in the State of Chihuahua, Durango.

A. A. Brady, of North Attleboro, Mass., has been in the Empire district, Clear Creek county, Colo., looking after mining interests.

L. E. Tobias, of Idaho Springs, Colo., has returned from a professional visit to mining districts in the southern portion of Colorado.

H. P. Dickenson, general manager of the Hoosac tunnel in Clear Creek county, Colo., has returned from a business visit to Chicago.

C. L. Fichtel, of the electrical department of the Calumet & Hecla Mining Company, at Calumet, Mich., is visiting New York.

H. W. Hardinge has returned to New York from a trip to Georgia, and has left again, to investigate some mines at Cobalt, Ontario.

D. A. McDonald, dredgemaster for the Reliance Dredging Company, of Breckenridge, Colo., has returned to that place from California.

G. A. Duncan, of Denver, Colo., is opening some mines in Eldorado cañon. His address for the present is Nelson, Lincoln county, Nevada.

Charles S. Walter, vice-president of the Security Investment and Mines Company, has returned to Denver, from an extended business trip to the East.

R. B. Binsmade is making examination of mines in Socorro and Grant counties, in New Mexico; also in Santa Cruz and Pima counties in Arizona.

Chas. W. Howbert, of Colorado Springs and Cripple Creek, Colo., has left for his new position as manager of the Cieneguita Copper Company's properties in Mexico.

Juan F. Brandes arrived in Denver a few days ago, after a prolonged stay abroad, and is at present on his way to Mexico on professional business, stopping in California.

E. J. Frantz, formerly of Silver City, N. M., and New York, has been appointed superintendent of the mine and mill of the Indian Valley Mining Company, at Greenville, California.

David Ellis, manager of the Pittsburg Consolidated Company, of Idaho Springs, Colo., has gone to Pittsburg, Penn., to attend a meeting, and may extend his trip across to England.

Edwin Higgins, mining engineer, has returned to Butte, Mon., after spending several weeks in New York on business connected with the Butte Knickerbocker Mining Company.

L. A. Desy, of Montreal, has left for India, having received from the Indian Government the appointment of superintendent of the dredging of the Jhelum river, in Cashmere.

A. E. Keables, president of the Security Investment and Mines Company, of Denver, Colo., has returned from a trip of inspection of some of the company's holdings in South Dakota.

Walter F. Lineberger and Lloyd A. Rone, forming the firm of Lineberger & Rone, mining engineers, have moved their offices from Pedriceña to Torreon and their address is now Torreon, Coahuila, Mexico.

In our issue of Jan. 28, page 211, reference was made to "J. A." Traylor, in connection with the Tri-Bullion Mining Company. It should, of course, have been "S. W." Traylor, president of the Traylor Engineering Company.

Herbert G. Cannon, of Goldfield, Nev., is in New York on business connected with some Nevada mining properties, which he recently examined for New York parties. He leaves shortly to examine mines in Durango, Mexico.

S. B. Tyler has resigned his position as superintendent of the San Luis Mining Company, at San Gabriel, Durango, Mexico, with which he has been connected for the past five years, to take charge of the mines of the Jimulco Mining Company, at Otto, Coahuila, Mexico.

Bertram Mellon has resigned charge of the operations of the Slough Creek, Ltd., at its deep-drift gold mine, Cariboo, British Columbia, and is proceeding to New Zealand on a trip through the mining districts of that country before returning to England. His successor at the Slough Creek mine is H. H. Water, who recently arrived from England.

L. M. Hartzell has been appointed superintendent of the bessemer department of the Homestead works of the Carnegie Steel Company, to succeed E. G. Weisner, who has been made general superintendent of the bessemer steel plants of the company at Bellaire and Mingo Junction, Ohio. Mr. Hartzell was formerly assistant to Mr. Weisner at Homestead.

J. L. Parker, at one time manager of the North Star mine, East Kootenay, British Columbia, and for the last two years manager for the Brown-Alaska Company of New York, with mines at Hadley, Prince of Wales Island, southeast Alaska, and Portland Canal, British Columbia, has retired from the latter position and opened an office at Seattle, Washington, as a consulting mining engineer.

Obituary

John Phillips, a pioneer iron manufacturer of Pittsburg, died at his home in Carrick, Penn., aged 84 years. When a young man he and his brother James formed a copartnership in the building and contracting business, erecting some important buildings in Pittsburg and vicinity. About 1860 he joined the late William J.

Lewis in establishing a bolt factory. In 1883 the late Henry W. Oliver became a partner and the firm was then Lewis, Oliver & Phillips. After Mr. Lewis withdrew from the firm it was styled Oliver Brothers & Phillips, which later gave way to the Oliver Iron and Steel Company, of which Mr. Phillips was vice-president. The mine-supply department of this enterprise was bought by Mr. Phillips and his nephew, John Phillips, was established in a separate plant, and when Mr. Phillips retired from active business in 1900 it was incorporated as the Phillips Mine and Mill Supply Company.

Societies and Technical Schools

Montana Society of Engineers—The twentieth annual meeting was held in Butte, beginning Jan. 10. The first day was devoted to an inspection of the Washoe reduction works at Anaconda, and Jan. 11 to a visit to the Montana School of Mines and the Boston & Montana plant. On Jan. 12 the business meeting was held and the following officers declared elected for the ensuing year: President, E. C. Kinney; first vice-president, Archer E. Wheeler; second vice-president, Arthur H. Wethey; secretary and librarian, Clinton H. Moore; treasurer and member of the board of managers of the Association of Engineering Societies, Samuel Barker, Jr.; trustee for three years, Azelle E. Pobart. President Dunshee retiring, President-elect Kinney commenced the duties of his office by making a short speech of acceptance. The annual reports of the secretary and treasurer were then read and referred to the trustees. The committee on resolutions on the death of the late Geo. H. Robinson presented resolutions of regret, which were adopted.

A communication from President Bowman, of the State School of Mines, was next, having for its object the establishment of a Montana Geological Survey by legislative enactment. After discussion the paper was referred to the trustees, with instructions that they present a report on the same. The address of the retiring president, B. H. Dunshee, was delivered. Prof. A. N. Winchell, of the State School of Mines, gave a very interesting account of some experiments on the genesis of copper ores, and Prof. Geo. W. Craven, of the State School of Mines, presented a thesis on concrete and its practical uses. A short discussion closed the exercises of the afternoon. The usual banquet completed the work of the annual session.

Industrial

Princess furnace, formerly operated by the Princess Iron Company, at Glen Wilton, Va., has been sold to Matthew Addy & Co., of Cincinnati.

The Warwick Iron and Steel Company has leased Anvil furnace, previously operated by the Glasgow Iron Company, of Pottstown, Pennsylvania.

The Sullivan Machinery Company, of Chicago, has established a branch office in Birmingham, Ala., where rock drills and other machinery will be carried in stock.

In order to meet the demands of their rapidly extending business, W. S. Barstow & Co., of New York, and Portland, Ore., have recently enlarged their power-plant department. At the head of the department is Perry West, recently with the New York Edison Company. Associated with him are Carl F. Schreiber and Rulof Klein.

The Piqua Blower Company of Piqua, Ohio, is being incorporated with a capital of $50,000. This corporation will take over the interests of the Piqua Foundry and Machine Company, and will make a specialty of positive blowers and gas exhausters as developed by the latter company in the past two years. It was necessary to effect this re-organization in order to take care of the large volume of business offered.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

A. Leschen & Sons Rope Company, St. Louis, Mo. "St. Louis Today." Pp. 96; illustrated; paper; 10x13 in. 1907.

Ohio Brass Company, Mansfield, Ohio. Monthly Bulletin. Vol. 2, No. 6. Pp. 12; illustrated; paper; 6x9 in., Jan., 1907.

Arthur Koppel Company, Machesney Building, Pittsburg, Penn. Map of Eastern and Middle-Western States. Paper, 13x20 in.

Wellman-Seaver-Morgan Company, Cleveland, Ohio. Circular No. GP-i. Hughes Continuous Gas Producers. Pp. 32, illustrated; paper; 6x9 in.

Crocker-Wheeler Company, Ampere, N. J. Bulletin No. 74. Engine Type Alternating Current Generators. Pp. 11, illustrated, paper, 7½x10 in. January, 1907.

Utah Mining Machinery and Supply Company, Salt Lake City, Utah. Bulletin No. 300. Callow's Traveling Belt Screen. Pp. 21; illustrated; paper; 8½x10½ in.; Jan., 1907.

Robins Conveying Belt Company, Park Row building, New York. Bulletin No. 16. Robins Conveying Machinery as Applied to Ore Handling. Pp. 24; illustrated; paper; 6x9 in.

Ingersoll-Rand Company, 11 Broadway, N. Y. Catalog H 36. Ingersoll-Sergeant Class "H" Air and Gas Compressors. Pp. 64, paper, 6x9 in. Form 45 A. Ingersoll-Rand Rock Drills. Form 35D. Air and Gas Compressors. Pp. 20, illustrated, paper, 3x5½ in.

Westinghouse Electric and Manufacturing Company, New York Life Building, Chicago, Ill. Folder No. 5. Westinghouse Motor-Driven Champion Blacksmith Blowers. Folder No. 10. Westinghouse Motor-Driven A. B. C. Disk Fans. Pp. 8; illustrated; paper; 3½x6 in.

Construction News

Silver Plume, Colorado—The Waldorf Mining Company is arranging to put in a wire-rope tramway at its mine. E. J. Wilcox, Silver Plume, Colo., is manager.

Gold Butte, Nevada—The Gold Butte Mines Company is preparing to install a stamp mill. Charles F. Porter, Keith block, Salt Lake City, Utah, is purchasing agent.

Empire, Colorado—The Empire Tunnel Company is figuring on the installation of an electrical power plant for the more economical operation of its property on Covode mountain, near Empire. Address, Empire, Clear Creek county, Colorado.

Millersburg, Kentucky—The Kentucky Mining and Development Company, principal address 519 Madison avenue, Covington, Ky., has recently been incorporated with a capital of stock of $100,000 for the purpose of developing lead deposits near Millersburg, in Bourbon county, Kentucky. A mill building about 60x75 ft. will be erected and equipped at an approximate cost of $15,000, and estimates are desired on a concentrating plant of 100 tons daily capacity. Louis Fritz is the president of the company.

Montreal, Canada—The contract has been let to the Canadian White Company, of Montreal, for the construction in that city of a large cement plant to be operated by the Fordwick Company, of New York, which is largely controlled by the same interests as the Shawinigan Power Company. The plant will have an initial capacity of 2500 bbl. per day. The special feature will be the utilization of electric power transmitted from the Shawinigan hydro-electric plant. Nearly 4500 h.p. will be employed, requiring about 100 motors of the alternating-current type, and carrying from 10 to 150 h.p. each to operate the machinery. The works are to be in operation by August.

Montreal, Canada—The Laprairie Brick Company, near Montreal, which manufactures bricks from shale, is largely increasing its plant with the object of bringing it up to a capacity of 300,000 bricks daily. Included in the new equipment is a plastic brick machine, having a daily capacity of 150,000 bricks. An order has been placed with Allis-Chalmers-Bullock, Ltd., for induction motors of 500, 30 and 15 h.p., respectively, to operate the electric equipment. The property of the company is 125 acres in extent, from 12 to 15 of which is occupied by the plant. The shale which outcrops on the surface is of unknown depth, boring for 1000 ft. having failed to find the limit.

Special Correspondence

San Francisco Feb. 6

The Los Angeles Chamber of Mines has been organized for the work of promoting and protecting the mining industry in the Southwest. John R. Mathews, president of the State Bank and Trust Company, has been elected president. A committee on investigation and reports on mining properties has been appointed, including E. W. Gilmore, H. Z. Osborne, W. H. Wilson, Charles M. Shannon and R. King. There are also committees on mines and mining, manufacturing, commercial and mercantile affairs, transportation and laws. The present membership is about 200.

The Anti-Débris Association denies that its proposed injunction suits against the Oroville dredge men amounts to a general attack on the gold-dredging industry. They say that they only want restraining works which will prevent any silt resulting from the operations from entering the Feather river. The dredge operators all profess to be complying with the law.

A new dredging field is expected to be opened along Honcut creek, four miles from Honcut, Butte county, where considerable prospecting has lately been going on. A number of farms along the creek have been bonded for dredging purposes. There has been no dredge mining in that locality thus far.

A plan is being favored by the independent oil companies in Santa Barbara county to market their own petroleum. According to the information given out the project calls for an independent steamship line to run from Santa Barbara and San Luis bay to San Francisco. The scheme includes the coöperation of the Midway Oil Company, near Bakersfield, the fuel to be carried by pipe line from the company's wells to tidewater at Monterey or Port Harford on San Luis bay.

At a meeting of the executive committee of the California Miners' Association this week the representatives of all the mining companies present agreed to pay $25 a year dues for each company, and an effort will be made to get all the prosperous mines of the State to join the association. Moreover, mining companies of Nevada and other neighboring States which have offices in San Francisco will also be asked to join and give strength to the organization.

From the desert comes the news that the Greenwater people believe that they are growing so rapidly that they need a county all to themselves, with Greenwater as the county seat. The town is now located in Inyo county and not far from the county line. If the citizens should decide to form a new county and should be given the necessary permission by the legislature, it would be natural to take a slice off Inyo county, and a slice off of San Bernardino county.

The legislature of California is asked by a joint resolution introduced in the senate by J. B. Curtin, of Tuolumne county, to put itself on record as opposed to the action of President Roosevelt in allowing the land frauds to interfere with patents on mining claims. In his recent message President Roosevelt touched on this matter and expressed the opinion that until new laws were drafted patents should be held up as they have been for the last three years. Mr. Curtin believes that this stricture should be removed from patents affecting honest mining claims. He does not mention Roosevelt in the resolutions, but contents himself with taking formal exception to the rules drafted by the Secretary of the Interior. These rules stipulate that "no final certificate, patent or other evidence of title shall be issued under the public-land law until an actual examination has been made upon the ground by a Government officer." The examinations of the last three years have not resulted in the issue of patents.

Assemblyman Geo. W. Root, of Nevada county, has devised a scheme to assist the hydraulickers of the mountains. The plan is to interest the Federal Government and thus obtain a sufficient number of large dredges to keep the navigable stream clear of débris, while at the same time Congress would provide for powerful pumping plants for the purpose of depositing the silt on the swamp lands, thus filling in a vast acreage of what is now worthless ground and rendering it fruitful. To make the proposition still more attractive the law, if finally passed, would require that a certain per cent. of returns from each cubic yard of dirt washed out should revert to the State, and that hydraulicking should be limited to the capacity of the dredges.

The California Ore Company has completed the purchase of the manganese deposits owned by J. H. Cook on Red mountain, between Potter and Redwood valleys, Mendocino county, the price being reported at several thousand dollars. The company will proceed with development work immediately, a crew of men having already been sent to the grounds.

Salt Lake City Feb. 9

At the annual election of the Blackbird Gold and Copper Company John E. DuBois was elected president; Charles J. North, vice-president; B. N. Lehman, treasurer; F. O. Frick, secretary; with F. B. Stephens, L. N. Morrison and M. F. Murray, directors. The minority shareholders have brought suit against the company to prevent the organization from disposing of the remaining bonds in the treasury, amounting to $156,700, at 10c. on the dollar, or $156,700, in addition to a bonus of stock. The property of the company is located adjoining the mine of the Newhouse Mines and Smelters Corporation in Beaver county.

The annual meeting of the Yankee Consolidated Mining Company resulted in the election of John E. DuBois, of DuBois, Penn., president; Judge J. E. Frick, of Salt Lake, vice-president; B. N. Lehman, of Salt Lake, treasurer; with H. C. Edwards, of Salt Lake, and Charles J. North, of Buffalo, N. Y., directors. C. J. Canfield, of Salt Lake, is secretary.

There appears to be a well founded report out to the effect that Samuel Newhouse may yet conclude to utilize the site, purchased some time ago, at Pelican Point, Utah county, for smelter purposes.

Word has been received from Gold Butte, in the southeastern part of Nevada, that the Gold Butte Mines Company, controlled by Salt Lake parties, has recently made some important developments in its Eureka property located near Scanlon's ferry, on the Colorado river. A drift from the bottom of an 80-ft. shaft shows a full face of ore assaying about $20 in gold. Ore taken from an open cut across a parallel vein for a distance of 8 ft. gave returns of $17.40 in gold. The company has acquired a millsite on the Colorado river, and will install a stamp-mill in the near future. Charles F. Porter, Keith block, Salt Lake City, is purchasing agent.

Nine mines paid dividends to the amount of $1,143,000 in Utah during January, as follows: Columbus Consolidated, $42,500; Daly Judge, $112,500; Century, $5000; Yankee Consolidated, $15,000; Beck Tunnel Consolidated, $40,000; Grand Central, $15,000; Victoria, $10,000; Utah, $3000; Utah Consolidated, $900,000.

Scranton Feb. 11

After raging for six months, the fire in the Warrior Run mine of the Lehigh Valley Coal Company has been extinguished. In that time several homes have been destroyed, a number of deaths caused and much sickness, due to the escaping fumes. This is the case where the entire surface collapsed in such manner that the gas escaped through the fissures into the houses and asphyxiated a number of people. The fire was subdued by flooding the workings. The water will now be pumped out.

No. 5 breaker of the Delaware & Hudson Company was destroyed by fire last week. It was located in Parsons, near Wilkes-Barre, and was valued at $100,000. The fire throws 1200 men and boys out of employment.

Owing to the long continued strike in the Morea colliery of C. M. Dodson & Co., the clerks in the store and offices have been pressed into service to provide coal for the boilers of the plant.

A number of men and mules were entombed, by a fall of roof, in No. 3 slope of the Cameron colliery, Shamokin, last week. The men managed to crawl out through the air-tubes, but with the mules the proposition was entirely different. Large shifts are working day and night to release the mules, and until that time

men are compelled to crawl through the air-holes with feed bags to keep them alive.

Dover, N. J. Feb. 9

Fire broke out in No. 5 shaft of the Richard mine on Jan. 31 and, besides destroying the head-house and part of the conveyer, caused a cave-in at the head of the slope which has resulted in the entire abandonment of operations. The loss to the Thomas Iron Company, the owner and operator, amounts to $50,000 and will be considerably more unless the efforts to renew pumping succeed before the entire mine is flooded.

The fire was discovered about 40 ft. from bank just after the day shift came up and is supposed to have been caused by some miner leaving his lamp among the timbering. The strong draft in the shaft fanned the blaze fiercely and the head-house and conveyer were also soon in flames. Within half an hour after the fire broke out the head of the shaft caved in and while this smothered the shaft fire it broke the pipes from the pumps and cut off the water supply. The head-house was entirely destroyed and with it a comparatively new electric crusher and the big dynamo which furnished light and power. The brick building containing the new electric double-hoisting engine was saved by hard work.

The work of cleaning out the debris from No. 5 was begun on Feb. 3 and it is hoped that after the shaft is repaired and the pipes re-connected the pumps at the foot of the slope may be started. There are about sixty chances in one hundred that the pumps will start under water. Should the attempt to start them succeed, Superintendent James Arthur says he will be raising ore again within a week; but if the flooded pumps fail to start, it will mean a shut-down of from four to six months until the company can secure and install new machinery and pump out the water.

No. 5 was a double-track shaft, the best of the four shafts in use at the Richard mine. It was equipped with the best modern machinery and the ore was not handled from the time it was shoveled into the skip until after being crushed it was dumped upon the cars. It was the deepest of the four shafts and the entire mine drained to it. Up to a few years ago, each of the shafts was pumped independently of the others and in all 16 pumps were necessary to handle the water. The company then put in two big pumps, each weighing 28 tons and capable of raising a 6-inch stream 1000 ft. perpendicularly. One of these could handle all the water, but the two were put in in case one should break down; that both should be lost by reason of the pipes breaking in the shaft was not anticipated. After the big pumps were installed the old ones were taken out of each shaft and shipped away so that the entire mine was dependent on the pumps in No. 5. The boiler-house got its water from the mine, too, and it was necessary after the fire to lay a 4-in. pipe line about a quarter of a mile to a small brook and set up a pump in the road to secure water for the boilers.

The Richard mine has been in operation about 50 years. It has been one of the best producing mines in New Jersey. For a number of years the Thomas Iron Company has secured from it more than 100,000 tons of ore a year. The output last month was 10,800 tons.

Toronto, Ont. Feb. 12

The Geological Survey of Canada announces that tinstone in a solid vein has been discovered by John Keddy at Lake Ramsay, three miles west of New Ross, in Lunenburg county, Nova Scotia. Samples received were assayed and proved to be cassiterite, containing 78 per cent. tin. The ore is found in semi-crystallized forms, disseminated through a vein of decomposed kaolinized pegmatite in granite. The vein has only been opened 12 ft. in depth and requires to be further developed to ascertain the economic value of the discovery. The region was examined in 1903 by E. R. Faribault, of the Survey, who reported the occurrence of valuable minerals there and recommended it as a promising field for prospectors. He will devote some time next summer to studying the deposits near New Ross.

Notwithstanding the cold weather there is a great rush of prospector to the Larder lake district. All the land on the lake shore has been staked and gold seekers are staking claims back from the lake in all directions, though the snow is quite deep. Grassy lake, six miles west of Larder lake, also attracts many. The total number of locations taken up in the district is roughly estimated at 1800. The route is by train on the Timiskaming & Northern Railway to Heaslip, a point about 30 miles north of New Liskeard, and thence 30 miles northeast by wagon road to Larder lake. Sleighs for carrying supplies can be procured for $7 per day. There are two stopping places on the road and a hotel is being put up on the southwest bay of the lake, which is about half finished. Indian dog teams are also used to some extent for the conveyance of supplies.

J. E. E. Leonard, of St. Rose, Quebec, who is largely interested in the smelter of the Montreal Reduction and Smelting Company now under construction near North Bay, Ont., states that the plant will be ready for operation by March. The company has already spent $800,000 on the enterprise.

The Dominion Power and Transmission Company, Ltd., capital $25,000,000, has obtained a Canadian charter of incorporation giving extended powers, including smelting by electricity and any form of manufacturing. The head office is in Toronto, and it is understood that the controlling interests are those of Mackenzie & Mann, of the Canadian Northern Railway.

A find of iron ore has been made by George K. Taylor in the Wiley properties in the Loon lake iron area, where explorations are being carried on for a large American syndicate. The deposit, which was found at a depth of 3 ft., is said to be the most extensive and best as to grade in the district, samples assaying 60 per cent. iron.

Cobalt, Ont. Feb. 11

Owing to the intensely cold weather matters have been rather quiet in the Cobalt camp during the last week or two. The temperature has latterly ranged between 30 and 40 deg. below zero, which has greatly interfered with out-door work. Shipments for the week ending Feb. 2 amounted to 262,484 lb., of which the Nipissing sent 222,484 lb. and 40,000 lb. came from the Buffalo.

London Feb. 2

In my letter last week I referred to the position of the Lloyd Copper Company, operating in the Bathurst district of New South Wales. I mentioned that with the present high price of copper, the directors had been able to make a small profit on very low grade ore, and pointed out that under present circumstances their policy was to persevere on the mine and on the adjoining property, recently purchased. At the meeting of shareholders, held this week, the directors had additional information to give which makes the position very much stronger. The £50,000 debenture debt is to be extinguished. For this purpose 30,000 new shares have been issued, and taken up, and it is confidently hoped that the profits of the mine will provide the rest of the money required. Moreover the directors stated that they intended to pay a dividend at the rate of 5 per cent. on the total share capital now issued—£280,000—in March. The great advantage of extinguishing the debentures is that they carried such a high rate of interest, 10 per cent. That the directors feel able to pay for part of the retirement of the debentures out of profits and also declare a dividend shows that the grade of the ore has materially increased. The information given, however, is not sufficient to form an opinion as to the grounds the directors have to go on. But as they are men of experience and position we will take their word. Another interesting fact in connection with the Lloyd company is that shares have been bought recently in Australia to a considerable extent, and that to meet the requirements of these new shareholders, two local directors have been appointed, one of them being the manager, W. H. Corbould.

The Coromandel mine in the Kolar district of Mysore, India, is to be closed down. This mine was an offshoot of the Champion Reef, which in turn was an offshoot of the Mysore Gold Mining Company. Very early in its career the lodes became poor, and in spite of several successive subscriptions of new capital, no payable ore has been found. It is now decided that no more development work shall be done, and that as soon as the ore known to exist is extracted the mine shall cease operations. The directors are about to acquire the Hosur property in the Dharwar goldfield, to which John Taylor & Sons and their companies are turning much of their attention nowadays. The Coromandel Company is therefore to be reconstructed once more, with the object of acquiring the new property, and providing £40,000 working capital.

Another of Messrs. John Taylor & Sons' companies has met with misfortune inseparable from mining operation during the past year. This is the Tasmania Gold Mining Company, which was formed three years ago to acquire a local company of the same name at Beaconsfield, Tasmania. The local owners had done well, and there were still large ore reserves in the mine, with every likelihood of the ore extending in depth. The difficulty was the water question. The mine was on a water course and the amount of pumping required was prodigious. One of the largest pumping plants in the world was put down by Hathorn Davey & Co., of Leeds, on the order of John Taylor & Sons. The complete plant was not finished until recently, and in the meantime an extraordinary flood occurred, which not only swamped the workings, but did great damage on the surface. In consequence the operation of the mine had to be suspended for some time, and the profits made have had to be spent on repairing the damage and providing additional means for combating the water difficulty. It is not anticipated that any further difficulties of this sort will be met with, when once the pumping plant is in full operation.

Johannesburg Jan. 24

If the stock exchange be taken as the barometer of the Rand, then there has been a distinct improvement in affairs during the past fortnight. Most of the shares have gone up, and a few of the "gilt-edge" shares show a marked advance. The chief reason for the improvement is the change of front of the Boer party (Het Volk) in the matter of Chinese labor. From the beginning they have been rabidly against the Chinese and have preached that the yellow men must be sent out of the country, no matter what happened. The Progressives have been so successful in their attempts to show what disaster would fall upon the country were the coolies sent away that Het Volk saw it was necessary to change their tactics. The Boers are opportunists. They now qualify their statements by saying that, while opposed to Chinese labor, they never intended to cripple the mining industry in any way; that before they would agree to the repatriation of the coolies they would find a substitute of some kind.

Save for one or two rabid extremists there are no politicians in favor of the repatriation of the coolies until some substitute is found. The public has concluded that the mines will not be wrecked by the banishment of the unskilled labor; that somehow or other a way out of the difficulty will be found. Hence the rise in shares.

Another reason for the better state of the market is the excellent output for December, namely 550,167 oz., valued at £2,336,961. This makes the total of gold produced in the Transvaal for 1906 worth £24,492,288. This amount will be far ahead of the United States or Australia, so that for the year 1906 the Transvaal is the greatest producer of gold in the world.

During the month of December there were at work on the Rand 8070 stamps, while in the outside districts there were 340 stamps at work, making a total of 8410 stamps for the Transvaal.

The number of indentured coolie laborers at work on December 31, 1906, was 52,889. The last batch of 2000 coolies reached Durban from China a few days ago. No more Chinamen will come to South Africa until the Transvaal decides the coolie question. It is interesting to note that the organization for recruiting Chinese in China is to be kept together, so that it looks as if the mining houses expected a favorable decision in regard to Chinese labor.

During December 20 companies declared outputs of over 10,000 oz. each, the premier position being taken by the Simmer & Jack, with an output of 24,659 oz., valued at £104,744. The Robertson comes next with an output of 20,768 oz., while the Robinson Deep is third with an output of 20,241 ounces.

The Bonanza mine, which was supposed to be dead six months ago, is still crushing, and in December it produced 2179 oz. gold, although only 35 of its 50 stamps were kept at work.

One of the features of the month was the interest taken in alluvial gold prospects, the most conspicuous concern being the Good Luck Syndicate, which has acquired farms south of Rustenberg. Supposing that a payable alluvial deposit does exist, the next problem is where to get the water. It is to be feared that this alluvial boom is simply another form of the inveterate tendency for gambling. Too little is as yet known of the alluvial prospects to say whether they will be successful or not. So little was known of one such prospect that the secretary did not really know whether it was east or west of Johannesburg.

General Mining News

This company has been organized under a West Virginia charter, with a capital of $1,000,000, with headquarters in the Monadnock block, Chicago. The purpose is to explore, develop and mine iron-ore properties, and to do a general ore business. The officers of the company are: President, Samuel A. Kennedy, general manager Iroquois Iron Company, Chicago; vice-president, D. T. Croxton, president Cleveland Furnace Company; secretary and treasurer, E. L. Billingslea, Rogers, Brown & Co., Chicago. The board of directors is as follows: D. B. Gamble, Cincinnati; W. A. Rogers, Buffalo, N. Y.; D. B. Meacham, Cleveland, O.; M. C. Armour, Chicago; Joshua Monroe, D. T. Croxton, and Samuel A. Kennedy.

ARIZONA

GRAHAM COUNTY

Arizona Copper Company, Ltd.—The directors had before them at their recent meeting the results for the year to Sept. 30, 1906, subject to final audit. After carrying to reserve a sum of £80,000 for capital outlay, etc., the surplus, including £11,874 brought forward from 1905, is £435,012. After deducting the preferential dividends, amounting to £24,531, a sum of £410,481 is left. The directors have resolved to recommend to the annual meeting, to be held on Feb. 18, the payment out of this sum of a dividend for the year 1906 of 5s. 3d. per share, free of tax, on the preferred ordinary and deferred ordinary shares. To account of this dividend 2s. 3d. per share was paid on July 26 last, and it is proposed that the balance of 3s. per share be paid on Feb. 27. This dividend absorbs £398,972, and the balance of £11,509 will be carried forward.

CALIFORNIA

AMADOR COUNTY

Chapman—The company owning this mine has had to pump out the old Square Head mine adjoining, to avoid the menace of the water to the old working of the Chapman.

Hercules Horse Shoe Group—These mines, in Indian Creek near Murphys, have not been worked for some time, and the timbers gave way, causing a cave which has exposed a body of ore 9 ft. in width, which prospects well. Machinery is soon to be added by the superintendent, W. R. Wyatt.

Bishop Creek—At the mines of this company the snow on the level was 125 in. deep, two weeks since, and operations are retarded.

Furnace—Work on the various claims near Furnace is being pushed rapidly.

The Copper Blue claim of the Furnace Creek Company continues to show up well. The shaft is nearing the depth of 500 ft.; ore has been encountered at intervals the entire depth. The town of Furnace is growing and promises to be an important point.

[illegible] is now completely moved from the Kunze townsite to that of Ramsey, though the town retains the name of Greenwater; it has a population of about 700. The Furnace Creek Copper Company is sinking two shafts with gasolene hoists; one is down 400 ft., and the intention is to continue down to 600 or 700 ft. before crosscutting to the vein which was opened on the 50-ft. level. The other companies in that section are all working, and the complaint of lack of laborers is frequently heard.

[illegible]

Bidwell—Everyone at Bidwell is satisfied that prospectors will get in the mountains a great deal earlier than last spring, as there is not so much snow. A great many locations will be made as soon as the snow melts and leaves the mountain bare. Four men are now at work on the Bidwell Discovery property, running the tunnel in on what was known as the Kafader property, and which is one of the main claims of the Bidwell Discovery Gold Mining Company. Machinery will be put in on the mill site in the spring to work the ore. The Fort Bidwell Consolidated Gold Mining Company has planned to do a great deal of work early in the spring.

MONO COUNTY

Masonic Mountain Gold Company—The new mill for this company, at Masonic, will be shipped from San Francisco as soon as the roads permit transportation.

NEVADA COUNTY

Boss Mine—The Bay Counties Company is building a line two miles in length to convey power from the Nevada-Colgate line to this mine near Sweetland. The Boss company is installing an electric plant, including compressor, hoist and pump.

Canada Hill—For the first time in many years this mine has been unwatered, and in a short time a full crew will be at work. The old property is being reopened by a company with A. A. Charronat in charge as superintendent. The shaft is 1300 ft. deep. Sinking will commence immediately and drifts will be run from the bottom of the shaft.

Brunswick Consolidated Gold Mining Company—At this mine, Nevada City, a body of high-grade milling ore is in sight, and the mill is being run to its full capacity. R. Gilman Brown is now president of the company.

[illegible]

Belleview—This property, near Ophir, has been sold for $30,000 to W. F. Byrne and associates of Los Angeles. The shaft is down 300 ft. Electric power is to be supplied to this mine, and the Gold Blossom and Eclipse, owned by the same gentlemen.

[illegible]

Highbinder Group—This group, at Vintrigger, has been sold recently to C. F. Spaulding of Idaho, who has set a force of men at work.

[illegible]

[illegible] acres of mineral ground eight miles from Mono and 12 miles from Cayucos, on the coast, has started development work on several claims carrying in their ores gold, silver and lead.

[illegible]

[illegible] great inrush of water at this mine, which is being very gradually overcome. A new body of ore has been met at the 700 station.

Rattlesnake—This mine, near Redding, is shipping 50 tons of quartz daily to the Mammoth smelter at Kennett, for fluxing purposes.

[illegible]

Keystone—Work has been resumed at this mine, Sierra City, the snowslide having done but little damage.

SISKIYOU COUNTY

Blue Gravel—Impediments to clear title to this property, at Yreka, having been removed, a local company proposes buying it from H. E. Stratton, and starting it up.

TULARE COUNTY

White River District—W. T. Adams, of Corinth, Miss., has bought the Bald Mountain and Eclipse groups, and will put in air compressors, hoists and mills.

TUOLUMNE COUNTY

Mountain Mining Company—In the Mary mine, owned by this company, a good breast of ore is being opened on the 100-ft. level. W. A. Monroe, the superintendent, expects to add 20 stamps to the present five-stamp mill.

COLORADO

CLEAR CREEK COUNTY

Buffalo-Colorado—Buffalo and Detroit people have become interested in a lease and bond calling for $35,000 in two years on the Fraction, near Idaho Springs. J. W. Boyd, Idaho Springs, is manager. Machinery is being overhauled and heavy operations are planned.

Waldorf—Large ore-bins have been erected at the Wilcox tunnel and an aërial tramway will be built from the mine so that ores can be handled to the Argentine Central Railroad. E. J. Wilcox, Silver Plume, Colo., is manager.

Quartz Dike—Boston people have become interested in this company, having taken hold of the Weston property in Gilson gulch. S. A. Weston, Idaho Springs, is in charge of operations.

GILPIN COUNTY

Jefferson-Calhoun—Arrangements have been made to take over the East Calhoun property in Leavenworth gulch, and as soon as machinery is overhauled the 1100-ft. shaft will be unwatered. Consideration is not known. H. C. Eastman, Central City, is manager.

Old Town Consolidated—The annual report shows a production for 1906 of $268,849. New machinery is to be installed for deeper operations and three 75-kw. transformers have been ordered. G. K. Kimball, Jr., Idaho Springs, Colo., is manager.

Chicago-Carr—A four-drill air compressor of the Rand make has been ordered and sinking operations are planned. B. M. Myers, Central City, is manager.

Newhouse Tunnel—It is reported that operations may be suspended entirely at the breast of the Newhouse tunnel in the near future, unless some steps are taken by the owners of properties along the line of the tunnel in this county, to help pay the operating expenses, by reason of their properties being drained through the Newhouse tunnel workings. The Gilpin County chamber of commerce will take steps to get the tunnel and mine operators together to arrange some satisfactory basis. George Collins, Idaho Springs, is manager of the Newhouse tunnel.

Pewabic Consolidated—The tenth quarterly report shows gross production from Oct. 15 to Jan. 15 of $58,081. A large amount of development work has been performed. J. C. Fleschhutz, Central City, is manager.

LAKE COUNTY—LEADVILLE

Musk Ox—On Long & Derry hill a new company, with John F. and George F. Campion at the head, has secured 160 acres of patented land at a place where the Iowa and Empire gulch road tops the hill, and about four miles in a direct line from the foot of Harrison avenue south, in Leadville. The district has been prospected on the surface and fair values in gold have been found in different veins. The shaft is now down a little over 100 ft. and is three-compartment, 4½x9 ft. in the clear; it is equipped with a modern plant of machinery and will be sunk to the blue lime before any prospecting is done for the ore-shoots. The company has erected commodious houses for the comfort of the men, and work will be pushed during the winter.

A. Y. & Minnie—After 28 years of strenuous mining this old stand-by is producing at the rate of 7000 tons of ore per month. The crude ore that is sent direct to the smelter amounts to 2000 tons per month, while the concentrates bring up the balance. Three grades of concentrates are made, the first and second being of zinc and the third a lead concentrate.

Settling tanks have been placed at different points below the mill, where most all of the slimes; they are dried and shipped.

Water Problem—The water problem in the down-town section is being solved monthly to the satisfaction of all concerned. When the Penrose shaft was sunk the pumps were raising 2250 gal. of water per minute; today, with the connections made with the Coronado, the pumps are only lifting 1500 gal. per minute.

Mining and Pumping News—In addition to the work being carried on by the company, 11 sets of lessees are at work on the different shafts, and the properties are shipping 400 tons per day of an excellent grade of iron. The men who recently secured a lease on the Crescent shaft have started to drift from the bottom into virgin territory. Outside of the iron that is being shipped a good tonnage of lead ore is going to the smelter.

Harrington Tunnel—This tunnel, in East Tennessee district, is now in 140 ft. and for the last 30 ft. has shown indications of mineral. When the parting quartzite is caught, it is expected that the orebodies will be exposed.

Leo Shaft—The last time this property, at the head of California gulch, was worked was in the early 80s by Joe Watson, and he sunk the shaft to a depth of 600 ft., when the inflow of water became so great that he had to abandon work. This was the first known water-hole in the camp. The shaft was sunk to catch the rich gold-bearing orebodies that were and are supposed to be at the head of the gulch. Since that time no work has been done on the property until a few weeks ago, when a lease on the ground, 20 acres, was secured by the Twin City Mining Company, composed of the principal owners of the Cloud City Mining Company operating in the down-town section. A first-class plant of machinery has been installed, and the shaft put in order; when this work is completed, drifting will start in an old drift 50 ft. above the bottom of the shaft. At this point there is a good streak of ore which will be followed with the hope that it will lead to the main ore channel.

Lord Byron—Iowa Gulch—This property is situated above the Lillian and the Florence, and on different occasions good bodies of ore have been opened, but were never permanent. Recently at a depth of 250 ft. in one of the drifts a good body of ore was caught which will run $30 per ton. The shoot dips rapidly and Fred Arnold, who has a lease on the ground, and is one of the owners, will sink the shaft another lift of 200 ft. At present he is installing heavier machinery, as he expects to strike a heavy flow of water.

Minerva—This property, Mosquito range, is located in Sacramento gulch, and it is claimed is the western extension of the London. The owners have been pushing work steadily on it during the winter, and last week opened up a good body of ore 3 ft. wide, which in every respect is the same as found in the London.

New Monarch—The rich body of ore recently opened in the Winnie workings, South Evans gulch, improves as work proceeds; enough has already been done on the ore-channel to prove that it is in place and permanent; the values still remain high in gold and silver and 8 per cent. copper.

MICHIGAN

HOUGHTON COUNTY—COPPER

Atlantic—F. McM. Stanton, the agent for the Atlantic property, returned from New York, and will examine the showing at section 16. Future plans with regard to development will be decided upon after examining the opening.

Rhode Island—A fourth shaft is to be started on the property of the Rhode Island Copper Company, but the exact location has not been definitely decided upon. At the present time there is one diamond drill at work on the Kearsarge lode. This method of proving the location of the lode has, however, proved generally unsatisfactory and the new shaft will be sunk instead.

Winona—Work has begun on the erection of the new compressor at Winona. The electric power house is now nearly completed.

KEWEENAW COUNTY—COPPER

Central—The old Central Mining Company, whose property was first opened in 1854 and closed down in 1898, is to be dissolved and application is soon to be made to the courts of Michigan to allow the company to wind up its affairs. There are about 250 stockholders, and these will probably receive a small dividend, about 75c. per share, to be declared after all outstanding debts have been paid. There is approximately $20,000 in the treasury. In 1905 the property was sold to the Calumet & Hecla Company.

ONTONAGON COUNTY—COPPER

Lake Copper Company—It is reported that four drill cores taken from the property of this company show good copper and the cores closely resemble the Baltic lode. If the strike proves to be on this lode, it will prove its continuity for 25 miles southwest of the Globe property, which heretofore has been the westerly point of this disclosure. The location of the supposed lode is to the east of the line of bluffs along which all the Ontonagon mines have been worked.

MISSOURI

RANDOLPH COUNTY

Randolph-Macon Coal Company—This company, which owns a large tract of coal land and several producing mines, failed to pay the interest due Feb. 1 on $2,000,000 outstanding bonds. The cause is said to be labor difficulties at the mines. J. T. Gardiner, of New York, is president.

MONTANA

BUTTE DISTRICT

Amalgamated—Car and coal shortage, with cold weather, have been interfering with the operations of this company for a month or more, and the end is not in sight. The Washoe smelter is not receiving more than two-thirds of its customary quantity of ore per day and the Boston & Montana plant is in a similar fix. Feb. 4 some 1900 tons were loaded for the latter, this quantity being all for which the railroad company could furnish cars, and next day only a little more was shipped. On account of the drawbacks the output of copper in Butte last month did not reach quite 25,000,000 lb., and will fall considerably short of this quantity this month. The Boston & Montana is still operating only three of its five blast furnaces. It has been short of coke for several weeks and is unable to secure more than enough to keep the plant running in part. It has 3000 tons in transit between Duluth and the plant and Fernie and the plant, but cannot locate it.

North Butte—This company is experiencing trouble similar to that of the others. It has lost several days recently by reason of inability to have its ore transported to the Washoe. Development work in new ground north of the opened veins is going ahead without interruption.

Reins Copper—This company is cutting a station south of the shaft at 1200 ft., to accommodate an 800-gal. pump. It has a 700-gal. pump on the opposite side of the shaft at the 1200, but the flow of water is heavy and the addition is for reserve work. It is shipping about two carloads of copper ore a week from the 900- and 1000-ft. levels, and driving east on the 1200 with a view of prospecting the Ella property, which it acquired recently for $240,000

Coalition—Shipments of ore from the mines of this company during the last week have averaged only about 800 tons a day, 300 tons less than the regular quantity.

Cable Consolidated—This company has struck copper ore on the tunnel level and 200 ft. below this level, and has shipped five carloads to the Washoe. The ore carries an excess of iron, and is treated for practically nothing on this account, as it is valuable for mixing with the sulphide ores of Butte. The company has an abundance of gold ore in sight, and is operating a 30-stamp mill on it.

Butte & London—The company is cutting a station 68 ft. long at the 800, and will not finish it until late in February, after which it will install temporary pumps

and resume sinking to the 1500. Two pumps, each of which will have capacity [illegible] will be duty in the mine, one on the 800 and the other on the 1500. The latter will throw to the 800 and the former to the surface. The pumps will not be delivered until spring. The company does not expect to strike commercial ore until it reaches 1500 ft. depth.

[illegible] drilling in the property of this company is progressing under the supervision of H. H. Taft, in the interest of Boston men, who are supplying the money for development. The drill is working in the face of the crosscut south of the 250-ft. station, and is making 25 or 30 ft. a day.

Davis-Daly Estates—Development on the property of this company is progressing, but no ore worth mentioning has been struck in any of the openings. The face of the crosscut south of the 1800-ft. station of the Original is in 1100 ft. A stringer has been cut in the Smokehouse claim.

United Copper Company—In order to simplify the capital account, it is proposed to retire the preferred stock. Holders of that stock are asked to exchange it for common, at the rate of 1¼ shares of common stock for each share of preferred.

PARK COUNTY

Montana Coal and Coke Company—The new plan of reorganization recommends the organization under the laws of Maine of a holding company to be known as the Montana Consolidated Coal and Coke Company, with a capital of 200,000 shares of stock, par value $10; an issue by the Montana Coal and Coke Company of New Jersey of $1,000,000 6 per cent. 20-year sinking fund new bonds, to be used for the retirement of the $500,000 outstanding bonds and for the payment of the company's floating indebtedness, which amounts to approximately $425,000, and the exchange of the present company's 200,000 shares of stock for the stock of the new corporation on a share-for-share basis, on the payment of $1 per share in cash, the proceeds thereof to be used to provide working capital. A special meeting of stockholders is called for Feb. 27. The new Montana Consolidated Coal and Coke Company has been organized by the election of the following officers: President, C. F. W. Dilliway; vice-president, Larkin T. Trull; treasurer, N. Willis Rumstead; chairman of the board of directors, H. M. Burton.

NEW MEXICO

Lost Bullion Spanish Mines Company—This company is operating extensively on the east slope of Bear mountain, 7 miles northwest of Silver City. It has recently purchased 1000 acres of mineral land in the Bear mountain mining district and is driving a double-compartment tunnel 1000 ft. to cut the contact and also to tap the old workings. It is also sinking a shaft on the line of the tunnel to open up the old workings and to use as an air shaft for the tunnel, and is working a force of men on a road grade leading from the mesa into the cañon where the tunnel is now being driven.

The old workings referred to were discovered to be old Spanish workings and up to the present time over 10 miles of these workings have been explored.

Shakespeare Camp—W. P. Black, president of the company owning the Shawmut copper mine, near Salida, Colorado, has just bought the Eighty-five mine for $75,000. This property fell into the hands of Roberts & Leahy, the Lordsburg merchants, some years ago for a debt of $3500, and since then has been quietly developed to its present showing.

Burro Mountains—If present appearances are not deceptive, this region is destined to be a big copper producer. The ore lies in lenses formed by stockworks and impregnations in the decomposed porphyry of the range. The copper appears above as malachite, but in depth changes to chalcocite coating pyrite crystals, as in Butte and Cananea. Bodies as long as 500 ft., with a maximum width of 50 ft., and of unknown depth, have been found with an average around 3 per cent. copper. The low grade prevented the previous exploitation of this camp, but for a year, since even 2 per cent. concentrating ore became desirable, the activity has been feverish.

There are now five strong companies, the Burro Mountain, the Tyrone, the National, the Copper Gulf and the Comanche. The first has only one working shaft, but has a 200-ton concentrator, 400-h.p. boilers and a mine with two years' development. The second company is sinking three shafts with air drills, and has 500-h.p. boilers. The claims of the National are in Whitewater cañon, and will ultimately ship to the Silver City Reduction Works, owned by the Comanche. A Norwalk air compressor of 350 cu.ft. capacity has been ordered by the National, for use in sinking its three shafts. The National is financed by St. Louis parties. The Copper Gulf Company is a new arrival, but has already begun two shafts, and has just received a new steam hoist and boiler. The two towns of the district are Leopold and Tyrone, from which a daily stage plies to Silver City. The Comanche will ship to its Silver City works, and has three shafts now open.

LINCOLN COUNTY

An event which may mean much to this region is the sale to English capitalists from London, of the Coruna Queen mine in the Gallinas mountains.

NEVADA

EUREKA COUNTY

Richmond-Eureka — During the last year $350,000 to $400,000 has been expended in putting the property of this company in good condition, and a further amount of about $125,000 has been provided for. During the last few months the company has been in a position to ship a great deal more ore than the railroads could handle. This company took over the property of the old Eureka Consolidated Mining Company and Richmond Consolidated Mining Company, which for many years were at loggerheads, the Richmond refusing to pay half the expense for pumping out the mines. The United States Smelting, Refining and Mining Company owns a one-third interest in the new company.

LYON COUNTY

Yerington Red Metal Company—This company now owns a group of claims in the Yerington district, on which development work is in progress. A considerable body of copper ore is already blocked out.

ESMERALDA COUNTY—GOLDFIELD

Rochester—A small talc vein has been cut which carries free gold. This mine is situated in the Diamondfield section of the field, and has several auriferous veins outcropping on the surface. The management is sinking to prospect these veins at depth and the present strike is looked upon as a good augury for the value of the veins which will shortly be cut at a depth of about 250 ft.

Combination Annex—A prospecting shaft on this property has disclosed a fine quartz boulder at a depth of 50 ft., which carries gold. It is believed to be connected with a vein in close proximity.

Jumbo-Extension—A strike of phenomenal richness which gives promise of rivaling the famous Hayes-Monnette lease has been made by the Higginson Leasing Company on the Wedge claim of the Jumbo-Extension mine. The strike was made in the vicinity of the Mohawk ground and the vein is over 9 ft. in width. It has been opened by shaft and incline and will give a good hight of backs.

Atalanta—Splendid specimen ore is being taken out of this 165-ft. level in the Union Jack claim. It is believed to be from a vein which has yielded good returns in the St. Ives mine. The leasing company has completed arrangements for increasing its mining facilities by sinking another shaft and erecting a more powerful hoisting plant.

Silver Pick—Three shifts are engaged in sinking the shaft, which is now 100 ft. in depth. The country is andesite, and is carrying stringers of quartz, which are in places mineralized. The lessees believe they will strike the ledge within a few weeks.

[illegible] shaft-sinking operations, and is employing three shifts of miners. The shaft is 330 ft. in depth. On the 500-ft. level a crosscut is being driven south to locate the vein system developed in the Montana and North Star mines. This crosscut has been extended a distance of 245 ft. from the shaft.

[illegible] pecting shaft is being sunk at a point 800 ft. west of the old working shaft. It is at present 20 ft. in depth, but will be sent down to 500-ft. level.

Montana—The bad weather conditions are severely interfering with the erection of the new 40-stamp mill. When the weather moderates and the snow disappears a large force of mechanics will be engaged in order to complete the mill early in the spring. Development operations in the mine continue to be satisfactory.

Ohio—Arrangements have been made to resume sinking operations as soon as the fuel famine is overcome. The mine is now controlled by the West End Consolidated Mining Company.

WHITE PINE COUNTY

Nevada Consolidated Copper—A special meeting of this company has been called for Feb. 25, at Portland, Me., to vote on increasing the number of directors from nine to 11, and to vote on selling a half-interest in the Nevada Northern Railway to the Cumberland-Ely Copper Company and buying a half-interest in the Steptoe Valley Smelting and Mining Company.

OREGON

BAKER COUNTY

United Elkhorn—Development work is going on steadily on the 400-ft. level in this mine, 16 miles west of Baker City. The pumping plant has been repaired and is now in full operation. Edward I. Field is manager in charge.

PENNSYLVANIA

ANTHRACITE COAL

Delaware, Lackawanna & Western—This company has been experimenting with chemical fire engines for extinguishing fires in mines. The experiment was so successful that the company has equipped a number of the mines with 90-gallon engines. They are mounted on mine-car trucks and can be transported through the workings.

Lehigh & Wilkes-Barre—A serious fire occurred in No. 19 colliery of this company, at Wanamie, Feb. 8, as a result of which seven men lost their lives through suffocation. The fire broke out on the fourth lift, in the heavy timbers, and before the men could be notified the workings were filled with thick smoke. Owing to the heroic work of the miners first alarmed many lives were saved. Men went through the dense smoke to warn the miners and laborers in the chambers and assisted them to the shaft. Had each man looked after himself and first escaped, regardless of the fate of others, the loss of lives would have been very heavy. The cause of the fire is unknown.

Philadelphia & Reading Coal and Iron Company—This company's statement for December and the half year from July 1 to Dec. 31 is as follows:

	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

For the half-year there was a decrease of $110,465 in earnings; an increase of $210,811 in expenses, and a resulting decrease of $321,276 in net earnings.

BITUMINOUS COAL

Indianola Coal Company—J. V. Thompson, of Uniontown, Penn., and J. P. Brennen, of Scottdale, president of the Thompson-Connellsville Coke Company, have acquired a majority interest in the holdings of the Indianola Coal Company and the Allegheny & Western Connecting railroad. These corporations were organized by the late Selwyn M. Taylor to acquire and develop 7500 acres of Freeport coal near Harmarville, and to build a low-grade railroad to connect the West Penn, the Bessemer & Lake Erie and the Pittsburg & Western tracks by about 16 miles of track. The entire tract secured by Thompson and Brennen is underlaid with a vein of coal 7½ ft. thick. Two years have been spent in making tests which have shown it to be a coking coal second only to the best of the old Connellsville region. Its proximity to Pittsburg, only 12 miles by rail, gives to this field a high value.

COKE

Tower-Hill Connellsville Coke Company—Notice is given of the purchase of 2000 acres of coal territory near Uniontown, by a syndicate of Cleveland capitalists, for $3,400,000, and the formation of the Tower Hill Connellsville Coke Company, with a capital stock of $1,500,000 preferred, $4,000,000 common, and $2,500,000 in bonds, to develop the property. Arrangements are being made for the construction of 800 coke ovens which will be equipped with machines for drawing the product. The officers of the company are: George D. Howell, Uniontown, Penn., president; first vice-president, F. M. Osborn, Cleveland; second vice-president, J. V. Thompson, Uniontown; treasurer, Joseph R. Nutt, Cleveland; secretary and general manager, L. W. Fogg, Uniontown; assistant treasurer, John R. Thompson. Andrew Squires, of Cleveland, George H. Burr, of New York, and Lloyd G. McCrum are on the board of directors with the officers. A mortgage for $2,500,000 covering the property has been given by the new company to the Citizens' Saving and Trust Company, of Cleveland.

Pickands-Magee Coke Company—This Pittsburg company has changed its corporate name to the Pickands-Magee Company, and increased the capitalization from $100,000 to $200,000, all of which is paid in, and has also taken into the company several new interests in addition to buying out the interest of the Pickands-Brown Company, Chicago. The new organization last year controlled an output of 600,000 tons coke and 200,000 tons coal, and with the additions it expects to handle in 1907 at least 1,000,000 tons coke and 500,000 tons coal. Several of the smaller companies formerly controlled by the company have been merged into the Southern Connellsville Coke Company, of which George Whyel, of Uniontown, is vice-president and general manager, and this company, together with the Whyel Coke Company, controlled by George and Harry Whyel, is now a part of the Pickands-Magee Company, with both of these gentlemen, who are large operators, as directors. The Pickands-Brown Company, Chicago, will now devote itself entirely to the manufacture and sale of by-product coke manufactured at Milwaukee and South Chicago. The new officers of the Pickands-Magee Company are W. C. Magee, president and treasurer; Harry Whyel, vice-president; C. L. Boyle, secretary; C. S. Bygate, general sales agent. The new board of directors consists of the following: D. M. Clemson, Thomas Morrison, C. L. Doyle, Pittsburg; W. C. Magee, I. W. Semans, George Whyel and Harry Whyel, Uniontown.

BERKS COUNTY

Boyertown Ore Company—It is reported that the property of this company at Boyertown, including the iron-ore mines and mineral rights on 280 acres of land, has been sold for over $400,000 to Chas. M. Schwab, representing the Bethlehem Steel Company.

SOUTH CAROLINA

In his annual report to the governor Earle Sloan, State geologist of South Carolina, urges the importance of requisite provision for a reasonably comprehensive survey of the phosphate deposits with a view to establishing their value to the agricultural and economic interests of the State, and to provide such regulation of mining methods as will tend to eliminate the system of skipping, through which accumulations concentrated in pockets are exhausted, while intermediate deposits are greatly depreciated in value. The report states that the phosphate deposits of South Carolina are fast being consumed, and the equivalent of every ton exported will have to be returned at the cost of the consumer.

SOUTH DAKOTA

PENNINGTON COUNTY

[illegible] this property to a depth of 250 ft. to develop the vein already opened in apex workings. In the 70-ft. shaft a face of ore 28 ft. deep and 6 ft. wide has been exposed. The ore is a heavy concentrating material, carrying practically no free gold.

Bed Rock Placer—This corporation, owning 120 acres along Rapid creek, plans to install a dredge to be in operation by June 1. This dredge will have a capacity of from 2000 to 2500 cu.yd. daily. The large volume of water to be handled has heretofore prevented the exploitation of the ground.

Golden West—Work at the mill at Rochford, which has been suspended for two months, will now be resumed and carried on through the winter. It has been the custom to operate only during the summer months, on account of lack of water in cold weather, but with the recent change of ownership repairs and improvements have been made to insure a steady and constant water supply. Charles Curtis, of Chicago, is president.

TEXAS

BURLESON COUNTY

Texas Fullers' Earth Company—This company, which owns a deposit of fullers' earth, near Somerville, is now making preparations for marketing the product, and expects its plant to be in full operation by April 1. It is constructing a plant on the main line of the Gulf, Colorado & Santa Fé Railway, about 75 miles north of Houston, at a cost of $35,000. All machinery has been ordered. Officers of the company are: George W. Norrell, president; W. M. Rice, vice-president and assistant general manager; N. W. Dunham, secretary and general manager; J. S. Rice, treasurer; P. S. Tilson, chemist. N. W. Dunham is in charge of operations at Somerville.

WASHINGTON

FERRY COUNTY

Colville Mining and Smelting Company—This company has been formed with a capitalization of $2,000,000, divided into 2,000,000 shares. Republic, Wash., is the principal place of business. A branch office has been established at 42 Broadway, New York. The trustees for the first year are: G. Weaver Loper (president and general manager) and J. Q. Thompson, of New York City; Charles N. Jacobs and R. H. Galbraith, of Cincinnati, O.; M. R. Staight, secretary; G. V. Alexander and J. C. Caie, of Republic, Wash. The principal object of this company is to develop the Mountain Boy, Silver King, Little Girl, Copper King, and Mountain Boy Fraction claims, at Park City camp, on the south half of the Colville reservation, about 25 miles southeast of Republic.

The Mountain Boy claim has yielded some very rich ore, and always paid a profit when worked to advantage.

Bortle Copper-Gold Company—The shaft is down 60 ft. to the foot wall of the vein, and a winze has followed the footwall down about 20 ft., and averages 15x7 ft. in the clear. A drift has been driven from the head of the winze 20 ft. southwest along the footwall. From 5 ft. below the collar of the shaft those openings are all in solid iron sulphide ore, with no sign of a hanging wall in sight. Considering the depth the showing is by far the best looking on Belcher mountain. Upward of 500 tons of ore have been extracted and placed on the dump, which the superintendent estimates will average 2 per cent. copper, in addition to other contents, and net $10 per ton at the smelter, after paying mining, transportation and treatment. The company is now employing on exploration and development 20 men on 2 shifts.

Copper King—A connection has been made between the upper adit, 250 ft. from the portal, and the bottom of the winze, in the old workings, and the mine is again in good condition to ship ore, of which a large tonnage is in sight. The connection was made by raising 40 ft. above the adit level.

Winnipeg—The main shaft is down 200 ft., and some drifting and crosscutting has been done on two levels to demonstrate the width and value of the vein. An adit has been driven 785 ft., to tap the vein about 300 ft. deep. Lately some rich, but small stringers of ore were cut which show well in chalcopyrite and are similar to streaks found in the upper workings. A survey has been made for a raise from the tunnel to connect with the upper workings.

Oversight—A number of new pits have been sunk along the trend of different veins on the group during the winter, some of them with encouraging results. The principal work has been done, however, on the Pin Money shaft, which is now down about 60 ft. Fifty sacks of ore are on the dump awaiting shipment. An average sampling of the vein gave the following analysis: Cobalt, 2.45 per cent.; copper, 2 per cent.; arsenic, 44 per cent.; iron, 25 per cent.; sulphur, 20 per cent.; silica, 3.40 per cent. Accommodations have been provided in the way of ore bins at the most eligible points on the group and at the railway sidings, and new wagon roads have been built recently.

WISCONSIN

ZINC DISTRICT

Several prominent engineers have been going over this district systematically and they report a promising future.

With the present facilities of transportation from mine to railroad, production will be retarded, but the producers are quite confident that the new electric road will run so as to be of great assistance to them.

Benton Camp is fast approaching second place as a producer and shipper. As soon as the new strike at the Aetna is developed and separating plants are put in operation it will be pushing Platteville for first place. The Dall will be shipping again soon; the roaster that was destroyed by fire has been replaced by a steel structure, with all the latest improvements.

Foreign Mining News

BRITISH COLUMBIA—SLOCAN

Byron White Company—This company has closed down its Slocan Star mine and concentrating mill near Sandon in the Slocan district. They will probably remain idle until a decision is reached in the pending litigation with the Star Mining Company over extra-lateral rights.

NEW BRUNSWICK

New Brunswick Petroleum Company—Arrangements are being made to turn this company's property over to a London company, which will provide working capital for further exploration.

Wentworth Copper Company, Ltd.—This company has been organized under a special charter, to take over the copper property at Wentworth, which was formerly owned by the Cumberland Copper Company, and was sold out under foreclosure. The new company has made provision for the old stock and other claims, and proposes to work the property.

ONTARIO—COBALT DISTRICT

Jacobs—A sample of rich ore from this mine, Cobalt, has been received at the Provincial Bureau of Mines. It is of dyscrasite, a combination of silver and antimony, and weighs about 10 lb., showing high values.

McKinley-Darragh—The plant at Cobalt is being replaced by larger and better machinery which is now on the ground, comprising two 80-h.p. boilers, 12-drill compressors and a large hoist. The old plant will be installed at the Savage mine, which is owned by the same company. The cofferdam inclosing four acres of the end of Cobalt lake, embraced in their property, is nearly completed.

O'Brien—From this mine Cobalt, four cars of high-grade ore have been shipped to the smelter at Copper Cliff near Sudbury, Ont. It is claimed that assays show a record value per ton. A government official accompanied the shipment and will stay at the smelter until the value is definitely determined, as under the recent arrangement the Province is entitled to a royalty of 25 per cent. Two cars of low-grade ore are being treated at an American smelter.

Timiskaming—In this mine, Cobalt, a rich strike has been made at the 70-ft.

[illegible] where the work is [illegible] A nugget weighing several hundred pounds, which was extracted, is now on exhibition in Toronto.

[illegible] it was announced on [illegible] that four directors, known as the International Nickel party, had resigned from the board of the Nipissing Mines Company. The retiring directors are: Capt. J. R. De Lamar, Ambrose Monell, E. C. Converse and Robert M. Thompson. Their places are to be taken by W. B. Thompson, Eugene Meyer, Jr., Frank Schirmer, and J. G. Hopkins.

Ore Shipments—Shipments of Cobalt ore over the Timiskaming & Northern Ontario Railway for the week ending Jan. 26 were officially reported as follows: Silver Queen, 125,683 lb.; Nipissing, 124,177; University, 61,385; O'Brien, 60,570; Coniagas, 56,720; Cobalt Townsite, 47,160; Buffalo, 40,000; Total, 515,695 pounds.

New Companies—One week's incorporations are 14 mining companies—including two American companies licensed to operate in Ontario—with a total capitalization of $13,585,000. The largest is the Larder Lake Proprietary Gold Fields, with $3,000,000. The Ontario Boston-Cobalt, chartered in Maine, has $2,000,000 capital.

ONTARIO—HASTINGS COUNTY

E. B. Davis, an experienced miner, has made a discovery of gold about nine miles north of Madoc village. A sample weighing 10 lb. has been brought to Belleville. It consists of milky quartz, dolomite and black country rock, and has free gold. The find has caused great excitement in the locality.

Central Ontario Granite and Marble Company—The first piece of marble was lifted at the quarry near Bancroft last week, a big Chandler machine having been installed.

Henderson Talc Mine—Shipments of talc from this mine, near Madoc, during 1906 amounted to 1102 gross tons, which were sent to New York, Cincinnati, Newark, N. J., and Maryland. This season's output is expected to be considerably larger.

Ontario Pyrite Company—This company, the headquarters of which are in New York, is developing the Oliver property in the twelfth concession of Hungerford township. It is putting in a complete mining outfit and has a shaft 45 ft. down.

MEXICO

CHIHUAHUA

El Plata Mining Company—A report from D. W. Shanks, general manager, notes the completion at the mine of a number of necessary buildings; also of the telephone and electric light plants. A new trail to the mine 100 km. long, has been opened. A masonry retaining wall and dam have been built. An important work is the water-power plant, which is to operate the mill and other machinery. The flume grade starting at the river with a tunnel 6½ ft. high, 5 ft. wide and 151 ft. long and an open cut 40 ft. long, has been cut into the mountain side for 5099 ft. to a point above the stamp-mill where the flume will deliver the water to the pressure pipe. One cut, 600 ft. long is 20 ft. high and others vary from 5 ft. to 30 ft. In addition to the intake tunnel there are four others, 40 ft., 55 ft., 55 ft. and 94 ft. in length respectively, and an open cut 84 ft. long. There are two bridges, one 62 ft. and the other 40 ft. Most of the grade has been cut in the solid rock, 162,000 cu.ft. of material having been moved. The flume is 3 ft. 4 in. wide by 1 ft. 6 in. high, inside measurement. There are 4x6-in. sills every 4 ft., into which are mortised uprights which in turn carry cross-pieces making solid mortised frames at intervals of 4 ft. for the entire length. The pressure pipe is 402 ft. long and weighs 16,000 lbs. It is being carried in on mules in 4-ft. lengths all punched ready for riveting. In making the excavation for the plant 125,000 ft. of material, principally rock, was moved and 8028 cu.ft. of masonry retaining walls built. For the battery pit an excavation in rock 48 ft. long, 6 ft. wide and 8 ft. deep was made. In all 200,000 lb. of machinery and supplies have been delivered at the mine, necessitating the constant employment of 200 mules on the trail. This machinery has been despatched promptly from the warehouse at Aguatos, though much trouble has been experienced in the failure of manufacturers to make deliveries according to agreement, which has made it impossible to complete the plant in the time first estimated. All of the delayed machinery will have been delivered at Aguatos by February. Fortunately the stamp-mill was delivered on time. From 150 to 175 Mexican laborers are constantly employed, together with a large force of American and Mexican machinists and carpenters. The mine is 99 miles from the railroad and when the plant is completed it will have made a record in mountain transportation and quick construction.

GUANAJUATO

Mexican Mining Company—At the annual meeting of this company, held Jan. 18 in Pittsburg, the officers reported an excellent condition of the mines and the following vote of thanks was offered: "Resolved, that a vote of thanks be tendered C. C. Auld, the officers and board of directors for what has been accomplished to date and for the great encouragement offered." The favorable report from the officers, the present outlook at the mines and the announcement that the officers were negotiating for the erection of the mill were well received. The directors and officers elected were as follows: C. C. Auld, president; A. Vignos, first vice-president; T. W. D. Heber, second vice-president; Jas. L. Morrow, secretary; M. S. Riggs, treasurer; W. J. Aber, assistant secretary and treasurer; Thomas Maxwell, W. M. Holmes, Fred Volquarts.

The Guanajuato district, in which the company is operating, is now fast coming to the front in the way of developing new mines, unwatering old propositions that were worked by hand process, and supplying them with machinery and up-to-date [illegible]

AFRICA

RHODESIA

Gold production in December was 48,329 oz. bullion. For the full year the total was 409,836 oz. bullion in 1905, and 551,895 oz. in 1906; an increase of 142,059 oz. The bullion reported in 1906 was equal to 491,187 oz. fine gold, or $10,152,835. Other production reported in Rhodesia for the year includes 120,574 oz. silver, an increase of 31,296 oz.; 652 tons lead, an increase of 82 tons; 44 tons of copper; 15 tons wolframite; 2339 tons chrome ore; 5512 tons zinc ore. The output of coal from the Wankie mines was 103,803 tons, an increase of 6612 tons.

WEST AFRICA

Gold output reported in December was 22,276 oz. For the full year it was 167,537 oz. in 1905, and 221,591 oz. in 1906; an increase of 54,054 oz. last year.

EUROPE

GERMANY

A cable from Saarbrücken, Rhenish Prussia, Jan. 28, says: A fire-damp explosion occurred today in the Bildstock shaft of the Reden mine at Saint Johann-on-Saar, opposite this town. Up to this afternoon the bodies of 164 miners had been recovered; 17 men dangerously injured had been rescued. An outbreak of fire has driven out the rescuers. It is considered probable that 30 to 40 men are still in the pit. The number of dead is now estimated at 200. About 600 men were working in the shaft when the explosion occurred, but more than half of them were not in the wrecked galleries. Rescuers worked desperately in efforts to reach the entombed men.

NEW ZEALAND

Dr. James Macintosh Bell, of Canada, was appointed director of the New Zealand survey, in February, 1905, and since that has reorganized it. The staff now includes, in addition to the director, the following officers: Alex. McKay, geologist and paleontologist; P. G. Morgan, general geologist; Colin Fraser, mining geologist; Ernest John Webb, assistant geologist; Edwin Clark, assistant geologist; R. P. Geville, topographer; R. J. Crawford, draftsman; John Thompson, secretary.

[illegible] Mining Company [illegible] recently [illegible] The Santo Domingo mines, for which the hoist is destined, lie in Peru and behind the Lake Titicaca region. The mines were discovered about twelve years ago by a [illegible] property was acquired by a party of Bradford [illegible] Mining [illegible] taken out up to this time. The company [illegible] placed in a tunnel which has been run 1700 ft. into the mountain, cutting the vein 1500 ft. below the outcrop at the top of the hill. A 500-ft. shaft has been sunk from the tunnel, and the new hoist is to bring the ore from the lower workings to the tunnel level. Accompanying the hoist are two 200-kw. General Electric generated from a water-power which will operate the hoist, mill and other machinery. The mill contains 10 stamps, a concentrating and a cyaniding plant. The hoist will be [illegible] to the port of Mollendo, [illegible] by railroad to Arapata; thence [illegible] over a wagon road, [illegible] the summit of the Andes at [illegible] above sea level. The last 50 miles is only a mule road. To make it possible to transport the big [illegible] this part of the route it was built in sections, with no one piece weighing [illegible] The total weight of the hoist is 13,800 lb. The drums are each 48 in. diameter with 40-in. faces.

Coal Trade Review

New York, Feb. 13

[illegible] in the West has been [illegible] having [illegible] and heavy snow [illegible] all further emphasized the railroad situation. The shortage of cars has increased and the delay in transporting coal has been serious. Not only the smaller towns, but some of the large consumers [illegible] been brought forward.

In the East, cold weather has started up the [illegible] in steady demand, and is in rather short [illegible] directly affected thereby.

[illegible] Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Feb. 2 were as follows, in short tons:

	1906.	1905.	Changes.
Anthracite	188,961	188,476 I.	10,020
Bituminous	4,442,443	4,442,681 I.	80,118
Coke	1,196,469	1,229,534 I.	33,265
Total	5,117,963	5,421,540 I.	103,387

There was an increase of 2 per cent. in the total this year.

Anthracite coal shipments in January are reported as follows, in long tons:

	1906. Tons.	Per Ct.	1905. Tons.	Per Ct.
Reading	1,098,385	20.1	1,070,898	20.4
Lehigh Valley	968,418	17.6	887,970	16.8
N. J. Central	644,560	13.1	633,554	12.1
Lackawanna	858,540	15.2	862,400	16.4
Del. & Hudson	562,961	10.1	529,076	10.0
Pennsylvania	492,145	9.0	467,500	9.6
Erie	365,166	10.4	532,400	10.2
N. Y., Ont. & W.	245,856	4.5	244,704	4.5
Total	5,438,081	100.0	5,419,040	100.0

The total decrease this year was 208,138 tons, or 3.8 per cent. Only two companies —the Delaware, Lackawanna & Western and the Pennsylvania—showed gains. The tonnage of the Delaware, Susquehanna & Schuylkill, or Coxe Bros. & Co., is now included in that of the Lehigh Valley road.

The coal and coke tonnage of the Chesapeake & Ohio Railway for the six months of its fiscal year, from July 1 to Dec. 31, was as follows, in short tons:

	Coal.	Coke.	Total.
New River	2,671,696	97,546	2,769,242
Kanawha	1,777,386	42,873	1,820,259
Kentucky	83,509	.....	83,509
Connecting lines	233,733	55,887	289,620
Total	4,766,324	196,306	4,962,630
Total, 1905	4,197,567	229,196	4,426,763

The total increase for the half-year was 12.1 per cent. Deliveries of material originating on the line in 1906 were: Points west of mines, 2,211,531 tons coal and 105,905 tons coke; points east, 852,701 tons coal and 34,514 tons coke; tidewater, 1,468,299 tons coal.

Coal and coke tonnage of the Baltimore & Ohio Railroad for the 11 months ending Nov. 30, was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	960,932	864,759	D. 96,173
Bituminous	20,346,995	23,031,330	I. 2,684,335
Coke	4,417,105	5,387,624	I. 970,519
Total	25,725,032	29,283,714	I. 3,558,681

The total gain in 1906 was 13.8 per cent., notwithstanding the decrease in anthracite.

Coal receipts at Boston for the full year were as follows, in long tons:

	1905.	1906.	Changes.
Anthracite	1,977,898	1,660,679	D. 317,719
Bituminous	2,798,290	3,548,385	I. 750,095
Total domestic	4,775,688	5,208,064	I. 432,376
Foreign coal	608,471	658,072	I. 49,601
Total	5,384,159	5,866,136	I. 481,977

Some of the foreign coal came from Great Britain, but the larger part was from Nova Scotia. The total increase was 9 per cent.

Coal receipts at St. Louis for the 11 months ending Nov. 30 were 5,149,793 tons in 1905, and 6,840,760 tons in 1906; an increase of 1,300,000 tons, or 25.5 per cent. last year.

Receipts and shipments of coal at all lake ports for the 11 months ending Nov. 30 were, in short tons:

	1905.	1906.	Changes.
Receipts	12,034,735	14,547,528	I. 2,512,793
Shipments	13,879,279	16,712,761	I. 2,833,482

The difference between shipments and receipts—1,844,544 tons in 1905, and 2,165,233 tons in 1906—is accounted for by coal furnished to vessels and by shipments to Canadian ports.

Coastwise shipments of coal from the chief Atlantic ports for the 11 months ending Nov. 30, were as follows:

	Anthracite.	Bituminous.	Total.
New York	12,789,418	9,527,131	22,266,619
Philadelphia	1,613,736	3,586,473	5,200,209
Baltimore	211,309	2,925,478	3,136,787
Newport News	.....	2,624,208	2,624,208
Norfolk	.....	1,979,906	1,979,906
Total	14,564,563	20,643,196	35,207,759
Total, 1905	15,640,302	19,274,301	34,914,703

The total increase was 293,056 tons, or 0.8 per cent. New York includes all the New York harbor shipping points.

New York Feb. 11

ANTHRACITE

The anthracite market is slowly recovering from the effects of the recent storm, which seriously menaced the movement of coal during the past week. However, the roads are still suffering from considerable congestion due mainly to the difficulty of handling cars at switching and terminal stations, rather than to difficulties along the line. Another factor which has played an important part in delaying shipments and causing car shortage is the fact that many locomotive engineers have been sick and no class of men on a railroad can be spared less easily than the engineer.

The demand for hard coal has been good and the supplies, in spite of the above conditions, have been very fair. The scarcity of coal exists principally among the small steam sizes, producers reporting that it is practically impossible to supply any of these sizes, except those already contracted for. Prices remain unchanged at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are quoted nominally at $3 for pea, $2.25@2.50 for buckwheat, $1.50 for rice, $1.40 for barley; all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic Seaboard soft-coal trade has been affected materially by weather conditions; coal in the cars is badly frozen, and the loading of vessels is accordingly delayed. This prevents free deliveries, and a continuation of this state of affairs would produce a shortage of stocks among consumers. Outside of this, trade is generally a little quiet. Inquiries on contracts for next season's business still continue, but the railroads have not yet named their through rates, which prevents contract prices being made. It is understood that a few speculators have been offering coal, taking their chances on favorable rates. It seems to be the general idea that an advance of 10c. per ton

will be made on all soft coals, beginning April 1. The car-supply question has again become an active issue; the West Virginia fields have been feeling this particularly this month.

Trade in the far East does not seem to be active. The better transportation conditions during January permitted good stocks of coal to be accumulated, hence the needs of this district are not so urgent. Trade along the Sound is absorbing quite a little coal.

New York harbor trade is quiet. Fair grades of steam coal can be bought for from $2.65@2.75 f.o.b. New York harbor shipping ports. All-rail trade has been taking its regular quota of coal. Car supply is poor and the West Virginia mines, outside of a few favored ones, receive from 10 to 20 per cent. of their requirements. Transportation from mines to tide is slow and irregular, due solely to weather conditions. In the coastwise trade vessels are very much congested, owing to an ice blockade in the Chesapeake and the Delaware. We quote freight rates from Philadelphia to Boston, Salem and Portland at $1@1.10 and discharge, loading and discharging clause included.

Birmingham Feb. 11

The coal output is somewhat better than it has been, as the railroads begin to furnish better service. However, there is need for more cars in this district and more locomotive power. The mine operators state that the demand for coal was never more satisfactory than at present. The development in the coal fields of Alabama is being pushed. In Jefferson and Walker counties the development is on a large scale. Some work is being done now in Tuskaloosa county. Coal lands in the lower part of Jefferson and in Tuskaloosa county are being bought up right along.

The legislature has under consideration now laws covering the mining operations in Alabama, the mine employees being interested in amendments looking to a better protection of life.

Chicago Feb. 11

Both bituminous and anthracite sales continue brisk under the demand created by cold weather. Illinois and Indiana coals are fairly well regulated as to supply and demand, the amount of demurrage coal on track being small. Eastern coals are generally firm and in fairly good demand.

Prepared sizes from Illinois and Indiana bring $2.25@3.50; run-of-mine, $1.75@2.25, and screenings $1.25@1.60.

Eastern coals are firm, owing to transportation difficulties and increased demand, due to cold weather. Hocking sells for $3.40@3.65, with new business chiefly at the higher figure. Smokeless is strong as to run-of-mine, which holds up firmly to $3.40; lump and egg smokeless are firmer but not strong yet. Youghiogheny is bringing $3.15@3.25.

Anthracite is steadily increasing in demand and everything indicates a strong market until April. Chestnut size is scarce.

Cleveland Feb. 12

The heavy consumption of coal, due to the continued cold weather, has given additional strength to the market. The stocks on hand have been used up almost altogether and the market is depending upon shipments direct from the mines. Slack is almost off the market, due to heavy previous buying and the lessened production. There is not much promise of relief until three-quarter coal starts to move toward the lake. Ohio mine-run is sold on the basis of $1.20@1.25 at mines. Slack is selling at about the same figure. Pennsylvania mine-run is worth $1.10@1.15 at the mine and Pennsylvania slack will bring $1@1.05 easily at mines.

This week there has been started a movement to consolidate the mines in No. 8 district. The promoter is Thomas W. Latham, supported by Lawrence Barnum & Co., of New York. For the present the report looks a good deal like a feeler. There are no possibilities of immediate developments, although they may come later. The plan is to merge 100 mines, with a capitalization, to the new company, of $20,000,000. The lake trade would be most influenced, since the announced intention is to engage principally in that end of the busness. Nothing has been done yet looking to the making of rates for the coming season of navigation, and prices have not yet been agreed upon or suggested. It seems possible, however, the up-lake prices will be about the same as last year.

The coke market is just a little easier. Last-half delivery of 72-hour foundry coke is selling at $4, which is also the spot price. Furnace coke is selling at $3.50@3.75 at oven.

Pittsburg Feb. 12

Coal—The coal market is a trifle weaker, and mines are running almost to capacity, there being an adequate supply of railroad cars. Prices have sagged a little and some contracts are being made as low as $1.05 a ton for mine-run coal. The severe weather this week has strengthened prices for prompt shipment, and sales have been made on a basis of $1.15 for mine-run coal at mine. All the river mines are running in full, and there are enough empty coal boats and barges in the pools and harbor to keep them going for several months.

Connellsville Coke—Prices have declined and spot furnace coke is quoted at $3.50@3.60, but for contracts running through the year the price seems to be firm at $3.15@3.25. This is due to the heavy purchases made by the H. C. Frick Coke Company late last year, when the bulk of the available output of a large number of independent concerns was contracted for. Foundry coke is weaker, as demand has fallen off, and for spot shipment $3.90@4.10 is quoted, and for contracts running through the year $3.75 can easily be done. The *Courier*, in its summary, gives the production of the Connellsville region for the week at 284,720 tons, and for the Lower Connellsville region 125,986 tons, the total production for both regions being 410,706 tons. Shipments for the week aggregated 14,195 cars, distributed as follows: To Pittsburg, 4689 cars; to points west of Connellsville, 8007 cars; to points east of Connellsville, 1499 cars.

Pittsburg Coal Company—The annual meeting of the stockholders was held at Jersey City, N. J., Feb. 11. William Flinn, of Pittsburg, was elected a member of the board of directors, in place of Francis L. Robbins, resigned, and J. C. Dysert was chosen to fill the vacancy on the board caused by the death of Charles Donnelly. The directors now are: Grant B. Schley, M. H. Taylor, George T. Oliver, John A. Bell, D. L. Gillespie, A. W. Mellon, W. R. Woodford, John I. Bishop, C. E. Wales, Alexander Dempster, Henry R. Rea, Calvary Morris, J. Denniston Lyon, William Flinn and J. C. Dysert. The board will meet in a few days and elect officers. Francis L. Robbins will retire as chairman and President M. H. Taylor will assume the duties or the office will be abolished. Mr. Robbins has been elected president of the Monongahela River Consolidated Coal and Coke Company, which is controlled by the Pittsburg Coal Company, and has transferred his interests to that company.

Foreign Coal Trade

Feb. 13

Imports of fuel into Belgium for the full year were as follows, in metric tons:

	1905.	1906.	Changes.
Coal	1,230,[illegible]	[illegible]	I. 1,[illegible]
Coke	[illegible]	[illegible]	I. [illegible]
Total	1,[illegible]	[illegible]	I. 1,111,248

The larger imports were from Germany and Great Britain. Exports for the year were as follows:

	1905.	1906.	Changes.
Coal	1,[illegible]	4,[illegible]	I. [illegible]
Coke	[illegible]	[illegible]	D. [illegible]
Briquets	[illegible]	[illegible]	D. [illegible]
Total	1,[illegible]	[illegible]	I. [illegible]

The more important shipments were to France and Holland.

Iron Trade Review

New York, Feb. 13

The iron and steel markets are somewhat quieter than they have been. Pig iron, especially, is easier, the pressing demand having slackened off, so that prices have not been quite so strong.

some lines, but there is a strong call still ing for structural material continue to come forward.

There has been some commotion in the British iron market, pig-iron warrants having fallen sharply. This is the result, in fact, of the easier market here, the warrant prices having been forced up to a high level in anticipation of continued heavy exports to this country.

Baltimore Feb. 12

[illegible] for the week were 157 tons; of ferro-manganese, 587 tons. Receipts of iron ore were two cargoes, 11,000 tons, from Cuba. One cargo, 2910 tons iron pyrites, was received from Huelva, Spain.

Birmingham Feb. 11

Southern pig-iron manufacturers are beginning to announce that they have sold up well on the probable make for the third quarter in this year already. The inquiry is still strong for iron to be delivered during the last quarter of the year, and some sales are being made. The iron masters in this section are in a strong position, having sold their probable make for several months ahead at good prices. No. 2 foundry, delivery at any time after the second quarter of the year, has not been selling for some days under $19 per ton. Even at that price it is hard to find iron for delivery during the third quarter.

The iron make in this section of the country is about holding its own. One of the Sloss-Sheffield furnaces at North Birmingham has been blown out for repairs. The Shelby Iron Company is manufacturing charcoal iron at Shelby and the second furnace there is in shape for operation, on coke or charcoal, whenever desired.

Several bills have been prepared and will get before the legislature which will affect mining and manufacturing. The alleged pollution of streams of water by coal refuse from coal washers, the prohibition of operation of freight trains in Alabama on Sundays, taxes on corporations, are bills that give some concern Representatives have been sent to the capital city off and on in the interest of bills pending which are looked upon as likely to affect the interests mentioned.

The Red Ore Iron Company has been incorporated in this district by W. M. Byrd, Henry Hiden and Y. A. Dyer, the first named being president and the last, secretary. The capitalization of the company is placed at $60,000 and ore mining will be its business. This is one of a number of mining companies being organized to supply furnace companies with extra ore as the iron production is increased.

The Alabama Consolidated Coal and Iron Company has had some changes in officials. Guy Johnson, vice-president and general manager, is now in charge. M. W. Bush is assistant to the president. H. Hammond has resigned as assistant to the president and general sales agent, and with William M. Byrd, has formed a iron brokerage firm. J. Banks Hudson has been appointed superintendent of the Ironaton furnaces, in place of J. G. Thompson, who has gone to the Woodstock Iron Company.

The Birmingham Car and Manufacturing Company, recently organized in this district by C. Ellis Foust and associates, to manufacture small cars and car wheels, will erect a plant at North Birmingham.

Chicago Feb. 11

Both sales and inquiries on Northern and Southern iron have been strong in the last week, giving indication of a good market, for both present and future supplies. There is evident desire of melters to cover their requirements for the last half of the year; many of them have succeeded in making contracts for their probable needs, but the feeling of the trade is that much iron must be sold on quick-delivery contracts to supply the extra demands that will be sure to arise. The postponement for a month of the 25c. advance on iron to the Chicago district from Southern furnaces has equalized somewhat the demand for spot iron, but the chief interest of the trade centers in contracts for third and fourth quarters.

Northern No. 2 iron sells for $24.50@25; Southern No. 2 for $23.10@23.60 and Lake Superior charcoal for $25.50@26.50, on general orders. Southern furnaces, according to reports, are likely to advance prices, but it is difficult to see how they can do this in the face of strong competition from such Northern furnaces as are not sold up.

Coke is active, with the best Connellsville bringing $6.65 Chicago, or $4 at ovens. The supply of coke is good, there being little demurrage material on tracks.

Cleveland Feb. 12

Iron Ore—The market for iron ore is quiet. The consumption of the stocks on hand is more rapid than was believed likely at the close of navigation. The sales off the docks are fairly heavy at 1907 prices.

Pig Iron—There has come a decided lull in the pig-iron trade. This is natural, since it follows one of the biggest months in the history of the trade. January was unusually brisk. February so far has been dull. The prices have even eased a little. Spot shipment Northern No. 2 is now selling at $25, the same price being paid for delivery through the first half. This compares with $25.50@26, charged recently. For the time second-half No. 2 is selling at $22 in the Valleys, although it is possible to shade that price. Southern No. 2 for second-half delivery is being sold on the basis of $18.50@19 Birmingham. First-half delivery is almost out of the question. In this territory specifications against contracts are heavy, in some cases the consumers anticipating contract requirements. The market has let up a good deal nevertheless.

Finished Material—Just now the employees of the American Shipbuilding Company are threatening to strike for a nine-hour day and 10 hours' pay, the piece-workers wanting a corresponding increase. This would tie up about all the construction and repair yards and limit the demand for finished plates and shapes. Otherwise the market is healthy and active. There is a good demand for billets at old prices. Bar iron is strong, on account of scrap prices. Bar steel is being substituted for bar iron, and is in demand. Sheets are active at the old prices, and the customary increase in the business, with the promise of spring, is in evidence. There is not much buying, of rails, usually, in this territory, but some big traction enterprises are under consideration and the prospects are the demand will be heavier than it has been for several years.

Pittsburg Feb. 12

The week has been a quiet one in the iron and steel markets, but there has been no decline in strength, except possibly in bessemer pig iron, and this was expected. There is considerable talk, emanating from New York principally, regarding probable cancelations of orders by railroads, due to inability to finance contemplated undertakings. While it seems true that some roads will be unable to obtain necessary funds to carry out proposed plans, particularly in regard to bridge work, the material ordered that may not be taken will not seriously affect the situation. Even if large tonnages of railroad business are canceled, the steel mills have orders on their books against which specifications have been made that will keep them going steadily until November at least, and there is enough actual business in sight to keep them busy until the middle of 1908. The Carnegie Steel Company alone has absolute specifications for over 1,000,000 tons of finished steel products, and is sold up in some lines until the third quarter. In wire, sheets and tin-plate the markets are decidedly strong. There has been a lull in new business in structural material, but this is probably due to the fact that mills cannot guarantee deliveries, and some large enterprises figured on for the coming summer may be deferred. Specifications for plates from lake shipyards and from other sources are unusually large, but contrary to expectations there has been a less demand from steel-car interests. The car-making concerns are filled with orders and have enough business booked to keep them running all year. So bright has been the outlook that the Standard Steel Car Company began the erection of an additional plant, which is located in Indiana

The tin-plate mills are practically sold up for the first half and the independents continue to book large orders for delivery in the third quarter at 10c. a box above the established price of $3.90 a box. So far the American Sheet and Tin Plate Company has done nothing beyond July 1, and an official order for an advance is expected at any time, when it is likely books will be opened for last-half business. The proposed advance, it is believed, will be greater than 10c. a box. The Carnegie Steel Company is still booking steel-rail orders, although the tonnages are not large. During the week orders for standard steel rails were received amounting to 6500 tons and orders for light rails totaled about 1500 tons. The company is sold up on light rails until July 1.

Pig Iron—The market is dull this week and active buying of bessemer for second half is still being delayed, as consumers evidently believe the price will be lower later on. This was indicated when a sale was made last week of 2000 tons for third-quarter delivery at $21.35. Valley furnaces, which is 15c. a ton below the minimum price established by the furnaces for last-half delivery. The representative of a large furnace interest, when asked today if the rate of $21.50 would be maintained for second half, replied: "If we can get it. We may get more or may take less." This is taken as an indication that the producers are not altogether certain that they will be able to maintain a high price for bessemer iron. There is no doubt as to foundry-iron prices, and sales are being made for delivery at $21.50@22, Valley, and for prompt shipment furnaces have no difficulty in getting $25@25.50. A sale of 1500 tons of basic iron for delivery in the second quarter was made yesterday at $22, Valley furnaces. About 5000 tons of bessemer iron for delivery before July 1 were made last week at $22, Valley. Three of the five blast furnaces in the Eliza group of the Jones & Laughlin Steel Company are still idle, although two are expected to be blown in this week. Nos. 2 and 3 are out on account of accidents and No. 5 was blown out to avoid an accident. The repairs have been made as rapidly as possible, as by the idleness the company loses over 1500 tons of bessemer pig iron daily. If it has bought iron to make up this loss, the transactions have been kept quiet, as there is no record of sales having been made. Demand for gray forge is light and for prompt delivery is quoted at $22.85, Pittsburg.

Steel—The market for billets is easier and mills are catching up on deliveries. Some of the small mills are offering billets, but prices have not declined, bessemer billets being firm at $29.50 and open-hearth at $32. Plates remain at 1.70c. and merchant-steel bars at 1.60c.

Sheets—Since the advance in prices of galvanized sheets three weeks ago, specifications on old contracts have been very heavy. The mills are filled for several months ahead. Black sheets are decidedly strong and for prompt shipments premiums are paid. Quotations remain unchanged, with black sheets at 2.60c and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—The market is lower for future delivery, $69 being quoted for shipment after July 1 and $70 for delivery in the second quarter. For prompt delivery prices remain about the same, ranging from $73 to $74 a ton.

Dusseldorf, Germany Feb. 6

The German Iron and Steel Union reports the output of the blast furnaces in December at 1,069,638 tons of pig iron; an increase of 8066 tons over November. For the full year the production was as follows, in metric tons:

	1905		1906	
	Tons	Per cent.	Tons	Per cent.
Foundry iron	1,905,668	17.3	2,108,684	16.8
Forge iron	827,498	7.5	841,236	6.9
Steel pig	711,335	6.7	943,778	7.6
Bessemer pig	425,237	3.9	485,740	3.9
Thomas pig	7,111,885	64.7	8,088,534	64.8
Total	10,987,623	100.0	12,478,007	100.0

The increase last year in foundry iron was 203,016 tons; forge iron, 27,038; steel pig—which includes spiegeleisen, ferromanganese, ferrosilicon and similar alloys—229,238; bessemer pig, 57,503; Thomas, or basic pig, 973,649; the total gain being 1,490,344 tons, or 13.6 per cent.

Metal Market

NEW YORK, Feb. 13.

Gold and Silver Exports and Imports.

At all United States Ports in December and year.

Metal.	Exports.	Imports.	Excess
Gold:			
Dec. 1906	$1,729,194	$ 7,588,623	Imp. $5,859,429
" 1905	2,668,532	4,028,881	" 1,360,349
Year 1906	46,560,397	155,550,766	" 108,990,369
" 1905	46,794,467	50,293,405	" 3,498,938
Silver:			
Dec. 1906	5,486,094	4,122,324	Exp 1,063,770
" 1905	8,196,149	4,692,746	" 3,503,403
" 1906	59,036,340	44,350,896	" 14,685,444
1905	57,518,102	35,939,135	" 21,578,967

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Feb. 9 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 4,500	$ 70,838	$ 3,577	$ 19,770
1907	1,389,085	498,277	2,545,540	331,304
1906	1,053,875	285,678	10,931,748	296,199
1905	27,546,865	414,247	4,105,188	119,798

Exports of gold for the week were to Haiti; of silver to London. Imports for the week, both gold and silver, were from the West Indies and South America.

The joint statement of all the banks in the New York Clearing House for the week ending Feb. 9 shows loans, $1,099,356,400, an increase of $1,518,900; deposits, [illegible] compared with the preceding week. Reserve accounts show:

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

The surplus over legal requirements shows a decrease of $2,928,700, as compared with the previous week.

Specie holdings of the leading banks of the world on Feb. 9 are reported as below, in dollars:

	Gold.	Silver.	Total.
United New York	[illegible]	[illegible]	[illegible]
England	$177,370,705	[illegible]	177,370,705
France	529,928,105	$197,169,490	726,497,595
Germany	158,118,750	52,706,250	210,825,000
Spain	[illegible]	[illegible]	[illegible]
Netherlands	27,755,500	[illegible]	[illegible]
Belgium	[illegible]	8,213,335	24,440,000
Italy	161,210,000	23,086,500	184,896,500
Russia	[illegible]	23,675,000	613,930,000
Aust.-Hungary	231,975,000	60,240,000	292,215,000
Sweden	20,275,000	[illegible]	[illegible]

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Jan. 31:

	1905.	1906.	Changes.
India	£ 2,087,300	£ 496,510	D. £ 1,590,790
China	[illegible]	[illegible]	[illegible]
Straits	[illegible]	[illegible]	[illegible]
Total	£ 2,087,300	£ 572,810	D. £ 1,514,490

Receipts for the week were £12,000 from the West Indies, £295,000 in bars and £30,000 in Mexican dollars from New York; a total of £337,000. Exports were £76,300 coin to the Straits, £50,000 Mexican dollars and £50,000 bars to India: £176,300 in all.

Notwithstanding the purchases of gold in Australia, Indian exchange has continued strong, and the Council bills offered in London were taken at an average of 16.09d. per rupee.

The Treasury Department's estimate of the amount and kinds of money in the United States on Feb. 1 is as follows:

	In Treasury.	In Circulation.
Gold coin and bullion	[illegible]	[illegible]
Treasury	$ [illegible]	$ [illegible]
Gold certificates	35,006,180	[illegible]
Silver dollars	[illegible]	83,173,040
Silver certificates	[illegible]	462,936,189
Subsidiary silver	7,066,315	120,408,160
Treasury notes of 1890	14,460	6,474,543
U. S. notes	8,121,292	338,550,724
Nat. Bank notes	17,050,662	578,240,307
Total	[illegible]	[illegible]

Population of the United States on Feb. 1 estimated at 85,484,000; circulation per capita, $33.96. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the treasury and is not included in the account of money held as assets of the Government. The statement of money held in the treasury as assets of the Government does not include deposits of public money in national-bank depositaries to the credit of the Treasurer of

327,789. The amount in circulation Feb. 1 shows an increase of $19,001,765 over Jan. 1; and an increase of $222,272,161 over Feb. 1 of last year.

The total value of gold received at the United States assay office at Seattle, Washington, in 1906, was $23,346,938, as compared with $18,873,850, in 1905. The year just closed was a record one, the highest total of any previous year having been $22,038,796, in 1900. Of the gold received last year $5,670,086 was from the Canadian Yukon, $1,396,314 from British Columbia, and $16,141,492 from Alaska. The grand total of gold received at this office since its establishment is $139,353,686, of which Alaska contributed $47,060,099, the Canadian Yukon $82,365,352, and British Columbia $8,113,863. The remainder came from Oregon, Washington, Idaho and Montana, with a small amount from miscellaneous sources.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	80.51	80.55
[illegible]	0.484	0.49
[illegible]	1.854	1.87
[illegible]	....	3.80
[illegible]	4.75	4.80

SILVER AND STERLING EXCHANGE

	Silver.				Silver.	
February.	Sterling Exchange.	New York, Cents.	London, Pence.	February.	Sterling Exchange.	New York, Cents.	London, Pence.
[illegible]	[illegible]	[illegible]	[illegible]	11	4 84 5/8	66	31 5/8
[illegible]	[illegible]	[illegible]	[illegible]	12	[illegible]	[illegible]	31 1/2
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4 84 1/2	66	31 1/2

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Prices of Metals in New York.

	Copper.			Tin.	Lead	Spelter.	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	New York, per lb.	St. Louis, per lb.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,483,[illegible]	6[illegible]	[illegible]
Joplin	2,[illegible]	[illegible]	[illegible]
Oronogo-Duenweg	[illegible]	[illegible]	[illegible]
Alba-Neck City	[illegible]	[illegible]	[illegible]
Prosperity	[illegible]	[illegible]	[illegible]
Duenweg	[illegible]	48[illegible]	17,249
Aurora	[illegible]	[illegible]	12,490
Badger	[illegible]	[illegible]	10,144
Oronogo	[illegible]	[illegible]	9,016
Spurgeon	88[illegible]	62[illegible]	8,080
Granby	[illegible]	36[illegible]	[illegible]
Cardin	114,[illegible]	[illegible]	4,389
Central City	117,[illegible]	[illegible]	2,966
Hoover Springs	[illegible]	69,[illegible]	[illegible]
Zincite	82,940	[illegible]	1,990
Sherwood	14,[illegible]	[illegible]	[illegible]
Totals	12,001,510	1,532,740	$347,917

Six weeks, [illegible]

Zinc value, the week, $282,441; six weeks, [illegible]

Lead value, the week, 65,486; six weeks, [illegible]

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907	Month.	1906.	1907.
January	47.38	45.81	January	75.20	83.38
February	47.37		February	72.83	
March	42.68		March	73.73	
April	44.63		April	75.13	
May	40.51		May	78.40	
June	43.85		June	80.96	
July	46.25		July	74.31	
August	43.56		August	75.36	
September	42.58		September	79.64	
October	41.55		October	79.84	
November	44.14		November	81.98	
December	43.68		December	81.89	
Year	43.24		Year	77.40	

Wisconsin Ore Market

PLATTEVILLE, Feb. 9

Local buyers bought all the ore produced. The demand was strong, and buying began early in the week, last week's price of $48 per ton prevailing. Several choice lots were reported sold at prices ranging above $50. There was, as usual, a brisk demand for the unroasted ore.

Whether the continued activity and demand for zinc ore is due to pressing requirements at the smelters or simply a desire to load up for future stock, is hard to ascertain, but the latter is probably the reason. Preparation is being made on every hand to take care of increased production. The railroads are doing all within their power to get coal in and ore out, but the general scarcity of cars continues.

The camps of the district loaded ore for the week ending Feb. 9 as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	[illegible]		
Benton-Hazel Green	[illegible]		
Linden	[illegible]		
Lancaster	[illegible]		
Highland	[illegible]		
Elmo	[illegible]		
Galena	[illegible]		
Livingston	[illegible]		
Mineral Point	57,[illegible]	55,000	
Total for week	[illegible]	[illegible]	
Year to Feb. 9	[illegible]	[illegible]	[illegible]

The Platte mine, one of the large producers of the Platteville camp, shut down during the week, and it is reported that the present management will probably not resume operations, for some time, at least.

Chemicals

New York, Feb. 13

Copper Sulphate—The market remains steady, and business is good. Prices are unchanged, at $7.25 per 100 lb. for car load lots or over, and $7.50 per 100 lb. for smaller parcels.

Nitrate of Soda—The official figures for the movement of nitrate for the year are reported as follows, in long tons:

Shipments			
Europe	1,[illegible]	1,[illegible]	I. [illegible]
United States	[illegible]	[illegible]	D. [illegible]
Other countries	52,092	4[illegible]	D. 18,[illegible]
Total shipments	1,630,221	1,707,399	I. 77,178
Deliveries:			
Europe	1,192,120	1,241,400	I. 49,280
United States	365,000	361,000	D. 4,000
Other countries	46,000	36,000	D. 10,000
Total deliveries	1,543,120	1,639,300	I. 96,180

Stocks on Jan. 1, 1907 were: Chile, 430,000 tons; Europe, 190,420; afloat, 546,020; total, 736,440 tons, showing an increase of 59,210 tons over those at the beginning of 1906. The production was 1,733,664 tons in 1905, and 1,800,810 tons in 1906, an increase of 67,155 tons.

Mining Stocks

New York, Feb. 13

Some recovery in the general stock markets can be noted this week. The situation is still rather uncertain, but liquidation is less in evidence, and it begins to look as if a sounder position might soon be reached. Mining stocks, as for some weeks past, have been the most active section of the market, both in New York and Boston, and dealings continue large.

Boston Feb. 12

The continued strength of Amalgamated has put a little more life into the mining-share list and certain specialties have advanced sharply the last week. As remarked last week, some of the banking institutions are better disposed toward this class of securities in the matter of accepting copper shares as collateral, which is bound to prove more and more beneficial. The talk that New York is to list some of Boston's copper shares and thereby deprive this center of its reputation as the market for these stocks should be taken with a grain of salt. Boston is the natural center and will undoubtedly continue to be. La Salle was taken from the curb Friday and put among the unlisted stocks on the exchange, with the result that it broke from an introductory price of $31 to $27. This is the course usually followed in such instances of late. Quincy went to $148, Wednesday, closing Monday at $142, the same as a week ago. According to a Quincy director $18 per share will be paid for the current calendar year.

Greene Consolidated recorded an advance from $31.37½ to $33.25. The rise Monday was sharp and was not accompained with any rumors. Calumet & Ari[illegible] $107.50, closing at $102.50 last night. The advance was caused by the fact that the quarterly dividend was increased $1 to $5. Butte Coalition became active and ad[illegible] dend is expected to be 50c. quarterly, against the present rate of 40c. Wolverine touched $200 per share and a further increase in the dividend from $18 per annum is now expected, possibly to $24. Old Dominion spurted $4.37½ to $58.37½ during the week and Utah Consolidated is up $1.25 to $73.75 on pronounced New York buying. Granby rose $17.50 to $150.50 and Amalgamated is up $2.87½ to $114.75 per share.

Corbin mining stock has been the curb feature, being an Amster creation. There are but 80,000 shares, par $5. Allotments were cut down to 15 and 20 per cent. It rose steadily to $9.37½. The curb is extending continually.

Colorado Springs Feb. 8

The market has been dull and featureless the entire week. Prices have held steady with no fluctuations. The only stock showing any activity worth mentioning is Isabella, which had sales of only 24,500 shares for the week. Portland still continues weak, owing to the threatened lawsuit against the directors by James F. Burns, the largest stockholder. There are reports of rich strikes on the Acacia and Doctor Jack Pot properties, but these reports cannot be confirmed today.

Salt Lake City Feb. 8

At the annual meeting of the stockholders of the Salt Lake Stock and Mining Exchange a governing board, consisting of H. W. Doscher, Clark L. Whitney, R. J. Evans, W. J. Browning, J. L. Hamilton, James A. Pollock, F. R. Davis, Geo. T. Badger and William H. Child, was elected. James A. Pollock was re-elected president.

San Francisco Feb. 7

The San Francisco Stock and Exchange Board has adopted a new plan of management, a governing committee of seven having been appointed, who will control all matters heretofore decided by a majority of the whole board. A general revision of the rules that govern the board is not unlikely to be proposed. There is an element in the stock board favoring the adoption of some rule applicable to listing stocks, by which working mines and prospects may be classified for the information of all concerned. Moreover, considerable attention will in the future be devoted to finding out something definite about the mining properties seeking to be listed; some investigation will be made as to the character of the properties and of the men promoting them. All this will be for the better protection of the stock-dealing public, and should result in keep[illegible]

The board has also contracted for a new three-story building on Bush street, between Montgomery and Kearny. By this move it will secure permanent quarters on the old Stock Exchange building, on Pine street, or about twice the size of the room now used. Surrounding the enclosure where the sales are carried on, a raised floor, above the brokers, will be constructed so that what is said can be heard more easily. The building will be occupied entirely by the San Francisco Stock and Exchange Board, and the offices of brokers, so that the business will be centralized and convenience secured for all who have dealings in mining stocks.

STOCK QUOTATIONS

NEW YORK Feb. 11

Name of Comp.	Clg.
Associated Mines	1
Am. Nev. Mill Co.	3½
Cal. Consolidated	1½
Candelaria	1
Dominion	1
Florence	11
Florida Gold Corp.	1
Buffalo Cobalt	
Hecla & Jerome	2
Butte Coalition	38
Butte Cop. & Zinc	5½
Cobalt Contact	
Colonial Silver	½
Cum. Ely Mining	11
Davis Daly	18
Dominion Cop.	67
El Rey	2
Foster Cobalt	2
Furnace Creek	2
Guggenheim Mines	10½
Gold Hill	1
Greene Gold	2
Greene N. S.	2
Greene C. & D. Val	1½
Guanajuato	4½
Guggen. Exp.	96
Hancock	½
McKinley Dar.	2
Maxwell	6
Mines Co. of Am.	2
Mitchell Mining	1
Mont. Shoshone (New)	12
New Utah M. & S.	4
Newhouse M. & S.	59
Nipissing Mines	12½
Old Hundred	
Silver Queen	2
Stewart	2
Tennessee Copper	63
Tip Top Copper	1
Trade Dollar	1
West Columbus	

N. Y. INDUSTRIAL

Am. Agricultural	
Am. Smelt. & Ref.	141
Am. Smelt. & Ref. pf.	114
Bethlehem Steel	18
Colo. Fuel & Iron	43
Federal M. & S. pf.	93
Inter. Salt	34½
National Biscuit	
National Lead, pf.	108
Pittsburg Coal	18
Republic I. & S.	28
Republic I. & S. pf.	98½
Sloss-Sheffield	57
Standard Oil	541
Tenn. C. & I.	73
U. S. Red. & Ref.	29
U. S. Steel	44
U. S. Steel, pf.	98
Va. Iron, Coal & Coke	93½

ST. LOUIS

	High.	Low.
Adams	20	20
Am. Nicotine	98	98
Central Coal & Coke	32	32
Colonial	87	87
C. C. & C. pfd.	80.00	79.00
Commercial	10	10
Commonwealth	24	24
Doe Run	23.50	23.50
Granite-Bimetallic	14	14
Hydraulic-Press Brick	22	22
Kinloch	100	100
Laclede Gas	77	77
Missouri Edison	10.00	10.00
National Lead	108	107
Rubber	25	25
Scruggs	10	10
Standard Coal	2	2
Union Sugar	10	10
United Railways pf.	81	81
Wagner Electric	50	50

BOSTON Feb. 11

Name of Comp.	Clg.
Adventure	5
Allouez	60½
Am. Zinc	17
Arcadian	1
Atlantic	17
Bingham	31
Boston Con.	30
Calumet & Ariz.	124
Calumet & Hecla	900
Centennial	45
Con. Mercur	50
Copper Range	94
Daly West	
Franklin	28
Granby*, New	140½
Greene Con.	33
Isle Royal	30
Mass.	8½
Michigan	22
Mohawk	93½
Mont. C. & C. (new)	2
Nevada	17½
North Butte	111½
Old Colony	1½
Old Dominion	57½
Osceola*	166
Parrot	31½
Phoenix	2
Quincy	142
Rhode Island	107½
Santa Fe	5½
Shannon	22½
Superior & Pitts.	163
Tecumseh	
Trinity	36½
United Cop., com.	74½
U. S. Oil	12
U. S. Smg. & Ref.	63
U. S. Sm. & Re. pd.*	46
Utah Copper*	74½
Victoria	8
Washington	
Winona	13
Wolverine	198
Wyandotte	2½

*Ex. Div. †Ex. Rights.

BOSTON CURB

Ahmeek	110
Ariz. Com.	37
Black Mt.	8½
Cumberland Ely	25
East Butte	15
Hancock Con.	1½
Keweenaw	12
Majestic	37½
Raven	1
Shawmut	1
Superior	
Superior & Pitts.	28
Tuolumne	5½

LONDON Feb. 11

Name of Com.	Clg.
Dolores	£1 11s 3d
Stratton's Ind.	
Camp Bird	1
Esperanza	2
Tomboy	2
El Oro	2
Frontino	1
Stratton	
Utah Apex	1 13
Camp Bird pf.	4 15
Esperanza pf.	3 12

Cabled through Hayden, Stone & Co., N. Y.

SAN FRANCISCO Feb. 5

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.36
Best & Belcher	1.55
Caledonia	.01
Challenge	.12
Con. Cal. & Va.	.90
Crown Point	.25
Exchequer	.50
Gould & Curry	.32
Hale & Norcross	.90
Mexican	.30
Ophir	2.50
Overman	.18
Potosi	.16
Savage	.90
Sierra Nevada	.55
Union	.10
Utah	.04
Yellow Jacket	.95
TONOPAH STOCKS	
Golden Anchor	.10
MacNamara	.61
Montana-Pitts.ex	.25
North Star	.39
Reserve	.19
GOLDFIELD STOCKS	
Black Auts	.13
Blue Bull	.50
Columbia Mt.	1.97
Comb. Frac	3.87
Conqueror	.28
Daisy	2.80
Florence	3.00
Frances Mohawk	.8.87
Goldfield Con.	.30
Grandma	.31
Great Bend	1.10
Red Hills	.31
St. Ives	1.15
BULLFROG STOCKS	
Amethyst	.57
Bonnie Claire	.40
Mayflower Con.	.53
Montgomery Mt.	.40
Original	.24
MANHAT'N STOCKS	
Gold Wedge	.15
Manhattan Mg.	.16
Pine Nut	.24
Ruby Wonder	.34
Yellow Horse	.08

NEVADA Feb. 13
(Weir Bros. & Co., New York)

	Clg.
TONOPAH STOCKS	
Tonopah Mining of N.	17 12½
Tonopah Exten.	4.87½
Montana Tonop'h	3.95
Belmont	5.62½
Tonopah Midway	2.05
West End Con.	1.75
Jim Butler	1.06
GOLDFIELD STOCKS	
Sandstorm	.53
Kendall	.53
Red Top	3.75
Jumbo	3.75
Goldfield Mining.	1.30
Dia'dfield B. B. C.	.62
Atlanta	.84
Mohawk	17.00
Silver Pick	1.44
Laguna	1.38
BULLFROG STOCKS	
Mont. Shoshone C.	12.75
Tramps Con.	1.34
Gold Bar	1.25
Bullfrog Mining	.37
Bullfrog Nat. B.	.52
Homestake Con.	1.35
MANHAT'N STOCKS	
Manhattan Con.	.90
Manhat'n Dexter	.52
Jumping Jack	
Stray Dog	
Indian Camp	

COLO. SPRINGS Feb. 9

Name of Comp.	Clg.
Acacia	12
Black Bell	4½
C. C. Con.	6
Dante	
Doctor Jack Pot.	7½
Elkton	62
El Paso	54½
Findley	67
Gold Dollar	6½
Gold Sovereign	6
Isabella	22½
Index	6½
Jennie Sample	
Jerry Johnson	
Mary McKinney	63
Pharmacist	6½
Portland	1.16
Un. Gold Mines	
Vindicator	95
Work	14

New Dividends

Company.	Payable.	Rate.	Amt
Alaska Mexican	Jan. 28	$1 00	$200,000
Alaska Treadwell	Jan. 28	0 50	90,000
Alaska United	Jan. 28	0 30	90,000
Amalgamated Copper	Feb. 25	2,00	3,100,000
Bunker Hill & Sullivan	Feb. 4	0,60	180,000
Calumet & Arizona		5 00	1,000,000
Cambria Steel	Feb. 15	0 62½	562,500
Dolores	Feb. 25	0,15	49,500
General Chemical	Mar. 4	2 00	148,206
Jamison, Cal.	Jan. 18	0 05	11,700
McKinley-Darragh, Ont.	Mar. 1	0 02	40,000
Mexican Co. M. & S.	Feb. 25	0 50	120,000
Philadelphia Co., pfd.	Mar. 1	1 25	1,443,629
Pocahontas Collieries, pfd.	Feb. 1	1,50	225,000
Quincy Copper	Mar. 11	4,50	486,446
Republic Iron & Steel, pfd.	Apr. 1	3 75	765,634
Snowstorm, Idaho	Feb. 1	0,03	45,000
Union Copper, Land & Nv.	Jan. 31	2 00	
U. S. Steel Corporation.	Mar. 30	0 50	2,541,513
U. S. Steel Corp., pfd.	Feb. 28	1,75	8,300,019
U. S. Cast Iron Pipe	Mar. 1	1,00	150,000
U. S. Cast Iron Pipe, pfd.	Mar. 1	1,75	262,500
U. S. Smelt., Ref. & Mg.	Apr. 1	0,87½	1,442,500

Assessments

Company.	Delinq.	Sale.	Amt.
Bo mont, Idaho	Feb. 7	Mar. 7	$0 002
Black Diamond, U.	Feb. 13	Mar. 6	0 01
Bullion, Nev.	Feb. 11	Mar. 8	0.05
Crown Point, Nev.	Feb. 5	Feb. 26	0.10
Deer Lodge, Utah	Feb. 18	Mar. 11	0.004
Forty-nine Placer, U.	Feb. 8	Feb. 27	0.01
Johnnie, Utah	Feb. 25	Mar. 12	0.02
Nevada Superior	Jan. 21	Feb. 9	0.10
New Stockton, Utah.	Feb. 18	Mar. 11	0 02½
N.Y.-GrassValle, Cal.	Jan. 30	Feb. 25	0.01
Oro Blanco, Cal.	Feb. 25	Apr. 22	0.03
Sierra Nevada	Feb. 25	Mar. 18	0.10
Scottish Chief	Feb. 6	Feb. 25	0.02
Tetro, Utah	Feb. 6	Mar. 11	0.03
Union Con., Nev.	Feb. 11	Mar. 4	0.10

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65,288	68,673	30 113	31,769
February	66,108		30 464	
March	64,597		29 854	
April	64,765		29 984	
May	66,976		30 968	
June	65,394		30 185	
July	65,106		30 113	
August	65,949		30 529	
September	67,927		31,483	
October	69,523		32,148	
November	70,813		32 671	
December	69 650		32,003	
Year	66,791		30 868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	New York.				London.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18,310	24,404	18 419	24,825	78,869	106,739
February	17,869		18 116		78,147	
March	18,361		18,641		81,111	
April	18,375		18,688		84,793	
May	18,475		18 724		84,867	
June	18,442		18 719		85 994	
July	18,190		18,585		81 167	
August	18,380		18,706		83 964	
Septemb'r	19,033		19 328		87 831	
October	21,203		21 722		97,269	
November	21,833		22,398		100 270	
December	22,885		23 350		105 226	
Year	19,278		19,616		87 282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36,390	41,548	July	37,275	
February	36,403		August	40,606	
March	36,662		September	40,516	
April	38,900		October	42,852	
May	43,313		November	42,906	
June	39 260		December	42,750	
			Av. year	39,819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5,600	6,000	16,850	19 828
February	5,464		16,031	
March	5,350		15,922	
April	5,404		15,959	
May	5,685		16,725	
June	5,750		16,813	
July	5,750		16,525	
August	5,750		17,109	
September	5,750		18,266	
October	5,750		19,350	
November	5,750		19,281	
December	5,900		19,609	
Year	5,687		17,370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6,487	6,732	6,337	6,582	28 225	27 125
February	6,075		5,923		25 844	
March	6,209		6,056		24 563	
April	6,078		5,931		25 781	
May	5,997		5,846		27 000	
June	6,036		5,948		27 728	
July	6,006		5,856		26 800	
August	6,027		5,878		26 938	
September	6,216		6,056		27 564	
October	6,222		6,070		28 075	
November	6,375		6,225		27 781	
December	6,593		6,443		27 938	
Year	6,198		6,048		27 020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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MINING ON THE KIRGHESE STEPPES

Conditions in Southern Siberia—Ancient and Modern Workings—Extensive Deposits

BY H. E. WEST*

There is today a country of vast proportions, in area roughly comparable to the United States, or about 4¾ million square miles, where there are stores of treasure of all kinds as yet practically untouched. This country is known to contain great mineral wealth. It comprises almost a half of that continent that was the cradle of the world and fashioned its most ancient civilization. I refer to that dominion of the Tsar in Asia, "Siberia."

The Siberian railroad from Moscow to Omsk is, with the exception of one day through the Ural mountains, where the greatest altitude attained is about 3000 ft., entirely in flat country. Near the railroad there is considerable land under cultivation, but away to the south, beyond the timber patches and the more fertile lands, the country is still for the most part destitute of any growing thing save bunchgrass and the small sage-bush, the habitat of the prairie dog and the great bustard.

All this country is included in the Kirghese steppes, since it is inhabited by numerous tribes of this nomadic and interesting people. The Russian element, represented by the Cossacks, dwells entirely in the small towns and villages on the communal system. They are prohibited from living on their farms by law, although the farms may be many versts distant. The Cossack is a Russian who is not of the serf class and who has settled on lands given him by the government.

COSSACK VILLAGE IN THE TIMBER COUNTRY

CROSSING THE STEPPES

It was my fortune some months ago to undertake a trip "away down south" in this Kirghese country; farther than any Cossack village, farther even than the last Kirghese zamofka, or winter-quarters. Foreigners who travel in these parts are rare. Indeed, the whole of this section is included in what is spoken of as "the forbidden country," for there are political reasons why this section should not become too popular with foreigners. The countries immediately south include the

*Mining engineer, Spassky Zavod, Akmolinsk, Siberia.

buffer states of Beloochistan and Afghanistan, with the Mongolian empire to the east and Persia to the west.

Leaving Petropavlovsk at midnight in "korabok" and "troika," the journey south began. The korabok is constructed on the principle of the buck-board, with a wicker basket large enough [illegible] at full length. Hay and rugs are spread on the bottom, on which one can lie and sleep with considerable comfort. Indeed, for the very long journeys, traveling both night and day, it is probably the most comfortable conveyance devised. The "troika" is essentially the Russian method of harnessing three horses, and consists of one shaft-horse, bearing the yoke and troika bells, whose gait is that of a fast trot, with a horse on either side running free at a gentle canter, with neck and head thrown outward. It is a very pretty and effective system when everything goes well; but, as often happens, when one of the side horses is new it is surprising to see what complications can arise in an incredibly short time. But, here again the situation is saved by the Russian harness, which is so scientifically proportioned and intimately associated with sundry odds and ends of string, that it parts on the least provocation; hence, one's comparative safety.

The Russian driver always starts and finishes a trip with a vigorous gallop, and rarely, if ever, does a good troika walk, even on stages of 30 versts and more.

On the stage-roads the troikas were usually good, but the farther south we went the worse they became, and at times there were none at all. We had many thrilling moments as may be imagined, but despite one minor accident, during the whole of our 1500-mile drive, entrusted to the care of strange drivers and horses at almost every stage, we had no serious accident.

In 36 hours we were at Atbasar, the principal town of that district, a distance of 358 versts. Here we parted company with the telegraph, and all postal facilities.

The way south lay over a post road little frequented. This, in turn, connected with the caravan route to Tashkent, near the borders of Afghanistan. The mines, of which there were three groups, copper, lead and coal, appeared to be most indefinitely located; they lay about 200 versts across country from each other, unworked and unconnected with roads—not altogether an assuring outlook. Only one member of the party had visited one of the mines.

The Russian villages we had passed were mostly desolate agglomerations of low log or stone houses flanking wide, naked streets, and all had the look as if life in these parts were a pretty hard proposition out of doors; while within it was necessary to economize space in order to keep warm.

THE KIRGHESE TRIBES

But now even the smallest village was long past, and the only dwellers were the wandering tribes of Kirghese, with their countless flocks of goats, camels and oxen. This is the Kirghese country, or steppe. The ant-hill structures, which serve as dwellings, are "yuarts," a collapsible framework of wood, covered with a thick felt, the summer homes of these people. Camp is easily moved from water to water as the feed is consumed, until at length, on the approach of winter, they arrive at their "zamofka," or winter-quarters, a low stone hut, with a turf roof, for all the world like a wart on the open face of the steppe.

Some days the country would be perfectly flat, and here mirages would open out pleasant sheets of water with tree-fringed headlands reflected on their gleaming surface, which, on nearer approach, would vanish or form again beyond. On other days the country would be undulating, the hills rising to about 2700 ft. above sea-level; but neither in hill or plain did a friendly tree offer the slightest shade or serve to break the monotonous landscape.

A KIRGHESE ZAMOFKA

In appearance the Kirghese somewhat resembles the Mongolian, with flat face and high cheek-bones. They are short of stature, for the most part, and very bow-legged, suggesting long generations of horsemen ancestors. The Kirghese are

great herds as well as lodges of horses, and even walking as much as the Spanish [illegible]. Indeed, with their hardy pet horses and countless quilted wrappings, a [illegible] as well as winter, it would be a hard matter for them to walk any distance. They are, of course, Mohammedans, and very strict members of the faith. They neither smoke nor drink, and are extremely tractable, and in most respects make ideal workmen. They work every day in the week, and have but two recognized holidays, of some three days each, in the year. They are a docile, childlike race, in whom there is no guilt, except in the trade of horses, when all the latent cunning of their Oriental mind is at once awakened.

GEOLOGY OF THE COUNTRY

There was not much opportunity for ex[illegible] the structural geology of the [illegible] the globe

and many evidences of underground working. The shafts were so badly caved that it was foolhardy to attempt any examination below. On the dumps were found some very promising piles of fine-grained galena, and also steel galena, but, strange to say, the silver contents were very low. Usually past experience has taught me to associate a fine-grained galena with silver contents. In the lead deposits near Lake Balkash, now being opened by the Siberian Syndicate, the galena is a coarse-cube variety and runs high in silver value. So it is apparent that the grain of the galena is not a safe guide as to argentiferous contents, except in each separate and particular locality. In the store were some piles of pig lead that the former workers had not apparently considered worth shipping, after the immense trouble of production in that out-of-the-way portion

tary life, the sentry-box of a mighty empire, today a solitary policeman in a faded green coat and tawdry braid represented law and order.

It was now "up to" the Kirghese to take care of our further journeyings, as we were at the end of our resources and without horses. It was not long before the neighboring chiefs paid us their respects, and with much talk and the consumption of quantities of "chai," or tea, from the obliging samovar, everything was definitely arranged for an early start next morning. There were about ten in the party, including Kirghese interpreters, guides, spare saddle-horses and attendants, altogether forming a most imposing cavalcade. We had not proceeded far before we were joined by several Kirghese families, also "en trek," with their scores of camels and horses, the women riding the [illegible]

HORSE WHIM AND STEAM SHAFT HOUSE IN WINTER TRIM

trict until we arrived at the rolling hill-country. From the presence of sandstone buildings in most of the villages, it was evident that large beds underlay a great part of the steppe. In the hills shales were much in evidence, and some interesting limestone beds, carrying an abundance of fossils, were encountered. Sandstone conglomerates were also of frequent occurrence. An interesting occurrence of selenite, the clear crystalline gypsum, was encountered in considerable quantity.

The higher hills, from 3000 to 4000 ft. in altitude, were almost entirely of granite or granitoid rocks, usually of a coarse crystalline texture, and without any apparent valuable mineral deposition.

LEAD MINES

After sundry adventures, and many misgivings as to our location, we at length sighted the lead mines. Here a small smelter had been built and considerable work had been done on the deposits. There were a number of shafts

The lead veins were both numerous and high grade, but small. The country was entirely composed of gneiss, rather an unusual habitat for galena ores, the veins cutting obliquely the lines of foliation.

AMONG THE KIRGHESE

There were copper mines 200 versts to the south and coal mines 200 versts to the west still to be examined. Owing to the absence of roads to the latter we decided to proceed to the copper properties, as a korabok could be driven most of the distance. At Yulutahoo, 181 miles south, we reached the end of the stage-road, or rather, military road. This is a quaint old town, built of slabs of granite from the nearby hills, said to have been the dividing line with Persia fifty years ago. The frontier today lies many hundreds of miles to the south, an interesting occurrence of contact-metamorphism of a distinctly recent period. There in that square verst of what was once a town bristling with mili-

equipment, the *tout ensemble* giving the impression that we were the leading float in some gigantic circus procession.

Progress was slow as we had no change horses; consequently we had to camp about six hours during the heat of the day, under the shade of the wagons, as there was no other. At night we camped in the open.

On the second day at evening we arrived at the copper properties, situated in a regular "never-never" country, apparently on the confines of the deserts to the south. For some time the water had been brackish and salt pans were common. The district to be examined comprised some 8 miles long by 5 miles broad, in 6 blocks of two versts each, a long day's work to even ride the boundaries, much less make any attempt at examination. It was soon apparent that the deposits, which were easily traced by the green carbonates at the surface, comprised the softer bedded sandstones impregnated with copper minerals,

parent value.

ing for one individual—especially when unable to speak a word of the language, and with a scant supply of tools, and not even a forge to point a pick. Added to which it soon became apparent that the representative of the owner had a most hazy idea of the individual blocks, which were often several miles apart. However, this gentleman could speak a few words of French, and although my knowledge of this useful language is by no means profound, we found it to a certain extent a happy medium of exchange. By dint of hard riding and considerable work in the blazing sun, after a few days I was able to approximately estimate the possibilities, having cut representative samples of the several exposures for subsequent assay.

The Russian requirements as to development are curious; their special import seems to insist on a certain poodage of ore extracted annually and suitably stacked for measurement. The consequence was that although the properties had been worked in the past, and developed for several years previously, all that was to be seen were numerous apple-green funeral-pyres dotting the low hills, with corresponding holes in the ground, which afforded a most unsatisfactory knowledge of the deposits. There was an open-cast of considerable area that had been worked from time immemorial, as the richer ore was easily mined, and could be reduced to copper in our camp-fires, consisting of horse, or camel droppings, the only fuel of these parts.

There still remained the coal properties, 200 versts to the west, to be examined. A horseback trip of some ten days through an uninhabited barren country with a few wells of brackish water, during the heat of summer, and with a very scanty larder, was now before us. This we had reluctantly to abandon, as we realized it was about all we could manage to extract ourselves successfully from our present position. The Kirghese are flesh eaters entirely, mostly living on mutton. Horseflesh is a delicacy. Their principal drink is "koomis," or mare's milk. When fresh this is palatable, but when fermented and drunk in quantity, it is capable of rendering its devotee quite intoxicated. They never eat vegetables, nor appreciate the eating of "grass," as they term it. The difficulties of the position are therefore apparent, as our provisions were reduced to little more than dried bread, or "rusks," and a few cans of meat.

A KIRGHESE YUART

We arrived once more at Yulutahoo, where we camped with the hospitable policeman and paid off our retinue, and eventually reached Atbasar, where we again connected with the outside world, learning for the first time of the dissolution of the Duma, and the expected troubles that might ensue.

A bill now before the French chambers contains a provision reducing shareholders' profits to a dividend of 10 per cent., after a 50 per cent. share on the original capital has been reserved; the rest to be divided between the workmen and the pension fund. Some of the older French coal companies pay large dividends; for instance, the Compagnie de Dourges last year paid 1050 fr. per share of 500 fr. par value.

Mineral Resources and Mining Laws of Cuba

Consul Max J. Baehr writes as follows from Cienfuegos on the mining industry of Cuba: The mineral resources are represented by the following products: Gold, silver, iron, copper, manganese, lead, asphalt, petroleum, naphtha, graphite, amianthus, asbestos, zinc, mercury and coal. These minerals are found in most of the provinces, but the richest district is the province of Oriente, followed in importance by Santa Clara, Camaguey, Pinar del Rio, Matanzas and Habana.

The total number of mines surveyed, and the boundaries marked in the island up to Dec. 31, 1905, was 386, containing 20.871 hectares (hectare = 2.471 acres), divided among the provinces, and classified as follows: Asphalt, 78; copper, 77; iron, 63; pit coal, 11; manganese, 84; gold, 13; graphite, 2; lead, 5; zinc, 2; asbestos, 1; other kinds, 49; total, 386. The total area of the mining regions of Cuba is 56,395 acres, of which 44,586 belong to the province of Oriente, 4288 acres to Santa Clara, 5202 to Camaguey, 1361 to Pinar del Rio, 444 to Matanzas and 514 to Habana.

Of the above number of mines very few of iron, manganese and copper in the province of Oriente are in operation. The others can be considered only as concessions waiting for funds for exploitation. The administration, according to the laws in force, cannot compel the miners to operate their claims.

The applicants for mines can, according to law, ask for one or several claims at the same time. A claim (pertenencia) is 300 m. (984 ft.) long by 200 m. (656 ft.) wide (6 hectares, or 14.8 acres), except when the mines are of iron, coal, anthracite, lignite, turf, asphalt, or bituminous clays), when the pertenencia is 500 m. (1640 ft.) long and 300 m. (984 ft.) wide (15 hectares, or 37 acres).

The taxes to be paid to the government are $5 yearly per hectare (2.471 acres), or $30 for each claim containing 6 hectares (14.8 acres), when the mines are of precious stones or metalliferous substances. In the other cases the tax is $2 per hectare, and therefore the total to be paid for the pertenencia may be $12 or $30, according to the surface of the claim.

The annual production of the mines actually operated, namely, 5 asphalt, 3 copper, 12 iron, 3 manganese and 1 naphtha, give a total output valued at $1,446,000, as follows: Asphalt, $122,900; copper, approximately, $13,068; iron, $1,146,892; manganese, $163,140.

In the pamphlet published by the Bureau of Insular Affairs of the United States War Department, entitled "The Mining Law," is quoted the law in force, which is that of July 6, 1859, with the modifications introduced March 4, 1868.

THE COST OF A GOLDEN AGE*

The Debit Side of the Patent Account

BY A. S. FITCH

The last half of the past century together with the early days of the present, covering a period of some sixty or seventy years, is popularly considered the most brilliant era in either history or tradition; an era in which the greatest achievements in science, discovery and invention have been made, yielding a larger and more general betterment to the human race, in the conditions in which it now exists, than ever heretofore attained. During this golden age the telegraph, wired and wireless, the submarine cable, the sewing machine, the mower, the reaper, harvester and binder, the modern steam engine, the manifold appurtenances of land travel, the ocean greyhound, the telephone, the phonograph, the marvels in electrical appliances for the generation and utilization of the fluid for illumination and power, and the wonders in automatic and labor-saving machinery, have all been conceived and brought to their present perfection. Things of which our forebears never dreamed as possibilities, and many which even those still living looked upon as little less than miraculous when first announced as accomplished facts, are now the ordinary necessities of daily life on every continent and in every land under the sun.

THE OTHER SIDE OF THE ACCOUNT

While it may not be denied that this age of materialistic wonders has bestowed innumerable blessings upon mankind from an ethical viewpoint, in that never before in the history of this planet could man get so much of comfort and luxury in life by so small an expenditure of labor, either with hands or brain, as now, there is another aspect in which it may properly and profitably be viewed, weighed and measured, which has seldom, if ever, been seriously considered. How little thought has been given to the actual cost of this great era? Not in the brain-fag of the thinker; not in the muscle-weariness of the explorer, the experimenter, the laborer; not in the bitter sorrow and despair over unrequited zeal; but in the monetary cost—the cost in the gold that has been wrested from the bosom of our old Mother Earth to deck her with the glories of her golden age—in hard, metallic coin, the final and definite measure of value of everything in these practical days.

PATENT-OFFICE RECORDS OF COST

Apart from the revelations given to men by philosophers and great scientists, whose labors were largely speculative, involving little of material cost, and whose voices were more as of those crying in the wilderness than like the lusty ring of the blows of the smith at his forge, there is no surer index to the financial cost of modern achievement than the records of the governmental patent offices of the world. There we find facts which are unassailable and unquestionable; for through them have passed myriads of scientific and mechanical inventions and discoveries, among them all that we call the great inventions, as well as the hundreds of thousands which have played minor parts in the world's work, or have been lost in the oblivion of failure and disuse. From these facts may be deduced further facts of approximately equal reliability, so that a tenable basis may be constructed for a reasonable and conservative estimate of the actual cost of this golden age.

Since the foundation of the patent system, over three and a half million applications for patents have been made to the various governments of the world, and very nearly two and one-half million letters patent have been granted. These figures do not include copyrights, trade marks or the registration of labels, all of which are, however, in some measure, more or less linked with or concomitants of "inventions." Of the total number of patent applications, about one-half have been made to our own government, and the United States of America has issued, up to date, about one million patents. Moreover, nearly, if not quite, seven-eighths of this activity in invention has occurred during the past fifty years.

THE AGGREGATE OF GOVERNMENT FEES

The filing of these applications for patents in this country has involved the payment to our government by inventors and applicants of about $50,000,000, and to the other governments of the world from about $85,000,000 to $90,000,000. But these fees payable to governments are only a drop in the bucket in comparison with the other expenses involved in obtaining patents. The fees and charges of the solicitors or agents who prepare and prosecute these applications must be taken into account. There are hundreds, yes, thousands, of instances in this country, especially during the past thirty or thirty-five years, in which expert attorneys of high standing have charged and received anywhere from $1000 to $3000 for the preparation of the specification and drawings of a single intricate and important invention. A case is on record in which the solicitor labored for one entire year exclusively on one specification, receiving, as his fee, a check for $10,000. This was exceptional to be sure; but very heavy fees are frequently charged in difficult cases.

SOLICITORS' FEES

Without attempting to itemize these larger fees, it is not unwarrantable to state that, in at least one-half of one per cent. of all the applications filed in the United States patent office, the fee paid the solicitor in each case has amounted to not less than $1000; in another 17,500 cases to not less than $500; in 5 per cent. of the total number, or 87,500 cases, not less than $250; in 10 per cent., not less than $100; in one-third of the entire number, $50; and that, in the remaining one-half of all cases, the ordinary fees of $25 to $30 has been charged. These figures, if they err, do so in their moderateness rather than excess; and thus reckoned, the total sum paid to American solicitors foots up nearly $100,000,000, or an average of about $60 per application. Anyone familiar with the profession of patent soliciting will recognize the conservatism of these figures and the probability that the average cost of a solicitor's services has been nearer $100 in each case than the $60 above given; so that the nearly 2,000,000 applications for United States patents, including government fees paid, has undoubtedly aggregated about $200,000,000.

But, as about one-half of the total number of applications filed at Washington has been rejected and patents thereon have never been granted, this total cost of $200,000,000 is properly chargeable, in reckoning the debit side of this great account, against the million patents which have been granted in this country. Thus, the charge for this item against issued United States patents would average $200 each, a moderate figure when all circumstances are considered.

THE COST OF EUROPEAN PATENTS

Until within a very few years, the fees, both governmental and to solicitors for applications in European and other foreign countries, have been considerably greater than those averaged in the United States; besides which, fees for the prolongation of these foreign patents year after year have had to be paid. It is entirely safe to state that the cost of procuring and maintaining the nearly 2,000,000 patents granted in foreign states has been at least three times the cost of the like number of patents in our own country, or about $600,000,000. This gives a grand total of very close to one billion dollars expended by inventors throughout the world during, say, about 100 years, for governmental and solicitors' fees alone in connection with the applications filed in that period.

This billion of dollars covers only the instances in which the attempts to protect inventions has proceeded thus far; but the records and files of the host of solicitors throughout the world, and especially in this country, will disclose a vast number

*From *The American Machinist.*

of cases in which, because either of change of purpose or of lack of funds on the part of the inventors, the applications have been cast aside or abandoned after entire or partial payment for their preparation; so that it is entirely reasonable to add to the total debit of this item of cost a further sum which will swell the amount already named to nearly two billions of dollars.

PRELIMINARY EXPENSES

But, even yet, we have only begun to count the cost. There are other items of such colossal proportions that they are appalling in their magnitude. These are the expenditures involved in the preliminary or embryo stage of an invention or discovery, and necessary to demonstrate or at least indicate its probable practicability and worthiness to be made the subject of an application for a patent. Under this head, as well as any other, may be placed the cost of models illustrating, in miniature, the features of the invention. For many years the model halls of our patent office contained tens of thousands of models which represented the expenditure of millions of dollars in their construction by or for inventors. Of late only the more important of this great array of models have been retained by the office; and while the filing of a model of an invention for which application for a patent is made is now no longer compulsory, except in certain special instances, the production of models by inventors still goes on, as many of them think it a necessary step in development.

DEVELOPMENT EXPENSES

Then there is the cost of thoroughly and practically developing the invention and getting it into final condition for commercial or public usage. Further than this are the disbursements for legal advice, in very many instances, concerning the scope and validity of the patent, and the still greater fees and expenses connected with litigation in court to enforce, defend or maintain the patent right. And, further again, is the capital drawn into partnerships or corporations formed for the purpose of exploiting and selling the patented thing in the markets of the world, a large part of which is lost through the failure of the invention to meet the popular demand. We have heard much of some few great fortunes made from certain radical inventions; but it is only now and then that we learn what it has cost in litigation and other expenses to protect the patents on these inventions, and to realize the advantage the monopoly is supposed to bestow upon its possessor; and we rarely notice or consider the scores of thousands of invention and patent wrecks which strew the shores of the commercial seas, gaunt witnesses of failure, disaster and financial loss.

In the preliminary stage, many inventions, notably those that have first blazed a trail through some theretofore unexplored jungle of physics, have involved years of labor and the expenditure of thousands of dollars before their feasibility and utility were demonstrated. But grouping these greater and fundamental inventions with others of large importance in like fields of discovery, it is not unwarrantable to assert that at least 1 per cent. of all have averaged over $10,000 each in preliminary development, although a great number have thus cost ten or twenty times as much; that another 1 per cent. has averaged $15,000; 5 per cent., $2500; 20 per cent., $1000; another 20 per cent., $500 each; still another, $250; and the remaining third, $100 each. The total of these figures is close to two and one-half billions of dollars; and this total is probably below rather than above the true sum.

Another item comprises the expenditures involved in this preliminary development of those inventions which fail of satisfactory demonstration, and consequently never appear as subjects of applications for patents. There can be no absolute accuracy in estimating the exact number of these cases, but they have occurred over and over again and are witnessed daily. That they almost, if not quite, equal those which have proved practical there can be little doubt. But if they are set down as only one-half such number, these abandoned efforts will add at least another billion and a quarter of dollars to our debit.

The final development of patented inventions has certainly exceeded in cost that of their preliminary demonstration. At this stage inventions are brought to practical form and generally demand the construction of machinery or apparatus. Hundreds of thousands of dollars have frequently been thus expended in individual instances only to be totally lost in the end. We can easily count the great or even ordinary successes of exploited patents; but their financial wrecks are as the sand on the seashore. But, disregarding individual cases and applying the same percentages and ratios of expenditure for this item as are given for preliminary development, we have a total of two billions and a half of dollars for this additional debit. It can, by a little figuring, be proven that this item more nearly approximates five billions of dollars than the sum first named.

THE COST OF LITIGATION

Litigation has called for the expenditure of enormous sums. Not one of the great, fundamental inventions has escaped this outlay for the enforcement or defense of its rights under patents. From 1867 to 1885 the United States courts were crowded with these cases all over the country, and the eminent counsel engaged received from $100 to $1000 per diem for their services, which continued in many cases for several years. Instances of very large fees, some as great as $100,000, or even $250,000 were known. Since 1880 the litigation concerning electrical inventions has greatly increased. Of course, all patents have not been litigated; but certainly, at least, one-half of all granted here or abroad have called for some expenditure on this account, or, at least, for legal advice, and it cannot be far from the truth that, taken together, they have averaged $1000 in each instance, and that the total of this expenditure aggregates at least one and one-half billions of dollars.

PROMOTER'S CHARGES

The final item should cover the losses suffered by investors in patents whose money has gone, not into development or actual exploitation of inventions, but into the pockets of promoters and schemers for worthless title interests in the patents themselves, or for the inflated stocks of corporations holding the patents. This sum must be enormous, but can only be surmised from known facts. In a single State in our Union corporations capitalized in stock to over twenty-five millions of dollars were dissolved during a single year, and most of them were closely related to some patented monopoly. One patent scheme drew, in one year, over £3,000,000 out of Great Britain, and fell to pieces before another twelve months. Two other American inventions were exploited there in the early eighties, which proved a total loss within two years of £1,000,000 to the stockholders. That the loss to investors in patent rights all over the globe during the past sixty years has been billions of dollars cannot be doubted, when the fact is recognized that not over 10 per cent. of all patents ever actually yield a financial profit any greater than that derivable from an unprotected article in the open market. It is more probable than not that this item of lost capital put into patents which have proved chimerical or been abandoned for other reasons, amounts to not less than three billions of dollars.

THE GRAND TOTAL

When the items of this great debit against our golden age are added up, they give a grand total of nearly fifteen billions of dollars; and, adding interest at 6 per cent. per annum for a term of thirty years, as nearly all this vast sum has been expended for the purpose stated during the past sixty years, we have a final total of debit to the account of modern invention of almost forty-five billions of dollars. This almost inconceivable sum is greater than the national debts of all the countries of the world.

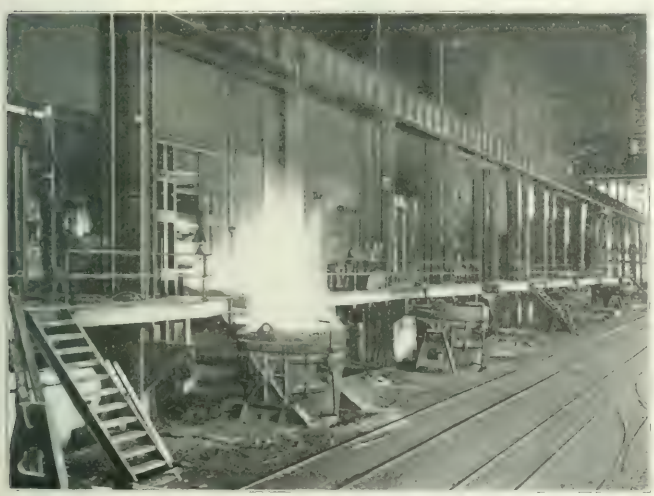
A serious contemplation of these facts naturally suggests the question: Have the successful inventions of our golden age in and of themselves yielded to their inventors and owners an actual money-profit adequate to offset this colossal debit and show a balance on the right side of the world's great ledger?

MAKING OPEN HEARTH STEEL AT PUEBLO

Basic and Acid Furnaces at the Colorado Fuel and Iron Company's Steel Works

BY LAWRENCE LEWIS *

Open hearth steel was first made at the Minnequa works of the Colorado Fuel and Iron Company at Pueblo, Colorado, June 29, 1903. The original open-hearth plant consisted of six furnaces only. Owing, however, to chemical constituents in the ore found in the new deposits of the company now being opened at Sunrise, Wyoming, the open-hearth process is becoming more and more important. For 22 years the works depended exclusively upon the bessemer process. It is likely that, although the bessemer process will always be a very important feature, the open-hearth process will hereafter overshadow it. Indeed, at present a large sum of money is being expended upon the construction of six additional 50-ton open-hearth furnaces, a 300-ton hot-metal storage reservoir and a calcining plant for calcining the dolomite used in the lining of the furnaces and limestone used as flux.



TAPPING FLOOR, OPEN-HEARTH DEPARTMENT, MINNEQUA WORKS

THE FURNACES

All of the open-hearth furnaces are of the stationary type with basic bottoms. Each is 60 ft. 6 in. long by 17 ft. wide. Each is of 50 tons capacity and is equipped for the use of producer gas. The regenerative chambers are extra large and are placed immediately under the charging floor. Gas is suppled by 48 large-size water-seal Duff producers, the building for which is provided with cranes and mechanical coal-handling arrangements. The main flue into which the producer gas is delivered is parallel with the line of furnaces and is 10 ft. high by 6 ft. wide, and is easily accessible from one end for cleaning. Flues 5 ft. high and 3 ft. 6 in. wide, at right angles to the main flue, deliver the gas to the furnaces.

The plant was built after plans of the Garrett-Cromwell Engineering Company and the erection of the structural material was done by the Riter Conley Manufacturing Company. The main building, when the six new furnaces are completed, will be 1005 ft. long, 95 ft. high and 203 ft. wide, including the lean-to over the stock yard, all of steel construction. The charging floor is 10 ft. above the pit-floor level and is equipped with two low-type Wellman charging machines and two 40-ton Shaw electric overhead traveling cranes to handle hot metal from the storage reservoir. The pit is 55 ft. wide and is equipped with three 75-ton electric overhead traveling cranes, three pouring stands, two tracks for ingot buggies and one standard-gage track. The pouring tracks are fitted with three center pushers. The ingot stripping is done by means of two Aiken duplex hydraulic strippers.

The stock yard, 72 ft. wide and of the same length as the main building, is equipped with three 5-ton electric overhead traveling cranes, three standard-gage tracks and three narrow-gage tracks for charging cars. The three standard-gage tracks are at a lower level than the narrow-gage, so that the top of an ordinary railroad car is on a level with the tops of the charging buggies to facilitate the handling of scrap, ore, etc.

THE OPEN-HEARTH PROCESS

In manufacturing finished steel products from the raw ore, several processes are necessary. These processes may be divided into two classes: first, reducing the ore to pig iron, and refining pig iron to steel; second, rolling and working the ingot steel into various finished shapes. For reducing the ore to pig iron the blast furnace is employed, but the pig iron contains impurities which must be eliminated in order to produce steel. For this purpose either the bessemer or open-hearth process is used. In these processes we must have either oxidizing or reducing conditions. This statement is apparently highly technical, yet it is simple enough. Oxidizing means adding oxygen to a substance; reducing means removing oxygen. Consequently it is impossible to have both oxidizing conditions and reducing conditions in the same place at the same time.

Iron ore is metallic iron combined with oxygen. The blast furnace removes the oxygen by the use of carbon in the form of coke. Coke at a high temperature has a greater attraction for oxygen than has iron, but there are impurities in the iron ore—such as silicon, manganese, sulphur and phosphorus—combined with oxygen in the same manner as in the iron of the ore. These are also reduced and go with the pig iron. These impurities must now be removed from the iron or oxidized, and this constitutes the process of making modern "steel." Chemically speaking, the so called "steel" of commerce today is comparatively pure iron, more so than pig iron.

The open-hearth furnace consists of the hearth, the gas and air ports and the regenerative chambers. There is also a stack for draft and valves for reversing the currents of air and gas. There are also various mechanical appliances for handling raw material and products.

THE HEARTH

The hearth is in shape an oblong basin. It is inclosed by a roof and side walls, but is readily accessible by doors and for this reason takes the name open hearth. Fig. 1 gives a plan, Fig. 2 a longitudinal section, and Fig. 3 a cross section of the

*The writer of this article is indebted for the material herein contained to J. A. Durfee, formerly superintendent of the open-hearth department of the Minnequa works, and now assistant manager of the Minnequa works.

Note.—The Minnequa did not run continuously during the coal trouble of 1903 as stated in a previous article of this issue.

as the bottom of the open space. Each half of the furnace divided on the line *A A* (Fig. 1) is the counterpart of the other. The hearth is 32 ft. long and 14 ft. wide inside the walls, which are of silica and magnesite brick in the basic furnaces. In acid furnaces they are of silica brick only. At each end of the hearth are the ports, uptakes or flues, which lead the gas and air into the furnace to be burned; *c c* are the gas ports and *a a* are the air uptakes.

The gas ports are nearly horizontal, extending from the vertical flues *o o* and *d d*, which are called the uptakes—thus *o o* are the gas uptakes and *d d* are the air uptakes.

At the bottom of each uptake is a slag pocket, so called because it catches the slag or cinder drippings which come over from the furnace. These flues, the vertical parts of which are called "uptakes" and the horizontal parts "ports," lead from the regenerators to the hearth with the slag pockets acting as a sort of catch-basin between the regenerators and uptakes.

THE REGENERATORS

The regenerators are large chambers, variously called "regenerators," "chambers," or "checkers" by the furnace men. They are shown in plan in Fig. 1, *B B'* and *C C'*. *B* and *B'* are gas chambers, *C* and *C'* are air chambers. They are placed below the level of the furnace and hearth and back of it, or between it and the stack and under the charging floor, as shown in the cross-section elevation, Fig. 2. Each chamber is 21 ft. long and 15 ft. high. The two gas chambers *B* and *B'* are 7 ft. wide. The two air chambers, *C* and *C'* are 10 ft. 9 in. wide. This makes the capacity of the air chambers practically one and one-half times that of the gas chambers. Each chamber is filled with fire brick piled so that spaces and bricks alternate.

The valves are shown at *F* and *F'* of Fig. 1. *F* is the valve for the gas chamber, *F'*, the air chamber valve. They are for the purpose of directing the currents of gas and air into the furnace or the spent gases to the stack. While one set of air and gas valves is directing the current into the furnace, the other set is directing it out to the stack. But the current may and does go through the furnace in either direction.

PRINCIPLE OF THE REGENERATIVE PROCESS

The gas from the producers and the air are admitted by the valves *F F'* to flues leading to the bottom of the regenerative chambers *B C*, shown at the lower part of Fig. 1. The air and gas spread and circulate all through the slag pockets and uptakes into the ports *o o* and *d d*.

The gas enters the hearth through two ports, but the air, after leaving the uptakes, sweeps down from the top from one broad port so as entirely to surround the gas. The gas and air unite at the mouth of the ports. The gas burns in two long flames reaching nearly the length of the hearth to the opposite ports. The heat produced is absorbed partly by the charge in the hearth, but a large part of it passes out through the air and gas ports on the opposite side.

This current of hot gases passes through the ports and down the uptakes through the slag pockets and into the checker brick work of the chambers at that end of the furnace, the checker work absorbing and retaining much of the heat. The current of gases passes to the bottom of the chamber, by which time it has given up most of its heat, and then goes to the valves, which are directing the current out by way of the stack.

In a short time the checker work becomes thoroughly heated, whereupon the valves are changed, and the current is reversed in direction. The air and gas now enter first through the valves to the bottom of the preheated chambers. As they rise through the checker work they absorb much of the heat and pass on through the

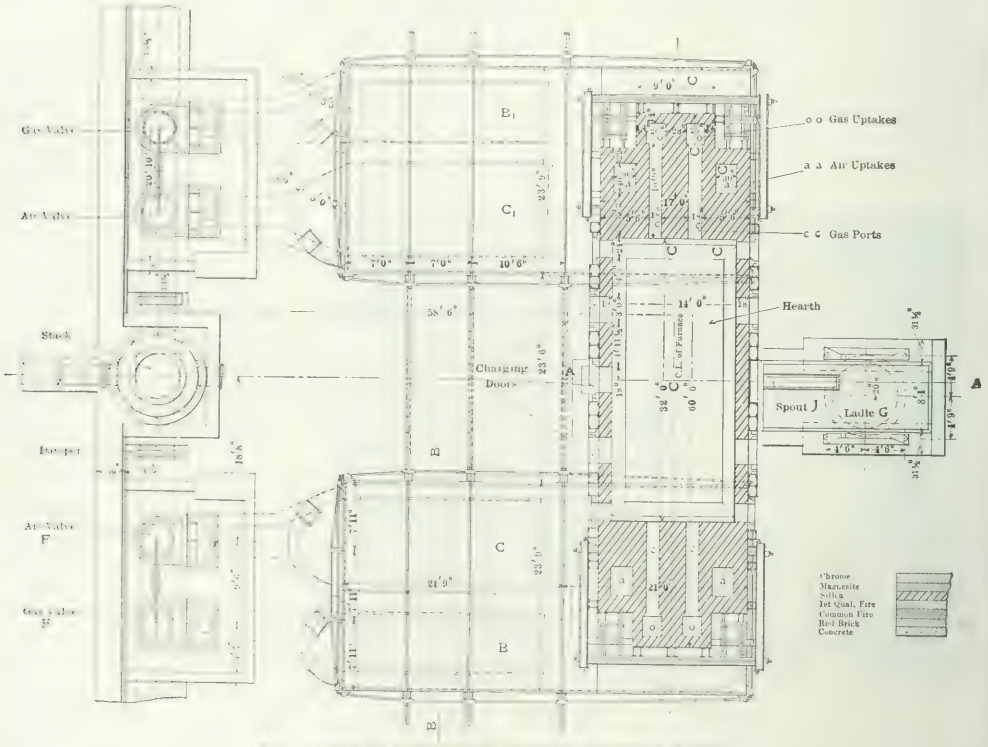


FIG. 1. PLAN OF OPEN-HEARTH FURNACE, MINNEQUA WORKS

uptakes and ports into the furnace and burn as before, except that this time the flame is directed in the opposite direction. On their way to the stack they heat the chamber first mentioned.

In this way a constant see-saw or reversing of the direction of the gases is maintained. The reverses under ordinary conditions are made every fifteen minutes. The regenerative chambers act as a reservoir for the storage of the heat of combustion which would otherwise pass off through the stack. In a sense the heat, stored in the checkers, is carried back into the furnace at each reverse.

HIGH TEMPERATURES

The preheated gas and air from the checker work give a more nearly perfect combustion than could be secured by burning cold gases, and this added temperature is an indirect result of the system. With proper conditions so great is the heat that the attention must be directed not so much to keeping up the temperature as to keeping it under control so that it does not melt or "burn" the brick work of the furnace.

The glare of the furnace, through the open door, is so dazzling that nothing can be distinguished by the naked and untrained eye. The skilled furnaceman uses dark blue glasses, and constant practice enables him to judge with great precision the degree of heat that the brick work will stand. The open-hearth furnace is not a contributor to the smoke nuisance. This is due to the perfect combustion obtained by the regenerative process. Except for a short time during charging, when the cold material lowers the temperature of the gas flame and consequently renders combustion less complete, no black smoke is ever seen at the top of the stack.

Although the furnace is built of brick, it is held in place or supported by a framework of channels, beams, rods, etc., for which the shop name is the "binding." On the charging side of the furnace are three large doors and two smaller ones. Through the larger doors the material is charged. These, together with the two smaller doors, are also used after each heat for repairing the "scorification" or wearing away of the hearth. There are four doors at the tapping side of the furnace, shown in Figs. 1, 2 and 3.

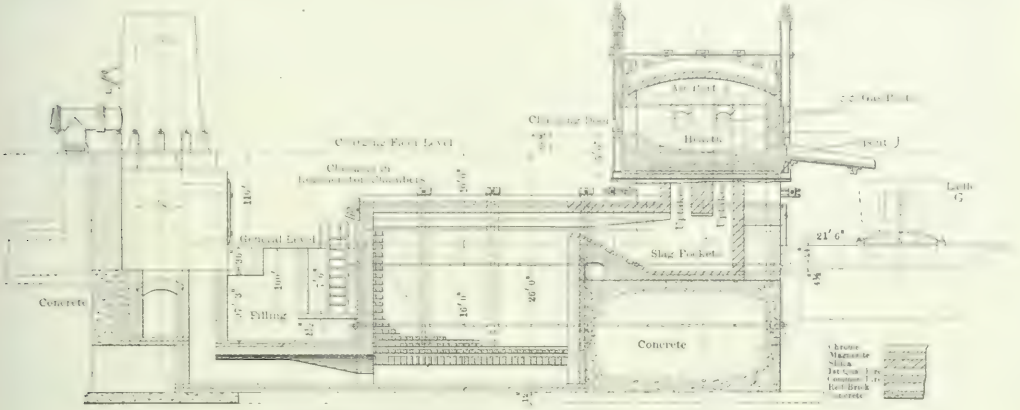
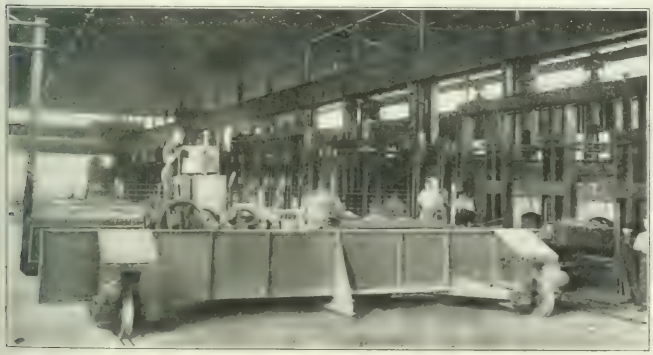


FIG. 2 LONGITUDINAL SECTION OF OPEN-HEARTH FURNACE

THE CHARGE

The charge of the furnace consists of pig iron—either cold or molten—and scrap steel or iron together with limestone and sometimes iron ore. The amount of pig iron varies from 35 to 75 per cent., according to conditions. It is usually 50 to 75 per cent. for basic furnaces. The cold pig iron and scrap iron and scrap steel are loaded in pressed-steel boxes 6 ft. long, 27 in. wide and 2 ft. deep. The loaded boxes are thrust through the doors of the furnace by the charging machine and by rotating the arm supporting the box dumped in a large pile on the hearth where the charge slowly becomes a molten mass. The mass assumes a level and boils like water, the slag or cinder formed floating on the top of the heavier molten metal. This "boil" facilitates the removal of the impurities, the carbon being the last to leave the metal. When the carbon is nearly gone the steel must be "tapped" into the ladle, for otherwise the iron also would combine with oxygen, practically returning to its original state of iron oxide. If any trace of oxygen is left in the molten metal the addition of ferromanganese during the pouring removes it.

The period between charging and tapping varies largely with different mills and practice. About two charges or heats each 24 hours may be taken as an average.



MECHANICAL CHARGING OF COLD MATERIAL INTO OPEN-HEARTH FURNACE

ACID AND BASIC STEEL

There are two kinds of soft steel in commerce, basic steel and acid steel. There is also a basic as well as the acid bessemer converter.

The hearth of a basic open-hearth furnace is made up or lined with magnesia—in the form of magnesite brick and dolomite. When the raw material for making steel is placed in a basic furnace, lime in the form of limestone, also a base, is charged with it. When the metal melts,

the limestone melts also, and forms a slag or cinder, which floats on the surface. The two bases, the magnesia of the hearth, and the lime of the charge, do not attack each other, but if any acid is in the charge it will immediately combine with the lime, the more active base.

Phosphorus and sulphur are very injurious in steel. Fortunately, all the more deleterious elements have a greater attraction for oxygen than has iron. Phosphorus and sulphur uniting with oxygen form well known acids during the "boil." These are instantly attracted by the base, lime, and enter the slag. Thus, in the open-hearth process the phosphorus and sulphur are removed permanently from the steel.

duced in the acid furnace. It is owing to the fact that some of the Colorado Fuel and Iron Company's largest new ore deposits run comparatively high in sulphur and phosphorus that the basic open-hearth process has lately assumed so much importance at the Minnequa works.

Considered from the standpoint of mere cost of refining, the acid furnace offers the cheaper process. It is partly because ores and other material (scrap, etc.) running low in phosphorous and sulphur are becoming more and more scarce that the basic process has of late assumed such prominence. Ten or fifteen years ago there was scarcely a basic open-hearth furnace in America.

are the regenerative chambers and the valves for operating them. On the right of the line of columns *D* is the "pit" or "tapping side," covered by three 75-ton cranes *F*. The ground level of this pit, or tapping side, is 10 ft. below the level of the charging floor on the other side of the column. It contains the ladles *G G*, into which the steel is delivered from the furnaces, also the ingot molds *H*, into which the steel is poured from the ladle *G*. Railroad and ingot car tracks run the entire length of the building.

CHARGING COLD METAL

At the left of the charging side is the stock yard into which all the cold pig iron, scrap iron and steel and limestone are

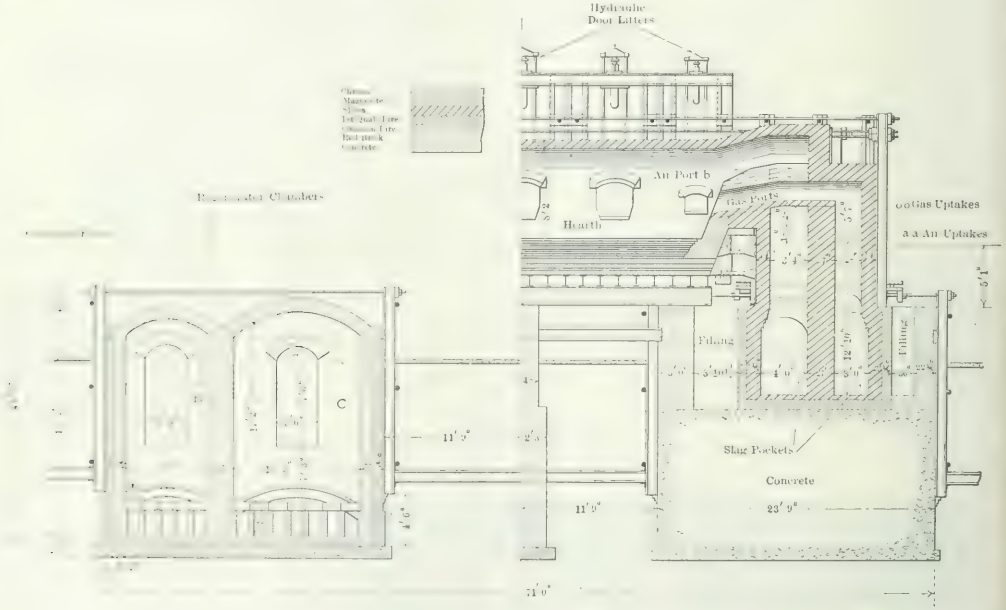


FIG. 3. TRANSVERSE SECTION OF HEARTH AND PORTS

THE ACID FURNACE

The hearth of an acid furnace is lined with pure sand, silica sand, which is an acid. If the base, lime, were charged in this furnace it would attack or combine with the acid, silica, forming a fusible slag and thus cutting or wearing away the hearth very quickly. In the acid furnace there can be no basic slag. The phosphorus and sulphur may take oxygen and thus go to form acids just the same as in the basic furnace, but there can be no base to receive them. All of the phosphorus and most of the sulphur again give up the oxygen and remain in the steel.

The virtue of the basic furnace is that it can use material containing higher percentages of phosphorus and sulphur and still make a purer product than that pro-

MOVEMENT OF MATERIAL THROUGH PLANT

The new main building, exclusive of the stock yard, is 131 ft. wide, including the stack line, and 1005 ft. long. It has three gables or roof-trusses. There is also a line of columns nearly in the center. This line divides the building lengthwise into two parts. The left side of the columns at *D*, Fig. 4, contains the charging machine *B*, the buggies and boxes *A*, and the furnace *K*. This, the charging side, is covered by two 40-ton cranes, shown at *E*, which carry the ladles of molten iron from the hot-metal storage reservoir to the charging doors of the furnace.

From the charging floor all the work of filling the furnace and manipulating its contents after it has been charged is performed. Under this charging floor

brought in open railroad cars. The stock-yard has a framework of columns and girders extending the entire length of the open-hearth building, and supporting the three 5-ton cranes. Each of these three overhead electric traveling cranes covers the entire yard. Lengthwise through the yard and parallel to the main building are three standard-gage tracks and three narrow-gage tracks. These tracks are separated by a retaining wall, the standard gage being on a lower level. The top of a railroad car is on a level with the top of the boxes on the narrow-gage cars or buggies.

The buggies carry three charging boxes. At one end each box has a slot into which fits the flaring end of the ram of the charging machine. A buggy with a box resting upon it is shown in sectional view

in the main building at *A*. The boxes are lifted from the buggies by a 5-ton crane and placed in the railroad cars.

Laborers in the standard-gage cars load the boxes which are then returned by the crane to their respective buggies. The buggies are then run to the scales, are there weighed and then switched to the track directly in front of the furnaces.

The charging machine *B*, Fig. 4, is worked by electric motors and runs along the entire length of the charging floor. It has a carriage which runs at right angles to the floor travel. The carriage carries a revolving ram. The whole machine moves in front of a buggy, the ram picks up the box from the buggy, runs it into the furnace, revolves, dumps the contents, brings the box out again from the furnace and replaces it on the buggy.

CHARGING HOT METAL

Hot metal, before the erection of the hot-metal storage reservoir at Minnequa, was charged by running the metal, contained in blast-furnace ladles and mounted on cars, directly into the open-hearth building, where they were handled by the 40-ton cranes and poured directly into the furnaces. Now the metal is poured from the blast-furnace ladles into the 300-ton storage reservoir, where it is kept in a molten state by oil burners. As needed it is drawn off into ladles, which in turn are hoisted by a crane to a point immediately in front of the furnace. The contents are then poured slowly into the furnace by means of a spout, which is temporarily thrust through the charging door by means of the charging machine. This facilitates the melting of the cold charge to a considerable degree. Usually the limestone, ore and scrap are charged in the furnace and heated for a short period before the molten iron is added.

DISPOSAL OF THE HEATS

When the charge has been melted and refined to the proper point, the tapping hole is picked open and the steel runs out through the spout *J* into the ladle *G* (Fig. 4). The large crane *F* then picks up the ladle, as at *G*, and moves it over to a point above the top of the mold *H*.

The ladles are large vessels of steel and cast iron lined with fire-brick. Each ladle has a two-inch hole in the bottom for pouring. A steel rod covered with fire clay covers the nozzle and extends up through and out of the ladle in a crook over the side to a lever by which a man on the pouring platform raises or lowers, as desired.

The molds are long shells of cast iron 18x20 in. in sectional area, and 6 ft. deep. Each rests upon a block of cast iron, which is a part of the ingot car. The molds are slightly larger at the bottom than at the top. This gives a slight taper to the ingot, which facilitates removing.

After the molds are filled they are hauled by a pony engine to the stripper building. The stripper, or stripping machine, is a device for lifting the molds from the steel ingots. It consists essentially of a pair of powerful jaws—by which the sides of the ingot mold are gripped—with a powerful ram between. The jaws grip the sides of the mold and lift it from the base on the car. At the same time the ram presses down, forcing the mold from the ingot.

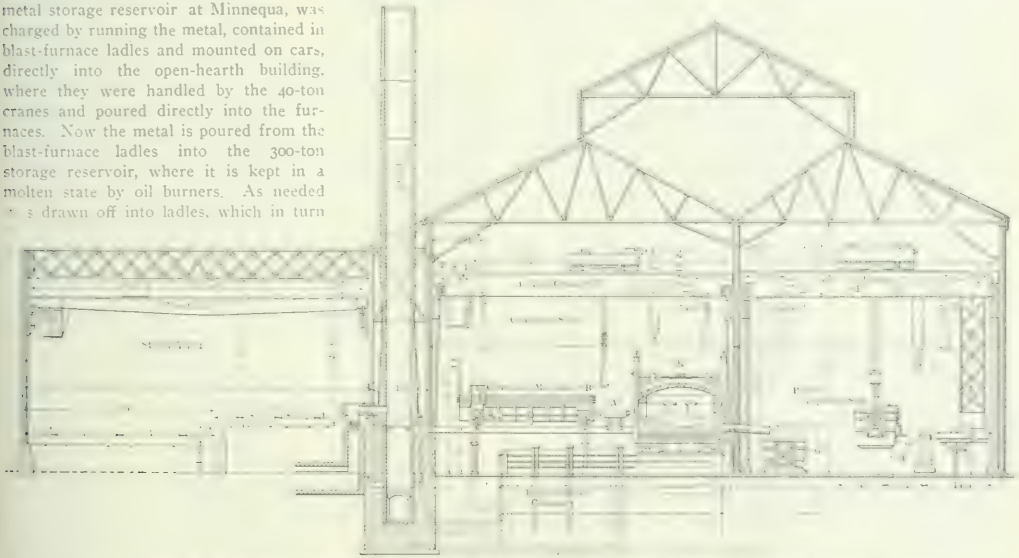


FIG. 4. ELEVATION AND CROSS SECTION OF OPEN HEARTH BUILDING, MINNEQUA WORKS, PUEBLO.

The ingots are taken to the soaking pits of the 40-inch blooming mill or of the rail mill, where they are kept hot until they are taken out and rolled into billets or rails.

Steel castings are also made at the open-hearth plant. There are iron cupolas but no steel furnace at the foundry of the Minnequa works. Accordingly narrow-gage cars carrying the molds for the castings are run to the pouring floor, or pit, of the open-hearth plant, where the pouring is done while the molds are still on the cars.

When the six furnaces now under construction and the other improvements and additions in this department are completed, it is expected that the open-hearth steel department at the Minnequa works will have a capacity of at least 1500 tons per 24 hours.

The Nourse Mines, Limited

The report of the Nourse Mines, Limited, for the year ended July 31, 1906 shows that the ore development of the year amounted to 381,050 tons of an average assay value of 7.68 dwt. The crushing duty of each of the 145 stamps employed was 5.284 tons per 24 hours. The value per ton of ore was 9.25 fine dwt., and the yield per ton was 5.335 dwt. The cyanide works treated sand, slime and concentrate amounting to 258,852 tons for a return of 3.458 dwt. per ton. The theoretical extraction was 82.28 per cent., and the actual extraction 86.9 per cent. The total working costs were £1 5s. 5d. per ton, comprising 18s. 2d. for mining, 5s. 3d. for development, and 1s. 11d. for office expenses. Milling and cyaniding cost 5s. 4d. per ton.

The two tube mills erected during the year proved an unqualified success. One of them increased the duty per stamp from 4.9 tons to 6.25 tons, while the residues from the cyanide plant were decreased in value from 0.99 dwt. to 0.5 dwt. gold per ton.

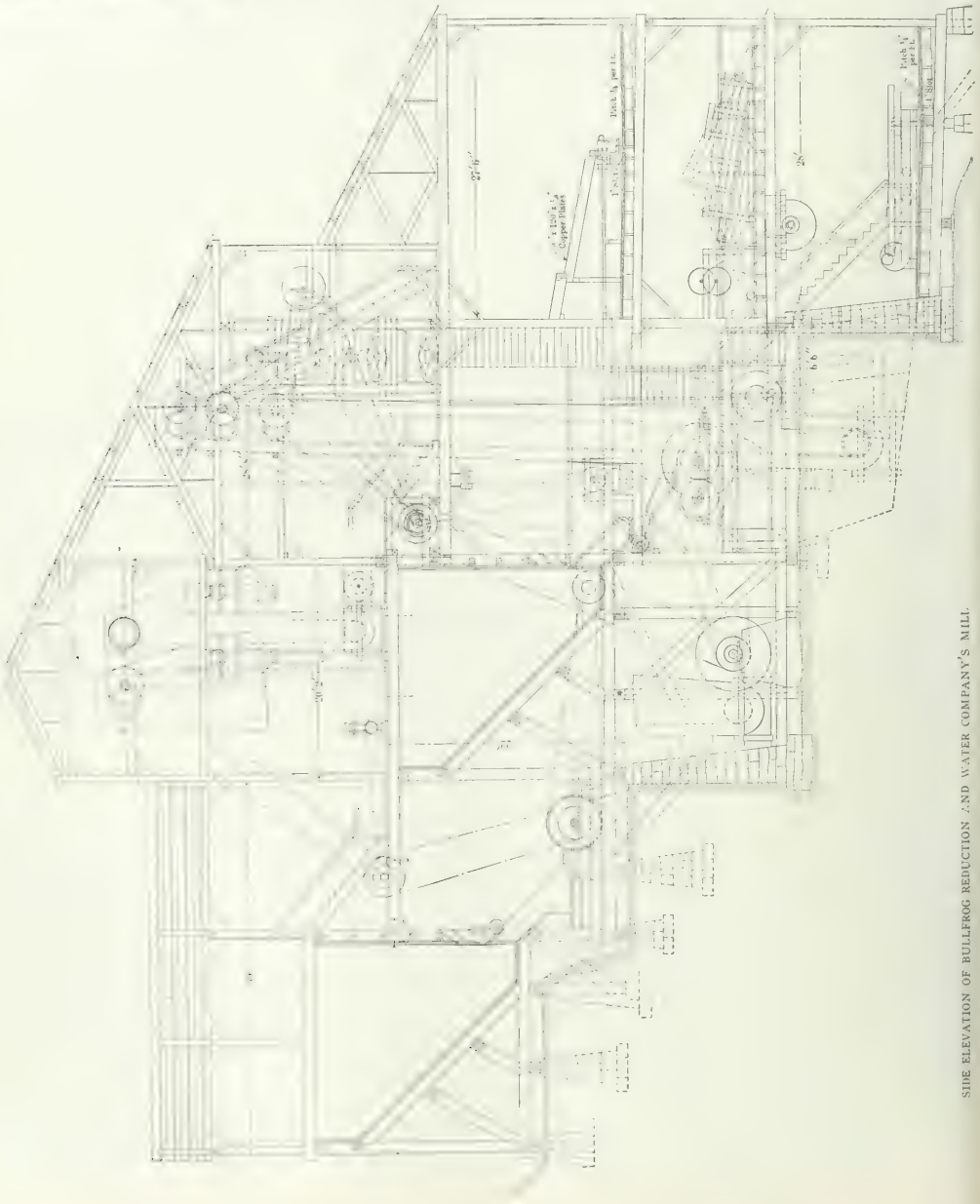
The shipments of phosphate rock from the Gafsa field, Tunis, in 1906, amounted to 593,276 metric tons. The total production of Tunis is estimated at 800,000 metric tons.

The Bullfrog Cyanide Mill

BY ENOS R. AYRES *

In the new mill which is being erected by the Bullfrog Water and Reduction Company, at Bullfrog, Nev., the ore goes [illegible] crusher, the product of which is elevated to a Vezin sampler, reject dropping to mill bin, sample elevated again to No. 2 sampler, reject dropping to mill bin and sample to sample bin, from which it is drawn to a sample crusher. From there it is dropped down to coning floor, quartered and run through sample grinder. From mill bin the ore is fed into No. 1 rolls, 42. in. diameter by 14 in. face, heavy-duty type, product being elevated to trommel provided with punched steel plate of coarse mesh; under-size to single-unit dry screen, provided with 8-mesh scalping cloth and 16-mesh primary cloth; under-size to amalgam plates; over-size to No. 2 rolls, 42 in. diameter by 14 in. face, standard type. Product from No. 2 rolls is elevated and distributed to two 8-mesh, dry, centripact screens; over-size dropping to

* [illegible] 114 Liberty Street, New York.



SIDE ELEVATION OF BULLFROG REDUCTION AND WATER COMPANY'S MILL.

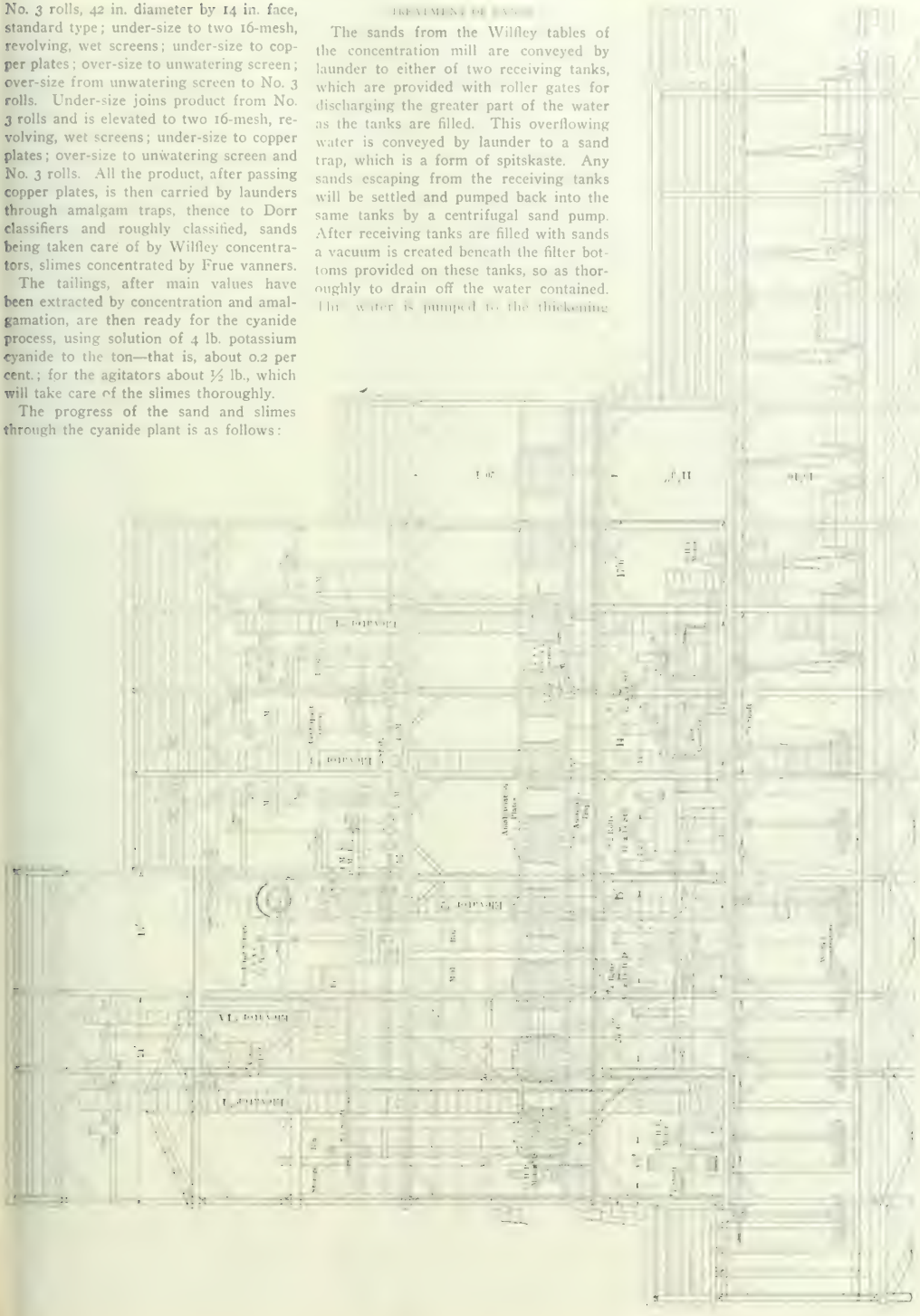
No. 3 rolls, 42 in. diameter by 14 in. face, standard type; under-size to two 16-mesh, revolving, wet screens; under-size to copper plates; over-size to unwatering screen; over-size from unwatering screen to No. 3 rolls. Under-size joins product from No. 3 rolls and is elevated to two 16-mesh, revolving, wet screens; under-size to copper plates; over-size to unwatering screen and No. 3 rolls. All the product, after passing copper plates, is then carried by launders through amalgam traps, thence to Dorr classifiers and roughly classified, sands being taken care of by Wilfley concentrators, slimes concentrated by Frue vanners.

The tailings, after main values have been extracted by concentration and amalgamation, are then ready for the cyanide process, using solution of 4 lb. potassium cyanide to the ton—that is, about 0.2 per cent.; for the agitators about ½ lb., which will take care of the slimes thoroughly.

The progress of the sand and slimes through the cyanide plant is as follows:

TREATMENT OF SANDS

The sands from the Wilfley tables of the concentration mill are conveyed by launder to either of two receiving tanks, which are provided with roller gates for discharging the greater part of the water as the tanks are filled. This overflowing water is conveyed by launder to a sand trap, which is a form of spitskaste. Any sands escaping from the receiving tanks will be settled and pumped back into the same tanks by a centrifugal sand pump. After receiving tanks are filled with sands a vacuum is created beneath the filter bottoms provided on these tanks, so as thoroughly to drain off the water contained. The water is pumped to the thickening



FRONT ELEVATION OF BELLE FOURCHE REDUCTION AND WATER COMPANY'S MILL

After sands in receiving tanks have thus been drained, they are excavated by the Blaisdell excavating machine and carried by a belt conveyer running beneath these tanks to a cross conveyer, delivering the sands to another conveyer running past the leaching tanks, which are on a line with the receiving tanks. From this conveyer the sands are discharged by an automatic tripper to the Blaisdell distributing machine, with which the excavator is equipped; this permits any one of the five leaching tanks to be filled with the sand from the receiving tanks. These five leaching tanks are of the same size as the receiving tanks, 36 ft. diameter by 6½ ft. deep. The sand in these leaching tanks is then treated with the cyanide solution and the gold solution filtered off and conveyed by pipes to two tanks. The filters on the bottom of the leaching tanks are also provided with a vacuum pump for thoroughly draining the solution after washing. The gold solution is then run through zinc boxes and thence to the sump tanks and returned to the solution re-standardizing tanks, two of which are provided, 20 ft. diameter by 10 ft. deep. The extracted sands, after having been dried by the vacuum as far as possible, are excavated and discharged onto the same belt conveyer by which they came. From this they are taken by the same cross conveyer to the same conveyer, traversing the entire length of the tanks as before, and discharged onto the stacking conveyer and thence to the dump.

TREATMENT OF SLIMES

The slimes from the vanners, together with the overflow from the receiving tanks, which contains some slime, is allowed to pass through the sand trap before mentioned, to settle any sands which may be contained. The overflow from this trap is then pumped by a 4-in. centrifugal sand pump into one of two thickening cones, these being 20 ft. diameter by 18 ft. high, with cone bottoms; they are provided with launders around the top, into which will flow the clear water, this water being returned by a triplex pump to the main water-storage tanks. The slime from the apex of these cones is drawn off as thick as desired by an upwardly extending, adjustable connection, and re-conveyed by a launder to any one of four slime tanks, 28 ft. diameter by 16 ft. deep, in which tanks the slime is treated with cyanide solution and agitated by a four-arm revolving agitator of the Blaisdell type. The slime, after treatment with cyanide, is settled and decanted, the decanted solution running into an intermediate tank, 30 ft. diameter by 8 ft. deep, where it is further allowed to settle, and then decanted and run through the zinc boxes. The slime from the four slime-agitating tanks is pumped by a 6-in. centrifugal pump into the Butters filter. After filtering and washing in this, the gold solution is taken to a sump tank and thence to zinc boxes. A separate sump tank is provided for receiving the solution from these zinc boxes, from which it is pumped into any one of the slime-agitating tanks requiring it. The cake from the Butters filter is washed and finally sluiced out to the dump. A clean-up room is provided for the gold precipitate, fitted with lead-lined acid tank, sand filter, receiving tank and sump tank, and a modern double-muffle furnace, with a double melting furnace annexed.

The plant was designed by the Traylor Engineering Company, New York.

The Geological Survey of Canada

SPECIAL CORRESPONDENCE

Owing to the growth of the mining industry of Canada in recent years, unusual interest attaches to the "Summary Report" of the Geological Survey for 1906, a volume of 206 pages, which has just been published. It deals with the latest results of mineralogical research by the officials of the Survey, and records some important advances in the information available as to the mineral resources of Canada. In the introductory pages Director A. P. Low calls attention to the need of more liberal appropriations for the work of the Survey, pointing out that while the value of the mineral production of Canada has risen from $10,221,000 in 1886, to $68,574,000 in 1905, the sums devoted by the Dominion government in aid of the mining and allied industries have only increased in the same period from $115,053 to $173,555. In the meantime there has been an enormous expansion of the area of settlement and industrial development, and the extension of mineral discoveries is increasing at such a rate that with the limited force at disposal it is only with the greatest difficulty that an intelligent track can be kept of them. A brief general summary of the mining industry in 1906 is presented, noting the increased activity prevalent in most of its branches, followed by reports of the work of the 24 field parties sent out during the year. This was mainly confined to economic subjects, being carried on either in mining districts developed or under development, or in districts along proposed routes of new railways. No parties were sent into the far north, or regions difficult of access, the chief idea being that exploratory work should advance from the known into the unknown. A few of the more important results of these investigations may be briefly noted.

The party in charge of R. G. McConnell was engaged in measuring the volume and estimating the values of the high-grade gravels in the Klondike district, the results of which will be published later. They report that dredging where the gravels are thawed presents few difficulties, the gravels being uniform in size and including few boulders. Hydraulic miners have had to depend so far on a small intermittent supply of local gravity water, or on water pumped up from the creeks, and consequently no large plants are in operation. The Yukon Consolidated Company has undertaken the construction of a ditch and pipe-line to bring water from a point on Twelvemile river to its camp. The line is 58 miles in length, with a capacity of over 5000 miners' inches. With 25 miles or more of proved dredging ground in the valley flats and tens of millions of cubic yards of low-grade, but still workable, gravels, on the benches, profitable mining is assured on the Klondike creeks for many years.

Explorations were carried on in a portion of the Yukon south of Whitehorse by D. D. Cairnes. Here a variety of valuable economic mineral deposits have been found, and quartz mining is progressing rapidly. Considerable work is being done on the Windy Arm silver and gold properties with good results. Quartz carrying free gold and telluride minerals was found between the Watson and Wheaton rivers. The first claim, the Gold Reef, was staked June 25 on Gold hill, 15 to 20 miles southwest from Robinson siding, and within 90 days over 700 claims had been located. In addition to occasional assays running as high as $300 or over, a number of fairly average assays—from $20 to $60—were obtained in this section, but with the exception of a small amount of work done on the Gold Reef, no attempt has been made to prove to what extent the veins are mineralized, or what values they really carry. Taking into consideration the large quantity of mineralized quartz in this part of the country, and the small amount of prospecting done, the results appear encouraging, as there are certainly some rich ores in this section. Seams of anthracite coal are located in an area known as the Whitehorse Coal and outcrop 12 or 14 miles in a southwest direction from Dugdale siding. The general strike of the measures, which are quite regular, and were traced for over 12 miles, is about north 74 deg. west. The seams measured were 9 ft. 8 in., 10 ft. 4 in., and 2 ft. 6 in., respectively. The samples run high in ash, but they were from the surface and with depth the ash will be considerably less. At Tantalus mine, on the west side of Lewes river, about 190 miles down the river from Whitehorse, the coal outcrops on the banks. Most of the river steamers burn this coal, of which about 7000 tons were loaded last season. Three workable seams are opened up, the coal being worked by the stall-and-pillar system from two tunnels. The measures are regular, and can be traced for over 20 miles down Nordenskiold river to the south, and over 10 miles to the north, showing that there is an enormous amount of coal in this district. Only coal near the river is at present of economic value. Samples show the coal to be bituminous, yielding an average of about 75 per cent. of firm coherent

coke. At Tantalus butte, across the river from the Tantalus mine, the same measures again outcrop. A considerable amount has been shipped from Five Fingers mine, about 8 miles north of the Tantalus. Just to the north of the Windy Arm and Watson and Wheaton river properties are the rich and extensive copper properties west of Whitehorse. The Pueblo, in particular, after the season's development, presents an enormous surface showing of copper ores. A Whitehorse smelter is a probability in the near future.

The work of mapping the Rocky mountain coal districts was continued by D. B. Dowling, whose efforts resulted in the discovery of a large coalfield, extending northward from the Saskatchewan to past the Brazean river. The beginning of this field, south of the Saskatchewan, occupies but a small triangle opposite Bighorn range. The top beds only are exposed, but a few coal seams were found. Across, on the north side of the Saskatchewan, the whole set of measures is raised much higher, and all the formation can be got at either on the western slopes of the range or in the gorge of Bighorn creek, a tributary from the west behind Bighorn range. The tops of the measures are exposed at the falls, and many seams can be seen in this cañon. A 16-ft. seam was found, samples from the first exposure of which showed moisture 2.50; volatile combustible matter 27.10; fixed carbon, 64.00; ash, 6.40. This gives a ratio of volatile to fixed carbon of 2.36, placing it at about the grade of Blaremore and Frank coal.

A. E. Barlow was engaged in tracing eastward into Quebec province the formations containing the silver-cobalt-nickel ores now being mined in the Cobalt area. The area examined was confined to the region lying immediately east of Lake Timiskaming, including the townships of Guigues, Baby, Duhamel, Laverlochere and Fabre, and some unsurveyed territory to the east of those municipalities. This area was found to be geologically practically identical with the country on the Ontario side. On the Quebec side, however, large tracts were found to be overlaid by the quartzite and conglomerate of the Upper Huronian; or clay drift often continuous for miles with comparatively small outcrops of the underlying rocks. No mineral discoveries of significance were made.

An investigation of the oil and gas fields of Alberta and southern British Columbia by T. Denis disclosed the fact that the work prosecuted by numerous companies, in the hope of finding oil in paying quantities, had not been attended with results commensurate with the outlay. Nevertheless operations were being steadily carried forward under the stimulus of encouraging indications.

Sections of the route of the Transcontinental Railway, between Lake Nipigon and Lac Seul, and from Lake Abitibi eastward, were explored by W. H. Collins and W. J. Wilson, respectively. The western portion of the first named section was reported as auriferous and iron bearing and worth the attention of prospectors. Mr. Wilson found molybdenite on an island in Seals Home lake and copper pyrites on the Harricanaw river.

The delimitation of the coal area in the Telkwa valley, British Columbia, undertaken by W. W. Leach, was found attended with much difficulty owing to the amount of faulting and folding in the coal measures.

Charles Camsell, who was engaged in survey work in the Similkameen district, in British Columbia, notes especially the large areas of low-grade ores abounding in this region, which may shortly be mined to advantage.

R. W. Brock, who during the season completed his examination of the mines in the Rossland district, in British Columbia, reports that while exact figures of production cannot be obtained, as nearly as can be computed Rossland has produced up to Jan. 1, 1906, a total of 2,247,295 tons of ore, containing 1,240,331 oz. gold, 1,723,249 oz. silver, and 60,753,330 lb. copper, valued at $34,879,239. The year's production will be seriously affected by the slackening of shipments from the Centre Star, while alterations were in progress, and by the shortage of coke at the smelters, occasioned by the strike of coal miners at Fernie.

Hoisting in Small Zinc Mines in Wisconsin

BY GEO. S. BROOKS*

The operator, in considering the equipment of comparatively small zinc properties, finds no little difference of opinion as regards the proper system to be employed for the transportation of ore from the working faces to the mill hopper. To one who has had an opportunity of closely observing the restrictions placed upon this choice, there appear to be two governing factors which should largely control the adoption of either the cage or the tub. The first, and perhaps more important in the judgment of the average manager, is that of a minimum initial investment in mine equipment; the second, and of by far more intrinsic weight, is the general character of the formation to be attacked.

It must be at once apparent to those who are at all familiar with mining of this class that a separation of the hoisting and tramming systems is nearly impossible, and that their close relation to one another renders the consideration of either individually unwise.

PREVAILING CONDITIONS

As the Wisconsin deposits are gradually becoming better known, their general characteristics are influencing the methods of breaking the ground. Intelligent churn-drill exploration enables the operator to plan a systematic opening up of his ore-body, and it is upon this general system to be followed that the transportation facilities are in no small measure dependent. For example, in properties where the blende is known to lie in the familiar flats of considerable area, it is doubtful if any carrier will be found superior to the ordinary tub, and its accompanying platform truck. For a reasonable length of tramming, this system lends itself readily to the working of wide stoping faces, where there is ample room for sorting and shoveling the broken ore.

On the other hand, where the greater portion of the deposit is expected to be found upon steeply inclined pitches, with only minor "terrace" flats, economy can only be secured from handling the ore at the base of the pitch. It is at once obvious that, where the foot and hanging walls impose such limitations upon the width of the haulage way, it would be impossible to load the ore into many small carriers without congestion. It is, at the same time, true that, in order to accomplish anything like the requisite tonnage, the capacity of each tramming unit must be increased. These conditions are admirably met by the car.

With these pitch stopes, the ore is sorted and shoveled into light, portable, pocket chutes, which are set up temporarily near the face, roughly parallel to the dip of the orebody. These extend down to nearly the track level, and under them the cars are run and filled.

MERITS OF CAGE-CAR AND TUB SYSTEMS

My connection with two mines, one of the flat and one of the pitch type, has enabled me to make some detailed observations as to the relative merits of the cage-car and tub systems, and I am firmly convinced that each has a domain of utility. Naturally the cost of shoveling and tramming on the pitch stopes was a few cents in excess of that of the same service on the flats. Unfortunately, the item of shoveling and tramming is not yet subdivided and, as a result, the ratio of the two tramming costs is not known.

One point which has been emphasized by experience is that the car system responds more readily to a temporary forcing than is possible with the tub. This clearly arises from the fact that the hoisting units of the cage are nearly double those of the tub, and, with the frequent contingencies arising from delays or break-downs below, it is a common occurrence for the mill hopper, which is seldom of more than 75 tons' capacity, to become empty. To prevent a shut-down in the mill, it is necessary to crowd the hoisting capacity to its limit for a short time, and at these periods the cage and car appear to excellent advantage.

It often occurs that the working faces are from 500 to 1000 ft. from the shaft, so

*Mining engineer, Platteville, Wis.

that the time consumed in the trip to and from the shaft is 4 or 5 min. With these conditions, tramming costs with tub carriers are about double those of the car system. This would indicate that, were the operator assured of any such length of tramming, the cage and car should be adopted regardless of the form of the deposit. There are at present hardly any mines which are hoisting from more than one shaft, so that, as soon as the exploration and development work has established the extent of the orebody and the position of the shaft is definitely located, the possibilities of any such long hauls below can be predicted.

Aside from the hoisting of ore, there can be small doubt that the cage offers many advantages in the handling of men, machinery and supplies, over the tub.

COMPARISON OF COSTS

The weight of a cubic foot of mine-run in Wisconsin varies enough to render any constant figure decidedly unreliable. The proper basis for computation should, therefore, be on volume. Naturally, the weight per cu.ft. is dependent upon the percentage of mineral, as well as upon the percentage of powder used in breaking the ore. I have found in my experience that the range in a dirt which has very nearly the same mineral content may be between 92 and 108 pounds per cu.ft. In this case, the variation was entirely due to the change in percentage of dynamite from 30 to 40 per cent.

The ordinary tubs have a nominal capacity of from 600 to 1000 lb., the latter being the more common. These are 28 in. in diameter by 30 in. deep, and therefore have a capacity of 10.7 cu.ft. The cars are built with a rather narrow gage, and have a capacity of 18.5 cu.ft.

Below is given the hoisting investment at mines *A* and *B*, *A* being equipped with cars and a cage, while *B* has the customary 1000-lb. tubs of this district.

EQUIPMENT, MINE *A*

[illegible]	$400.00
[illegible]	50.00
[illegible]	700.00
[illegible]	125.00
[illegible]	60.00
Total	$1335.00

[illegible] MINE *A*

Interest on $1335, 6 per cent.	$80.10
Depreciation on $1335, 18 per cent.	240.30
Total for 300 working days	$320.40

EQUIPMENT, MINE *B*

[illegible]	$480.00
[illegible]	470.00
[illegible]	110.00
Total	$1060.00

INTEREST AND DEPRECIATION, MINE *B*

Interest on $1060, 6 per cent.	$63.60
Depreciation on $1060, 18 per cent.	190.80
Total for 300 working days	$254.40

At *A* the hoist is set up on the ground about 40 ft. back from the shaft, and the engine is of the horizontal type. At *B* the upright 7x7-in. engine is stationed near the derrick top about 10 ft. below the sheave, and located so that the engineer may handle the throttle with one hand, while with the other he can attend to the dumping of the tubs.

OPERATING COSTS

The following operating costs are the result of monthly averages. In both cases, for the sake of comparison, the same charge is made per horse-power per hour, although in reality there was some 20 per cent. difference owing to the excessive line condensation at the *B* shaft. Neither schedule includes cost of administration. The approximate horse-power is computed from the following formula, to which an additional 0.25 h.p. is added for friction and inertia:

$$H.P. = \frac{\text{gross weight hoisted in lb.} \times \text{speed in feet per min.}}{33{,}000}$$

It is given as follows: *A*—Mine run, 1870 lb.; cage, 400 lb.; cable, 108 lb.; car, 300 lb.; total, 2678 lb.

The hoisting speed per minute is 360 ft. Then

$$H.P. = \frac{2678}{33{,}000} \times 360 + 0.25\ H.P. = 36\ H.P.$$

The same calculation applied to the case at mine *B* gives mine run, 980 lb.; tubs, 175 lb.; cable, 102 lb.; total, 1257 lb.; hoisting speed per minute, 295 ft.

$$H.P. = \frac{1257}{33{,}000} \times 295 + 0.25\ H.P. = 14\ H.P.$$

The actual hoisting performance per day of 9 hours at *A* is 120 tons, and at *B* 100 tons. With forcing, *A* has handled 600 cu.ft. per hour, while at *B* 450 cu.ft. is about the best that can be done.

HOISTING EXPENSE, 9-HOUR SHIFT

Mine *A*

One hoisting engineer	$2.50
One lander	2.25
36 h.p. for 5 hr. at 1c. per h.p. per hour	1.80
Interest and depreciation	1.06
Repairs	0.70
Total	$8.31
Ore hoisted	2590 cu.ft.
Cost per cu.ft.	0.0032
Cost per ton approximately	0.06

Mine *B*

One hoisting engineer	$2.50
14 h.p. for 5 hr. at 1c. per h.p. per hour	0.70
Interest and depreciation	0.85
Repairs	0.70
Total	$4.75
Ore hoisted	2140 cu.ft.
Cost per cu.ft.	0.0022
Cost per ton approximately	0.044

Both of these cost accounts show what is possible when a steady output is made for a month. The average hoisting expense, month in and month out, has been a few cents above this.

It appears from the comparative figures that the tub is considerably the better on hoisting alone, and until the workings become extended to such a distance from the shaft as to materially increase the tramming costs, it will show a smaller operating expense in working flats. The initial investments in reality show only a difference of $275, which amount deserves little consideration in the matter of a suitable hoisting and tramming equipment.

Production of Gas, Coke, Tar, and Ammonia

According to a supplementary report on the production of gas, coke, tar and ammonia at gas works and in retort coke ovens during 1905 by Edward W. Parker, of the U. S. Geological Survey, the total production of gas, coke, tar and ammonia in 1905 was as follows: 40,454,215,132 cu.ft. of gas (not including that lost or wasted), 5,751,378 short tons of coke, 80,022,043 gal. of tar, 46,986,268 gal. of ammonia liquor (equivalent to 22,455,857 lb. of anhydrous ammonia), and 38,663,682 lb. of ammonia sulphate; against 34,814,991,273 cu.ft. of gas, 4,716,049 short tons of coke, 69,498,085 gal. of tar, 52,220,484 gal. of ammonia liquor (equivalent to 19,750,032 lb. of anhydrous ammonia), and 28,225,210 lb. of ammonia sulphate in 1904. The total value of all these products in 1905 was $56,684,972, against $51,157,736 in 1904.

Returns from 477 oil and water-gas producing companies show that the total production of water gas in 1905 was 82,959,228,504 cu.ft. Of this quantity 5,547,203,913 cu.ft., or 6.7 per cent., were lost by leakage, etc., leavng 77,412,024,591 cu.ft. as the net production obtained and sold. As the quantity of gas made and sold at coal-gas and by-product coke-oven works was 40,454,215,132 cu. ft., it appears that the consumption of water gas and gas made from crude oil was nearly twice as much as that made from coal. It also appears that while the average price of coal gas in 1905 was 81.4c. per 1000 cu.ft., that of oil and water gas combined was a fraction of a cent in excess of $1 per 1000 cu.ft. Still further comparison shows that, whereas 66 per cent. of the production of coal gas was sold as illuminating gas, 77 per cent. of the combined production of oil and water gas was used for this purpose.

Lake Freight Rates

The yearly tabulation of freight rates on the lakes made by the Cleveland *Marine Review* gives the following rates on iron ore to lake ports, in cents per gross ton:

From:	1905. Wild	1905. Contract.	1906. Wild.	1906. Contract.
Escanaba	61.00	60.00	60.00	60.00
Marquette	70.00	70.00	70.00	70.00
Duluth	77.00	75.00	75.55	75.00

The correspondence between the wild and contract rates last season was rather close. Rates on coal were as follows, in cents per net ton, soft coal being from Ohio ports and anthracite from Buffalo:

To:	Anthracite. 1905.	Anthracite. 1906.	Bituminous. 1905.	Bituminous. 1906.
Milwaukee	44 58	45.38	46.53	46.05
Chicago	44.58	46.20	....	....
Escanaba	....	....	41 63	41.97
Duluth	33.05	35.19	33.80	34.85

The lower rates to Duluth are explained by the number of ore boats going up light, unless they are able to secure coal cargoes.

DIAMOND DRILLS

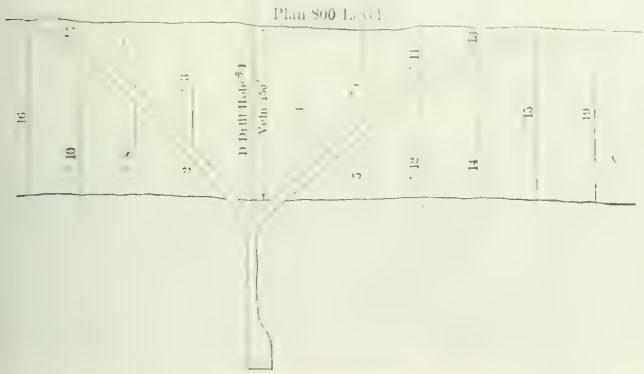
Their Utility for Underground Exploration

BY JAMES HUMES*

The writer has charge of a mine that is now 1200 ft. in depth, and there is only one working shaft on the property, equipped with a geared engine and a single-deck cage. Our time was limited, and we found it necessary recently to do all the prospecting possible in a short time. For this purpose we bought a small diamond drill, selecting a "Sullivan E" 400 ft. capacity.

The shaft is a vertical one and was started on the footwall of the vein, which might properly be called a zone between two fault fissures 150 ft. apart, and has a dip away from the shaft of about 77 deg. to the north, so that when the shaft reached the 1200-ft. level, it was a considerable distance from the vein.

The previous management had followed the old custom of opening a level at each 100 ft. in depth. In the work of opening up the first level the best ore was found on the hanging wall. After this a crosscut was run on each of the other levels directly to the hanging wall, thence turning the drifts along the wall right and left. In addition to the drifts each level had a number of crosscuts amounting in all to about 2000 ft.



PLAN OF WORKINGS SHOWING DIRECTION OF DRILL HOLES

THE PLAN ADOPTED

When the writer took charge of this property the 600 was the lowest level, and the owners were desirous of sinking much deeper, but they had been informed that they had not boiler or compressor capacity enough to go any deeper, which appeared to be the case. We knew that to sink and drift at the same time we would very likely congest our hoisting rig. In order to help out the boilers we made a simple water heater to utilize the many units of heat escaping with the exhaust steam. This solved the boiler problem and we were able to sink the shaft to the 1200-ft. level, and to run a drift also.

We opened a drift at the 800-ft. level and also at the 1200-ft. level. It was at the 800-ft. level where we found the diamond drill of special advantage. As soon as we had the station cut we started a hole for the hanging wall of the vein. This hole was drilled 260 ft.; the bottom was far enough in the country rock to assure us that we had passed through the vein, and that there was no ore on the hanging wall at that point. This work was executed in a very few days, and while the drill was at work there we had the miners doing some very needful repair work elsewhere. The advantage which we gained from the use of the drill in this one hole was that we obviated the necessity of running a long crosscut to the hanging wall, thus saving at least a month's time, and the fixed expenditures that keep pace with time, in this case about $1700.

We started our drifts right and left from the point where we had started the drill hole; these drifts were each advanced at an angle approximately 45 deg. to the strike; this angle located the drifts in an easy curve, and facilitated the handling of timbers, rails and pipe, but our main object was to push along the strike of the vein, and also to get to the hanging wall as soon as possible.

DISTRIBUTION OF THE HOLES

As soon as the miners advanced the drifts a safe distance, about 100 ft., we started the diamond drill, putting in crosscut holes every 50 ft. on the course of the vein. This drill work did not interfere with the drifting in the least. When putting in the air line for the use of the rock drills, we put in a tee every 70 ft. or so, and in this way the diamond-drill men could connect to the air line in a very short time, and it very seldom required the cutting away of rock to give room for the operation of the machine.

This particular machine is mounted on two columns, which are similar to rock-drill shaft bars, except that they are connected at the top and bottom by cross bars. On the top bar is a small worm-geared hand hoist for raising or lowering the machine, which is thus moved out of the line of the hole when putting the rods in or out. The rods are in 5-ft. lengths so that a distance of 6 ft. between walls will give ample room. The columns can be set up within 6 in. of the rails; the machine is then raised until there is room for the loaded mine car to pass under it, and if there is a space of 3 ft. in front of the columns, breast high, that is all that is required.

In the manner described we drilled about 4000 ft. of crosscut holes. Think what it would have cost to run as many feet as that in crosscuts, hoisting the broken rock, which in our case we could not have done. It certainly would have cost more than it did to operate this machine. The reader will notice that all holes were horizontal, and at right angles to the strike of the vein. Never allow anyone to persuade you to drill a prospecting hole with the dip or strike. There are few cases in which that would be excusable. Of these we may have something to say in the future.

DRILL OPERATORS AND RESULTS

There is another point that deserves particular stress, and that is, that whoever the person may be who has the supervision of diamond-drill operations, he must never allow the drill operators to think that the management has not the greatest interest in the results of their work. Examine the core each day, inquire as to which of the operators make the highest percentage of core. Your inquiries will reach the proper ears and will act as an incentive to do better. Do not allow the operator to use his discretion as to what kinds of rock he may core. Have him core everything, and insist upon it.

In many cases we found ore where we least expected it, and only by adhering to the system outlined could we get results.

I have in mind a remark made to me by the manager of one of the largest copper mines in the world when beginning work of this class: "Now, Jimmy," he said, "we are not looking for small things; we want to know where the large bodies of ore are." That remark would

*Mining engineer, Basin, Mont.

average ease-loving drill operator nil. I happened to know that if a crosscut were to be run on any one of those holes, and anything appeared that had not been reported, it would be to the everlasting discredit of that particular operator. But, of course, the ordinary tramp drill operator does not care for honor or credit. He cannot be expected to exercise care unless compelled to do so.

The Hurricane Valve for Piston-inlet Air Compressors

BY FRANK RICHARDS

The piston-inlet device for air compressors has been extensively and successfully used for half a generation, yet there are many engineers who are not familiar with its principle and mode of operation. Fig. 1 is a section of an air-compressor cylinder with piston inlet, one of the inlet valves being shown separately. The entire air supply is taken into the body of the piston through the inlet pipe and passes through an annular passage on each side into the two ends of the cylinder. The function of the piston-inlet valves is to alternately close and open the annular openings in the piston.

The piston is unusually wide or thick, thus distributing the weight over about double the usual cylinder area, securing better lubrication and reducing the friction. This thickness of the piston provides a chamber for the air sufficiently large to permit it to move with freedom. The cutting of the annular grooves in the faces of the piston separates the periphery from the inner portions, the piston being cast with six or more radial webs which connect the parts. The annular grooves are cast in the piston and are trued and finished in the lathe.

The body of the inlet valve rests in the annular groove with a full bearing surface and an easy, sliding fit, but with the outside cut away to leave a free passage for the air when the valve is opened. The valve has lips which overlap the annular groove both inside and outside and so close the passage. The outside of the valve body has thickened ribs or projections. In each of these is an elongated hole, through which passes a taper pin. The holes through which the taper pins pass in the valve are slightly larger than the pins and are elongated toward the interior of the piston to an additional length equal to the required lift or opening of the valve.

In Fig. 1 the piston is moving toward the left, the piston-inlet valve on the left side of the piston being in the closed position, while the valve on the right-hand side is open. Both valves retain their positions relative to the piston until the end of the stroke, when the valve on the right-hand side of the piston is carried forward by its own momentum, closing the annular passage.

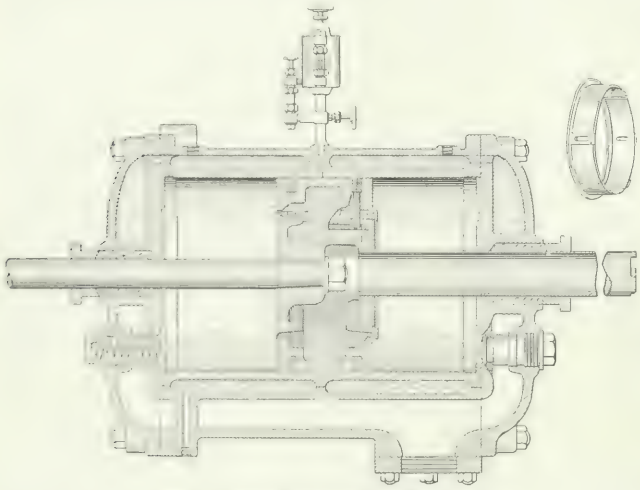


FIG. 1. AIR CYLINDER WITH PISTON INLET

The indicator card from a piston-inlet compressor gives the highest practical indorsement of this device. It shows the cylinder full of air at or slightly above atmospheric pressure at the very beginning of the compression stroke. The explanation is simple enough. The column of air in the piston-inlet pipe has a momentum of its own, and when its rapid inflow is suddenly stopped, the entire column behind acts for the moment as a rammer.

The face of the piston on each side is flat and the inner surface of each cylinder head also is flat. The head of the valve is merely a flat ring against the piston face, this ring overlapping each side of the annular opening in the piston, and a corresponding annular depression is turned in the cylinder head.

The details of the improvement embodied in the Hurricane valve are shown in Fig. 2. The essential change is in the valve itself. The annular openings in the face of the piston are carried close to the periphery, thus increasing the length and area. The passage is entirely unobstructed by the valve, and the valve allows the air to escape from the inner as well as the outer edge of the opening. The actual area of opening with piston-inlet valves of this type is from 10 to 12 per cent. of the piston area.

The valve is a thin annular plate of sufficient width to give a proper lap over the piston opening on both the inner and the outer edges, with a central stiffening and guiding rib. It is an unwelded, oil-treated ring of steel, turned and finely finished. The valve is guided and retained in position by a heavy steel ring fastened to the face of the piston by a number of screws. The ring has a number of holes around it, through which the air from the inner edge of the valve is delivered into the cylinder. These holes constitute the only addition to the clearance, the deficient outer corner of the piston when the valve is closed being made up for by an inwardly projecting lip on the cylinder head.

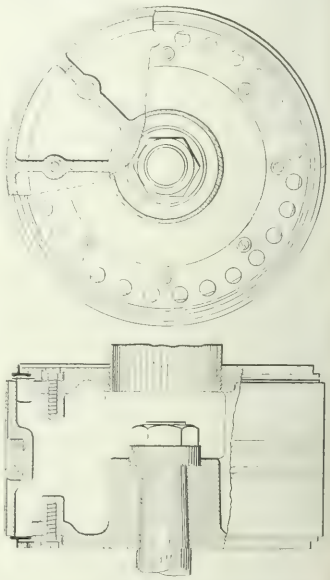


FIG. 2. PISTON WITH HURRICANE VALVE

In regard to the recent activity in manganese mining in India, it is reported that no less than 32 licenses were issued in 1906 for manganese exploring and prospecting alone.

HANDLING THE COAL OUTPUT IN SOUTHERN ILLINOIS

The Successful Operation of a Combined Passenger and Coal Traffic Railway

BY E. J. WALLACE*

The Coal Belt Railway, in the southern Illinois coal field, is an example of how successfully a coal traffic road can be operated as an interurban trolley line.

Constructed in 1902 by Frank P. Reed, an engineer of some note, it extends from Spillertown, two and one-half miles south, to Marion, the seat of Williamson county, thence in a northwesterly line to a point about eight miles from Marion, where it connects with the Carterville division, the main line continuing on to Herrin three miles north. The Carterville line is about the same distance west. Hourly service is given the three towns from 6 a.m. until 10 p.m.

Marion being the central point, five cars leave the public square between 6 and 7 p.m., for the mines on the Carterville-Herrin divisions. The capacity of the cars is about 85 persons. A five-cent fare is charged, entitling the passenger to a ride of three miles. Nearly 2000 passengers ride daily, paying from one to three fares. Out of Marion, the railway furnishes transportation for the employees of five mines, a brick plant and a powder plant. It serves four mines out of Herrin and the same number out of Carterville, besides a machine shop and foundry.

On the Herrin-Carterville line there are four small villages, Fordville, Crenshaw, Pollard and Scotsboro. These with the exception of the first and last are mining settlements. There are twenty-one miles of track for electric service, with six passenger and two express cars, while twenty conductors and motormen complete the force.

EQUIPMENT

The power-house for the line is situated three miles from Marion, within a few hundred feet of the Peabody Mine No. 3, and on the bank of a large pond, which furnishes a good supply of water. It is equipped with three Whitehead 60x18-in. return tubular boilers and one Wangler 60x18-in. boiler; one Erie City Tangye type, 300 h.p., 20x24-in. engine, and one Williams 225-h.p., 17x30-in. engine. The two generators are of the Edison bi-polar 550-volt, 175-kw. type. At the junction of the Carterville-Herrin line there is a storage-battery house of 240 cells complete. In addition there is a complete machine shop, with lathes, shapers, etc., where almost all the repairing is done.

At the time of construction there were three mines on the road; today there are fourteen, and several more planned. This addition calls for many miles of extensions, and recently the Johnson City group of mines have been connected, and a new extension north from Marion and east of Spillertown will tap another group. Connecting with this, a line is about to be built to the new mining town of Pittsburg, six and one-half miles east of Marion, where three mines are sinking.

During the past year five new operations with an aggregate of 1000 tons daily have been connected. At present only three mines depend entirely for transportation upon the Coal Belt, the remainder being connected with the Chicago & East [illegible]

*Fuel agent, Marion, Ill.

[illegible] connection is Peabody No. 3 with a record of 2570 tons in eight hours. The Chicago & Big Muddy Coal and Coke Company's mine No. 1 follows closely, while the smallest mine is Hampton, with about 40 tons per day.

The average daily output for each of the fourteen mines is:

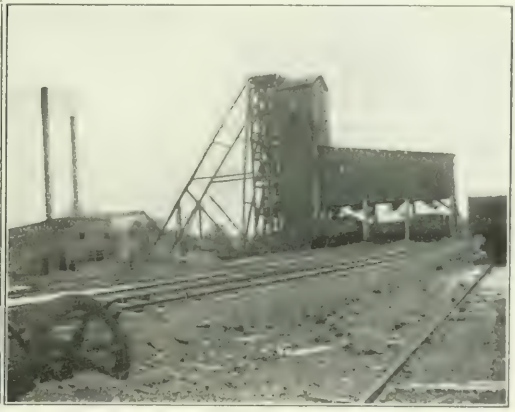
In the Marion district:

	Tons
Peabody Coal Co. No. 3	1800
Chicago & Big Muddy C. & C. Co.	1200
Carterville District	1000
Watson Coal No. 1	600
Watson Coal No. 2	250

In the Carterville-Herrin district there are:

	Tons
St. Louis Carterville Coal Co.	600
Hemlock Coal Co.	200
Carterville Mining Co. No. 1	700
Carterville Mining Co. No. 2	600
Carterville Mining Co. No. 3	700
Hampton Coal Co.	40

PEABODY NO. 3 MINE—IRON TIPPLE AND COAL WASHER



"WHITE ASH" MINE OF THE CHICAGO & MARION COAL COMPANY

In the Johnson City district:

	Tons
Carterville-Herrin Coal Co.	600
Johnson City-Carterville Coal Co.	400
Johnson City Big Muddy Coal Co.	1000

This is a total daily production of 9480 tons, and requires about 316 cars, which are furnished by the Iron Mountain Railroad. Annually this would call for 94,800 cars, with a tonnage of 2,844,000 short tons. Within twelve months' time new connections will be made with other mines aggregating 3500 tons daily.

Two standard freight locomotives are in service, and a yardmaster and three train crews handle the coal traffic. The Coal Belt line connects with the Iron Mountain Railway at Herrin, and this latter road ships the greater part of the coal from the district southwest and far

for this traffic. The rolling stock owned by the Coal Belt company does not number over a dozen cars of all kinds, outside of the electrical department.

Aside from the coal traffic, general merchandise freight is received and shipped from points on the road. For carload lots such as brick, powder and machinery, cars are set in. For small consignments, the express car picks them up and also delivers them. Marion being the shipping point for some few wholesale houses, a large business is secured in this way.

Considered as a whole, the Coal Belt Railway is a practical and financial success, and suggests a unique method for not only providing passenger transportation between the mines and adjacent towns but benefits the coal operators and affords the company a considerable freight revenue without any large additional cost. It is probable that many coal districts today would find such an electric system most beneficial. The accompanying illustrations show the general character and style of the mine tipples along the Coal Belt line.

COMBINATION BAGGAGE-PASSENGER ELECTRIC CAR AND LOCOMOTIVE

Cost of Diamond Drilling in Coal Measures

In exploring new ground, to determine whether or not there is coal or ore in workable quantities, there are several drills which may be used, but by far the cheapest, and most satisfactory one, is the diamond core drill using the double-core barrel. Diamond drills are probably used to a greater extent than any other drill on the market. They are operated by steam, electricity, hand and horse-power. The bits used are hollow and solid, the solid

and the hollow where an accurate section

THE DOUBLE-CORE BARREL

The double-core barrel is practically a new feature in diamond drilling, and is a great improvement over the old method, where the core revolved with the core barrel. The continual revolving of the core ground up the loose sections, therefore the different formations would be mixed, and there was no way of telling accurately the thickness of the vein. This occurred especially with coal, because being much softer than the formation above and below, it would be ground almost to powder. All this is eliminated with the double-core barrel because the core does not revolve, but remains stationary. The breaking of the core and the holding of it in the tubes is accomplished by means of a core lifter, which consists of a ring so constructed that it will grip the core near its base whenever the rods are raised.

CONDITIONS THAT INFLUENCE COST

In taking up the cost of diamond drilling, there are quite a number of things to be considered. The chief one, of course, is the kind of formation the drilling is done in; the harder the rock, the longer it takes to drill, therefore the higher the cost. In drilling through loose and broken formations, the wash water is liable to be lost, if the crevice cannot be stopped by casing, or sending down bran, sawdust, cement, etc., in the hope that they will wash into the openings in the rock, and close them, thus forcing the water to the surface.

The distance water, coal and supplies must be transported contributes greatly to the expense. Water is the most important item in diamond drilling; without it, the work must be suspended. Where

TIPPLE AT MINE NO. 7, BIG MUDDY COAL AND IRON COMPANY

1000-TON WOOD TIPPLE, CARLEVILLE MINING COMPANY

water is scarce, and the labor that it must be hauled is considerable, it is a good plan to dig a pit, lining it with cement, and again use the waste water from the drill.

There are usually five or six men to a drill outfit. These include the day driller, assistant night driller, assistant, teamster and cook. The day driller is usually foreman of the outfit, having charge of the other men; he keeps the records, sets diamonds, buys supplies, etc.

AVERAGE COST OF ACTUAL OPERATIONS.

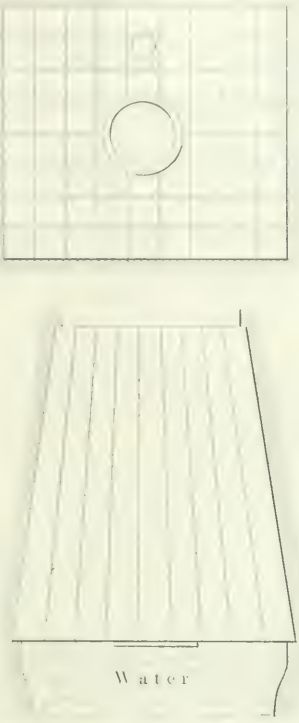
The average cost of diamond drilling in three separated districts in Colorado is shown in the following table. Column 1 is the average of 9 holes, which reached a total depth of 4736 ft. Column 2 is based on a record of 7 holes, reaching a total depth of 3040 ft. The last column is formed from data on 3 holes, which reached a depth of 1767 ft. The strata drilled through were formed largely of a compact sandstone, with layers of clay and shale:

	(1)	(2)	(3)
Foreman	$0.070	$0.068	$0.180
Labor	1.150	0.814	1.700
Camp Acct.	0.540	0.359	0.540
Supplies	0.080	0.093	0.128
Repairs	0.190	0.125	0.170
Carbons	0.865	0.221	0.650
Fuel	0.020	0.450	0.240
	$2.917 per ft.	$1.651 per ft.	$3.583 per ft.

Wooden Dams in Coal Mines

BY RICHARD LEE.

It is often necessary in coal mining to isolate a portion of the workings which is to become filled with water. In such cases, the quantity and head of the water to be shut in is often so great that the necessary dam must be built capable of withstanding a heavy pressure. Masonry stoppings of the arched type, with the convex side facing the pressure, are generally used; however, such stoppings will crush and break if movement takes place in the surrounding strata, and for this reason some mine managers advocate the construction of wooden dams. A stopping of this latter type may be built of well seasoned timbers 10 ft. long and tapering from 12 in. square at the large end to 8 in. square at the small end.



WOODEN DAM, ELEVATION AND PLAN.

After selecting a proper place for erecting the dam, the entry is carefully shaped by pick work to suit the taper of the blocks. No firing of shots should be permitted, as this latter method might fracture the surrounding strata and render the entire construction faulty.

The place in the entry where the dam is to be located would be 10 ft. in length; the larger end, which would be in contact with the water, and consequently receive the pressure, would be 9 ft. wide and 8 ft. high. This would mean that the smaller end of this taper cut would be 6 ft. wide and 5 ft. 4 in. high; the entire dam therefore would require 72 blocks (nine blocks for its width and eight for its hight; see Fig. 1.) The timbers should all be prepared and fitted on the surface before being erected underground. In most cases it is necessary to provide a small hole at the top for fresh air to pass through, and another larger hole for the workmen to get through after the building is completed; these holes are carefully closed with key, or taper plugs, when the construction is finished.

A dam of this sort has the advantage of being more flexible than a masonry stopping, and since the wooden blocks swell when in contact with the water, the dam becomes tighter after being put in use.

Quarrying Ice

A new industry of Switzerland consists of utilizing the glaciers by quarrying ice and transporting it to large cities remote from the Alps. Large blocks of ice are removed by blasting, using black powder for the purpose, and these are transported down the mountain sides in ice-slides or V-shaped troughs. To prevent excessive speed the chutes are constructed with many curves, which act as brakes, and the ice blocks reach the railroad in good condition and are loaded into specially refrigerated cars. The construction of the slides required much engineering skill and ingenuity.

At the Berlin School of Mines there are 213 students, at Clausthal 149 students, and at Freiberg 427 students.

WOOD TIPPLE AT DALE MINE, NEAR HERRIN.

STEEL TIPPLE AT [illegible]

Pittsburg Coal Company

This company is a consolidation of a [illegible] the Pittsburg district in Pennsylvania, and is the largest coal operator in this country. Its report is for the year 1906. Its capital account shows $32,000,000 common stock; $32,000,000 preferred stock; $23,261,000 first-mortgage bonds; $158,125 collateral bonds; $1,075,248 bonds of subsidiary companies.

The income account for the year is as follows:

Net earnings from operation	$8,207,125
Depletion of coal lands	$ 743,050
Depreciation of plant	1,111,071
Interest on bonds	1,167,241
Total charges	$3,101,555
Surplus for the year	$5,105,568
Balance from 1905	1,986,113
Total undivided earnings	$7,091,211

The surplus of cash assets over liabilities, as of Dec. 31 last, was $1,606,146, which is the working capital of the company.

The production and sales of coal and coke were as follows:

	1906.	1906.	Changes.
Pittsburg tons	14,084,[illegible]	15,[illegible],[illegible]	I [illegible]
Hocking tons	1,[illegible],[illegible]	1,115,[illegible]	I 44,[illegible]
Total coal	15,[illegible],[illegible]	16,[illegible],[illegible]	I [illegible]
Coke tons	[illegible],[illegible]	[illegible],[illegible]	I [illegible]

The coal given above does not include that used in making coke; this would add about 640,000 tons to the quantity mined.

The report says: "In the beginning of the year conditions were unusual owing to uncertain miners' wage settlement; the consumers were all storing coal, cars were plentiful, men were working fairly well, and the output of the mines good. After the mining scale had been arranged, covering a term of two years, the mines in the Pittsburg district resumed work before those of other operators in this field, and the still longer idleness in the mines in the Western fields made a somewhat increased demand for our product; the greatest benefit realized was the maintenance of selling prices during the lake shipping season. Cars were in better supply by reason of this idleness of other mines, and there was a fairly good supply of miners. After resumption of work in the Western fields, we lost many men, cars became scarcer, and in the latter part of the year, although a larger output than in the preceding year was made, its total did not quite come up to our demand requirements until the lake shipping season was over.

"There were operated during the year upon an average 60 mines, including coking plants, as compared with the operation of an average of 50 mines during 1905; the average number of days operated was 242, or 78 per cent. of full running time. Chiefly by reason of scarcity of men and cars a number of mines have been idle during the year and when trade conditions required an increased output; the opening of new mines in the near future will not be necessary.

"As of Dec. 31, 1906, the company had in commission 729 coke ovens, and there is now under construction at Colonial No. 4 plant a group of 214 additional ovens to be completed about April 1, 1907; and there is also in course of construction at Colonial No. 3 a further group of 350 ovens, expected to be done and in operation by the end of the current year. With the completion of the ovens at Colonial No. 3, there will then be in commission 1293 ovens; and there are two further plants to be constructed hereafter, when warranted by the demand. These plants are planned to exhaust the coking-coal acreage of the company, consisting of about 7557 acres of coking coal, which promise by this use, conversion into a steady, as it is a special, source of income and a large ultimate value to the stockholders.

"Labor costs for the period from April 1 (when the mining scale changed, causing an advance of 5 cents per ton in mining, with a corresponding advance in all day and dead work), compared favorably with 1903, when there was in effect the same price of mining and the same conditions. The installation of electricity has been of great advantage. It is cheaper to carry electric power from central plants than to operate a number of smaller ones, and whenever possible to do away with individual power plants, it is being done. Gradual substitution of haulage by electric motors of 10 to 20 tons, for animals, and of 45- to 60-lb. steel rail for light rail on roads, which together insure steady and enlarged haulage facilities, is being done. The result is that during the past year additional boilers, generating sets and extended mechanical haulage have been added in 31 of our mines. An automatic dump is now being installed on the tipples, which has been thoroughly tried and tested for the proper screening of the coal, thus insuring a standard percentage of fine coal and securing a better and cleaner article of coal for our customers. Progress has been made during the past year in installing a retreating system in mining by which a larger percentage of coal can be recovered—and this will be continued.

"During the past year 10 old mining properties taken over in the beginning and exhausted of solid coal have been leased to individuals to recover ribs and pillars, and on terms more satisfactory than by company mining. The total acreage mined out in Pittsburg district during 1906 was 2229 acres, with an average recovery so far of 8093 tons per acre. The total unmined acreage as of Dec. 31, 1906, was 143,796 acres owned and 24,225 acres leased, or a total of 168,021 acres of the Pittsburg or River vein, with a life, based on 1906 production of 76 years; and in addition there is owned in fee 42,425 acres of the Freeport vein. . . .

"Under a contract dated Oct. 14, 1903, the company purchased controlling interest in the capital stock of the Monongahela River Consolidated Coal and Coke Company, acquiring 50,000 out of a total of 200,000 shares of that company's preferred stock outstanding (par value $50), and 300,000 out of a total of 400,000 shares of its common stock outstanding (par value $50). The common stock has been paid for outright; the preferred stock is being paid for semi-annually based upon an allotment of 6c. per ton for each ton of run-of-mine coal which the Monongahela River Company mines from its properties. As of Dec. 31, 1906, 18,102 shares of the 50,000 shares preferred stock to be purchased have been so paid for and received by the company, at a cost of $814,599, leaving 31,898 shares yet to be paid for, the balance of the consideration unpaid being $1,435,400. . . .

"The tonnage and earnings of the New Pittsburg Coal Company, operating seven mines in the Hocking district of Ohio, are included in the general results shown. To take the places of mines Nos. 1, 3, and 6 nearing exhaustion, mines Nos. 9 and 10 were authorized begun during 1906, at an estimated cost of $293,484, of which $117,141, has been expended. The total exhaustion for 1906 was 164 acres of fee coal and 126 acres of leased coal. The total unmined acreage as of Dec. 31, 1906, was 8215 acres owned and 2033 acres leased, or a total of 10,248. . . .

"The directors have continued the Employees' Association on the grounds of mutual benefit, and under such conditions as will strictly limit its conduct within its proper functions and will not again permit liabilities to be incurred against the company. The work of the Accident and Death Association has been conducted through the year with interest and success. The average number protected by this insurance during the entire year was 16,628. The ratable coöperation between the company and its employees at the mines during 1906 resulted in the distribution of $85,114 in benefits, of which the company paid $13,129. There was paid into the pension fund during the year $7,727, of which the company paid $2025. The treasurer of this company is responsible for all the funds and securities. Continued good results from the organized work of these associations is expected and the contributions of the company, including all administration expense, are a duty and an investment.

"The general plan of administration was changed during 1906 by the constitution of an active executive committee. This change has resulted in great benefit to the company."

According to the Queensland *Government Mining Journal* a discovery of tin is reported from Waratah, Tasmania. The lode is said to be 12 ft. wide and 30 per cent. ore has been taken out.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

In testing for coal with a hand drill machine it is thought advisable by many superintendents to use a bortz bit, while a diamond bit should be used for a steam-power outfit.

In a mine where the water is acid, it is not advisable to discharge exhaust steam into the sump, as the chemical activity of the acids is greatly augmented by the rise in temperature of the acid water, which latter condition causes it to readily attack the pump and iron pipes.

In very cold weather when mixing concrete for use in a shaft or other mine purpose, better results will be obtained if the sand and gravel are stored in bins, where, by suitable heating pipes, the material may be gently warmed. It is also wise to use water that has been warmed to at least 100 deg.

Eminent investigators claim that black-damp is chiefly produced by the action of the oxygen of the air on iron pyrites, (FeS_2) contained in the coal. These same authorities state that the men, horses and light in a mine, only account for about one-fiftieth of the consumption of oxygen in the air.

The United States Steel Corporation is now making provision for the establishment of about 400 by-product coke ovens near their new plant at Gary, Indiana. Careful tests are now being conducted both in this country and Europe to determine the style of oven that will be most satisfactory to install.

In preparing mine shafts, if the timber is carefully dried, the strength is increased 100 per cent. If the props are soaked in cold water, the strength is reduced below that found in the green wood; when the timber is soaked in heated water, it absorbs still more moisture, and its strength is further reduced.

In 1890 statistics showed that on an average in our country, 158 tons of coal were required to manufacture 100 tons of coke; this quantity of coal necessary has steadily decreased, until during the past year less than 148 tons of coal were required to manufacture 100 tons of coke. This speaks well for the growth of the industry and the efficiency of operation.

It is not generally known that the State of Michigan contains a workable coal area of more than 6000 square miles. The coal seams are reached by shafts, and at present only those veins lying within 250 ft. of the surface are being worked. Michigan produced less than 2,000,000 tons of coal in 1906; however, conservative estimates place the available coal tonnage of this State at more than 15,000,000,000 tons.

Recent experiments have shown that a washing coal which has gone over a three-quarter-inch screen, the washed product contains 40 per cent. less ash, 15 per cent. less sulphur and 5 per cent. more fixed carbon than the unwashed coal. The amount of water used in washing was about 36 gal. per ton of coal, and the cost of the operation was 2.5c. per ton, for a plant whose capacity is more than 350 tons per day.

In driving a rock-heading, the best results will be obtained when the line of least resistance is three-fourths of the depth of the hole; also when the powder fills the hole to about one-third its depth. If a 3-inch hole is drilled 8 ft. deep, with its line of least resistance 6 ft., the hole should be loaded to a depth of about 31 in., which would need about 7 lb. of powder. In this connection it may be said that 1 lb. of blasting powder will occupy about 28 cu.in.

Some geologists have claimed that coal is produced by the decay under fresh water of plants belonging to the conifer, fern and palm varieties; these grew during the carboniferous age. The density of the vegetation may be taken at 100 tons per acre per century, and if the vegetable matter thus formed was to be compressed to the density of coal, it would give only 0.6 in. acre of coal; however, four-fifths of this is lost as gaseous product, leaving only one-eighth inch per acre, or 1 ft. of coal in 10,000 years.

The results of recent investigations tend to contradict many of the long accepted theories dealing with the subject of coal. It has generally been believed that the amount of sulphur in a coal is an indication of the tendency of the ash to clinker. Now comes the emphatic statement that in some of the Illinois seams, where the sulphur content is highest, the ash produces the least clinkering, and that as a consequence, conclusions regarding the behavior of the ash, when based on the amount of sulphur in the coal, are not justified.

The average contents of carbon dioxide (CO_2) in flue gases has been found to be about 8 per cent., where coal is used as fuel. If the coal used at mines contains 75 per cent. of combustible matter, then to burn one ton of the coal requires 23 tons of air. If the percentage of CO_2 is 6 per cent. instead of 8 per cent., then 30 tons of air are needed for each ton of coal burned. This latter amount of air occupies 32,530 cu.yd. of space under ordinary conditions. A comparison of these figures with those required to satisfy the conditions of theoretically perfect combustion shows how widely theory differs from practice.

The most important consideration in the successful operation of a briquetting plant is the selection of a suitable binder. The cost of this latter material often decides how profitable the operation will be. In this connection it should be remembered that a binder such as pitch, tar, asphalt, creasote, petroleum, etc., may give good results with one coal and at the same time prove most unsatisfactory with other fuels. To test whether a certain pitch is suited for use as a binder, put a piece of pitch the size of a pea, into the mouth and chew it; if the results are the same as when chewing spruce gum, that is, first crumbles and then becomes plastic, the pitch may be considered of the proper quality for briquetting purpose.

The costs of sinking shafts are so entirely dependent on local conditions that only general figures are available for basing an estimate. The principal factors influencing costs are, nature of strata, depth of shaft, and the cost of coal and timber. Where the ground is of the nature of that generally found in a coal district, the cost of sinking a shaft from 100 to 200 ft. deep will vary from $45 to $60 per ft., while if the depth is more than 200 ft., the cost will likely vary from $60 to $90 per ft. At one operation where a200-ft. shaft was sunk, the cost of installing the sinking plant was $1100; the dynamite averaged $4 per foot in depth; coal for power purposes cost $2.25 per ft.; 400 ft. of lumber, b. m., were required to timber each foot in depth. The shaft was 14x22 ft.

The plan of collecting the coal dust that results from the dumping of coal over screens or its preparation in a breaker or washery, is one of the newer innovations that is destined to become widely used in handling anthracite and bituminous coal. All that is necessary is to have an exhaust fan connecting to a main flue or tube, about 2 ft. in diameter. Smaller branch flues can be projected from the main flue to various points where it is desired to catch the dust. In catching the dust the mouth of the flue, or collecting chamber, should be placed just over the point of dumping, since the dust naturally tends to rise of its own accord. The fan should be run only fast enough to produce a 2½ or 3-in. water-gage in the main flue. At one plant where such an installation is already at work, the collected dust is being sold to advantage; which item, however, is really of least importance. At one mine where the dust from the washery, tipples, etc., is caught, there are six branch flues connecting to a main pipe, and the cost of the entire apparatus was less than $2200.

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*Illustrated

The Federal Coal Lands

The President, following up his recent recommendation concerning the public coal lands, has sent to Congress a special message, further outlining his policy and urging the enactment of laws to carry it out. He advocates the leasing of these coal lands, and reservation by the Government of the right to supervise their development.

In support of his argument, the President refers to the successful operation of this policy in certain foreign countries. This reference was entirely unnecessary, inasmuch as in our own country, examples of such a system may be readily observed. In Colorado, where thousands of acres of public coal lands have been taken up by corporations which are at present operating and developing mines, the State retains possession of a certain section (640 acres) of land in every township. In coal districts, this square mile of land, generally known as a "school section," is leased to and developed by the operators who control the adjoining area. The State retains engineers who examine the mining operations carried on under school lands, and check up by measurement the advances of all entries and rooms, thus forming the basis for estimates of the monthly tonnage extracted. The estimates prepared by the State engineers are compared with those made by the engineers of the company, and from this comparison a basis for the monthly settlement is determined. The royalties accruing to the State from leases on such coal lands amount to a considerable figure.

The President, in his message, did not specify the rate at which these coal lands ought to be leased, but suggested that the same liberality be extended as has already been shown by the Government in its dealings with the public. In the meanwhile, the House Committee on Public Lands has reported favorably upon a bill conforming somewhat to the President's recommendations, which authorizes the President to lease coal lands at a royalty of not more than two cents a ton.

The idea of liberality on the part of the Government will certainly be carried out if two cents per ton is to be the maximum royalty. Thousands of acres of coal lands throughout the United States are being worked today on the royalty basis, and in no instance is the minimum royalty so low as that, so far as we are aware. In most parts of West Virginia the royalties range from 8 to 10c. per ton; in Ohio, from 6.5 to 12.5c. per ton; in Pennsylvania, Kentucky, Illinois and Colorado, the average royalty is about 8c. per ton. In metalliferous mining, royalties are rarely less than 10 to 15 per cent., even in the case of the lowest grade of ore, such as the zinc ore of the Joplin district, which is worth only about $1.50 per ton. The average value of coal in the Western States is about $1.25 per ton at the mines. Thus it will be observed that even the existing custom is decidedly more favorable to the lessee in coal mining than in metalliferous mining, and, as everyone is aware, the collieries exploited under current royalties are in most instances profitable to the operators. If the public coal lands are to be leased, why should the maximum royalty be so low as 2c. per ton?

However, even that low rate will produce an income that will show in strong contrast with the present policy of giving away these resources. If we consider that the average thickness of the workable coal seams underlying the Government land is 5 ft., and that only 4000 tons of coal will be produced from each acre, the Government will receive $80 in royalties for each acre of coal that is worked under lease, less the cost of administration. Up to date about 30,000,000 acres of public coal land have passed under private control. There is no doubt that a large part of these holdings were acquired by the present owners at a price not exceeding $2 per acre, and in many cases for less than $1 per acre. It is conservatively estimated that the Government still controls 50,000,000 acres.

As to the amount of land to which one lease is limited (2560 acres) in the bill before Congress, this area is sufficiently large to justify the installation of a substantial plant, and since such an area would produce from 6,000,000 to 10,000,000 tons of coal, the life of the operation would extend over a period of from 8 to 15 years. The chief question to be considered is the rate of royalty. Inasmuch as the value of the remaining coal lands is largely dependent upon their proximity to existing or projected railways, or upon their situation in districts likely to be developed by railways in the near future, it would appear that the rate of royalty ought to take this into consideration.

Consumption of Copper

We now have the Government statistics as to imports and exports of copper for the 12 months of 1906. These do not differ much from our estimates of Jan. 5; the imports were almost exactly as we estimated. They amounted to 225,843,281 lb. The exports were 467,839,041 lb. The imports showed a small increase as compared with 1905; the exports showed a large decrease.

Assuming the production of the United States in 1906 as per our preliminary statement, viz., 915,000,000 lb., the domestic consumption was 667,179,240 lb., against 616,125,695 lb. in 1905. We think that the final statistics will show it to have been really a little larger in 1906 than above figured, inasmuch as the actual production will probably turn out to exceed slightly our first figure, some large producers having done somewhat better in December than they estimated. It is probable that the final figure for consumption will be in the neighborhood of 675,000,000 lb., which will be about 9.5 per cent. gain over 1905.

When all the statistics for 1906 become available, it will be possible to compute the consumption of copper in the United States in 1906 with unusual accuracy, the stocks at the beginning and end of the year having been substantially the same, and chiefly the crude material that is always in transit and process of refining.

The domestic consumption increased at a considerably greater rate than the production, but not so much as many have thought. Obviously, when we start with no stocks we cannot consume more copper than we produce. In the case of a single country, like the United States, the increased demand for consumption is met by a diminished exportation. As to the whole world, however, when the stocks have gone, the consumption cannot be greater than the production. Under such conditions, the anxiety of consumers to secure their necessary supply leads them to bid up prices against themselves as they have done in 1905 and 1906.

The actual consumption of copper is always greater than the statistics show, because a rather large amount of manufacturing scrap and old material is constantly coming back into the market. If it were possible to collect statistics for it, we think that the junk business would prove surprising in its magnitude. However, in times of excessively high prices the sources of old material are carefully scoured and sooner or later this supply diminishes largely, all of which adds to the stringency of conditions until consumers can no longer stand the pace and stocks begin naturally to accumulate again. As yet there is no evidence of this. Probably there will be no great increase in production in 1907. There will be in 1908. The great question is as to the demand for consumption during the next 12 or 15 months.

The Calumet & Helca

Last year we noted with interest the first departure of the Calumet & Hecla company from its traditional policy of confining its operations to its own territory. This was first manifested by the acquirement of several new properties in Keweenaw county, in the Lake district, and the organization of subsidiary companies, which at once began active work in the development of the new mines. This was accepted as evidence that the company was looking ahead to the provision of new sources of production in the future, as its present mines should gradually be exhausted, and there were many surmises made, whether the policy of expansion would stop there; the general opinion being that it would.

Now, however, it seems to be apparent that the company's ambitions extend much further. The managers are not in the habit of taking the public into their confidence, but some facts have already come out, and in other cases inferences can be drawn to establish a strong probability. It is known, for instance, that large—probably controlling—interests have been acquired by Calumet & Hecla interests in Centennial and Allouez, both of which have recently developed into valuable properties. Reports, with strong support, have it that recent heavy buying of Osceola is in the same interest; that Tamarack is also sought after; and even Quincy is mentioned in the list. These include all the more prominent Lake mines outside of the Copper Range group.

If these reports have a basis of truth—and what is known makes them at least probable—the object aimed at is a great consolidation of Lake copper interests under Calumet & Hecla leadership. The consolidation of copper interests in other districts has doubtless pointed the way to [illegible] position to carry it through successfully, if such a combination has really been definitely decided on, and a short time only will be needed to show the results.

Mining-fraud Legislation

[illegible] Nos. 44, 47 and 49 [illegible] to correct the mining-fraud evil, have been favorably reported by the committee on corporations of the lower house of the Colorado legislature. These bills provide that when stock of a corporation is issued in payment for property, there shall be filed a statement of the persons from whom purchased, the amount paid, and other conditions. The second bill makes it unlawful for an officer of a corporation authorized to sell its stock, to sell private stock in the same corporation without declaring the fact. The third bill requires foreign mining corporations to file a certificate showing what proportion of their capital stock has been paid for in money, and what proportion by the purchase of property.

These bills appear to us to be meritorious and may safely be passed by the Colorado legislature. They will provide for some salutary restrictions, to which no honest promoter can object. However, they are by no means broad enough to correct the mining-fraud evil as it exists today, which probably even their sponsors do not expect. Nevertheless, they will do [illegible] deal.

According to cable advices just received from Australia, the litigation between the owners of the Potter and the Delprat processes, which has been pending for a long time, has been decided in favor of the latter. Further particulars are not yet at hand. It will be remembered that this litigation concerned the priority of invention of the acid flotation process, which is now extensively in use for the treatment of the mixed sulphide ore of Broken Hill. C. V. Potter invented a process in which use was made of an acidulated bath. G. D. Delprat altered the composition of the bath and made other improvements in the working details of the process. Potter sued the Broken Hill Proprietary Company, which has been using the Delprat process, for infringement of his patents. Hence the recent litigation.

PUBLIC OWNERSHIP OF COAL LANDS

Special Message of President Roosevelt Recommends Conservation of Mineral Fuels

The President sent to Congress, on Feb. 13, a special message urging legislation to cover the different phases of the public-land situation. He said in part:

"In the first place, I wish to speak of the conservation of the mineral fuels belonging to the United States. In my annual message of Dec. 4, 1906, and special message of Dec. 17, your attention was called to the importance of conserving the supplies of mineral fuels still belonging to the Government. I recommended to Congress the enactment of such legislation as would provide for title to and the development of the surface land as separate and distinct from the right to the underlying mineral fuels in regions where these may occur, and the disposal of those mineral fuels under a leasing system on conditions which would inure to the benefit of the public as a whole.

"I again call the attention of Congress to the importance of enacting such legislation. I care little for the details; the prime need is that the system should be established; that from henceforth the nation should retain its title to its fuel resources and its right to supervise their development in the interest of the public . . .

THE LEASING SYSTEM

"Such a leasing system as that proposed represents by no means an untried policy. In the Australian countries during the last fifteen years coal has been mined under a system of government leases and on conditions so favorable to development that their coal and coke are today being sold on the Pacific coast of both American continents. In all the great coal-producing European countries, except Great Britain, coal is being mined under government leases.

"In Great Britain leases are granted almost entirely by the private landowners, but there, as in other countries, the surface culture and the mining operations are conducted independently of each other. In Nova Scotia, British Columbia, India, and other British colonies a government leasing system has been adopted and is working satisfactorily.

"In the United States, although conveyance of the mineral rights with the surface has been the common practice, the separate development of the two intereses is increasing; and in the Eastern and Middle States a large part of the coal is being mined under a system of private leases. It is gratifying to note that in these States, as in foreign countries, these two great industries, agriculture and mining, are conducted within the same boundaries, and the country thus attains its highest dual development without conflict of interests. Indeed, the mining industry and the factories using these fuels create larger local markets for the products of the farm.

"Mineral fuels, like the forests and navigable streams, should be treated as public utilities. This is generally recognized abroad. In some foreign countries practical control of a large portion of the fuel resources was allowed years ago to pass into private hands, but the existing governments are endeavoring to regain this control in order that the diminishing fuel supply may be safeguarded for the common good instead of being disposed of for the benefit of the few—though the mistake of the preceding generation in disposing of these fuels for a nominal return cannot always be corrected by the present generation, as the cost may be so enormous as to be prohibitory.

"In our own Western States and Territories the scarcity of both water and forests has rendered necessary their preservation as public utilities, and the preservation of the forests for the purpose of conserving both the waters and the timber supply has come to be recognized as the wise and proper policy of the Federal Government.

"The quantity of high-grade mineral fuels in the West is relatively much smaller than that of the forests, and the proper conservation of these fuels is a matter of far-reaching importance. This Government should not now repeat the mistakes of the past. Let us not do what the next generation cannot undo. We have a right to the proper use of both the forests and the fuel during our lifetime, but we should not dispose of the birthright of our children. If this Government sells its remaining fuel lands, they pass out of its future control. If it now leases them, we retain control, and a future Congress will be at liberty to decide whether it will continue or change this policy. Meanwhile, the Government can inaugurate a system which will encourage the separate and independent development of the surface lands for agricultural purposes and the extraction of the mineral fuels in such manner as will best meet the needs of the people and best facilitate the development of manufacturing industries.

ANSWERS TO OBJECTIONS

"I am aware that objections to this system are being urged. It is claimed that so large a part of the coal in some of the Western States has already passed into the hands of certain large corporations that parties endeavoring to operate under a lease system other than coal deposits would be unable to compete with these corporations, and, therefore, that the fuel deposits still belonging to the Government should also be allowed to pass into private ownership, presumably into the hands of the same or other large corporations. It is also claimed that reservation of the fuel supplies still belonging to the Government would raise the price of coal in the West, and, as an argument in favor of this contention, it is claimed that the reservation of the natural forests is raising the price of lumber in the West.

"It should be remembered that the best and most accessible bodies of timber in the West passed into private holdings before the forest reserves were established; that while the price of timber has advanced in the West, it has advanced still more in the East, where there are no forest reserves; that supplies of timber are today being shipped from the West to the markets of the Mississippi valley, and even to foreign countries; and that the probability of obtaining future supplies of both timber and mineral fuel in the West at reasonable prices will be much greater with a large portion of both the forests and the fuels under the control of the Government, than if this control should pass to private parties. To secure cheapness of timber and fuel for the moment at the cost of ruin to our own children would surely be a suicidal policy.

ADVANTAGES OF THE LEASING SYSTEM

"It may be fairly claimed among the advantages of the leasing system that: (1) it will facilitate the working, under favorable conditions, of coal deposits for local markets by miners without large capital, as no land-purchase money would be required, and the small royalties charged would be paid out of the earnings; (2) it will facilitate larger operations, as the leases could be made sufficiently liberal in the matter of time, area, and other conditions, to induce healthy competition and meet all real demands; and yet in all cases the general supervision of the Government could be such as to (3) prevent waste in the extraction and handling of these fuels; (4) the system can be operated in such manner as to prevent the evils of monopolistic control; (5) that it will permit the Government to reserve from general use, fuels especially suitable for metallurgical and other special industries; and (6) it will enable the Government to protect the public against unreasonable and discriminating charges for fuel supplies.

"Already, probably one-half of the total area of the high-grade coals in the West has passed under private control. In

claiming both the lignite and the coal areas, these private holdings probably aggregate not less than 30,000,000 acres of coal fields. With the remainder of the lands containing mineral fuels reserved and leased by the Government, there will be ample opportunity to determine, in the near future, which of the two systems—private ownership, or the leasing system with general Government supervision—will best protect the interests of the people and thus promote the permanent development of the West.

DETAILS OF PLAN LEFT TO THE FUTURE

"In planning such a leasing system by the Government, the question of revenue, beyond that necessary to cover the expenses of administration and exploration, need not be seriously considered. The spirit of generosity which the country as a whole has shown in connection with disposal of the public lands and the use of the proceeds of the sales from these lands for the further development of the West through the reclamation service and in other ways, is of itself a sufficient guarantee that in the administration of both the coal reserves and the national forests this generous policy will be continued. It is safe to believe also that Federal supervision of both the coal lands and the forests will be reduced to a minimum, and that in the future even more than in the past this supervision will be limited to that necessary to carry out the policy of conserving these natural resources in such a manner as will best promote the permanent interests of the people, and above all of the Western people, of the people in the neighborhood of the mines and the forests which we seek to preserve for the public use.

NECESSITY OF CONSERVING FUEL SUPPLIES

"The necessity for care in the future management of these fuel supplies is further illustrated by the rapid rate at which the use of such fuels is increasing in the United States. This remarkable development and the certain continuity of this prodigious growth compel us to recast all estimates as to the life of our 'inexhaustible resources.' We can foresee the time when the Eastern industries will be much more largely taxed for supplying foreign markets.

"It would surely be greatly to the advantage of this country if some, at least, of the coal fields of the East, and especially of the anthracite fields, had been left under the control of the Government. Let us provide in the West against the recurrence of the conditions which we deplore in the East. At the outset the law would be administered in a spirit of the broadest liberality, with the least possible interference with the development of the coal fields.

"Moreover, I cannot too emphatically say that all laws which merely seek to prevent monopoly or the mishandling of the public by forbidding combination, are certain to fail of their purposes. One experience with the interstate commerce and anti-trust laws shows that what is needed is not prohibition of all combinations, but such supervision and control over combinations, and over corporations entering into them, as will prevent the evils, while giving to the public the advantages of combination.

LAND FRAUDS

"Let me urge that Congress provide $500,000, in addition to the present estimates, to be immediately applied to the clearing of the arrears of business in the general land office, as regards the detection and prevention of fraud in disposng of applications for patents to the public lands.

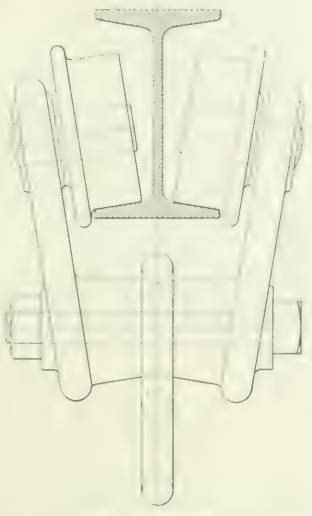
"I wish to express my utter and complete dissent from the statements that have been made as to there being but a minimum of fraud in the actual working of our present land laws."

The message concludes as follows:

"From the standpoint of the public interest, failure to prevent fraud of this kind is peculiarly serious, because in so many cases the success of the fraudulent claimants means the prevention of the establishment of a home by some honest home-seeker. The earnest wish of the administration is to discontinue the advertisement of fraud in connection with the public-land system; but the only way to accomplish this is by putting a stop to the fraud itself."

Cylindrical Wheels for I-beam Trolleys

W. Hoy Bradley, in the *American Machinist*, calls attention to a common fault in the design of rollers for I-beam trolleys, giving point to his criticism with the accompanying sketch. A roller larger at the outer edge of the flange than at the web produces friction by reason of necessary slip. In the sketch showing a better arrangement of rollers, the axis of the roll is parallel with that portion of the flange on which the roll treads, thus making a rolling cylinder instead of a cone.



AN I-BEAM TROLLEY

The Dominion Copper Company

The report of the Dominion Copper Company for the fiscal year ended July 31, 1906, states that negotiations for the purchase of the Montreal & Boston Copper Company, including the smelter at Boundary Falls, B. C., and the Sunset, Crown Silver and C. O. D., mineral claims, were satisfactorily concluded on Jan. 31, 1906, and they are now solely owned by the Dominion Copper Company.

An analysis of the company's operations for the eight months from Dec. 1, 1905, to July 31, 1906, which was largely a period of construction and development, shows that 133,084 tons of ore were smelted for a return of 3221 tons of matte, valued at $640,129. The operating costs, including mining, smelting, converting, marketing, and administration expenses, amounted to $500,985. The net profit for the eight months during which the smelter was operated was $139,144.

A new furnace is being installed by the Traylor Engineering Company, which will be the largest in British Columbia. It will have a daily capacity of 800 tons of ore, and on account of its superior appointments, a saving of 20 per cent. in fuel is expected to be effected. Its saving in fuel and labor expenses is expected to be upward of $100 per day. When it is in full operation the company anticipates being able to produce its copper at a cost of not more than 8c. per pound.

It is believed that the Rawhide and Idaho claims will be able to furnish from 1200 to 1400 tons of ore per day as soon as the new furnace is in commission. The Rawhide workings are 130 ft. in depth, and the average value of the ore is 1.44 per cent. copper. The Idaho tunnel has been extended a distance of 476 ft. The first 200 ft. are in good ore. Ore has also been developed in a winze from the tunnel at a depth of 100 ft.

The mines have been equipped with electrical power in place of steam. The mines and smelter are using about 600 h.p. per day at a cost of from $135 to $140 per h.p. per annum. It is estimated that when the new furnace is in commission 1000 h.p. will be consumed daily, and the change to electric power will result in a saving to this company of not less than $100,000 per annum.

In view of the favorable prospects of the mines the directors have taken steps to secure options on new mining claims, and should any of them on development prove valuable they will be purchased and regularly operated.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

Mining Frauds and—Frauds

"I am glad to see this agitation about [illegible] promoting fake mining schemes," said to Colonel Quartz, etc., whom I found examining a battered slag pot when. "It is time this thing were stopped."

"Anything new?" the old gentleman inquired, without looking up.

"New? You surely have heard about the proposed law and the discussion in the papers."

"After you have lived as long as I have," he said, straightening up and thrusting his hands deep into his pockets, "you get used to these spasms of virtue. The only unusual thing about the present flurry is that it strikes the mining business."

"This is different," I interposed. "When the matter is taken up seriously by the Mining Congress and the leading journals something is bound to be done."

"Oh, I don't know," replied the Colonel. "The professional moralists, the preachers and others, have been at it ever since the days of Noah, yet it is not much trouble to find stories of fraud in the papers. Once in a while practical people take a hand. Then things are expected to happen. The practical man is used to action; it is his business to bring things to pass, and when he gets started he expects things to move at once." The old gentleman paused. "You can't make folks honest by main strength," he said.

"It used to work pretty well with horse thieves," I suggested.

"The horse thieves are not all dead," returned the Colonel. "Besides, this is not a parallel case. This is a blanket contract and the specifications are not all in. It reminds me of a rule that the teacher in a little red school-house back East once tacked on the blackboard. It prohibited roguery in general. What he meant was stealing apples from Deacon Perkin's orchard; but all the boys thought it referred to chewing gum, gum being scarce [illegible]."

"I do not see anything so very indefinite about this," I said. "Everybody knows what fake promotion means."

"Nobody knows what it means," he replied quickly. "It would take the Supreme Court 17 years to figure that out, and then there would be 17 reversals. Fraud is a mighty general term. It may mean running smelter assays a little too hot, and it may mean selling cast-iron gold bricks."

"Legitimate promotion must have some[illegible]"

"That is where the trouble lies," he said. "Who is going to determine whether the property is or is not good enough to be something? Take Jim Holloway's case, for instance. We thought he had nothing better than a gopher hole, and so did all the engineers sent out from New York. We called it robbing widows and preachers. Now look at Jim! He has paid over 200 per cent. dividends, and he rides in the biggest automobile in Denver. You can't afford to hang a man like that."

"And some beautifully recommended companies fail," I admitted.

"You can't draw the line," mused the Colonel, more to the distant mountains than to me. "As long as the working mottoes in successful business are, 'Get as much as you can and give as little as possible, in return' and 'A bluff well chucked is better than an ace,' there will be this same old question. Usually it is the fellows who are working too near the dividing line that howl loudest for more laws. You see, they want to know just how far they dare go." BROMIDE.

Pueblo, Feb. 18, 1907.

Estimating Weight of Ore at Kalgoorlie

In the JOURNAL of January 5 under the heading "Metallurgical Progress in 1906" and the sub-head "Costs," on page 20, Alfred James makes certain statements in regard to operations at several of the West Australian mines. How were these results obtained?

I am quite familiar with the conditions prevailing in this district of Westralia, having designed, constructed and managed the largest combination mill constructed in that section, for roasting, amalgamating, cyaniding and filter-pressing the entire product. In the entire district up to the time I left the Kalgoorlie field, at the end of 1905, there was only one mill, i.e., the Great Boulder Perseverance, that was provided with the means of *weighing the ore as it was delivered to the mill*, while on the other properties the tonnages were estimated, generally by weighing the moist roasted product as it came from the filter presses, making allowances for moisture and the difference between the dry roasted ore and the original raw ore as delivered to the mill. This roasted ore when dry naturally varies considerably from time to time owing to changes in composition, the amount of sulphur, etc., expelled and oxygen absorbed, thus leaving a factor of uncertainty.

This method of approximating tonnages in the mills is not accurate and one is apt to infer from the statements in the article in question that the figures are based on actual weights of raw ore.

I am pleased to note, on the same page and column under the head "general," that Mr. James gives proper credit to the "all-roasting" product. In your pages about three or four years ago there was a long controversy on the subject of the two methods then in vogue, roasting and raw treatment of sulpho-telluride ores in Westralia on the Kalgoorlie field. At that time Philip Argall, of Denver, Colo., predicted that the all-roasting, amalgamation and cyanidation system would be found the most efficient and would ultimately prevail in the Kalgoorlie district.

RALPH NICHOLS.

Gabriel, Durango, Mex., Feb. 12, 1907.

Concrete Foundations for Stamp-Mill Mortars

Can you give me the benefit of some solid experience with concrete or other stone foundations for stamp batteries? My experience with them has not been extensive, and from what I gather those who are enthusiastic about them at first seem to cool off somewhat after they get the necessary time to observe results. Right here it is rather a serious question, for the white 'ant will tackle even the pile blocks; and as for the 3-in. staves of cyanide tanks, he seems to leave dry wood alone to get at them. A person who has not seen it himself can hardly believe it. That insect thrives on the wood even when the solutions are 0.5 per cent. KCN. Where we are here, you are also taking chances if you guarantee any woodwork that is not either always wet or the reverse. A discussion on the advantages or otherwise of concrete and anvil blocks would be much appreciated, as just now they are both much to the fore. However, from what I can gather, some of the most enthusiastic advocates of the great cast-iron anvil block are already finding out that it has also some vices as well as virtues.

For the last six years we have been using 9-in. anvil blocks which fill the bill well under 1050-lb. stamps, at 95 to 98 drops of 8 in. per minute, with wood pile blocks; but they take more holding down than the boxes on the wood direct, and I am

inclined to think that if 1 foot on top of concrete and more than 2 ft. thick, the mortar box, when everything is swinging along, will take a lot of keeping in place, and, if not attended to at once, would soon destroy the concrete bed. This would be a serious business, for grouting up the bedding faces in the ordinary way would only be wasting time.

I gather from an engineer who has just returned from the Rand that they have gone in largely for concrete foundations, but instead of the bolts passing through vertically, they are at an angle and pass outside the concrete, which should add much to the stability of the block. The block is therefore solid and not full of holes at the weakest place; also all bolts are accessible and can be attended to easily, also an important consideration.

JOHN P. FULLER.

[illegible] Dec. 1, 1906.

Iron Balls for Jig Beds

[illegible] the issue of the JOURNAL for Feb. 2, the question about iron balls for jig beds.

I have just received a letter from Albert P. Man, general manager of the Arminius Chemical Company, Virginia, in which he gives me some information in regard to his practice, and since it was sent to me for the appendix to my book, I feel sure he would permit me to give the information to you for publication.

The size of feed to his pyrites jigs is through a 9/16 in. wide slot when the crushed ore is moist, through a 7/16 in. wide slot when it is dry. The cast-iron balls are round and ½ in. in diameter; the screen of the jig has ¼-in. square holes punched in the plate.

He gets these balls from the Canton Malleable Iron Company, of Canton, Ohio.

ROBERT H. RICHARDS.

Boston, Feb. 13, 1907.

Relative Importance of the Mineral Mica

I take the liberty of calling your attention to a most remarkable statement in the JOURNAL of January 19. On page 153, under "New Publications" you speak of mica as being an interesting, though comparatively unimportant, commercial mineral.

Now I have always regarded mica as of the utmost importance in electrical work, especially in the building up of commutators for dynamos and motors. Is there any known substance that will satisfactorily take its place for this work? Is there any doubt as to the great commercial importance of electric dynamos and motors? Does not our prosperity today depend largely upon the immense advances made in the application of electricity? If mica can be replaced by other substances having the same efficiency then your statement is correct; otherwise you certainly owe an immediate apology to that remarkable and indispensable mineral.

H. M. WILLIS.

Latchford, Ont., Feb. 6, 1907.

We assure the friends of mica that no disrespect to that remarkable mineral was intended in the paragraph to which our correspondent takes exception. The idea of the relative unimportance which the writer meant to convey applies only to the position of mica in the world's commerce. According to "The Mineral Industry," the United States in 1905 produced minerals to the value of $802,377,086 while the value of mica, both sheet and scrap, produced during the same period was only $200,000. In view of this modest showing it should not be difficult to pardon a writer for losing sight, for the moment, of the great importance of mica in a single technical field.

The Prevention of Mine Frauds

In the JOURNAL of Jan. 26 I [illegible] the gist of the proposed law for the prevention of mining frauds. It seems to me that the proposed law would prevent also the formation of companies for developing properties of merit. Would not something of the kind shown below serve the purpose as well, and still leave the road open for developing properties which are legitimate risks? The proposed law should be:

MINING CORPORATIONS

"Any number of persons, not less than three, may associate themselves, to establish a corporation for mining purposes. Articles of incorporation of mining companies filed after the passage of this bill must show that the incorporators are *bona fide* owners of at least 20 acres of known mineral ground in the State, which is to become the property of the corporation. The articles of incorporation when presented for filing must be accompanied by the affidavit of three disinterested citizens of the State that the property of the incorporators contains valuable mineral deposits, and that at least $500 has been spent in labor upon said deposit.

"The incorporators of any mining corporation formed after the passage of this bill who shall not conform to the requirements of this act or who shall make false affidavits in relation to same shall be subject to imprisonment, and be liable for the par value of all stock issued."

H. L. HOLT.

Edgemont, Nevada, Feb. 4, 1907.

Disposal of Hydraulic Debris

In your issue of Nov. 17, 1906, on page 914, there appeared a statement that a bill to appropriate $200,000 had been introduced in Congress, for the purpose of [illegible] survey of the project to convey the hydraulic débris of the placer mines of California to low-lying swamp lands. I wish to know if the bill passed.

G. E. ALEXANDER.

Denver, Colo., Feb. 9, 1907.

The bill has not passed.

The Outlook for Mining in Bolivia

In an illustrated lecture in Liverpool on trade possiblities in Bolivia, Sir Martin Conway described the character of the country, which he said was broken, divided, and contained both barren and fertile areas and was subject to every conceivable form of climate. Unfortunately for it, Bolivia had no sea coast at all, and its Swiss-like characteristics made the matter of communications a very serious problem. Brazil had bound herself to construct a railroad, which would make an immense area accessible from the Atlantic. The prosperity of Bolivia would depend on its railways. Before very long La Paz would be made the meeting point of three great railways from the sea. They would in time have a trans-continental route to San Antonio, the Madeira, La Paz and the Pacific. When these developments were accomplished a new situation would have been created in the country.

Sir Martin discussed the silver mines of Potosi. These are now practically exhausted, but they have been worked for 300 years, producing £800,000,000.

Along the range of mountains south of La Paz tin had been discovered in great quantities, and the enormous exports were still increasing. He had no doubt that before long this tin district would so develop that the output would rise to a second, or even first, place among the tin districts of the world.

A copper area was also being worked, but that industry was restricted by the difficulty of communications. Five or six mines had been prosperously worked for a number of years, and more of them were likely to be opened before long.

There is no doubt that the eastern valleys of the Andes are extremely rich in gold, but, excepting the San Domingo mine, nothing much had been done on account of the heavy rainfalls. The Incas had unlimited hand labor, and it was by most simple means that they managed to get their gold. There was plenty of gold there, but communications were extremely difficult. It was stated that gold existed from Bolivia to Colombia. The only question was how to get machinery to the spot. The distance from La Paz to this particular place was 160 miles. The route had been carried 130 miles in that direction, and when another 30 miles was completed a great gold region would be reached.

New Publications

"Die Zentrifugalpumpen, mit besonderer Berucksichtigung der Schaufelschnitte." By Fritz Neumann. Pp. 197; illustrated. 6x9 in.; cloth, 8 marks. Berlin, 1906; Julius Springer.

"Stream Pollution by Acid-Iron Wastes." A report based on investigations made at Shelby, Ohio. By Herman Stabler. Pp. 36; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Turbine Water-Wheel Tests and Power Tables." By Robert E. Horton. U. S. Geological Survey, Water Supply and Irrigation Paper. No. 180. Pp. 134; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"The Geomorphic Features of the Middle Kern." By Andrew C. Lawson. Bulletin of the Dept. of Geology of the University of California, Vol. 4, No. 16. Pp. 13; illustrated. 7½x10½ in.; paper, 15 cents. Berkeley, 1906; University Press.

"The Geomorphogeny of the Tehachapi Valley System." By Andrew C. Lawson. Bulletin of the Department of Geology of the University of California, Vol. 4, No. 19. Pp. 32; illustrated. 7½x10½ in.; paper, 35 cents. Berkeley, 1906; University Press.

Arbeiterschutz und Unternehmergewinn im rheinisch-westfälischen Steinkohlenbergbau." By Dr. Jüngst. Reprinted from [illegible] Nos. 37, 40, 1906. Pp. 34. 11 x8½ in.; paper. Essen (Ruhr), 1906: Verein für die begbaulichen Interessen im Oberbergamtsbezirk Dortmund.

Annual report of the Chief of the Bureau of Construction and Repair to the Secretary of the Navy for the Fiscal Year ending June 30, 1906. Pp. 185. Paper, 5½x9 in.; indexed. Government Printing Office, Washington, D. C. 1906.

"Gold Mining Machinery; Its Selection, Arrangement and Installation." By W. H. Tinney. Pp. 308; illustrated. 6x9 in.; cloth, $5. New York, 1906: D. Van Nostrand Co. London: Crosby, Lockwood & Son.

Contents. Introductory. Motive power. Engine erecting. Boilers. Chimneys. Management of motive power. Pumping machinery. Winding machinery. Air compressors. Rock drills. Crushing machinery. Concentrating and gold-extracting plant. Transmission of power. Transport. Piping and joints. Construction. Tackle and tools. Details for estimates.

The author of this work is a mining engineer, who was formerly in charge of the machinery at the Mysore mine, India, and was manager of other mines, in connection with which his experience has been extensive. He has been able therefore to write a book of highly practical character, which will be of general value. Naturally it will be found more useful by British and colonial engineers than by American, inasmuch as reference is largely to the materials and machines that are supplied abroad, but American engineers will find many useful hints in it. The scope of the work is indicated by the table of contents given above. Our general impression of the treatment is distinctly favorable.

Mexico's Treasure House (Guanajuato). By Percy F. Martin. Cloth, 9½x6 in. Pp. 259. Illustrated. Price, $3. New York, 1906: The Cheltenham Press.

The author of this book is special correspondent for the London *Financial News*. The book is beautifully printed and bound, and is well illustrated by excellent reproductions of photographs, but the general effect is marred by the incorporation of some poor reproductions of charts of figures, which have been reduced too much. In one case the author appends a note saying: "The above figures are very minute, but can be read by the aid of a powerful magnifying glass!"

The early chapters of the book are entertaining in their accounts of general conditions in the district, which are presented in a popular and rather naïve way, but when the author passes on to his descriptions of the mines and mining companies interest wanes. There is not much of value to the mining engineer, and as to the investor for whom the work is primarily intended, we are dubious about what he may be led to think. In the accounts of the various mines we had the uncomfortable feeling of reading some things of the nature of "write ups." However, Guanajuato is certainly a great mining district, and an author may be forgiven for the expression of some enthusiasm.

Patents Relating to Mining and Metallurgy

UNITED STATES

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Feb. 5, 1907

DISTRIBUTING MACHINE FOR CLOSED FILTERS—Hiram W. Blaisdell, Los Angeles, Cal. No. 842,850. Filed Nov. 16, 1904.

CONVEYER—William H. Moreaus, Lake View, Iowa, and Frank R. Jones, Harvey, Ill., assignors to Austin Manufacturing Company, Chicago, Ill. No. 842,900. Filed Nov. 30, 1906.

ROCK DRILL—Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. No. 842,953. Filed Aug. 11, 1904.

ROCK DRILL SADDLE—George S. Power, Passaic, N. J. No. 842,972. Filed Mar. 31, 1906.

AUTOMATICALLY-MOVABLE DAM-CREST—William R. Davis, Albany, N. Y. No. 843,002. Filed Nov. 16, 1906.

CONVEYER—James A. Jamieson, Montreal, Quebec, Canada. No. 843,018. Filed Apr. 22, 1905.

PROCESS OF ENRICHING BLAST-FURNACE GAS—Carleton Ellis, White Plains, N. Y. No. 843,029. Filed Dec. 16, 1905.

ORE-SEPARATOR—Lucian B. Hunter, Greeley, Colo. No. 843,086. Filed Mar. 17, 1906.

AERIAL CABLE—Giovanni Strambini, Truckee, Cal. No. 843,116. Filed Sept. 5, 1906.

LOCK FOR FEED-SCREWS FOR ROCK-DRILLING ENGINES—Frederick E. Glaze, Victor, Colo. No. 843,144. Filed Mar. 16, 1906.

HOISTER-DRUM WITH HOLLOW SHAFTS—Asher Lambert, Newark, N. J. No. 843,154. Filed Oct. 2, 1906.

MULTIPLE-HAMMER-PISTON ROCK-DRILLING ENGINE—John G. Leyner, Denver, Colo. No. 843,159. Filed May 9, 1905.

PROCESS FOR CLEANSING THE SCREENS OF PULP-SCREENING MACHINES—Peter R. Thom, Appleton, Wis., assignor of two-thirds to Kimberly & Clark Company, Neenah, Wis. No. 843,185. Filed Oct. 14, 1905.

TWIN-CUPOLA PROCESS OF MAKING SEMI-STEEL CASTINGS—James C. Davis, Chicago, Ill., assignor by mesne assignments, to The American Brake Shoe & Foundry Company, New York. No. 843,197. Filed Feb. 27, 1899.

CONVEYER FOR EXCAVATING—Irving J. Smith, Richmond, Va. No. 843,239. Filed Oct. 16, 1906.

COKE-DISCHARGING APPARATUS—Lewis Albrecht, Baltimore, Md. No. 843,251. Filed Jan. 31, 1906.

METHOD OF TREATING LIME—Mone R. Isaacs, Philadelphia, Pa. No. 843,277. Filed Apr. 25, 1906. Renewed Jan. 16 1907.

SCREEN FOR CAR-DUMPING APPARATUS—Charles A. Fry, New York, N. Y., assignor, by mesne assignments, to Dodge Coal Storage Company, Saugatuck, Conn. No. 843,334. Filed Oct. 18, 1904.

MECHANISM FOR HANDLING METAL IN ROLLING-MILLS—Adam J. Hoak, Kewanee, Ill. No. 843,395. Filed Sept. 12, 1905.

CRUSHING AND PULVERIZING MACHINE—Jacques Ancel, Asnières, France, assignor to Charles Brodbeck, Paris, France. No. 843,428. Filed Oct. 4, 1904.

SAFETY CLOSING DEVICE FOR MINERS' LAMPS—Alexandre L. Tombelaine, Chaptelat, France. No. 843,505. Filed Oct. 9, 1905.

PROCESS OF REVIVIFYING GAS-PURIFYING MATERIALS—Henry L. Doherty, Madison, Wis. No. 843,524. Filed Nov. 12, 1906.

BRIQUET-MAKING MACHINE—Edgar D. Misner, St. Louis, Mo., assignor to William C. Renfrow, Joplin, Mo. No. 843,565. Filed July 27, 1906.

COKE-DRAWING MACHINE—McClellan F. Stunkard, Fayette county, Pa. No. 843,568. Filed Oct. 29, 1906.

TREATMENT OF IRON AND STEEL—Harry Luckenbach, San Francisco, Cal., assignor of part interest to William H. Kelly, San Francisco, Cal., George L. Robinson, Frederick E. Fishel, and Joseph J. Robinson, New York, N. Y., and Frederick F. Nolte. No. 843,569. Filed Feb. 10, 1906.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Feb. 2, 1907.

ROCK CRUSHER—B. Gray, Johannesburg, S. A. In rock breakers of the jaw type, providing toggle arms the length of which can be adjusted according to the amount of wear of the crushing surfaces. No. 347 of 1906.

SODIUM PERBORATE—Deutsche Gold und Silver Scheide Anstalt, Frankfurt a. M., Germany. Manufacture of sodium perborate by treating a mixture of sodium peroxide and boric acid with carbonic acid. No. 503 of 1906.

ELECTROLYSIS OF COPPER—L. M. Lafontaine, Paris, France. An electrolytic bath for extracting copper from ores, consisting of a 10 per cent. solution of sulphuric acid, together with barium dioxide and sulphate of copper and a carbon agent such as lamp black. No. 2989 of 1906.

VAPORIZING WATER IN MINES—W. Collier, Bridgend, Glamorgan. An improved apparatus for producing water vapor in mines by means of fans which beat up water issuing from orifices. No. 8555 of 1906.

CUTTERS FOR DREDGES—F. Lobnitz, Renfrew. Improved cutters for breaking up ground under water, for use in connection with dredging apparatus. No. 15,852 of 1906.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. C. Douglas, of Houghton, Mich., is a visitor in New York.

F. L. Bosqui has returned from Colorado, and has taken an office in the Studio building, Berkeley, California.

Arthur Dickinson, of the firm of Charleton, Dickinson & Co., has left London for Norway to inspect a silver-lead mine.

Gentry Hillman has resigned his position as general superintendent of furnaces for the Southern Steel Company.

Charles F. Boyers is now mechanical engineer with the United States Coal and Coke Company at Gary, West Virginia.

J. W. Duntley, president of the Chicago Pneumatic Tool Company, has returned from a five weeks' business trip to Europe.

E. T. Buek has resigned his position as vice-president of the Southern Steel Company, but remains a director of the company.

George W. Maynard, mining and metallurgical engineer, of New York, went South this week to examine iron mines in Alabama.

Capt. Thomas Hoatson, of Calumet, Mich., president of the Superior & Pittsburg Mining Company, is in New York on business.

Charles M. Hampson, consulting mechanical engineer, has returned to Denver, Colo., from a trip through the Cripple Creek district.

Samuel W. Osgood, of Chicago, recently made an examination of property near Butte, Mon., owned by the Pittsburg & Montana Copper Company.

Edgar A. Collins has resigned the management of the Combination Mines Company, at Goldfield, Nev., and accepted the management of the Montana-Tonopah Mining Company, at Tonopah.

R. Gilman Brown, consulting engineer, has ceased to represent the firm of Charleton, Dickinson & Co., of London, in San Francisco, as it is his intention to reside in London permanently.

Abbot A. Hanks, chemist and metallurgist, who has been in Oakland, Cal., since the catastrophe in San Francisco, will return to the city March 1, having secured offices at 425 Washington street, San Francisco.

Martin J. Heller, general manager for Capt. J. R. De Lamar, has relinquished the position of consulting engineer to the Nipissing Mines Company, Cobalt, Ont., in connection with late changes in the directorate of that company.

Charles C. Derby, for five years past manager of the Mariposa Commercial and Mining Company at Mt. Bullion, Cal., has resigned and will take up work as consulting engineer, with office at 1001 Franklin street, San Francisco.

J. A. Lamoureaux, of New York, president of the Calumet Graphite Mining and Milling Company, with his engineer, W. T. Downs, of Jersey City, is at the graphite mines in Calumet, P. Q., to start the new 100-ton concentrating mill recently erected.

E. F. Daxman, formerly manager of the Derry Coal and Coke Company, Latrobe, Penn., has been appointed general manager of the coal and coke properties in western Pennsylvania and West Virginia belonging to the Central Iron and Steel Company, Harrisburg, Pennsylvania.

E. Gybbon Spilsbury, mining and metallurgical engineer, of New York, whose serious accident while in Mexico we mentioned some time ago, is still in the hospital at Nogales, Arizona. His recovery has been delayed by a severe attack of pneumonia. His friends will be glad to know that he is now out of danger.

Announcement has been made of the appointment of C. A. Saxton, of Pennsylvania, as general manager of the properties operated under the control of Capt. Henry Stern and associates, of New York. Among the list are the Yampa mines and smelter at Bingham, Utah, the Britannia mine and smelter in British Columbia.

A party from Minnesota visited the mines at Globe, Arizona, last week. In the party were H. B. Howland, L. Rouchelean, John U. Sebenius, and R. B. Whiteside, of Duluth, directors of the Globe Consolidated Copper Company; Dwight E. Woodbridge, mining engineer, of Duluth; G. G. Hartley, a Mesabi mine-owner; and F. B. Mott, superintendent of the Mountain Iron mine on the Mesabi range.

Frank E. Shedd, one of the district superintendents of the Lehigh Valley Coal Company, has been promoted from the Hazleton district to take charge of the new operations at Mt. Carmel. Six years ago when foreman of the William A. Colliery, at Duryea, Mr. Shedd was promoted to superintendent of a small operation and was again promoted at intervals until a short time ago he was placed in charge of the Hazleton district, one of the most important in the Lehigh's extensive properties. He was selected to take charge of the new operations at Mt. Carmel owing to the proficiency he has shown in developing new lands. He is succeeded in Hazleton by William Underwood, division engineer.

Obituary

Thomas F. Griffin, one of the pioneers in the manufacture of car wheels, and of iron suitable for that purpose, died in Chicago, Feb. 11, aged 80 years.

Hugh McMillan, who died in Detroit, Mich., Feb. 10, was largely interested in iron manufacture, and in iron-mining enterprises in Michigan and Minnesota.

Frank Wayland Higgins, ex-governor of New York, who died in Olean, N. Y., Feb. 12, was largely interested in iron property in Minnesota. He owned a large share in the Higgins and other mines and in lands adjoining the Morrow and McKinley mines. Governor Higgins, however, did not take any active part in the management of those properties.

Herman Unzicker, who died at his home in Chicago, Feb. 7, aged 60 years, was born at Schierstein, on the Rhine, Germany, in 1846. He received his early education from private tutors at the family home. Early in the 60s he entered the works of Emil Roth, at Iltstein, Hesse-Nassau. This firm built pumps and general machinery. He then entered the Baugewerbe Schule of Holzmünden. After leaving this institution he became superintendent of the Ostheimisch Maschinenfabrik at Marburg. Herr Ostheim, the owner of the works, at a later date repeatedly offered him equal partnership if he would return to Germany. He came to the United States in 1872 and settled in Chicago. His first position there was with Fraser & Chalmers, and there he made mining machinery his specialty. It may well be said that he was a most competent and able designer and constructor of that class of machinery. In 1887 Mr. Unzicker, with two partners, started the Chicago Iron Works. The work of that concern met with general approval, but the firm was, financially, not strong enough to withstand the panic of 1893. Later he returned to a position with Fraser & Chalmers, and subsequently with the Allis Chalmers Company. When the new firm of Chalmers & Williams was formed he took a position with them. Herman Unzicker designed and superintended some noted mining plants and reduction works, such as the Granite Mountain, Bi-metallic, Blue Bird, and Drum Lummon Mills; the East Grey Rock, and High Ore hoists, etc. His work is favorably known throughout the West, and in foreign countries. He left a widow, two sons and one daughter. Walter, the oldest son, is a graduate of the Michigan College of Mines, and is at present managing a silver-lead property in Guerrero, Mexico.

Industrial

The H. W. Johns-Manville Company has opened a new branch office at 214 Main street, Buffalo, N. Y., under charge of George A. Schmidt.

At the recent annual meeting of the Detroit Copper and Brass Rolling Mills, the following officers were chosen: Lewis H. Jones, president and general manager; Theodore D. Buhl, first vice-president; Richard P. Joy, second vice-president; William F. Montgomery, secretary and treasurer; Frank H. Hoffman, assistant secretary.

[illegible] describes a line of air compressors, known as "Type H." These compressors are duplex, steam-driven, automatic machines, mounted upon a single base and entirely contained. All possible combinations of steam and air cylinders are provided for, in sizes ranging from below 10 to above 200 h.p. These compressors are designed for practical adaptation to the special and exacting conditions of economical air compression.

The American Iron and Steel Company, Lebanon, Penn., reports that it spent during 1906 for betterments and extensions—mainly for new buildings and new machinery—$167,001; increased the reserve fund to provide for depreciation by $65,500; paid the usual dividends on preferred and common stock; and increased considerably the stock of raw materials and finished goods. After all this, the accounts show an increased balance of undivided profits amounting at the close of business, Dec. 31, to $1,618,220. The business of 1906 far surpassed, in tonnage and value, that of any previous year in the history of the company.

The Chicago Pneumatic Tool Company reports for 1906 net earnings amounting to $1,001,550. The largely increased sales and profits realized amounted to 11.2 per cent. Of the amount earned during the year, amounting to $686,468.61, available for dividends, the directors have appropriated 4 per cent. for dividends declared, and the remainder, amounting to $442,117, has been added to the surplus account. Substantial additions to plants have been made during the year, requiring liberal expenditures. The excess current assets, Dec. 31, were $1,542,076, an increase of over $883,000 since the company was organized five years ago. In addition, large expenditures have been made during the year in providing additional plant capacity and substantial amounts have been added to the assets of the foreign organizations.

Societies and Technical Schools.

The Connersville Blower Company, of Connersville, Ind., is making a number of models of its rotary blowers and pumps, which it intends to present to the different engineering and mining schools of this country, which have courses in mining and metallurgy.

University of California—The Mining College has at last taken possession of the new Hearst memorial mining building, soon to be the most commodious, best equipped, and in every essential the finest building devoted to such a purpose in any educational institution in the world. When completed the building will have cost over $[illegible] [illegible] equipped by Mrs. George Hearst as a memorial to her husband, who made his [illegible] in mining operations.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Western Tube Company, Kewanee, Ill. "Kewanee Union" Pipe Connections. Six-page folder, illustrated, paper, 5x7 in.; free.

John A. Traylor Machinery Company, Denver, Colo. Frisbie Friction Clutches and Pulleys. Pp. 4, illustrated, paper, 3½x6½ in.

The Locke Insulator Manufacturing Company, Victor, N. Y. Catalog No. 9. "The Insulator Book." Pp. 59, illustrated, [illegible], 1907.

Standard Sanitary Manufacturing Company, 35-37 West Thirty-first street, New York City. Modern Sanitation. Pp. 32, illustrated, paper, 7x10 in.; January, 1907.

Sutton, Steele & Steele, Inc., 194 North Jefferson street, Dallas, Texas. Bulletin T.I. The S. S. & S. Dry Concentrating Table. Pp. 4, illustrated, paper, 6x9½ in.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin 1419. Allis-Chalmers Crushing Rolls for Coal, Rock, Salt, Phosphate Rock, Etc. Pp. 4, illustrated; paper, 8x10½ in.; Sept., 1906.

Construction News

Webbwood, Ontario—The Shakespeare Gold Mining Company has decided to put up a 50-stamp mill at Webbwood at an early date.

Lead, South Dakota—A steam hoist and other machinery will be put in on the Pluma property in the spring. The company's address is at Lead City, South Dakota.

Pineville, Kentucky—The Edgmont Coal Company is preparing to open coal mines, and will need hoisting and other machinery. C. S. Nield, Wilton, Ky., is in charge of operations. An electric plant is also to be installed.

Sherwood, Tennessee—The Cross Creek Coal Company is arranging to open several coal mines; also to build a spur track two miles long, to give railroad connection. Machinery and materials will be needed. Mark Packard, Mutual Life building, Buffalo, N. Y., is largely interested.

Crab Orchard, Tennessee—The Southern Coal and Iron Company is preparing to open two coal mines at Crab Orchard and Cox Valley, and will need machinery. The construction of a blast furnace is also under consideration. John A. Shellito, 80 Wall street, New York City, is president and general manager.

Special Correspondence

San Francisco Feb. 13

A bill has passed the house of representatives which amends the Caminetti law relating to hydraulic mining by providing that where it shall appear to the California Débris Commission that hydraulic mining may be carried on without damage to navigable rivers or lands adjacent thereto, an order may be issued authorizing such mining to be carried on without requiring the construction of any restraining dam, impounding works or settling reservoirs. Under the present law an impounding dam of some sort is required, even if the commission does not consider it necessary. There are hundreds of small properties, especially in Plumas and Sierra counties in this State, at which, were it not for the prohibitory law, hydraulic mining might be carried on successfully without doing the least harm to navigable streams or farming lands. The members of the California Débris Commission know where these claims are, but they are powerless to act under the present conditions. If the amendment above referred to finally becomes a part of the hydraulic-mining law, many of these claims can again be worked profitably.

Announcement has been made by H. B. Underhill, president of the Selby Smelting and Lead Company, that the addition of an acid plant to the new smelting plant at San Bruno point has been authorized. The purpose of this plant is to make acid out of the sulphur fumes coming from the smelter during the season when the winds are variable. The acid department will cost $300,000. It has been concluded that with this arrangement no one can be harmed by the fumes. In the summer the winds are from the west. The smelter plant is situated 10 miles from San Francisco, between five and six miles from Burlingame, and 12 miles from Alameda. The business advantages to arise from the smelter to this community are great, as 1000 men will be steadily employed and a market will be supplied for the silicious ores of California and Nevada and make it possible to work low-grade deposits of copper in California at a profit. By building an acid plant to take care of the sulphur fumes, the company will do away with any possible annoyance to the community adjacent to the plant, and at the same time produce sulphuric acid at a low price.

The Midway district oil producers of Kern county have come out successfully in their contest with the Standard Oil Company for the sale of the oil of that district, a contract having been entered into with the trust for 3,500,000 barrels of oil at the market price of 30c. per barrel, the highest price for crude paid for five years. According to the agreement the Standard agrees to take 3,500,000 bbl. at 30c.; the pipe-line recently surveyed must

be built and ready to run oil within 60 days; all oil of 14 gravity or above shall be accepted; a minimum of 7000 bbl. a day must be delivered, with refusal to take all. There is no limit in which the producers' end of the contract must be filled. The Midway producers are unwilling to announce as yet the companies which have agreed to enter into this compact.

The Oil City and Twenty-eight oil properties in Coalinga district, Fresno county, have been purchased by parties interested with the Standard Oil Company for $955,000. This will make $3,000,000 spent on oil properties in that district recently. The price of light oil, such as Coalinga produces, has recently been raised largely in this market. The properties to be taken in the deal include 320 acres owned by the Oil City Company and 160 acres owned by the Twenty-eight Oil Company and many producing wells in Coalinga. The lands are under a lease to the Hanford Company, which is controlled by the Western Fuel Company, back of which is the Standard Oil. The product from Coalinga will be running to Point Richmond soon, where the great refinery plant of the Standard Oil on this coast is situated.

The supervisors of the county of Sutter, a little farming county lying south of Butte, have passed resolutions directing the district attorney of the county to institute proceedings against the dredgers to enjoin and perpetually restrain them from operating dredge boats on or near the Feather river at Oroville so as to allow tailings from the same to escape into the waters of the Feather.

The Sacramento Valley & Eastern Railroad Company has let the contract for building the first 10 miles of its 14-mile road from Kennett to Delmar. This section is to be completed by next August. Three camps have been established east of Kennett. The railroad is being built primarily to give the smelter at Bully Hill, or Delmar, a railroad connection with the Southern Pacific. The road will pass through Heroult, where an iron smelter is now under construction, and through the old mining town of Copper City.

Utah and Ohio men, among whom is F. H. Clark, of Salt Lake, have secured four miles of Shakespeare beach, between Manhattan and Hermosa beaches, about 20 miles from Los Angeles, and propose to mine the sands for gold, iron and platinum.

In opening the manganese deposits between Potter and Redwood valleys, in Mendocino county, it is expected to construct an aërial tramway from the top of the mountain down to the Redwood valley. A crew of men has been set at work opening the deposits for more careful examination.

Duncan McVichie, managing director of the Balaklala Company, is authority for the statement that the smelter at Coram, Shasta county, will be ready to go into commission in August, by which time there will be 2,000,000 tons of ore blocked out in the mine. Of this amount 400,000 tons will run 4 per cent. in copper, he says. The smelter will be increased to 1250 tons daily capacity, in order to treat the ore from the Shasta King and other mines of the Trinity Copper Company.

Seven men of the United States Geological Survey are now stationed at Furnace Creek ranch, Inyo county, working on the first Government topographical map of the region. The map will be struck off for the public by July 15. The demand for a Government map of the Death Valley region has been almost unparalleled and has come from all portions of the United States.

Salt Lake City Feb. 16

The Ohio Copper Company, which recently passed into the control of F. Augustus Heinze, has broken ground for its proposed mill which is to have capacity for the treatment of 2000 tons of ore per day. The plant is to be erected near the mouth of the Mascotte tunnel of the Dalton & Lark mine, which is being driven on to a connection with the orebodies of the Ohio mine, as well as to those of the Commercial mine of the Bingham Consolidated. To reach the latter the tunnel will have to be extended about 7000 ft. Contracts are to be let for equipment soon and the plant will probably be ready for commission before the close of the present year. It is not unlikely that the smelting operations of the Bingham Consolidated company will be conducted near the mill-site in the future, notwithstanding the company has secured options on ground elsewhere.

At the annual meeting of the Columbus Consolidated Mining Company, the old board of directors, with one exception, was re-elected. Tony Jacobson, of Salt Lake, will continue president and general manager. In his report, Mr. Jacobson shows that, during the last calendar year the cash receipts of the company from ore sales and other sources amounted to $403,528, which with the balance of $28,647 on hand at the beginning of the year, made up a total of $432,175. The disbursements amounted to $286,280. During the year there were mined 6590 tons of first-class ore and of this amount 6134 tons were sold at an average of $43.33 per ton. There was also mined 12,299 tons of milling ore, of a gross value of $11.15 per ton. New development consisted of 3304 ft. of tunnels, drifts and cross-cuts; 238 ft. of shaft sinking and 582 ft. of upraises, making the total 4124 ft.; the cost of the same averaging $16.99 per foot. The matter of providing transportation facilities is now receiving consideration by the directors of the Columbus Consolidated Company and it is probable that a standard-gage railroad will be built to a point within five miles of Alta, this year.

The annual meeting of the Ingot Gold Mining Company resulted in the election of John Dern, president; E. H. Airis, vice-president; George H. Dern, secretary and treasurer. This company owns territory adjoining the Consolidated Mercur mines. An assessment was levied on the stock to raise funds for development.

The Grand Central Mining Company has won another victory in the litigation which has been for several years pending in the courts with the Mammoth Mining Company. After being beaten in every step in the State courts, the Mammoth management endeavored to get the case into the Federal court for a re-hearing, but the application was denied and the judgment of the State supreme court will therefore stand. The only recourse left is the Supreme Court of the United States. The Grand Central sued for $300,000 damages, the value of ore alleged to have been unlawfully extracted, and for title to certain ground upon which apex rights were claimed.

The stockholders of the Utah Copper Company have been called to meet in special session, Feb. 19, at which time the capital stock of the company will be increased from 600,000 to 660,000 shares. The new issue is to be alloted to present shareholders for subscription on the basis of $25 a share and the proceeds are to be used to complete the construction of the new concentrating mill and power plant at Garfield. The plant will ultimately treat 6000 tons of ore per day. The initial unit of 3000 tons is nearing completion.

After several months spent in negotiations, the management of the American Smelting and Refining Company has succeeded in inducing the farmers who appeared in the late smelter-smoke cases to ask Judge Marshall for a modification of his late decree in which he set forth that in the future it would not be permissible for existing smelting concerns to treat any ore or combination of ores containing an excess of 6 per cent. sulphur in the charge. The smelting company agrees to compensate those of the farmers who were parties to the late suit to the extent of $60,000; of this sum, $20,000 is to be paid when the stipulation for the modification of the decree is properly signed and filed and the balance of $40,000 is due and payable as soon as the easements are signed by all the plaintiffs to the suit. The smelting company agrees to provide a bag-house system and cooling chambers, through which process it is promised that the dangerous elements contained in the fumes will be so far removed that there will be no danger to growing vegetation.

Globe, Arizona Feb. 14

At the Old Dominion concentrator at Globe, they are experimenting with a buddle or round table, with very satisfactory results. The table is [illegible]

plan is somewhat similar to those on Lake Superior, but it has been found that when covered with split vanner belts, rough side up, it gives better separation than from any other surface yet tried. This table takes the tailings from eight vanners and extracts therefrom daily nearly 2000 lb. of 4 to 5 per cent. concentrate, therefore making a saving, at present copper prices, of almost $20 per machine per day. Power used is not appreciable. It is probable that one or two more similar tables will be installed to treat the waste from additional vanners. Concentration at this mill is clean enough to leave only about 0.75 per cent. copper in tailings, and it is upon this sort of material that the new table works. Old Dominion smelter is now operating four furnaces steadily and is making from 110,000 to 118,000 lb. copper per day, or, say, 3,500,000 lb. per month. Troubles due to lack of fuel seem to have been overcome and the plant is working steadily. At the company's mine copper sulphides—chalcocite—cut on the 12th and 13th levels have now also been opened on the 14th, at the depth of 1100 ft. from surface. The vein, carrying ores grading from 5 per cent. up, has been opened into at points 600 ft. apart from foot-wall drifts, and a few days ago was 23 ft. wide in a crosscut, with the full width not determined. This discovery is of the highest importance to both this mine and the district; to the former because it has always struggled against a deficiency of sulphur in its furnace work, and to the latter because it is an additional proof that the ores of Globe extend deep into the diorite as fissures, secondarily enriched. Proofs of this have been multiplying of late. While a late examination of Old Dominion, under options on the stock at $52.50 per share, resulted in the forfeiture of the option, there is no doubt that the mine is in far better condition than at any previous period. Possibly if the company had been more anxious to open its orebodies for expert measurement than to preserve its underground workings, this examination might have resulted differently.

The Globe district is now the most active in Arizona in the way of new development. Every day machinery for new operations is sent out from the town. The Gila Valley, Globe & Northern Railway is building north down Pinal creek to reach a number of small mines that now send their product out by team. This should add materially to activity outside the immediate circle of Globe proper. Several large Eastern interests are examining the district with care, preliminary to development. One new property, the Superior & Boston, is sinking two shafts to cut ground that has been opened by the Arizona Commercial Copper Company. The Globe Consolidated Copper Company, easily the most important new development in the district, is down 500 ft. in one shaft, and is developing along the 465-ft. level of another. It will sink to 1100 ft. at once on the first shaft and is cutting a station and will crosscut on the 500. Arizona Commercial is developing at depth and has completed a standard-gage railway 3½ miles long from the Old Dominion smelter to its mines. A 300-ton matte smelter, largely for custom ores, is under construction some three miles below town on Pinal creek.

Indianapolis Feb. 16

The miners of Indiana during the past week twice stood out for the enforcement of State laws. At the Union mine, in Sullivan county, owned by the Deering Company, the mine boss had not regularly entered the mine for inspection each morning before the men began work and one morning the men refused to go to work. The superintendent threatened to discharge the mine committee, but a settlement was effected by assurances that the law would be complied with.

At mine No. 2, near Terre Haute, 50 miners quit work because the company does not provide an engineer to hoist the shot-firers after they have fixed the shots in the afternoon. These shots cannot be fired until the men have left the mine, and by the time they get through the engineer is off duty. There is a disputed question of law as to the requirement, and the case has been referred to the State mine inspector.

A mine explosion occurred in Castle Garden mine No. 6, south of Booneville, Feb. 15, fatally injuring three and seriously injuring 10 or more miners. The investigation shows that the explosion was probably due to what is known as a windy shot, from a hole drilled into the face of the coal 8 ft. deep and containing too much powder, the shot setting fire to dust, which added force to the explosion.

A report of the legislative committee recommends that the working places of every miner be tested by using a safety lamp every morning before the miners enter the mines; a restriction in the amount of powder to be used in shot firing to not more than 6 lb.; limits the number and the rapidity of the shots; recommends that shot-firers be employed by the miners in all mines of 300 tons daily capacity or more, and that the inspection force be increased from two deputies to four. The committee also recommends that the mixing of dynamite with black powder be forbidden in blasting coal; that dead shots be prohibited except in the block-coal field; that the opening of powder cans with a pick be prohibited under heavy penalty and that the storing of powder and dynamite within a mine be absolutely prohibited.

Scranton Feb. 19

Michael Kelly, an engineer at the Locust Spring colliery at Mt. Carmel, died in the engine house while hoisting the mine cage, and by the merest accident the cage was stopped in the middle of the shaft. George Fishinger, one of the fire-bosses was in the cage at the time, and after it stopped he signaled the engine room repeatedly. The fireman, hearing the signal, went to investigate and found that Kelly had died as the engine was in action. His right hand clutched the lever, while in his left hand he grasped the reverser. The slightest relaxation of either lever would have resulted in the cage being dashed against the hoisting machinery, or being thrown to the foot of the shaft.

The Pennsylvania Railroad, last week, made some tests of reinforced-concrete poles to take the place of wooden telegraph poles, owing to the increasing scarcity of timber. The concrete pole is about the same size and shape as the ordinary wooden pole, and was subjected to various tests to ascertain the strength as compared with the wooden pole. The officials state that the tests were satisfactory.

A bitter contest is imminent between the employees at the Morea colliery and the owners, Dodson & Co. The mine workers have refused to permit their case to go before the conciliation board, claiming that the company failed to obey the award of the board in a previous dispute. The company announces that it will secure other workers to take the place of the strikers.

Iron ore has been discovered in paying quantities at St. John's, a village between Wilkes-Barre and Hazelton in Luzerne county. M. S. Kemmerer & Co., owners of the Sandy Run colliery, have offered to lease the tract, paying 45c. a ton royalty on the ore mined.

The recently completed shaft of the Scranton Coal Company in Scranton, where considerable engineering difficulties were encountered, owing to the presence of a bed of quicksand, has been named Bryden shaft in honor of General Manager John R. Bryden.

Three miners employed in the Diamond mine of the Lackawanna railroad, in Scranton, were severely burned in a peculiar manner this week. They were preparing to drive a crosscut into an abandoned chamber when, while using the drill, they broke into an accumulation of gas. One of the men took off his coat and had partly succeeded in changing the course, when, the air-current was suddenly changed and the volume of gas was blown toward his fellow workmen, who were carrying naked lights. The three men escaped by lying down as soon as they saw that an explosion was imminent. Their injuries were very severe.

Toronto, Ont. Feb. 18

Numerous changes in the tariff bill now before the Canadian Parliament were announced this week by Finance Minister Fielding. Among new provisions affecting the mining and metallurgical industries

are the following: Blowers of steel of a kind not made in Canada for smelting and refining metals; rotary kilns, revolving roasters and furnaces of a kind not made in Canada for roasting ore, etc.; blast furnaces, slag trucks and slag pots of a kind not made in Canada; well-drilling machinery and apparatus of a kind not made in Canada for drilling for water, natural gas and oil, and prospecting for minerals; all these are placed on the free list.

A drawback of 99 per cent. of the duty is allowed on imports of lap-welded tubing of iron or steel, not less than 2½ in. diameter, testing 1000 lb. pressure to the square inch, when used in oil or natural-gas wells and for transmission of natural gas; also on bituminous coal, when imported by proprietors of smelting works and converted into coke for the smelting of metals.

The Ontario Government bill providing for the taxation of mines was introduced into the provincial legislature, Feb. 13, by Hon. Frank Cochrane. It provides for an acreage tax on mining lands in unorganized territories, and also for a tax on the profits of working mines whether in organized or unorganized territories in cases where the profits exceed $10,000 per year. In neither case is the amount of the tax specified in the draft bill, the fixing of the rate being postponed to a later stage. A companion bill provides that a portion of the proceeds of the tax will be devoted to the encouragement of the refining of metals within the province. Bonuses for the term of five years will be given as follows: On refined nickel or the nickel contained in nickel oxide, 6c. per pound, the aggregate bounty not to exceed $60,000 in any year; on refined cobalt, or cobalt contents of oxide of cobalt, 6c. per pound, aggregate bounty per year not to exceed $30,000; on refined copper, or on copper contents of sulphate of copper, 1½c. per pound, or on any copper product carrying at least 95 per cent. copper, ½c. per pound, the aggregate bounty not to exceed $60,000 per year; on white arsenic produced from mispickel ores, but not from other ores, ½c. per pound, the aggregate bounty not to exceed $15,000 per year. In case the bounty in any year is insufficient to meet all claims it is to be divided *pro rata*.

The completion of a power plant at Michipicoten falls, in the Michipicoten mining district, which is being constructed at a cost of $150,000, and will be ready to deliver electric power by next July, is regarded as likely to revive the gold-mining industry in that neighborhood. Economic working of the mines has been difficult, owing to the cost of operating machinery. The supply of power from the falls at a cost of $40 per horse-power per year, 24 hours per day, will, it is anticipated, render gold-mining profitable. Several of the companies are arranging for a supply. The Manxman, Grace and Reid will between them take 6000 h.p.

Alex. Scott, usually known as "Lucky" Scott, and John McKane, of Tonopah celebrity, have invested largely in copper properties which they intend to develop. They have taken over the Hamilton property in the Sudbury district where they have a diamond drill at work, and also secured the Campbell-Duke property in the Bruce mines region.

A 100-ton sampling plant is to be erected at Argentite, in the neighborhood of Cobalt, by S. L. Silverman, of Montana, to be conducted on an independent basis. It will be subsequently increased to a daily capacity of 250 tons.

Cobalt, Ont. Feb. 16

The official report of the Timiskaming & Northern Ontario Railway for the week ending Feb. 9 shows shipments of Cobalt ore as follows: La Rose, 117,578 lb.; Nipissing, 105,300; Kerr Lake, or Jacobs, 75,000; O'Brien, 67,000; Coniagas, 44,800; Cobalt Central, 32,307; total, 441,994 lb., or 221 short tons.

The contracts for the construction of a branch line of the Timiskaming & Northern Ontario Railway from Cobalt to Kerr lake, a distance of about five miles, has been let. This line will give transportation facilities to some of the principal mines.

American capitalists have secured a charter for the building of a line along the Montreal river through the Edison property. It may run as far north as Evelyn lake.

In the Larder Lake district, important finds have been made on Victoria creek, a branch of the Blanche river, including native silver, native gold, copper, galena and bismuth. There is also a black quartz said to be rich in gold, though its value has not yet been definitely ascertained.

London Feb. 9

A few weeks ago I referred to the case of the Copiapo Company, which owns the well known copper mines of that name in Chile, and mentioned that the new directorate appointed last year had come to the conclusion that the method of mining and disposing of the ores required thorough overhauling. The new scheme is now practically settled. The main shaft is to be sunk deeper and other levels are to be driven for prospecting purposes; also a smelter is to be erected, so as to smelt on the spot. For these purposes £50,000 of new capital is required, and the money is to be raised by the issue of debentures to this amount, exchangeable at any future time into shares of equal par value.

The British Aluminum Company, having got rid of the various troubles that clogged its operations in earlier years, is now extending its scope of action in many ways. The works at Foyers, in Scotland, have long been unequal to meet the demand for the metal, and the power to be supplied by the new works at Loch Leven will also fall short of the requirements. The latter works are not yet ready, and the directors are making special efforts to complete a part of them. It is hoped that 3000 h.p. from this source will be ready in spring. The directors have also acquired a partially developed water power in Stangfiord, Norway, and have purchased a similar concession at Orsieres, Switzerland. When all these schemes have fully fructified, the company will have available a total of something like 70,000 h.p. For the purpose of carrying out these additional schemes the capital is to be increased by the issue of £600,000 in 40,000 6 per cent. preference shares of £5 each, and 40,000 special shares of £10 each. The total cost will probably come to £200,000 more, which will subsequently be raised by the issue of debentures.

Some interesting information is now available in connection with the richer shoots of ores found at the Mexico mines of El Oro. These mines are under the control of the Exploration Company, and are an offshoot of El Oro Mining and Railway Company. The neighboring Esperanza mine developed some very rich shoots, and the possibility of such developments at El Oro, and the Mexico mines has always acted as a piquant sauce for the shareholders. Some of the richer ore at the Mexico is found on the third level on a small branch vein, which has so far been opened up for a length of 60 ft. Across a width of 2 ft. the values run $80 in gold and 700 oz. of silver per ton. Another similar body has been located on No. 4 level of greater width, but slightly less value, running $55 in gold, and from 4 to 5 ft. wide. The policy of the company is to pick out this ore and ship it to the smelter, in order to provide additional capital for completing the erection of the 40-stamp mill. During the month of January the amount shipped in this way was 279 tons, and the net proceeds were $33,000 in gold, the ore assaying $89 in gold and 70 oz. of silver. During the next four months similar amounts will be shipped, and the proceeds used for capital purposes.

Perth, Western Australia Jan. 10

An important and promising silver-lead mine, only about 25 miles from Perth, is being opened up by a syndicate of local men. A shaft has been sunk 85 ft. where the lode, which was 7 ft. wide near surface, has widened out to 15 ft. and carries rich values. Assays so far made have returned from 70 to 80 per cent. lead, and from 2 to 16 oz. silver per ton. Prospectors are testing the adjoining country and have picked up continuations of the lode.

The production of tin is steadily increasing, the principal districts being Greenbushes in the southwest, and on the Pilbarra goldfields in the northwest. At Moolyella some 400 men are working on alluvial tin deposits, and several lodes have been also located

General Mining News

[illegible] The exports of mineral oils from the United States during the month of January were, in gallons:

[illegible]

[illegible] illuminating oils. The totals show a decrease of 30,834,110 gal., or 4.8 per cent., over the preceding year.

ALABAMA

Official figures given out by State Mine Inspector J. M. Gray show a reduction in coal output for 1906 in Alabama as compared to the output in 1905. The total production for 1906, with but one small county unheard from—and that will not materially affect the report—was 11,446,161 [illegible] tons. The production in 1906 by counties is given out as follows: Bibb, 1,220,534 tons; Blount, 159,963; Cullman, 115,607; DeKalb, 32,834; Etowah, 130,660; Jefferson, 5,826,892; Marion, 60,895; Shelby, 157,524; St. Clair, 159,478; Tuskaloosa, 694,193; Walker, 2,877,217; Winston, 10,363. In comparison with the previous year, reductions in output were noted in Bibb, DeKalb, Etowah, Marion, St. Clair, Tuskaloosa and Winston counties. Jefferson county, the largest coal-producing county in the State, produced only 10,728 tons more coal in 1906 than in 1905. The decrease last year was 453,992 tons.

Southern Steel Company—This company has filed a petition in the Circuit Court at Birmingham, Ala., asking for an injunction against the numerous plaintiffs in suits brought against the Alabama Steel and Wire Company as a result of the explosion nearly two years ago in the Virginia mines, in Jefferson county. The object is to determine the liability of the Southern Steel Company, which acquired the properties of the Alabama Steel and Wire Company, in the pending cases. The explosion, which was said to have been one of dust in the mines, caused the death of 112 men. More than 118 suits for damages were filed against the company for sums ranging from $20,000 to $50,000 each. Four of these cases were tried, two of them being decided in favor [illegible] a mistrial and in the other case a verdict for $6000 was awarded the plaintiff, from which decision an appeal was taken. The injunction desired is to determine whether the Southern Steel Company is liable and to what extent. In the petition, which is very lengthy, it is set forth that there are more than 114 cases yet pending and that each case so far tried took up from two to three weeks time, costing the State something like $500 each. Should the court decide that the Southern Steel Company is not liable, all the causes would be dismissed. The suit is a novel one and will be watched closely.

ARIZONA

There has been introduced in the legislative assembly of Arizona a bill making it a felony for any person or persons to make or publish any false or fraudulent statement regarding any mines in this territory for the purpose of procuring persons to invest in such mines. It is thought that the bill will become a law, and that several other restrictions will be added to it before its final passage.

COCHISE COUNTY

Trouble is reported at Bisbee, owing to the organization of the miners by agents of the Western Federation of Miners. A despatch dated Feb. 17 reports that 1100 men had been laid off by several of the larger companies, and that it was expected that most of the mines would be temporarily closed. Bisbee and the whole Warren district have always been non-union, and the mines have been worked on the "open shop "plan.

GRAHAM COUNTY

Arizona Copper Company Ltd.—This company reports the production of its works at Clifton, in January, at 1124 short tons of copper.

YAVAPAI COUNTY

Dividend Consolidated Gold Mining Company—It is reported that this company will soon resume operations. Its property is near McCabe, and has been idle for some time.

Octave—This mine has passed from the Octave Gold Mining Company into the hands of Chicago capitalists, who will organize a new corporation and work the same. It has been given out by the management that operations on a large scale will be commenced in a short time. The Octave has been one of the large gold mines of the county, but has not been operated to any extent for the past two years.

Consolidated Arizona Smelting Company—In January this company smelted 12,000 tons of ore, producing 403 tons of blister copper. It is expected that the works will be soon operating at their full capacity.

[illegible] *Copper Company*—This company, recently organized in Boston, has closed a deal for a group of copper claims in the Hassayampa district, 12 miles southeast of Prescott.

CALIFORNIA

BUTTE COUNTY

Nugget Ranch—This company has been organized at Oroville by Los Angeles men, to purchase lands and build a gold dredge on the Nugget ranch in Butte creek cañon.

Butte Creek Gold Dredging Company—The machinery for this company is nearly completed and will be soon installed in Butte creek.

Gold Bar Company—The machinery for the dredge of this company in the Ferguson lands, Butte creek, will be installed as soon as the weather permits.

East Magalia Mining Company—This company, W. H. Parry superintendent, is developing the old Parry mine three miles from Magalia. Two large pumps have been provided to handle the water.

EL DORADO COUNTY

Bachi-Collins—This quartz mine, a mile from Garden Valley, has been sold to Nevada men. The mine is a new one.

INYO COUNTY

Darwin—At this camp, 20 miles south of Keeler, the Rio Tinto mine owned by J. L. Girner is being rapidly developed. The Defiance, opened to the 400 level, is beginning to show copper ore. The Lucky Jim, operated by Boston, Mass., men, shows good silver-lead ore. Senator T. L. Oddie, of Nevada, has recently bought a group of nine claims.

Resting Springs District—The Tecopa group of 20 claims in this district is reported sold. The Tonopah & Tidewater Railroad will run within three miles of the mines, which were opened over 30 years ago.

MADERA COUNTY

Golden State—This mine, six miles from Raymond, has a small force of men at work and a mill is to be put up as soon as the roads are in condition for hauling.

NEVADA COUNTY

Copper—Men have started work on copper deposits in the Brown & Tissure ranch, west of Grass Valley.

Morning Star—In this property, on the Mother Mitchel ranch west of Grass Valley, specimen ore has been discovered by H. & W. James, who have a bond upon it.

Union Blue Gravel—In this drift mine at North Bloomfield good gravel is being found and milled. J. H. O'Connor is superintendent and A. D. Gassaway, manager.

Murchie—In this mine, at Nevada City, a rich ledge has been met on the northeast side of the shaft at the 850 level. It is 8 ft. wide, all of milling ore.

Mountaineer—At this mine, Nevada City, J. C. Campbell superintendent, a large body of ore has been found. It is 2000 ft. from the mouth of the tunnel and 1200 ft. beyond where the shaft starts down from the tunnel.

Blue Tent—At this mine, on the Yuba river, a force of men has been set at work reopening the property under Superintendent Oscar Jones. This was at one time a very prominent hydraulic mine, and was

later worked by drifting. A new tunnel is being run to open a channel which cannot be reached through the old workings.

PLACER COUNTY

Belleview—This quartz mine, near Ophir, has been sold to W. F. Brice and associates, of Los Angeles. The 300-ft. shaft is being enlarged and strengthened.

Peckham Hill Tunnel—This tunnel, on the Forest Hill divide, is expected to open up seven gravel channels, and will cross about 100 old tunnels. The tunnel, now in 2000 ft., will drain a number of drift mines.

SAN BERNARDINO COUNTY

Providence Gold and Copper Company—The tunnel is in over 800 ft. on this property, near Kelso station. The vein is not expected to be reached sooner than six to nine months.

SAN DIEGO COUNTY

Picacho Basin—This property will shortly be producing again. The railroad from mill to river is being put in order and so is the milling plant. The mines have been unwatered, and 30 miners have been set at work.

SHASTA COUNTY

Rattlesnake—This mine, near Redding, now under bond to the Mammoth Copper Company, will soon begin shipping ore to the smelter.

SIERRA COUNTY

Alleghany—This company, near Alleghany, operating the McNulty diggings, has started piping with one monitor. This is the first hydraulic property worked in that section for about 25 years.

Tightner—In this mine, near Alleghany, famous for its rich pockets, a new shoot of ore has been found in the south drift 100 ft. from the shaft.

SISKIYOU COUNTY

Helena—In this property at Callahans, James McKean, superintendent, the ledge has been struck in tunnel No. 5, and a good average value of ore found.

TRINITY COUNTY

Fairview—At this property, Minersville, Charles Dobler, superintendent, a body of ore has been found just above the lower level.

Brown Bear—An important strike has been made in this mine at Deadwood by Grigsby & Motherwell, leasers. They have found an 8-in. streak of high-grade work, and a 2-ft. ledge of $30 ore.

COLORADO

LAKE COUNTY—LEADVILLE

Big Evans Gulch—A great deal of interest is being taken in the resumption of work at the Mammoth. At present the new company is installing a 10-in. water column, electric hoists and pumps, and when this is completed, unwatering the shaft will be commenced.

To the west and south of the Mammoth is located the Fitzhugh and from several levels a high grade of ore is being hoisted and sent to the smelter; the average is 30 tons daily. The lower north drift has penetrated the fault, and is now heading toward the end lines of the Mammoth; it is in flint and an upraise has been started into the porphry.

New Monarch—Considering the hardness of the ground fair progress is being made in sinking the Cleveland shaft; so far only 25 gal. of water are being raised every minute. The shaft is being sunk in a body of quartz; a strange feature has occurred in the north end of the shaft a few feet out of the perpendicular course, which cannot be used in sinking. A perfect wall comes in, alongside of which is a good vein of ore running well in gold, silver, and lead; as the shaft gains depth it is expected that this wall will come into the shaft, when the breaking of the ground will be more rapid. The body of quartz that the shaft is going through runs $6 per ton.

Sunday—This property, Ball Mountain, has been leased to M. A. Nicholson and associates, and the main shaft will be sunk another lift of 300 ft.; the present depth is 375 ft. The shaft is a perpendicular one and when sinking is completed a cage will be installed, and drifting to the vein will be started from the bottom. A deal is on foot by the present lessees to secure the right of way for a tunnel to be driven from the base of the mountain into the Sunday vein, and if successful it is probable that the Garibaldi tunnel, now in about 700 ft., will be used and driven ahead.

Rock Hill—The Ben Burb, Oro City and O'Sullivan claims are under lease to several well known practical miners of the camp and in a few months they have accomplished a great deal of work. All of the properties in early days produced heavily from the upper workings, and at present the chances of catching one of the Rock hill ore channels are very encouraging. All of the work is carried on from the Ben Burb shaft, which was re-timbered and put into good working order; while this work was being carried out several good bunches of ore were found and shipped, which aided materially in cutting down the expenses. A drift has been run from the Ben Burb to the O'Sullivan, and prospecting from this drift is being carried on in different directions. The Reindeer, Murphy shaft, Rock, Crecentia, Dome and others are shipping daily the regular quota of ore with development in each case being kept well ahead.

Yak Tunnel—A large amount of development work is being carried on from the different laterals in the great bore, and the main tunnel is being driven ahead to the Ollie Reed property, in South Evans gulch. When the necessary arrangements are completed with other companies in this section the tunnel will reach out to them. At the Louisville lateral 50 tons daily of sulphides and zinc ore are being hoisted from the lower workings.

SUMMIT COUNTY

A shipment of a carload of rich lead carbonate ore has just been completed from this property in a lease held by Knorr, Kistler & Co.

New York—This group of claims on Gibson Hill is now being worked by a company and a trial shipment of a complex lead-zinc-iron-sulphide ore has been sent to the sampler to ascertain how the product can best be treated.

Wellington—As long as the Colorado & Southern Railway can supply empty cars, the Wellington Company can keep filling them at the rate of 75 or 80 tons per day. This ore is high-grade zinc and goes to the Colorado Zinc Company's works in Denver. Shortage of cars is the only drawback at present.

Senator—This mine has a force of 20 miners taking out ore and filling, the bins ready to make regular shipments when the roads are opened up in spring.

Washington Joliet—H. T. Keltie, president of this company, is now at the mine in company with W. R. Everett, of Chicago, who is considering the purchase of the property. F. H. Summeril, of Denver, is making the examination for the Chicago people.

Sundown Placer—This property is now being put into shape for vigorous work this year. It is situated in Illinois gulch and is owned by Wm. Squires and associates.

Reliance Dredging Company—Dredgemaster D. A. McDonald has returned to Breckenridge and has commenced the work of repairing and reconstruction on the dredge-boat on the French Creek property.

Gibson Hill—This is the title of a new incorporation of a group of properties on Gibson hill. The incorporators are B. W. Newcomb, O. W. Pitcher, Geo. Kellog, and W. F. Forman. The authorized capital is $300,000.

Kimberly Consolidated—This company at Kokomo is employing 80 men on the construction of its new mill for treatment of lead-zinc ores.

Rothschild—This mine, at Rathbone, made a shipment of high-grade silver ore recently. Ruby silver is prominent in some of the ore. This ore was obtained from the main tunnel workings in Cooper Mountain. Thos. Webb is superintendent.

Hibbs—This company is operating the Victoria mine on Mount Royal at Frisco, and is employing three shifts of men in sinking the main shaft. J. Percy Hart is in charge of the work.

TELLER COUNTY—CRIPPLE CREEK

Drainage Tunnel—Talk about the drainage tunnel is being indulged in, but no

for the commencement of the big bore. It is understood that final action is being delayed until the railroads can be heard from with regard to subscribing toward the construction of the tunnel. At present it is not known just what action will be taken by the roads on the matter.

Forest Queen—The new hoisting plant on this property has been installed, and the work of sinking will be commenced at once. Considerable ore has been shipped from this property, which is being operated under lease by Chicago people. The shaft is at present 600 ft. deep.

Iron Clad Mill—A successful run has been made on this mill and a clean-up better than expected was the result. This mill is being operated by the Ironclad Milling Company under lease from the receiver of the Homestake Company, and has been running for some time. The ore treated is of low grade. It is reported on good authority that the large mill will soon be started again.

Portland—At the annual meeting of this company at Cheyenne, Wyo., the old board of trustees were re-elected for the ensuing year. The result was a decided victory for the Howbert party, as against the Burns faction. The former voted 1,861,017 shares against 604,497 shares by the latter. The principal contention of the Burns faction was that the stock of the Shannon and Stratton estates should not be voted. This amounted to over 1,200,000 shares, and was finally voted for the Howbert faction. The report of President Howbert showed the affairs of the company to be in good condition. The gross output of the mine for the past year amounted to 92,265 tons of ore of the value of $19.69 per ton and 11,318 tons of low-grade oxidized ore of the value of $10.18 per ton, making in all 103,583 tons of ore of the average value of $18.64 per ton, giving a gross output of $1,932,083. The cash on hand Dec. 31, after paying all expenses, amounted to $371,844. The total profit for the year, from both mine and mill, was $512,106. A large amount of development work was done during the year and several new orebodies opened up. The most important of these were those discovered in the winzes below the eleventh level of the Burns shaft. The ore during the past year was of considerably lower grade than that of the previous one. Dividends paid during the year were $690,000 in all.

GEORGIA

WHITE COUNTY

Canadian-American Loud Gold Mines, Ltd.—This company has been incorporated at Athens to work the old Loud gold mine, which has not been operated for some time. Rufus K. Reaves and others are incorporators.

IDAHO

The annual report of Robert N. Bell, State inspector of mines, gives the number of fatal accidents for the year at 17, which compares with 20 in 1905; 10 in 1904, and 20 in 1903. There were approximately 7000 men employed in mining during the year, the exact number being difficult to ascertain, owing to irregular working of some mines. The causes of accident were as follows:

Explosions of blasting compounds	6
Falling ground	4
Falling down chutes, etc.	5
Tramway accident	1
Handling timber	1
Total number	17
Average per 1000 employees	2.43

This shows a low average of deaths, as compared with some other mining States.

INDIAN TERRITORY

CHOCTAW NATION

Ozark Coal and Railway Company—This company has a lease on 1000 acres near Panama, together with mines and mining equipment producing 600 tons per day, and a connection with the Kansas City Southern Railroad. The company is at present cleaning out its mines and making some necessary improvements with a view to beginning operations March 1. Officers of the company are J. H. Durkee, Kansas City, Mo., president; H. F. Durkee, treasurer, and C. A. Braley, attorney and secretary.

KENTUCKY

BELL COUNTY

Edgmont Coal Company—This company has been organized with a paid-up capital stock of $150,000, and will develop coal lands near Pineville, in Bell county, Kentucky. The company owns about 5000 acres of coal lands, containing the Straight creek seam, and producing, it is stated, an excellent quality of steam and gas coal. A modern electrical mining plant will be installed for a production of 1000 tons daily. C. S. Nield, of Wilton, Ky., will be in charge of active operations.

MICHIGAN

HOUGHTON COUNTY COPPER

Franklin—It has been decided to crosscut at the 22d and 23d levels from No. 1 shaft in the conglomerate to the Pewabic lode. This will facilitate prospecting at depth. In the spring the old Pewabic property will probably be pumped and efforts will be made to make a mine of the property.

KEWEENAW COUNTY—COPPER

Allouez—It is reported that with the transfer of 25,000 shares of Allouez stock the Calumet & Hecla Company has acquired control of this company. The rumor, which has been current for some time, is now practically confirmed by the announcement of this transfer of Allouez stock. The Calumet & Hecla mine now owns 35,000 shares in its own name, and the balance of control is held by interests favorable to that company. No. 2 shaft is now in country rock and is almost completely lined with concrete, which will eliminate water trouble. The compressors for this shaft have been shipped and will be installed as soon as they arrive.

Centennial—With the passing of the control of the Allouez, 60,000 of the shares of this company have been acquired by the Calumet & Hecla Company. Conditions at the property remain unchanged, except that work is progressing steadily and No. 2 shaft is being sunk to the 28th level. Work has suffered considerably on account of the heavy storms of the past few weeks.

Keweenaw Copper Company—Since its organization 1½ years ago this company has built an operating line of railroad from Lac La Belle to Calumet. A cross-section of the entire property has been taken with diamond drills and one shaft, the Medora, has been opened to a depth of 670 ft., while a second is down about 200 ft. It is stated that the amygdaloid lode shows very good values. It is expected that next summer's development will be most satisfactory and will throw new light on the extent of mineralization in Keweenaw county.

MONTANA

BUTTE DISTRICT

Amalgamated—All of the mines of this company, with the exception of the Neversweat, are again yielding their customary quantity of ore, the weather having moderated sufficiently to permit of resumption. The Neversweat is yielding only in part, but will be running full blast soon. Boston & Montana is shipping its usual quantity of ore, but is still a little short on coke at the smelter. It has passed the 1700-ft. mark in the West Colusa shaft, having sunk 100 ft. since it resumed work in the bottom, 45 ft. of which was put down in January. It is going to the 2000, and expects to make about 60 ft. a month hereafter. Parrot is preparing to sink the Little Mina shaft from the 800 to the 1000. It tapped the bottom of the opening with a diamond drill from a crosscut south of the 1000-ft. station of the Mountain Con, and drained the water. The Little Mina has not been worked for several years, but was a fairly good producer when in operation. The company expects to open greater orebodies between the 800 and 1000.

Butte Coalition—This company has opened an immense body of high-grade copper ore in the Minnie Healey. The point of discovery is 250 ft. west of the main shaft, where a winze was sunk from the 1200 to the 1300. The vein will be crosscut from the 1400 when the shaft reaches this depth. The Rarus is yielding about 700 tons of ore a day. During the car-shortage period no particular attempt was made to operate the Corra or Minnie Healey on an extensive scale, because there were not enough cars to transport

the output, and the company desired to concentrate its efforts on the Rarus. Most of the output of Rarus is coming from vein 40, which was lost in the upper levels by United Copper, and found lower by Coalition. Veins 14, 17, and 19 are not very productive at present, but may become better with depth. The shaft is sinking, and has reached the 2000. It is going to the 2500, and the remaining 500 will be sunk under contract.

North Butte—The crosscut heading for the Berlin from the 1600-ft. level of the Jessie has entered Snowball ground adjoining the Berlin on the south, and is said to have cut a 22-ft. vein of high-grade copper ore in the property. The company is now making its customary shipments, having recovered from the recent congested condition that affected all large operators.

Davis-Daly—The crosscut south of the 500-ft. station of the Smokehouse has encountered a 10-ft. vein, but the vein filling is not commercial ore. Drifting is in progress east and west, a distance of 23 ft. having been attained in either direction. The shaft on the Colorado, another company property, is 680 ft. deep, and is bound for the 1000. The shaft on the Mount Moriah is 520 ft., and is also going to the 1000 on an incline. The vein has pitched south of the opening and sinking is in the foot wall. The face of the crosscut from the 1800-ft. station of the Original is more than 1300 ft. south and advancing rapidly. It is supposed to be close to the vein of the Thomas claim.

Butte-Milwaukee—This company, of which Butte-New York is the holding corporation, has finished equipping its property with machinery, and is sinking a three-compartment shaft, now about 100 ft. deep. It is installing an air compressor to facilitate the work.

Butte Copper Exploration—A crosscut has been driven north of the 1000-ft. station and another started south. No commercial ore has been struck in the property, but indications are said to be favorable.

PARK COUNTY

Montana Coal and Coke Company—It is reported that this company has closed a yearly contract to deliver its coke output to the Anaconda and Washoe works at Butte.

NEVADA

LYON COUNTY

Yerington—A deal was closed in Salt Lake City recently for the purchase of the Copper King and Copper Deposit groups of claims at Yerington, and these will form the basis for the organization of the Yerington Consolidated Copper Company. The area is 225 acres, situated between the Mason Valley and Bluestone mines. The purchasers, with the exception of Col. E. A. Wall and John Dern, are heavily interested in the Nevada-Douglas mine in the same district.

LINCOLN COUNTY

Groom—These lead mines, in the Groom district, have been sold to a syndicate of Goldfield mining men.

NYE COUNTY

Shoshone—A shipment of 2000 sacks of the richest ore has been made to Salt Lake. The work of connecting the mine with the railroad by a short spur is nearly completed, and this will greatly facilitate mining. Development operations are being carried out in the mine, and large ore reserves have been opened.

Tramp Consolidated—A shipment of rich ore amounting to about three railroad carloads has been sacked and is awaiting cars. The mine workings continue to look well.

Venture Nevada—The main tunnel has been extended a distance of 520 ft., and it is estimated that it will have to be driven a further 100 ft. before cutting the main ledge, which outcrops at the surface.

Skookum—This mine is situated on Bare mountain, 10 miles from Rhyolite, and has not long been operated. The shaft is 125 ft. in depth, and is being sunk on a medium-sized vein. A recent trial shipment of the ore amounting to 20 tons gave an average return at the Salt Lake smelters of $166 per ton.

Gibraltar—The vein system has been developed by tunnels to a depth of 500 ft., and a large amount of ore of milling grade has been blocked out. A shaft is also being sunk to prospect for the Tramp Consolidated veins, which are believed to run into the southern portions of the Gibraltar leases. This shaft has now reached 330 ft. depth.

China-Nevada—Prospecting work is being vigorously pursued on this property, which is situated in the vicinity of the Mayflower mine. A promising quartz vein outcrops on the surface, and a shaft is being sunk to prospect it at the 150-ft. level.

PENNSYLVANIA

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company has completed the installation of electric lighting in the Sterling colliery, near Shamokin, where the workings are as well illuminated as the buildings on the surface. Arc lights are installed in the gangways while incandescent lights are used in the chambers. The North Franklin and the Enterprise collieries are also equipped with electric lights.

BITUMINOUS COAL

Ellsworth Collieries Company—This company has taken over the property of the Ellsworth Coal Company, consisting of 15,000 acres of land in Washington county, and opened mines which produced last year 1,321,000 tons of coal. The new company has issued $1,000,000 capital stock, all of which is held by the Lackawanna Steel Company; and $6,000,000 purchase-money bonds.

SOUTH DAKOTA

LAWRENCE COUNTY

Homestake Extension—The differences between the Douglas Lacey people and the local management have been adjusted, and the headquarters will be transferred from New York to Deadwood. Both this property and the New England Homestake, under the same management and located directly across the gulch, will resume operation at once.

New England Homestake—A settlement of the difficulties between the Douglas Lacey Company and the local management of this company has been reached, and at a meeting held in New York the following officers were elected: Charles E. McHugh, Deadwood, president; R. L. Spenser, New York, vice-president; N. E. Frankling, Deadwood, treasurer; John R. Russell, Deadwood, secretary; E. Boldwin Hammitt, of Hartford, Conn., W. H. Bonham, Deadwood, and John Treber, Deadwood, directors. Work will be resumed on the property at once.

Lucky Strike—The construction of a 40-stamp mill on this property will be begun early in the spring. Sufficient lumber has now been cut at the saw-mill on the ground for the entire mill, and the grading is also completed. The necessary machinery is all on the ground and has been housed in until the mill is ready to receive it.

PENNINGTON COUNTY

Caliboga—A deal is now pending for the purchase of ground about and including this property in the antimony belt near Silver City. This property was located 12 years ago, and considerable development work has been done upon it. A shaft, now 125 ft. deep, was sunk on a vein of lead-silver ore, and at the 80-ft. level a ledge 12 ft. wide and carrying lead was encountered. The company has a steam hoist and pump.

Mercedes—This property will be sold for debt at Rapid City, Feb. 23. The property was worked successfully for six months, and then owing to internal dissensions a receiver was appointed. The shaft is 140 ft. deep and in good ore.

UTAH

BEAVER COUNTY

Newhouse Mines and Smelters—The mill of this company is now being operated with equipment to handle 1200 tons of ore per day.

Indian Queen—A good body of lead-silver ore containing shipping values has been recently developed in this property, which is situated near the Cactus copper property of the Newhouse Mines and Smelters.

Talisman—The heavy mine equipment ordered for this property some time ago is being installed.

management of this company has contracted for electrical energy to the amount of 1000 h.p. from the Telluride Electric Power and Transportation Company, delivery to begin not later than Nov. 1, 1907. One object of this move is to guard against future trouble on account of a fuel shortage.

IRON COUNTY

Jennie Gold—The management of this property has announced that the mill under construction has been inclosed, and that it will be ready for commission about May 1. C. A. Short, of Gold Springs, is manager.

Fish Springs property has received $5600 in adjustment of the late loss of the company's hoisting plant by fire. Notwithstanding the loss the company has been marketing about the usual amount of ore, by utilizing an old shaft.

quite successfully with a dry-process concentrator.

place for the new hoisting machinery on the 1200-ft. level, copper ore of a commercial grade was encountered.

completed the surveys of the site selected for its lead smelter and the breaking of ground for the plant will begin by March 1. The Eureka Railway Company, a subsidiary corporation, has been formed, and will build a standard-gage railroad to connect several of the principal mines of the Tintic district with the smelter.

Tintic Ore Shipments—Last week shipments amounted to 148 carloads, the contributing mines being: Ajax, 3; Beck Tunnel, 12; Bullion Beck, 9; Carisa, 4; Centennial Eureka, 49; Eagle & Blue Bell, 7; Eureka Hill, 2; Gemini, 5; Godiva, 1; Grand Central, 10; Mammoth, 11; May Day, 5; Ridge & Valley, 3; Scranton, 6; Swansea, 3; Tintic Iron, 8; Uncle Sam, 3; Victoria, 4; Yankee Consolidated, 3 cars.

PIUTE COUNTY

Sciver Consolidated—The mill on the property of this company is in operation and is said to be effecting a good saving.

Annie Laurie—This property is being operated under the direction of the receiver appointed some time ago.

Utah Apex—This company has given notice of an issue of 26,000 shares of new stock. This is offered to present stockholders at $6 per share, each to have the right to take one share of new stock for each 20 shares of old stock held.

Ophir—This company, operating the Beckhorn mine, at Ophir, has its new aerial tramway almost completed, and expects to have it in commission in March. Regular ore shipments will then begin.

WASHINGTON

FERRY COUNTY

Danville Copper Company—This company has begun shipping ore from the Lone Star and Washington claims, situated near Danville.

Byrne Group—A vein 6 ft. wide has been discovered in a crosscut from the tunnel. It appears to strike parallel with the tunnel, at a distance of 25 ft. The material of the vein is mainly iron sulphide, with some chalcopyrite. On the west wall is a streak of galena 12 in. wide.

Bridge Creek Mining Company—A contact vein, between quartzite and lime, is traceable through five claims. A tunnel has been driven 246 ft., 174 ft. of it running on the vein. The face is nearly 100 ft. below the surface. The ore consists of lead carbonate, galena and iron sulphide.

Gwinn Group—Six claims are under bond to Seattle people, who have done 675 ft. of work, to determine their value, and claim enough ore in sight to pay for the property. A shaft was sunk 170 ft., and the vein drifted on shows an average width of about 5 ft., the widest part being 16 ft. in driving a little over 100 ft. Considerable good ore has been found in raises and winzes. The ore carries gold, silver, and copper.

Meteor—This camp, on the south half of the Colville Indian reservation, in Ferry county, has lately become unusually active. The veins in that section are usually wide, with the bulk of ore low grade and small rich streaks. The Meteor company is preparing to ship silver-lead ore as soon as the snow is off. The Black Thorn Mining Company has driven a tunnel about 300 ft. The Stray Dog Mining Company has commenced hauling ore to the railway, for shipment to the smelters. The Imperial Company, adjoining the Stray Dog, has erected new buildings for the miners, and is starting on active development. A tunnel has been driven 250 ft. on a 5-ft. vein of inferior ore in the Keystone mine, but in the face a body of ore, 3 ft. wide, is giving good assays in gold and silver. The Golden Treasure Company is driving a tunnel, to intersect a vein at a distance of 500 ft. It is now in over 300 ft. The Queen mine has a shaft down over 100 ft. on a vein of high-grade ore. Ladd & Tilton, of Portland, Oregon, have purchased the H. & E. group of four claims, and have started driving a tunnel to cut the lead at 500 ft. in. M. D. Rankin is superintendent. The Syndicate Mining Company, owning 11 claims, has driven a tunnel 250 ft., and let a contract for 50 ft. more. J. W. Bartlett is superintendent. D. S. Presscott, Hyde block, Spokane, Wash., is secretary and general manager.

Foreign Mining News

CANADA

BRITISH COLUMBIA

British Columbia Copper Company—Colgate Hoyt, of New York, was elected president, to succeed F. L. Underwood, at a meeting held in New York, Feb. 14. Newman Erb was elected chairman of the executive committee, and B. B. Lawrence was made second vice-president. Mr. Underwood remains a director.

ONTARIO—COBALT DISTRICT

Argentite—This company owns the Argentite townsite, two miles north of Cobalt, and several hundred acres of land. Walter Hovey Hill has been engaged as engineer, and is erecting buildings on the properties. This company announces that it will erect a hotel, electric-light plant, and other conveniences on its townsite, and will do active development and work on its mining territory during the winter.

Cobalt Lake Mining Company, Ltd.—Cobalt lake, which was purchased from the Ontario Government for $1,087,000, covers an area of between 40 and 50 acres. The company which acquired this property is now actively operating. The grant includes the right to mine under the lake, and on the borders for a horizontal distance of 33 ft. from high-water mark. Two steam drills are in operation, and 30 or 40 men are employed. Three veins have been exposed, but value is as yet indefinite, although some native silver has been encountered. The company expects to prospect the lake bed during the winter by installing a diamond-drill plant on the ice. E. L. Fraleck is engineer in charge of the work.

Coniagas—New buildings have been erected for compressor and power plant. The machinery has been ordered some time since, and is now in transit. At present, this company is obtaining power from the Trethewey mine adjoining.

Green-Meehan—This property, in Bucke township, has the most extensive and richest surface showing of any discovery which has been made during the past year. The company is erecting a power plant consisting of 200-h.p. boilers and six-drill compressor. Two 2-compartment shafts are being sunk on two of the richest veins exposed. Seventy-five tons of ore have been shipped from the surface during the past two months.

Kerr Lake—This new company, better known as the Jacobs mine, has ordered machinery consisting of 200-h.p. boilers and 14-drill duplex compressor, and intends sinking two shafts on vein No. 3, which is in the diabase, and which has produced a large proportion of the ore extracted, and on vein No. 7, commonly called the dyscrasite vein. A drift on this vein shows 170 ft. of practically continuous ore. The average value of ore extracted from this mine from its begin

ning is between 2000 and 3000 oz. silver per ton. No second-class ore has been shipped. On the 130-ft. level on vein No. 3 in the diabase, the drift has exposed ore for a distance of 35 ft. with ore continuing in the face. This is important, because of its depth from surface, which is about 170 ft.; from the fact that the vein is in the diabase which was originally thought to be the least desirable formation; and because the vein is a well defined fault fissure.

La Rose—John MacMartin, president of this company, announces that his company is about to sink the main shaft to the 400-ft. level, successful results having been obtained from diamond drill at depth of 383 ft. Should this work show ore value, it would be the most important development in the district, tending as it would to demonstrate the strength of ore bodies to considerable depth.

Violet—This property, recently purchased by New York parties, has resumed active operation. At present a force of 20 men is employed. Drifting and crosscutting at the 70-ft. level will be done in the main shaft, and sinking will be done at three other points on the property.

Kerr Lake Crown Reserve Company—Plans have been decided upon for early development work. S. D. Madden, a well known diamond-drill expert, will have charge of operations.

ONTARIO—MANITOU LAKE DISTRICT

Paymaster—At this gold mine, Manitou lake, the shaft is being put down to the 400-ft. level and a crosscut is being run at the 200-ft. level with good results. The latter work has been temporarily interrupted by a flow of water. Acting Superintendent Manby is in charge.

Nipissing—At a meeting of the board of directors of the Nipissing Mining Company, Ltd., held in New York, Jan. 16, a reorganization of the officers was effected. Samuel Newhouse assumes the duties of president, and the following other officers, were elected: W. B. Thompson, vice-president; F. W. Holmes, treasurer, and David Fasken, secretary. The new directors are Lyman B. Kendall and W. B. Thompson. President Newhouse is at present in Salt Lake City, but will assume active charge of the company in the near future.

ONTARIO—VERMILLION LAKE

Northern Pyrites Company—This company, near Dinorwic, of which E. R. Michie is general manager, has undertaken the development of a valuable sulphide property on Vermillion lake, in Northwestern Ontario. Four carloads of machinery, including two boilers of 65 h.p. each and a 12-drill duplex compressor are being forwarded from New York to the mine. A spur line of five miles will be built for the shipment of the output to connect with the Grand Trunk Pacific now under construction.

MEXICO

BAJA CALIFORNIA

[illegible] year 1906 this company's smelters at Santa Rosalia treated 302,499 tons of ore from the mines. The total value of the product was $4,780,600, chiefly in copper.

SONORA

[illegible] ing held in New York, Feb. 15, the board of directors was reorganized, in accordance with the recent deal by which the control is transferred to the new Greene-Cananea Company. The new directors are C. D. Fraser, J. W. Allen, W. D. Thornton, Clyde A. Mullen, F. E. Searle, Geo. N. White, Walter S. Reed, C. A. Wright, Jr., J. C. Lalor, Charles E. Scheide, E. A. Brennan, Edgar Davis, W. J. Sullivan, and Arthur G. Caldwell. The board was organized by the election of W. D. Thornton to succeed President Greene, C. D. Fraser as treasurer in place of Alfred Romer, and J. W. Allen, secretary, to succeed George S. Robbins. One of the preliminaries of the consolidation was carried out Feb. 15 in the transfer of the company's treasury of $4,000,000 in payment for the 200,000 shares of Cananea Central stock, which was the Greene company's return for its transfer of a large tract of mineral lands to the Cananea Central Company at the time of the latter company's organization.

ASIA

INDIA—MYSORE

Kolar Goldfield—Gold production in January is reported at 46,010 oz. bullion, which compares with 52,014 oz., in January, 1906; a decrease of 6004 oz. The bullion reported this year was equal to 41,409 oz. fine gold, or $855,924 in value.

AUSTRALIA

QUEENSLAND

Gold production in January is reported at 31,500 oz. fine gold, or $651,105 in value.

WESTERN AUSTRALIA

Gold production reported for this State in the month of January was 154,365 oz. in 1906, and 162,238 oz. in 1907; an increase of 7873 oz. this year.

NEW CALEDONIA

Mineral exports in November and the 11 months ending Nov. 30 are reported by the *Bulletin du Commerce*, of Noumea, as below, in metric tons:

	November.	Eleven Months.
Nickel ore	6,368	112,097
Cobalt ore	....	2,352
Chrome ore	8,494	47,479

The November exports included one cargo, 3556 tons chrome ore, for New York.

SOUTH AMERICA

BRITISH GUIANA

Exports of gold from the colony for the year were 91,736 oz. bullion in 1905, and [illegible] or 0.3 per cent. The bullion reported in 1906 was equal to 79,682 oz. fine gold, or $1,647,031 in value.

The diamonds entered for the year were 5315 carats in 1905, and 4330 carats in 1906; a decrease of 985 carats. The exports in 1906 were 3892 carats.

Coal Trade Review

New York, [illegible]

The weather and car shortage are the chief factors in the coal trade of the West, as they have been for some time past. Actually, there is no material change from last week, except that the severe cold and storms have been followed by higher temperatures. More coal is moving, but not enough to quiet the many complaints. There is room for much improvement in transportation conditions.

In the East a brief spell of very cold weather has stirred up the domestic trade. The demand for steam coal is steady and strong, as it has been for some time past. The cold and stormy weather has interfered with the coastwise trade to a considerable extent.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Feb. 9 were as follows, in short tons:

	1907.	1906.	Changes.
Anthracite	[illegible]	[illegible] D.	[illegible]
Bituminous	4,118,841	4,126,179 D.	7,338
Coke	1,470,118	1,488,940 D.	18,822
Total	6,130,928	6,181,977 D.	51,049

The coal tonnage of the Southern Railway for the 11 months ending Nov. 30 was, in short tons: Tennessee district, 1,407,553 tons; Alabama district, 1,699,410; total, 3,106,963 tons.

Receipts of coal at Boston in January are reported by the Chamber of Commerce as below:

	1907.	1906.	Changes.
Anthracite	126,561	172,843	D. 52,282
Bituminous	282,980	308,885	D. 24,005
Total domestic	409,541	481,728	D. 72,087
Foreign coal	72,572	44,100	I. 28,472
Total	482,113	525,828	D. 43,615

The receipts of foreign coal are chiefly from Nova Scotia.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to Feb. 16 were 143,566 tons.

Coal receipts at St. Louis for the full year were 6,146,363 short tons in 1905, and 7,582,209 tons in 1906; an increase of 1,435,846 tons.

Coastwise shipments of coal from the chief Atlantic ports are reported by the Bureau of Statistics as below, for the full year:

	Anthracite.	Bituminous.	Total.
New York	[illegible]	[illegible]	[illegible]
Philadelphia	1,794,773	3,977,909	5,772,682
Baltimore	[illegible]	[illegible]	[illegible]
Newport News	[illegible]	[illegible]	[illegible]
Norfolk	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The increase in 1906 was 499,620 tons, or 1.3 per cent.

The tonnage of the roads in the Ohio Coal Traffic Association for the full year was as follows, in short tons:

	1905.	1906.
[illegible]	[illegible]	[illegible]
Toledo & Ohio Central	1,576,962	1,881,666
Baltimore & Ohio	1,936,093	1,951,865
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Zanesville & Western	1,057,797	1,187,728
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Marietta, Col. & Cleve.	.....	15,675
Total, net tons	15,940,836	16,575,984

The total increase last year was 635,148 tons, or 4 per cent., notwithstanding the strike in April.

New York Feb. 19

ANTHRACITE

[illegible] scarcity of hard coal in the market [illegible] the brisk demand, and to [illegible] shortage which has been very noticeable during the past few weeks. The [illegible] at various points along the railroads [illegible] remains a factor in the car supply. Business among the local retail dealers has been very active; in some cases consumers have had considerable difficulty in having their orders filled promptly.

The Lehigh Valley Coal Company has started shipping coal from its new Sayre colliery to Skookum district.

Small sizes still remain practically out of the market. There is a little [illegible] wheat to be had, but smaller sizes are extremely scarce. The reason for the scarcity of small steam sizes is the curtailed production at the mines on account of the inadequate shipping facilities, which prevent the mines from producing their usual quota of small coal.

Consumers are not taking on any more coal than they can use. Prices remain unchanged at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are quoted nominally at $3 for pea, $2.25@2.50 for buckwheat, $1.50 for rice, $1.40 for [illegible] all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft coal trade is quiet at the present time; the cold weather of the last two weeks froze the coal in the cars so badly that a general embargo was declared by the Pennsylvania Railroad on shipments to South Amboy on account of the delays in unloading. This stopped shipments for the best part of a week. The question of contracts for the season is still held up on account of the railroads not having yet fixed their through rate. Car supply in West Virginia continues very poor. Trade in the far East is quiet and there does not seem to be much demand at this time. Trade along the Sound is taking a fair amount of coal quietly.

New York harbor trade shows a condition out of the ordinary in that the small steam sizes in the anthracite market are held at an advance of even 50c. per ton, while soft coal has shown no advances up to this time for any particular size. Good steam coal is quoted at $2.60@2.75 per ton f.o.b. New York harbor shipping ports. Transportation from mine to tide has improved although not up to the requirements. Car supply is generally poor.

In the coastwise market vessels are in sufficient supply for all demands. We quote freight rates from Philadelphia to Boston, Salem and Portland at from $1 to $1.10, and discharge for large vessels, the loading and discharging clause included.

Birmingham Feb. 18

Coal operators in Alabama have to hustle to get cars. The production is improving slightly. There is still a strong demand for coal and fuel agents of large consumers, especially railroads, are in the district watching movements.

Operators and miners alike have been interested during the past few days in probable action to be taken by the legislature of the State on mining laws. A law prepared by Capt. Frank S. White, attorney for the United Mine Workers in Alabama, is bitterly opposed by the operators on the ground that sections of it are oppressive. It is asserted that the proposed law has a mechanics' lien clause that is dangerous to the operator. Several officials of coal companies in this district spent several days recently in Montgomery in the interest of proposed legislation. The union miners were also at the capital looking after their interests.

Chicago Feb. 18

Western coals in general are weak, as the result of the long run of mild weather, and doubtless they will continue weak for the rest of the season, there being little hope now among dealers of enough cold weather to affect the trade substantially. But for conditions of transportation unfavorable to the receipt of large quantities, Eastern coals, particularly smokeless run-of-mine, would be in the same condition. Anthracite also is falling off, the reason being the approach of spring and the April discount. Individual orders for anthracite are already small in quantity, though their number shows that most retailers are carrying little coal.

Illinois and Indiana prepared sizes are especially weak. Lump and egg bring $1.75@2.65, run-of-mine $1.75@2.25, and screenings $1.25@1.50. The car supply is reported short from many Illinois and Indiana mines, though this affects out-of-town business rather than Chicago.

Smokeless probably leads eastern coals in demand, though lump and egg are weak in comparison with the demand for run-of-mine, which brings $3.40@3.65. The standard price of $4.30 for smokeless lump and egg is cut 25c. on many sales. Youghiogheny is fairly plentiful and brings $3.20 for ¾ in. Pittsburg No. 8 suffers from the weather conditions and brings $2.90 @3 for ¾ in. Cannel coal is active, the supply being limited and the demand large; it sells for $5.40 per ton.

Cleveland Feb. 19

Some of the bigger shippers by lake are beginning to inquire for lake tonnage for the ensuing season of navigation. It is likely they will close their contracts before long. At first it was supposed they would wait until the matter of railroad freight rates to the Lake Erie ports had been settled. This cannot now have an influence on the lake rates, since season charges have been fixed at last year's figures by the placing of some boats with the smaller shippers. All indications are for a big movement, in view of the fact that 1906 shipments increased 3,000,000 tons over those of 1905 and the indications are for clean docks at the opening of navigation.

The big merger of the mines in No. 8 district is moving along, and it is now known that 80,000 acres of land have already been optioned to the promoters, with other additions likely. This will probably take over some of the mines in No. 7 district, as well as the lake coal docks and boats.

The steam market in this territory is strong and steady. The market rules about firm, with Ohio mine-run selling at $1.20@1.25 at mines; Pennsylvania at $1.10@1.15; Ohio slack, $1.15@1.20; Pennsylvania slack, $1.

The coke market is strong with a good demand for spot shipment. The market holds firm at $4 at the oven for spot-shipment 72-hour foundry coke and $3.60@3.75 for spot-shipment furnace coke. Contract prices would likely shade these figures a little.

Hartshorne, Ind. Ter. Feb. 11

The Interstate Commerce Commission spent Feb. 7 and 8 at South McAlester, investigating the coal situation in the Indian Territory. The car shortage and prevailing high prices of coal were the special subjects of inquiry. The results are not yet reported.

Indianapolis Feb. 16

The recent brief cold snap stimulated the coal business slightly and strengthened the market for a few days, but mild weather followed during the past week. The tonnage of steam coal has been kept up by an unusual demand from the manufacturing industries; but local dealers are ordering in limited quantities, having given up hope of any zero weather this winter.

Operators say that prices have fallen since Nov. 1, instead of going higher, as is usual during the winter months. December and January of the present scale year have the unusual record of actual dullness

at many mines, with an over-supply instead of a shortage of cars.

Consideration of the Shippers' bill last week brought a large number of coal operators and dealers to the legislative halls, and a stubborn fight is on between the shippers and railroad men concerning this measure. The bill provides that the railroads shall furnish sufficient number of suitable cars to shippers under penalty; that loaded cars must be moved at least 50 miles every 24 hours, under penalty; that demurrage charges shall be mutual; that there shall be no discrimination in the furnishing of cars, and that the railroad commission be empowered to make rules for hauling coal and to equalize rates, raise blockades, and enforce the provisions of the law. The representatives of the railroads say the bill is sufficiently drastic to put them out of business; that certain provisions make requirements beyond the physical power of the companies. The indications are that the bill will pass in an amended form.

Pittsburg Feb. 19

Coal—The demand has increased and prices are firmer and higher this week. One or two small contracts for deliveries extending through the the year have been made on a basis of $1.20 a ton for mine-run coal at mine. The absolute minimum on large tonnages is $1.10, and many sales are being made on a basis of $1.15. The railroad mines are running almost full and there is a good supply of cars. All the river mines have been in steady operation and a large tonnage has been accumulated. The rivers are rising and are expected to be navigable before the end of the week, when some large shipments will be made to the lower ports.

Connellsville Coke—There has been but little change in the coke market. Prices remain strong on the basis of $3.50@3.60 for spot furnace coke, $3.25 for second quarter and $3.10@3.25 for deliveries extending through the year. Foundry coke is quoted at $3.90@4.10 for first quarter and $3.75 for all year. The *Courier* gives the production for the week in the Connellsville region at 283,840 tons and in the Lower Connellsville region at 125,836 tons. The shipments for the week aggregated 13,972 cars distributed as follows: To Pittsburg, 4749 cars; to points west of Connellsville, 8210 cars; to points east of Connellsville, 1013 cars.

The H. C. Frick Coke Company on Feb 18 ordered an advance in wages for its 18,500 employees, effective March 1, ranging from 8 to 12½ per cent. This increase will add $125,000 to the pay roll monthly, or $1,500,000 a year. All the independent interests are expected to grant a similar advance. The new rate of wages is the highest in the history of the industry in the Connellsville region except in two items where the new rate is the same as was in force in the boom year 1903. They are "mining and loading room and rib coal, per 100 bush.," which is advanced 15 cents to $1.35, the rate prevailing in 1903, and "drawing coke, per 100 bush. charged," advance 7 cents to 77 cents, the rate paid in 1903.

Foreign Coal Trade

Feb. 20

Imports of coal into Germany for the full year were as follows, in metric tons:

	1905.	1906.	Changes.
Coal	9,399,693	9,221,538	D. 178,155
Brown coal	7,945,261	8,152,188	I. 206,927
Total	17,344,954	17,653,726	I. 308,772

Imports of coke for the 10 months, March to December, were 448,656 tons; of briquets, 128,863 tons.

Exports of coal from Germany for the year were, in metric tons:

	1905.	1906.	Changes.
Coal	18,156,996	19,554,343	I. 1,397,346
Brown coal	20,118	18,735	D. 1,383
Total	18,177,116	19,573,078	I. 1,395,962

Exports of coke for the 10 months, March to December, were 2,849,005 tons; of briquets, 899,758 tons. Included in the coke exports are 16,729 tons to the United States.

The quantity of coal bunkered, or sold to steamships engaged in foreign trade, at all United States ports is given by the Bureau of Statistics at 413,016 tons, in December, and 5,125,103 tons for the year 1906. Adding this to the exports previously reported, makes a total of 15,036,922 tons consumed beyond the limits of the United States.

Exports of fuel from Great Britain in the month of January, with coal shipped for the use of steamers engaged in foreign trade, were as follows, in long tons:

	1906.	1907.	Changes.
Coal	4,030,460	4,624,741	I. 594,281
Coke	66,891	84,911	I. 17,950
Briquets	121,540	125,560	I. 4,020
Total exports	4,218,891	4,834,642	I. 616,251
Steamer coal	1,533,505	1,486,302	D. 47,203
Total	5,751,896	6,320,944	I. 569,048

This shows a total increase of 9.9 per cent. in the coal consumed beyond the limits of the United Kingdom.

Dusseldorf, Germany Feb. 8

The coal production of the German empire for the year ended Dec. 31 is reported as below, in metric tons:

	1905.	1906.	Changes.
Coal	121,298,607	136,479,885	I. 15,181,278
Brown coal	52,512,062	55,235,189	I. 2,723,127
Total mined	173,810,669	192,715,074	I. 18,904,405
Coke made	16,491,127	20,260,572	I. 3,769,145
Briquets made	13,074,682	14,500,851	I. 1,426,169

The increase in coal was 12.5 per cent.; in brown coal, or lignite, 7.9 per cent; the total gain in coal mined being 10.9 per cent. Deducting the excess of exports over imports for the year 1906, the approximate consumption of coal for the year, in all forms, was 190,795,722 tons. The activity of the iron trade and of most manufacturing industries explains the large gain made last year.

Iron Trade Review

New York, Feb. 20.

Business has been quiet so far as new trade is concerned. This is especially the case with pig iron, in which not much business has been done, and that at perceptibly lower prices. The high figures reached in the rush of last month have not held. This has little effect on the furnaces, which have enough of their capacity engaged well into the current year to make them independent.

Many people think that the rest and the shading of prices are good things for the trade. Prices of raw iron had reached dangerously near the point where they might check consumption. Moreover there is increasing difficulty in financing new construction projects, and this will have an effect on trade later. A pause in the rush can do no harm.

Pig Iron Production—Reports from the blast furnaces show that on Feb. 1 there were 317 coke and anthracite stacks active, having a total weekly capacity of 492,400 tons; a decrease of two stacks and 14,900 tons capacity, as compared with Jan. 1. The decrease is not due to any falling off in demand, but to the necessity of blowing out several furnaces for repairs. Taking the *Iron Age's* estimate for the coke and anthracite stacks, and making allowance for the charcoal furnaces, the total production of pig iron in January was 2,241,000 tons, approximately.

Baltimore Feb 19

Imports of spiegeleisen for the week were 1520 tons; of ferro manganese 186 tons. There were also 73 casks of ferro-silicon from Germany. One cargo, 4950 tons, of manganese ore was received from Brazil. Arrivals of iron ore were 6000 tons from Cuba.

Birmingham Feb. 18

While pig-iron sales in southern territory were not so brisk the past week, no word of complaint is uttered by the manufacturers save as to the transportation facilities. The car shortage and the lack of locomotive power still exist. The delivery this month will be no better than it was during January. The manufacturers had expected to move out a large amount of iron. The railroad officials assert that they have done everything possible to move the iron. Consumers are clamoring now for their iron.

As to quotations, all reports agree that No 2 foundry is bringing $18.50@19 per ton, delivery during the last half of the year. Second-quarter iron was quoted at $22 per ton the past week, with but little obtainable. None of the furnace companies in this district appears to be able to engage business for May delivery. A report that some of the smaller iron companies were selling their product at from

larger producers could not be verified.

Steel, cast-iron pipe and finished iron and steel are active. Extraordinary conditions prevail in cast-iron pipe, demand being good and prices firm. Some healthy shipments of pipe were made from this district recently.

Chicago Feb. 18.

Sales of pig iron on contracts are slow, with indications of continued quietness. Reports on quick-delivery sales are conflicting, but it is doubtless true that this end of the business has not gained in the last two or three weeks, and the impression prevails that the consumer is going to hold off for a while. The Southern market seems especially to be weakening, despite assurances from the sellers that prices will be held up firmly.

In the last week contract iron has sold at $23.50@24.50 for Northern, and $18@18.50 Birmingham ($22.10@22.60 Chicago) for deliveries in the last half. On deliveries prior to July the price runs up to $1 more. The demand for quick delivery is especially active on small lots to be had before March 1, when the advance of the freight rate to $4.10 is expected on Southern iron.

General trade conditions in iron and steel products continue good, but there is apparent a spirit of caution that is based on the possibility of over-production. With this spirit removed there probably would be little trouble with the market for pig iron, for it is apparently influencing the melters considerably. If it continues, the bear movement will grow from both within and without the pig-iron trade.

Coke is active, with little available for quick deliveries and $6.25@6.65 paid for the best Connellsville.

Cleveland Feb. 19

Iron Ore—The market is exceptionally dull. There are a few small sales off stock piles, but they do not amount to much. Prices have not changed. No further season chartering of lake vessels has been done. It is probable that going rates at the opening of the season will be the same as the contract rates, namely 75c. from the head of the lakes; 70c. from Marquette and 60c. from Escanaba.

Pig Iron—Inquiries are in this market for nearly 10,000 tons of No. 2 foundry for second-quarter delivery. It is known that other big consumers are partially uncovered and it is a question whence the supply is coming. In two inquiries obtained yesterday there was a demand for 5000 tons for second-quarter delivery. The demands of these consumers could not be met by imports of foreign irons. It is now an open question whether some of the consumers will not run short before July 1, especially as some of the purchasers are showing a disposition to anticipate contract requirements, leaving only a small amount open for the furnaces to sell. The prices are stiffening. Spot iron is selling at $25.50@26 in the Valleys; second quarter at $25 in the Valleys, with $22 quoted for second half. Southern prices have not changed, being based upon $18.50@19 Birmingham for No. 2.

Finished Material—The various lines of finished material are active and strong. Bars are still on a strong basis, due to the shortage of scrap. Bar steel is in demand, especially open-hearth. Sheets are steady at unchanged prices. One new ship, for the passenger trade, will be ordered soon. Spring building is about ready to open.

Pittsburg Feb. 19

There has been no large buying of finished material, but the iron and steel markets continue strong. It is expected that the agricultural-implement makers will come into the market during the next two months for their requirements of steel bars for the year beginning July 1. Heretofore producers have granted concessions on this business, but it is said they intend this year to insist on the full price of 1.60c. It is doubtful if the implement interests will place their contracts unless allowed the usual concession, and there will be likely some delay before these annual contracts are closed. There is a good demand for steel bars, and the established price is being readily paid. In some instances where prompt delivery is desired consumers willingly pay a premium. Iron bars also are in demand, and the minimum price remains at about $4 a ton above steel bars, or 1.80c. Orders for standard steel rails and light rails continue to be placed, the leading interest booking about 25,000 tons of standard and 1000 tons of light rails during the week. There has been a slight decline in the demand for plates for car-building concerns, but this has been more than made up by the increased demand from shipbuilding and other interests. Merchant pipe mills are crowded to capacity. The National Tube Company is putting its Youngstown works in shape for operation after an idleness of over a year, and it is expected a start will be made on Monday. These works, when in full operation, have a capacity for 5000 tons monthly. New business is being offered daily, and some large contracts are under negotiation. The National company has closed a contract with the Southern Pacific Railroad for 400 miles of 8-in. line pipe for an oil line in California.

Pig Iron—Large consumers of pig iron still refuse to enter the market for second-half requirements at the prices named by the leading producers. While the furnaces want $21.50, Valley, for bessemer pig iron for the last half, steel interests say they will not pay within $1 a ton of that price, and it is said the United States Steel Corporation, if it buys any outside iron, will not pay more than $19. A large tonnage of bessemer iron is sold for deliveries through the year at the average monthly price, but a maximum price is fixed which when reached releases the buyer. It is understood that this point has been reached in some contracts, and the buyers have refused to take the iron. The furnaces affected, however, have had no difficulty in selling the iron thus released, but in some instances the price has been shaded. This week one interest sold 6300 tons of bessemer for deliveries running from February to October at the average monthly price. One lot of 1500 tons of bessemer was sold today for delivery in the first half at $23.35, Pittsburg. Other late sales included 500 tons of malleable bessemer for third quarter at $21.30, Valley furnaces, and 800 tons of basic for delivery in the first quarter at $23, second quarter at $22.50, and third quarter at $21.50. The tonnage being small these prices do not represent the market. It developed this week that the Jones & Laughlin Steel Company, which was crippled by the blowing out of three of the five blast furnaces in the Eliza group, secured some outside bessemer pig iron by an exchange deal, giving ore for iron. Two of the idle furnaces were put in blast last week, the repairs having been completed in record time. No. 5 furnace will be ready to blow in shortly. Foundry iron continues in demand but prices have declined to about $24.85@25.35, Pittsburg, for prompt delivery. Gray forge for spot shipment is quoted at $22.85, Pittsburg.

Steel—Bessemer billets are quoted nominally at $29.50, and open-hearth at $32, and there is a scarcity this week. Billets are easier in the West and, according to reports, prices are lower than in the Pittsburg district. Plates are strong at 1.70c. and merchant steel bars at 1.60c.

Sheets—There is no change in the sheet market. The demand continues heavy and prices are firm, black sheets being quoted at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—The market continues dull, but is a trifle stronger than a week ago. Prompt ferro is still quoted at $73@74, but for the second half $70 is quoted as the minimum price.

London Feb. 11

Iron and Steel Exports—Exports of iron and steel, and of machinery, from Great Britain for January, are valued by the Board of Trade returns as below:

	1906.	1907.	Changes.
Iron and Steel..	£ 3,086,922	£ 2,985,204	D. £ 101,718
Machinery.....	2,140,958	2,473,236	I. 332,278
New Ships.....	198,238	628,880	I. 430,642
Total.....	£ 5,376,118	£ 6,087,320	I. £ 661,202

The increase in the total this year was 12.3 per cent. The larger items of the iron and steel exports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	90,700	175,820	I 85,120
Wrought iron.....	14,915	18,069	I. 3,152
Rails.....	35,346	30,225	D 5,121
Plates.....	18,610	33,900	I 15,290
Sheets.....	46,261	41,761	D 4,500
Steel shapes, etc	5,528	6,664	I 1,136
Tin-plates.....	29,053	36,872	I 7,809
All other kinds..	96,989	110,089	I 14,55

The total increase in quantity was 1,418 tons, or 34.5 per cent. Exports of pig iron to the United States were 59,539 tons, an increase of 39,886 tons; of tin-plates, 5900 tons, a nincrease of 2708 tons.

Iron and Steel Imports—Imports of iron and steel into Great Britain for January are valued as follows:

	1906.	1907.	Changes.
Iron and steel...	£ 944,801	£ 666,240	D £ 278,561
Machinery..	477,087	468,046	D 9,041
Total.	£1,421,888	£ 960,291	D £ 287,597

The total decrease was 27.1 per cent. The chief items of the iron and steel imports were, in long tons:

	1906.	1907.	Changes.
Pig iron	4,827	14,815	I 9,988
Wrought iron	13,057	7,985	D 5,072
Steel billets, etc.	66,328	21,492	D 44,836
Bars and shapes	6,822	1,160	D 5,662
Structural steel	16,636	7,536	D 9,100
All other kinds	47,129	27,224	D 19,905

The total decrease in quantities was 70,487 tons, or 47 per cent.

Iron Ore Imports—Imports of iron ore into Great Britain for January were, in long tons:

	1906.	1907.	Changes.
Manganiferous ores.	10,302	31,850	I 21,548
Iron ores	749,912	777,988	I 28,076
Total.	760,214	809,838	I 49,624

Of the imports this year 26,800 tons of manganiferous ores and 614,187 tons of iron ore came from Spain.

Dusseldorf, Germany Feb. 10

Imports of iron and steel into Germany for the full year were, in metric tons:

	1905.	1906.	Changes.
Iron and steel	623,024	690,081	I 267,057
Machinery	75,985	79,744	I 3,759
Total	699,009	769,825	I 270,816

The large increase was mainly in raw and half-finished material. Exports for the year were as follows:

	1905.	1906.	Changes.
Iron and steel	3,349,917	3,619,796	I 269,879
Machinery	301,112	296,094	D 5,018
Total	4,651,459	4,915,890	I 264,431

This shows the moderate increase of 7.2 per cent. in the total export trade

Metal Market

NEW YORK Feb. 20.

Gold and Silver Exports and Imports.

At all United States Ports in January and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1907...	$2,443,441	$ 3,204,457	Imp $ 761,016
" 1906	5,741,665	2,605,709	Exp. 3,135,956
Year 1907..	2,443,441	3,204,457	Imp. 761,016
" 1906..	5,741,665	2,605,709	Exp. 3,135,956
Silver:			
Jan. 1907...	4,766,874	3,620,988	Exp 1,145,886
" 1906	7,316,668	4,686,711	" 2,629,957
" 1907 ..	4,766,874	3,620,988	" 1,145,886
1906 ..	7,316,668	4,686,711	" 2,629,957

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Feb. 16 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week..	$ 5,970	$ 1,000,750	$ 300,800	$ 10,000
1907.....	1,305,055	1,009,950	3,283,540	1,041,888
1906	3,008,375	254,269	12,254,492	237,924
1906.....	28,511,165	492,938	1,942,931	124,331

Exports of gold for the week were to the West Indies; of silver to London. Imports of gold for the week were from London, Italy and South America; of silver, from Mexico.

The foreign trade of the United States for the month of January is valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.
Exports	$170,000,053	$189,290,260
Imports	106,521,525	126,776,966
Excess, exports	$63,081,528	$62,083,285
Add excess of exports, silver		1,145,986
Total		$63,829,271
Deduct excess of imports, gold		761,016
Net export balance		$63,068,255

The gold and silver movement in detail will be found in the table at the head of this column.

The Joint statement of all the banks in the New York Clearing House for the week ending Feb. 16 shows loans, $1,092,061,000, a decrease of $7,295,400; deposits, $1,057,546,200, a decrease of $8,016,300, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie	$188,309,500	$192,167,500
Legal tenders	79,438,300	76,650,100
Total	$267,947,800	$268,817,600
Surplus	$5,789,925	$4,431,050

The surplus over legal requirements shows an increase of $1,085,575, as compared with the previous week.

Specie holdings of the leading banks of the world on Feb. 16 are reported as below, in dollars:

	Gold.	Silver	Total.
Ass'd New York	.....	.....	$192,167,500
England	$176,912,755	.....	176,912,755
France	536,244,000	$196,846,000	733,090,000
Germany	159,626,250	53,208,750	212,835,000
Spain	77,015,000	121,490,000	198,505,000
Netherlands	27,712,000	28,695,000	56,407,000
Belgium	16,610,000	8,305,000	24,915,000
Italy	161,210,000	23,686,500	184,896,500
Russia	590,255,000	23,675,000	613,930,000
Aust.-Hungary	232,190,000	60,360,000	292,550,000
Sweden	20,540,000	.....	20,540,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Feb. 7:

	1905.	1906.	Changes.
India	£ 2,614,500	£ 914,410	D £ 1,700,090
China	.....	.....	.....
Straits	.....	.....	.....
Total	£ 2,614,500	£ 914,410	D. £ 1,700,090

Receipts for the week were £251,000 from New York, £5000 from the West Indies, and £11,000 from China; £267,000 in all. Exports were £291,000 in bars and £40,000 in Mexican dollars; a total of £331,000, all to India.

Indian exchange continues strong, and all the Council bills offered in London were taken at an average of 16.09d. per rupee. The gold reserve in India is reported lower.

The gold and silver movement in Great Britain for the month of January was as follows:

	1906.	1907.
Gold.		
Imports	£ 4,391,777	£ 4,544,082
Exports	3,305,024	3,391,236
Excess	Exp. £ 1,086,753	Imp. £ 1,152,846
Silver.		
Imports	£ 2,884,000	£ 2,345,450
Exports	1,809,214	1,148,421
Excess, imports	£ 1,074,786	£ 1,197,029

Of the silver imported this year £1,298,280, or 47.3 per cent. of the total, was from the United States.

Prices of Foreign Coins

	Bid.	Asked
Mexican dollars	$0.501	$0.56
Peruvian soles and Chilean	0.484	0.49
Victoria sovereigns	4.854	4.87
Twenty francs	3.86	3.89
Spanish 25 pesetas	4.78	4.80

SILVER AND STERLING EXCHANGE

February.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	February.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
14	4.84½	68⅞	31⅞	18	4.84⅝	68⅞	31⅞
15	4.84⅛	69	31⅝	19	4.84⅛	68⅜	31½
16	4.84⅛	69	32	20	4.84½	68¾	31½

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

February.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
11	25 @25¼	24¼ @25	107½	42	6.00	6.85 @6.90	6.65 @6.75
12	25 @25¼	24¼ @25	107½	42	6.00	6.80 @6.90	6.65 @6.75
13	25 @25¼	24¼ @25	107½	42	6.00	6.80 @6.90	6.65 @6.75
14	25 @25¼	24¼ @25	107½	42	6.00	6.80 @6.90	6.65 @6.75
15	25 @25¼	24¼ @25	107½	42	6.00	6.80 @6.90	6.65 @6.75
18	25 @25¼	24¼ @25	107½	42	6.00	6.80 @6.90	6.65 @6.75
19	25 @25¼	24¼ @25	107½	41½	6.00	6.80 @6.90	6.65 @6.75
20	25 @25¼	24¼ @25	106	41½	6.00	6.80 @6.90	6.65 @6.75

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

[illegible] a little more than a week ago the market relapsed into dullness, and during the past week has been extremely quiet. Consumers are fairly well covered for delivery until June, and are not very anxious to contract for their supplies beyond this period, although some small sales extending into July have been made. Quotations at the close are unchanged at 25@25½c for Lake, and 24¾@25 for electrolytic in ingots, cakes or wirebars. Business in casting copper has been done be[illegible]

The London standard market has softened somewhat but remains rather steady on the decline. The close is cabled at £106 10s. for spot, and £108 for three months'.

Refined and manufactured sorts we quote: English tough, £110@111; best selected, £114@115; strong sheets, £124 [illegible]

The American Smelting and Refining Company has purchased the copper refinery of the Baltimore Copper Smelting and Rolling Company, at Baltimore, Md.

Exports of copper from New York for the week were 1419 tons. Our special correspondent reports the exports from Baltimore for the week at 25 long tons.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—Although the London market toward the end of last and the beginning of this week has shown signs of strength, higher quotations could not be maintained for very long, and the close is cabled as weak at £190 15s. for spot, and £189 10s. for three months'.

The domestic market was not affected at all by the fluctuations in London, but through the arrival of a large consignment of tin the premiums which heretofore have been exacted for spot material have disappeared. Business was done by home consumers in a retail way only, and the market closes weak at 41¾.

Shipments of tin from the Straits for the full year are reported as follows, in long tons:

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

This shows practically no change. The shipments reported to Great Britain include a large quantity in transit to the United States.

Lead—The quotation remains unchanged at 6c. New York.

The London market shows no change from previous advices and the quotations remain steady at £19 10s. for Spanish lead and £19 12s. 6d. for English lead.

The movement of foreign lead in the United States for the year 1906 is reported by the Bureau of Statistics as below, in short tons:

In bond, Jan. 1	8,148
Imports for the year	84,134
Total supplies	92,282
Re-exports for the year	47,247
In bond, Dec. 31	5,691
Total deductions	52,938
Balance	39,344

This balance has, presumably, entered into consumption in this country.

St. Louis Lead Market—The John Wahl Commission Company telegraphs on Feb. 20 as follows: Lead is firm, but quiet. Missouri lead is selling at 6.07½@6.15c., according to brand and delivery.

Spelter—Notwithstanding that transactions have somewhat diminished the market remains firm and closes at 6.80@6.90 New York and 6.65@6.75 St. Louis. Near-by metal is still scarce and commands a premium.

The London market has again become weak and quotations have declined at the close to £25 15s. for good ordinaries and £26 for specials.

Zinc Sheets—The base price was advanced 10c. on Feb. 15, and is now $8.50 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The better tone which was noticeable has not been maintained, in consequence of which prices have declined somewhat. Quotations are nominal at 23½c for ordinary brands and 23½@24c. for Hallett's; 24½@25c for Cookson's.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at $38 per oz. for ordinary and $41 per oz. for hard. For good scrap $31.50@32 is paid.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities, and $42 for smaller orders. San Francisco prices are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Metal Imports and Exports, Great Britain

Copper Imports and Exports—Imports of copper and copper material into Great Britain, with exports of copper, were as follows in January; the total imports given being the copper contents of all material, in long tons:

	1906.	1907.	Changes.
Copper ore	8,392	8,267	D. 125
Matte and precipitate	6,380	5,626	D. 754
Fine copper	4,722	6,712	I. 1,990
Total imp., copper	8,751	10,352	I. 1,601
Re-exports	1,639	1,627	D. 12
Exports	4,075	4,543	I. 468
Total exports	5,714	6 170	I. 456
Balance, imp	3,037	4,182	I. 1,145

Of the imports this year the United States furnished 39 tons of matte, a decrease of 413 tons; and 3082 tons of copper, an increase of 1165 tons. Imports of precipitate from Spain were 1602 tons, a decrease of 63 tons.

Tin Imports and Exports—Imports and exports of tin in Great Britain in January were as follows, in long tons:

	1906.	1907.	Changes.
Straits	3,970	3.110	D. 860
Australia	436	568	I. 132
Other countries	81	196	I. 115
Total imports	4,487	3,874	D. 613
Re-exports	2,275	3,957	I. 1 682
Exports	423	538	I. 115
Total exports	2,698	4,495	I. 1,797
Balance	Imp. 1,789	Exp. 621	

The re-exports are largely of Straits tin to the United States.

Lead Imports and Exports—Imports and exports of lead in Great Britain for the month of January were, in long tons:

	1906.	1907.	Changes.
United States	1,277	1,400	I. 123
Spain	8,388	10,585	I. 2,197
Australia	4.952	5,339	I. 387
Germany	2,004	1,314	D. 690
Other countries	180	230	I. 50
Total imports	16,801	18 868	I. 2,067
Exports	3,565	4,524	I. 959
Balance, imports	13,236	14,344	I. 1,108

The lead credited to the United States is chiefly Mexican lead, refined in this country.

Spelter Imports and Exports—Imports and exports of spelter in Great Britain for the month of January were, in long tons:

	1906.	1907.	Changes.
Spelter	10,272	8,265	D. 2,007
Zinc sheets, etc	1,395	2,013	I. 618
Total imports	11,667	10,278	D. 1,389
Exports	529	309	D. 220
Balance, imports	11,138	9,969	D. 1,169

Imports of zinc ores are not reported separately.

Quicksilver Imports and Exports—Imports of quicksilver into Great Britain for the month of January were 7630 lb. in 1906, and 28,148 lb. in 1907; an increase of 20,518 lb. Re-exports of imported metal were 311,456 lb. in 1906, and 264,525 lb. in 1907; a decrease of 46,921 lb. this year.

Missouri Ore Market

JOPLIN, Feb. 16

The highest settling price of the week for zinc is placed at $53 per ton, with $53.50 bid for delivery Monday. The assay basis price ranges from $47 to $50 per ton of 60 per cent. zinc, and the average price, all grades, is $47.44 per ton.

The highest price paid for lead is reported at $88.25 per ton, with 80 per cent. grades selling around $86. The average price, all grades, is $84.06.

The zinc shipment of the week was 1,161,310 lb. greater than the preceding week and 4,359,260 lb. greater than the corresponding week of 1906. For seven weeks the increase aggregates 13,562,970 lb. of zinc. Lead shipments were correspondingly increased, and the value for the seven weeks is $437,679 greater than last year. This, too, with a large portion of this year's output still in the bins, which it has been impossible to move on account of the deplorable car situation.

Following are the shipments of zinc and lead for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,634,930	1,062,560	$142,396
Joplin	2,922,240	301,580	84,412
Galena, Kansas	1,261,960	169,570	37,463
Duenweg	1,157,910	127,690	33,215
Badger	1,082,990	75,330	27,801
Alba-Neck City	811,270	.....	20,281
Aurora	561,640	.....	11,580
Spurgeon	418,230	64,490	11,449
Prosperity	364,370	.....	8,744
Granby	365,000	60,000	7,395
Oronogo	181,120	10,300	4,884
Sherwood	62,700	46,360	3,191
Baxter Springs, Kan.	126,150	.....	2,996
Carthage	108,200	2,530	2,806
Stott City	116,920	.....	2,806
Totals	13,164,820	1,850,210	$390,919
Seven weeks	81,457,100	11,103,270	$2,353,154
Zinc value, the week, $312,311;	7 weeks,		$1,885,106
Lead value, the week, 78,608;	7 weeks,		468,048

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45 84	January	75.20	83.58
February	47.37	.....	February	72.83	.....
March	42.68	.....	March	73.73	.....
April	44.63	.....	April	75.13	.....
May	40 51	.....	May	78.40	.....
June	43.83	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	43.56	.....	August	75.36	.....
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.13	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

PLATTEVILLE, Feb. 16

The past six weeks have been full of rapid developments, advantage being taken of the mild weather that has prevailed. The feeling among producers and buyers remains about the same. Sellers are expecting higher prices and buyers are willing to accede to all reasonable demands. One of the principal producers has been receiving a low price for the ore sold, owing to the presence of barytes, which brought the grade of ore down. It has been proposed to sort the ore before milling. The price of 60 per cent. zinc held at $49.50. Lead was strong at $85@90, depending on manner cleaned. Dry-bone and sulphur same as last week.

The camps of the district loaded ore for the week ending Feb. 16 as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	307,750	80,680	.
Linden	249,550	47,490	.
Benton	246,680	.	.....
Cuba City	127,400		.....
Mineral Point	96,000		.
Galena	86,000	...	..
Rewey	54,000	.	.....
Total for week	1,167,980	134,180	. ..
Year to Feb. 16	10,042,015	541,070	96,480

The car shortage during the week was worse than ever before, which reduced the quantity of ore loaded.

Chemicals

NEW YORK, Feb. 20

Copper Sulphate—The market remains steady, with continued demand and prices unchanged at $7.25 per 100 lb. for carloads or over; $7.50 for smaller parcels.

Phosphates—Messrs. J. M. Lang & Co. report the exports of phosphate rock from the port of Savannah in the month of January at 8744 long tons, all to Germany

Nitrate of Soda—There is no material change in the market. Supplies are moderate and the demand is steady for the season.

British Chemical Trade—Exports of chemicals from Great Britain for January were as follows, in cwt. of 112 lb. each:

	1906.	1907.	Changes.
Bleaching powder	92,143	102,254	I. 10,111
Muriate of ammonia	10,730	16,610	I. 5 880
Soda ash	111,001	193,937	I. 82,936
Bicarbonate of soda	17,973	34,617	I. 16,644
Caustic soda	128,773	158 012	I. 29,239
Soda crystals	12,060	8,653	D. 3,407
Soda sulphate	65,838	81,064	I. 16 226
Sulphuric acid	9,904	4,839	D. 5,065

Exports of copper sulphate were 2081 tons in 1906, and 2921 tons in 1907; an increase of 840 tons.

Imports of chemicals and raw materials into Great Britain for January were, in long tons:

	1906.	1907.	Changes.
Nitrate of potash	898	1,009	I. 111
Nitrate of soda	4,283	9,813	I. 5,592
Phosphates	33,465	52,916	I. 19,451
Sulphur	2,116	1,860	D. 256
Pyrites	67,938	76,893	D. 45

Estimating sulphur contents of pyrites at the usual figure, the total imports of sulphur were 29,591 tons in 1906, and 29,017 tons in 1907; a decrease of 574 tons this year.

Mining Stocks

NEW YORK, Feb. 20

The main features of the general market have been quiet, varied only by moderate fluctuations. An increasing difficulty in financing new projects and placing new securities is apparent, which would indicate that the capacity of the country for investment has been strained already, and that a halt is imminent.

Mining stocks in New York have been rather quiet. An attempt to boom Nipissing again did not meet with much success. In Boston there has been some excitement, chiefly over the reported aggressive policy of Calumet & Hecla, whose managers seem to have decided to forestall the lake combination which was supposed to be in course of formation.

Boston Feb. 19

The market has been one of specialties the past week, with the high-priced mining stocks in the foreground. Calumet & Hecla made a new record, selling at an even $1000 per share for five shares, Friday last. This company is now the biggest factor in the Lake mining region and there is little doubt that plans which started some two years ago for expansion are now being carried out by this company for the taking over of leading properties. There is no doubt that control of Centennial is held by these people. Now their hand is shown in the fact that 25,000 shares of Allouez have been transferred to Calumet & Hecla interests, although they have not gained control of it. The action of Osceola, Tamarack and Quincy in this market the past week also indicates that they already do, or soon will, bear the Calumet & Hecla tag. Osceola made a new record price of $180 today, which is $13 above a week ago. Tamarack took a $10 jump today, touching $160, and Quincy is up $5.50 to $147.50.

Trinity has acted weak and peevish. From $38 a week back it has gone steadily down until today it touched $27.75, but rallied sharply to above $31. The action at the close was better than seen for some time. La Salle has acted queerly since it was put on the list. It broke $2.75 to $25.25, closing at $26.50 tonight. Isle Royale spurted $2 to $31. Allouez is up $5.50 to $72, and Centennial touched $47, closing at $46.50. Amalgamated, after touching $115.25, fell to $112.62½, closing above $113. Arcadian spurted to $14, but reacted to $12.62½ tonight. Butte Coalition is off $2 to $36.50, and North Butte is off $3.50 to $112. Old Dominion spurted almost $6 to $63 on rich strikes at the 14th level, but is back to $58.50 tonight. Parrot fell $4.75 to $30 on disappointment that no increase was made in the quarterly dividend of 25c. Shannon closes the same as a week back, at $22.75. The directors declared quarterly dividend No. 2 today of 50c. per share, payable March 30.

Boston & Corbin touched $9.87½ on the curb and Balaklala is up almost $2 in the week to $12.75, notwithstanding an issue of 100,000 shares.

Osceola is the first mining company to issue its annual report for 1906. Gross

[illegible] $2,691,371
[illegible] above expenses
[illegible] $760,180
against $300,846 last year.

Colorado Springs Feb. 16

[illegible] of trading
on the local exchange during the past week. Prices have not declined, and in some instances there has been a slight advance. Elkton, El Paso and Portland have each gained a few points. On the whole, the market has been dull and featureless. Work has not as yet begun on the much talked of drainage tunnel. The price of shares on the local exchange will probably not advance much until work on this tunnel begins in earnest.

STOCK QUOTATIONS

NEW YORK	Feb. 19	BOSTON	Feb. 19
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	1	Adventure	5
Am. Nev. M. & P. Co.	...	Allouez	72
Amalgamated	113	Am. Zinc	47
Anaconda	29	Arcadian	12½
Balaklala	13½	Atlantic	17
British Col. Cop.	10	Bingham	30
Buffalo Cobalt	2½	Boston Con.	30⅝
Butte & London	2	Calumet & Ariz.	104
Butte Coalition	36½	Calumet & Hecla	980
Butte Cop. & Zinc	5¼	Centennial	46
Cobalt Contact	...	Con. Mercur	.50
Colonial Silver	3½	Copper Range	94½
Cum. Ely Mining	12	Daly West	19
Davis Daly	1½	Franklin	25½
Dominion Cop.	7	Granby*, New	149
El Ray	...	Greene Con.	51
Foster Cobalt	2	Isle Royal	30½
Furnace Creek	1	Mass.	8¾
Giroux Mines	...	Michigan	21
Gold Hill	4	Mohawk*	93½
Greene Gold	2	Mont. C. & C. new	2½
Greene G. & S.	2	Nevada	17½
Greene C. & D. Val.	1⅝	North Butte	112
Guanajuato	4½	Old Colony	...
Guggen. Exp.	275	Old Dominion	58⅛
Hanapah	⅛	Osceola*	175
McKinley Dar.	2½	Parrot	30
Mednac	6¾	Phoenix	2½
Mines Co. of Am.	2	Quincy	146
Mitchell Mining	5½	Rhode Island	10¾
Mont. Shoshone	12	Santa Fe	...
New Utah M. & S.	4½	Shannon	22⅜
Newhouse M. & S.	19½	Tamarack*	169
Nipissing Mines	14½	Tecumseh	...
Old Hundred	37	Trinity	30⅞
Silver Queen	12	United Cop., com.	72⅝
Stewart	2⅛	U. S. Oil	12⅜
Tennessee Copper	49½	U. S. Smg., Ref.	66
Utah Cop.	...	U. S. Sm. & Re., pd.*	106⅜
Utah Apex	3½	Utah Copper*	71½
West Columbus	11	Victoria	8¾
		Washington	2⅛
		Winona	12
		Wolverine	198
		Wyandotte	2½

N. Y. INDUSTRIAL	
Am. Agri. Chem.	24
Am. Smelt. & Ref.	144
Am. Sm. & Ref., pf.	114
Bethlehem Steel	...
Colo. Fuel & Iron	48
Federal M. & S., pf.	...
Inter. Salt	...
National Lead	41½
National Lead, pf.	104½
Pittsburg Coal	...
Republic I. & S.	...
Republic I. & S., pf.	98½
Sloss-Sheffield	54
Standard Oil	651
Texas Co.	...
U. S. Red. & Ref.	...
U. S. Red. & Ref., pf.	...
U. S. Steel	44⅝
U. S. Steel, pf.	94½
Va.-Car. Chem.	...
Va.-Car. Chem., pf.	...

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Ahmeek	110
Ariz. Com.	5
Black Mt.	2
Cananea Cent.	35
East Butte	11½
Hancock Con.	1½
Keweenaw	11½
Mayflower	4
Raven	1
Shawmut	1
Superior	31
Superior & Pitts.	7
Troy Man.	1

LONDON	Feb. 19
Name of Com.	Clg.
Dolores	£1 15s. 0d.
Stratton's Ind.	0 2 6
Camp Bird	1 7 6
Esperanza	2 12 6
Tomboy	2 1 3
El Oro	1 13 1½
Oroville	1 0 0
Sonora	0 8 6
Utah Apex	1 11 3
Ariz. Cop., pfd.	3 15 0
Ariz. Cop., def.	3 12 6

Quoted through Hay Ins., stone & Co., N. Y.

ST. LOUIS	Feb. 19		
Name of Com.	High	Low	
Adams	6	5	
Am. Nettie	68	66	
Center Cr'k	2 50	2 25	
Cent. C. & C.	65 00	63 00	
C. C. & C. pd.	80 00	75 00	
Cent. Oil	50 00	50 00	
Columbia	5 00	4 00	
Con. Coal	24 00	22 50	
Doe Run	160 00	140 00	
Gra. Bimet.	6	5	
St. Joe	19 00	17 00	

S. FRANCISCO	Feb. 14		
Name of Comp.	Clg.		
COMSTOCK STOCKS			
Belcher	.50		
Best & Belcher	1.20		
Caledonia	.95		
Challar	.14		
Con. Cal. & Va.	.95		
Crown Point	.32		
Exchequer	.50		
Gould & Curry	.25		
Hale & Norcross	.82		
Mexican	.95		
Ophir	2.00		
Overman	.17		
Potosi	.16		
Savage	.87		
Sierra Nevada	.60		
Union	.50		
Utah	.06		
Yellow Jacket	.80		
TONOPAH STOCKS			
Golden Anchor	.41		
MacNamara	.62		
Montana-Ptts.ex.	.25		
North Star	.39		
Rescue	.20		
GOLDFIELD STOCKS			
Black Ants	.11		
Blue Bull	.49		
Columbia Mt.	1.05		
Comb. Frac.	5.62		
Conqueror	.23		
Daisy	3.20		
Florence	3.00		
Frances-Mohawk	.90		
Goldfield Con.	8.62		
Grandma	.29		
Great Bend	1.07		
Red Hills	.31		
St. Ives	1.27		
BULLFROG STOCKS			
Amethyst	.53		
Bonnie Claire	.46		
Mayflower Con.	.60		
Montgomery Mt.	.39		
Original	.21		
MANHAT'N STOCKS			
Gold Wedge	.16		
Manhattan Mg.	.15		
Pine Nut	.25		
Ruby Wonder	.22		
Stray Dog	.50		
Yellow Horse	.08		

NEVADA (Weir Bros. & Co., New York)	Feb. 20		
TONOPAH STOCKS	Clg		
Tono'h Mine of N.	16.50		
Tonopah Exten.	4.37½		
Montana Tonop'h	4.87½		
Belmont	5.50		
Tonopah Midway	2.05		
West End Con.	1.60		
Jim Butler	1.05		
GOLDFIELD STOCKS			
Sandstorm	.73		
Kendall	.51		
Red Top	4.25		
Jumbo	4.25		
Goldfield Mining	1.40		
Dia'dfield B. B. C.	.52		
Atlanta	.91		
Mohawk	17.50		
Silver Pick	1.49		
Laguna	1.65		
BULLFROG STOCKS			
Mont. Shoshone C.	13.00		
Tramps Con.	1.51		
Gold Bar	1.24		
Bullfrog Mining	.30		
Bullfrog Nat. B.	.52		
Homestake Con.	1.30		
MANHAT'N STOCKS			
Manhattan Con.	.87		
Manhat'n Dexter	.40		
Jumping Jack	.24		
Stray Dog	.42		
Indian Camp	.53		

COLO. SPRINGS	Feb. 16		
Name of Comp.	Clg.		
Acacia	12½		
Black Bell	...		
C. C. Con.	5½		
Dante	5½		
Doctor Jack Pot.	7¾		
Elkton	63½		
El Paso	57¼		
Findley	68		
Gold Dollar	6¾		
Gold Sovereign	67½		
Isabella	21		
Index	...		
Jennie Sample	7¼		
Jerry Johnson	...		
Mary McKinney	64½		
Pharmacist	6½		
Portland	1.21½		
Un Gold Mines	8¾		
Vindicator	93		
Work	15		

New Dividends

Company.	Payable.	Rate.	Amt.
American Coal, Md	Mar. 1	$7.50	$375,000
Am. Smelters Securities, A.	Mar. 1	1.50	255,000
Am. Smelters Securities, B.	Mar. 1	1.25	375,000
Butte Coalition	Mar. 19	0.50	500,000
Cleveland Cliffs Iron	Jan. 15	5.00	250,000
Elkton, Colo.	Feb. 24	0.01½	75,000
General Chemical	Mar. 4	2.00	148,206
Greene Con. Copper	Mar. 25	0.40	345,600
Greene Gold & Silver	Feb. 25	0.40	120,000
Homestake, S. Dak.	Feb. 25	0.50	109,200
McKinley-Darragh, Ont.	Mar. 1	0.02	40,000
National Lead, pfd.	Mar. 15	1.75	262,500
N. Y. & Hond. Rosario	Feb. 23	0.20	30,000
North Butte, Mon.	Mar. 23	2.00	400,000
Parrot, Mon.	Mar. 12	0.25	57,462
Philadelphia Co., pfd.	Mar. 1	1.25	143,620
Quincy Copper	Mar. 11	4.50	486,446
Red Metal, Mon.	Mar. 1	4.00	.....
Republic Iron & Steel, pfd.	Apr. 1	1.75	245,434
Sloss-Sheffield, S. & I.	Mar. 1	1.25	93,750
Standard Oil	Mar. 15	15.00	14,750,000
U. S. Red. & Refining	Apr. 1	1.50	59,18
U. S. Steel Corporation	Mar. 30	0.50	2,500,00
U. S. Steel Corp., pfd.	Feb. 28	1.75	6,301,919
U. S. Smelt., Ref. & Mg.	Apr. 1	0.87½	1,312,00

Assessments

Company.	Delinq.	Sale.	Amt.
Belmont Idaho	Feb. 7	Mar. 7	$0.002
Black Diamond, U.	Feb. 13	Mar. 6	0.01
Bullion, Nev.	Feb. 11	Mar. 8	0.05
Clark-Virginia, Utah	Mar. 5	Mar. 12	0.001
Crown Point, Nev.	Feb. 5	Feb. 26	0.10
Deer Lodge, Utah	Feb. 18	Mar. 11	0.001
Gt. Copper King, U.	Feb. 15	Mar. 10	0.001
Johnnie, Utah	Feb. 23	Mar. 12	0.02
Lady Washington, N.	Jan. 25	Feb. 25	0.05
New Stockton, Utah	Feb. 18	Mar. 11	0.025
Ore Blanco, Cal.	Feb. 25	Apr. 22	0.03
Quincy, Jr., Idaho	...	...	0.10
Scorpion, Nev.	Feb. 6	Feb. 28	0.02
Sierra Nevada	Feb. 25	Mar. 18	0.10
St. George, Utah	Mar. 4	Mar. 25	0.01
Tetro, Utah	Feb. 6	Mar. 11	0.03
Union Con., Nev.	Feb. 11	Mar. 4	0.10
West Century, Utah	Mar. 6	Mar. 24	0.00

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108		30.464	
March	64.597		29.854	
April	64.765		29.984	
May	66.976		30.968	
June	65.304		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.027		31.483	
October	69.523		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869		18.116		78.147	
March	18.361		18.641		81.111	
April	18.375		18.688		84.793	
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
Septemb'r	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.493		August	40.606	
March	36.663		September	40.516	
April	38.900		October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464		16.031	
March	5.350		15.922	
April	5.404		15.959	
May	5.685		16.725	
June	5.750		16.815	
July	5.750		16.525	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075		5.924		25.844	
March	6.054		6.050		24.563	
April	6.078		5.931		25.781	
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.078	
November	6.375		6.222		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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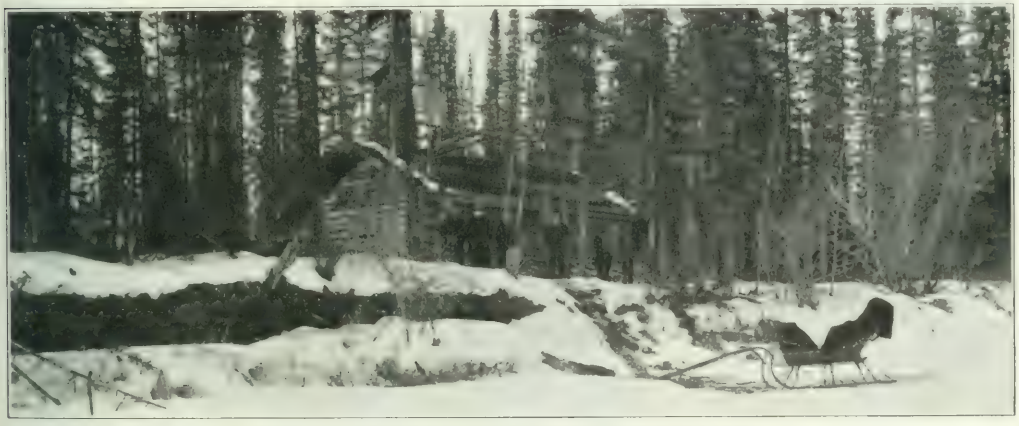
Placer Mining in the Klondike

The Unusual Conditions Prevailing in the District Have Produced Many Interesting New Methods. Costs of Mining are Steadily Falling

BY JOSEPH B. TYRRELL*

In the summer of 1896, marvelously rich gold-bearing gravels were discovered in the extreme northwestern corner of the Dominion of Canada, almost under the Arctic circle. The region in which the discoveries were made was very remote from the nearest city or center of civilization, and was practically isolated for the greater part of the year, and although vague rumors of a rich gold strike filtered to the outside world during the following winter, it was not until the summer of 1897, when the steamer from



VALLEY OF INDIAN RIVER—THE BANK SHOWS THICKNESS OF MUCK

the mouth of the Yukon river, bearing its load of gold, tied up to the wharf in the city of Seattle, that the world learned that a great new gold-bearing country had been discovered in the north.

The miners who reached the golden Klondike, and secured mining claims there, found themselves surrounded by conditions to which most of them were entire strangers. As in other placer camps, the native gold was lying free in the alluvial gravel, and consequently the mining properties were classed as "placer mines," but there was a very vital difference between these mines on the tributaries of the Yukon river and other alluvial mines in countries farther south. The gravel was frozen into a solid mass, and remained frozen summer and winter alike, and at the same time it was almost everywhere covered by a layer, from 2 ft. to as much as 100 ft. in depth, of vegetable mold or "muck," which was also frozen into a solid mass. The gravel had to be first thawed, and the development of the most economical methods of thawing had been a dominant factor in profitable mining in the Klondike.

For a time imagination and inventive genius seemed to run wild throughout the camp, and almost every claim had its own peculiar methods of procedure. The more important methods that have survived have been described and illustrated by C. W. Purington in his report on "Methods and Costs of Gravel and Placer Mining in Alaska," published by the United States Geological Survey.

For two years, after gold was discovered by George Carmack on the banks of Bonanza creek, mining was almost exclusively confined to the gravel deposits in the bottoms of the valleys, and was performed entirely by hand, with the assistance of such simple implements as the pick, shovel, wheel-barrow and windlass. Two general methods of mining were in vogue, depending on whether the claims were worked by a pit or a "cut" open to the surface, or by a shaft or shafts and tunnels or chambers underground.

Ground Sluices

The first method, usually known as "ground sluicing and shoveling in," involved expensive preparation before the pay-dirt could be reached. A narrow ditch was dug in the muck lengthwise of the claim, and a part or the whole of the water of the adjoining brook was turned into the ditch by a wing-dam. The water rapidly deepened the ditch to the level of the bottom of the muck, or the top of the underlying gravel, and men were set to pick down the muck and ice from the sides of the ditch into the running water below, by which it was in part dissolved and in part carried away down the stream. As the ditch was thus widened, the water was kept flowing against one side by little dams, and in this way an area, from 100 to 200 ft. in length and 50 ft. or more in width, was freed from its covering of muck, and the underlying sand and gravel were laid bare to be thawed by the sun and warm winds and rain of the remainder of that summer or of the following summer.

Of the gravel so exposed, the upper portion usually contained so little gold

Note—From a paper entitled, the "Development of Placer Gold Mining in the Klondike" read before the Institution of Mining Engineers, London, with photographs contributed by the author.

*Mining engineer, Toronto, Canada.

[illegible] it was, therefore, shoveled into wheel-barrows, and wheeled away and dumped to one side, all the ground being removed until the gold-bearing layer near the bed-rock was reached. A dam was then built in the stream some distance above the area of uncovered gravel, which, being now lower than the surrounding part of the bottom of the valley, or than the bed of the stream itself, was known as the cut, and a flume was built from this dam to sluice-boxes, which were strung on a proper grade across the top of the cut. Water was turned into the flume and sluice-boxes, and the pay-dirt was then shoveled, usually in two stages, from the bottom of the cut into the sluice-boxes.

CLAIM IN ACTION, ADAMS HILL.

This shoveling-in was a slow and expensive process, for wages were uniformly 6s. ($1.50) an hour. An average gang of six men, working in a cut, and shoveling dirt into sluice-boxes in two stages, would thus handle 15 to 20 cu.yd. in a day of 10 hours, making the cost of handling the pay-dirt alone from £1 4s. to 18s. ($6 to $4.50 a cu.yd.). In some of the richest mines this tremendous expense was a trifling matter compared to the great value of the output. For example, a clean-up was seen at one mine, after a force of six or eight men had been working for three shifts of 10 hours each, the yield being eight gold pans full of clean gold. The owner, at the time, was obliged by law to pay a royalty of 10 per cent. of this gross output, and the return made by him of the value of this clean-up was [illegible] ($[illegible])

Drifting

The other method of mining in vogue at that time, chiefly on claims where the muck and underlying barren gravel were deep, was conducted as follows: In the winter season, a shaft, about 3x6 ft. in horizontal dimensions, was picked down through the frozen muck to the sand or gravel. As a rule, the muck flakes off easily, and much of it is so free from grit that it will not even blunt the point of the pick. As soon as the shaft was sunk to the gravel, a fire was built in the bottom of it, and after this fire had burned out, and the gases arising therefrom had risen to the surface, the gravel that had been thawed by the fire, extending probably to a depth of from 12 to 18 in., was dug out and hoisted to the surface with a bucket and hand-windlass. Another fire was then built in the bottom of the shaft, the gravel being afterward removed as before, and so the work went on until bed-rock was reached. One and sometimes two fires were lit in a shaft each day.

When bed-rock was reached, fires were built against the face of the gravel, green timber being piled on the dry wood to keep down the heat as much as possible, and the gravel and bed-rock were hoisted to the surface as before and piled up in a dump. During the following spring, when the water was flowing in the adjoining creek, it was diverted into sluice-boxes and led past the dump (the surface of which, as it was thawed by the sun and atmospheric agencies, was scraped off and shoveled into the water in the boxes, the rate at which this pay-dirt could be handled being determined by the rapidity with which the dump thawed.

Exact accounts were rarely kept in the Klondike in those days, except by the banks, so that it is difficult to determine the precise cost of much of the mining that was then done, but it is safe to say that it varied from £2 to £5 ($10 up to $25) and more to the cubic yard.

Such underground mining, with the help of wood fires, could only be carried on in winter, for at that time of year the air in the drifts, though at freezing point, was much warmer and lighter than the air above, which was probably 50 deg. F. lower in temperature, and the noxious gases formed by the fires would quickly rise to the surface and be dissipated.

But the miners were determined, if possible, to prospect and work their claims whether the season was summer or winter, and after a number had been overcome and killed by gas the following plan was adopted: A shaft was picked down through the frozen muck to the gravel as before, and then a big fire was built on the surface close to the top of the shaft in which a number of large rocks were heated. These were then thrown to the bottom of the shaft and covered with moss or brush. Next day, the moss, brush and

CLEAN UP, ADAMS HILL.

rocks, now cool, were hoisted to the surface with a windlass and as much of the gravel as the hot rocks had thawed was also dug up and hoisted, after which hot rocks were again thrown down the shaft and the process was repeated until the bed-rock was reached.

Such were the methods of mining practised in the Klondike in 1897 and 1898, and such are still the only methods available in remote districts to which machinery cannot be transported.

Steam Thawing Plant

But men soon began to recognize that while shallow ground might still be worked by hand with a possibility of profit, deep ground, which must necessarily be undermined, must be thawed in some other way than by wood fires or hot rocks if it was to be mined quickly and cheaply, and that the great majority of the mining claims in the country were underlain by deep ground.

Many plans were suggested and tried, but, so far as the writer is aware, John McGillivray, a mining engineer from San Francisco, California, was the first to adopt the method which has since come into very general use. In the winter or spring of 1899, he took a small steam-boiler to a mining claim on Sulphur creek, and there began thawing the frozen gravel by steam, the method adopted being about as follows: The shaft was picked down through the muck, and near it the boiler was set up on the surface. A small iron pipe was connected to the boiler and run down to the bottom of the shaft, where it was connected by an india-rubber hose to a loose piece of ½-in. pipe pinched in at the point. Steam was raised in the boiler to a pressure of 20 or 30 lb. per square inch, a valve which had been set in the pipe was opened, and steam was let into the loose pipe, known as the "point," which was then pushed into the gravel to its full extent, and allowed to remain there for several hours, during which time steam was supplied from the boiler to the tip of the point penetrating into the gravel.

From this little boiler has developed the efficient steam thawing plant in use at the present day, in so many of the placer mines of the Yukon Territory and Alaska. It consists of a boiler of 25 to 50 h.p., not too heavy, iron piping, the steam hose, and points, 5 ft. or more in length, made of double-thickness hydraulic steel pipe, with a tip of very hard steel in the end of which is a hole ¼ in. in diameter, and a heavy steel head into the side of which is welded a hollow nipple on which the steam hose may be clamped. This point is driven into the gravel or bed-rock with a heavy mallet, the steam being kept up to a pressure of 80 or 100 lb. per sq.in., so that there may be no danger of pebbles or chips of rock wedging in the hole at the tip.

There are many occasions on which the steam thawer is now used, other than for extracting the frost from the pay-dirt in the drifts. Shafts are sunk with it, either by driving short points vertically into the ground and digging out the thawed dirt from time to time, or by driving a long point, from 20 to 30 ft. long, vertically down through the muck and gravel to bed-rock, steaming it for a day or two, and then digging out the whole of the thawed dirt at once, making a circular shaft. The dumps of pay-dirt extracted during the winter, and again frozen hard, are thawed in order to enable the miners to make full use of the heavy rush of water in the spring to wash the gold from the gravel. The uncovered gravel in the open cuts is thawed in order to hasten the work in summer, or to prolong the mining into the autumn, etc.

DRILLING IN WINTER, INDIAN RIVER

FLUME FROM ADAMS CREEK

Pulsators

In a number of mines, pulsometers are used underground to thaw and break down the face of the gravel in the drifts, the water in the sump being pumped over and over again against the face of the gravel, breaking it down and washing it back a short distance, the process being assisted by a man with a rake, the water being gradually heated by the absorption of the steam into it. In other mines, a similar result is attained by pumping the water with a duplex pump from the sump against the face of the gravel, the water being first slightly heated by steam direct from the steam pipe.

Dawson Carrier

The final and greatest improvement in the mechanical moving of the pay-dirt was

accomplished by the invention of the self-dumping cable-tram, or "Dawson carrier," carrying a bucket with a capacity of from 9 to 11 cu.ft. By its means one man at the hoisting engine can raise from the shaft, and either pile up in a conical dump, or empty into a sluice-box, as much dirt as eight or ten miners underground can pick down and wheel to the hoisting bucket.

By its assistance, the pay-dirt in solidly frozen ground can be mined from tunnels and drifts, hoisted and sluiced for about 25s. ($5) a cu.yd., with wages at £1 4s. ($6) a day of 10 hours, and dry spruce wood for fuel at £2 ($10) a cord.

DUMPS OF PAY DIRT ON GOLD RUN CREEK

Gold-washing Plant

The gold-washing and separating apparatus in use in the Klondike has remained practically unchanged throughout the life of the camp. Leaving the "rocker" out of consideration, it consists of a string of sluice-boxes, each 12 ft. long, and 12 or 14 in. wide at the upper end, and 2 in. narrower at the lower end. These boxes are placed so that the small end of one box just slips into the large end of the one below it, and are supported and braced so as to have a grade of from 6 to 9 in. to each box. In the middle of the string, there is usually one box much larger than the others, called a "dump-box," in which a man stands with a heavy "sluice-fork," to stir the gravel and throw out any rocks too large to run easily through the smaller boxes. In the bottoms of all these boxes, small rounded poles, called "riffles," are laid lengthwise, and are fastened together by short transverse strips every 6 ft. Water varying in quantity from 250 to 700 gal. a minute is turned into and allowed to flow through the sluice-boxes, and as the pay-dirt is shoveled or emptied into them, it is carried along by the water, and the gold settles to the bottom and is caught between the riffles, while the gravel and sand is discharged from the lowest box at the tail of the sluice. The riffles are raised and taken out from time to time, and while a small quantity of water is allowed to flow through the boxes, the gold is carefully separated with wooden paddles and brushes from the gravel, which was caught with it in the riffles.

Removal of Barrens

The modifications of the methods of open cutting and ground sluicing adopted in 1897 and 1898 have been usually on well known engineering lines, and have not exhibited the same originality as that evinced in the underground mining methods. Stripping the muck from the gravel is still generally accomplished by diverting the stream into a number of new channels, and picking down the banks. In one instance, the muck was stripped off very successfully by using a force-pump, and directing a stream of water from a small nozzle upon it. In this way, the light vegetable material was washed down into the stream as fast as it thawed, and the whole body of muck was quickly removed. But no one seems to have carried this method of removing muck to its full and legitimate extent, by using water under natural pressure for this work. The water can readily be obtained at sufficient elevation from tributaries of the main streams, and undoubtedly, before long, the only method of stripping that will be recognized as economical and rational will be by the use of such water delivered under pressure from an hydraulic giant.

Removal of Pay-dirt

After the barren gravel was removed, the pay-dirt was either shoveled into sluice-boxes set in the bottom of the cut, the water used being afterward raised by a centrifugal pump to the general surface level; or the sluice-boxes were set over the cut, and the pay-dirt was shoveled, usually in two stages, into them; or the sluice-boxes were set above and to one side of the cut, and the pay-dirt was shoveled into wheel-barrows and then wheeled and emptied into a car which was hauled up an incline and its load tipped into the sluice-box; or it was wheeled to a bucket which was hoisted by a swinging derrick; or it was wheeled to and emptied on an india-rubber belt conveyer, which discharged into the sluice-box; or it was wheeled to a bucket which was hoisted by the Dawson self-dumping cable carrier and emptied into the sluice-box. The latter is now much the most common method of conveying the pay-dirt from the mine to the sluice-boxes.

ONE OF THE OLDEST HOUSES IN DAWSON

Hill-side Claims

Comparatively early in the history of the camp, it was recognized that there were gravels rich in gold lying above, and often high above, the present bottoms of the valleys. These were at first attacked with rockers, the water in many instances being carried up several hundred feet in pails from the creek below. The owner of one of the richer of these claims would often have from six to ten men with rockers working for him, but on account of

the great expense of such work no attempts were made to mine ground that would yield less than £3 to £4 ($15 or $20) to the cu.yd.

After the narrow belts or rich and shallow ground along the edges of the benches or terraces had thus been shoveled off and washed in rockers, the miners began to run adits into the hills along the top of the bed-rock, and to bring out the pay-dirt to the "rim" to be washed in a rocker. But this process of mining and hand-washing proved entirely too slow and expensive; so the pay-dirt was mined and brought out to the mouths of the adits, where it was piled up for a time, and was then either run in a chute down the hill to a sluice set near the creek, and supplied with water from it, or in the event of its not being possible to dump tailings on the creek claim, a pump was installed, and water was pumped up the hill and allowed to run down again through the sluice-boxes, being often used two or three times over by different parties in its descent.

At a still later date, ditches, sometimes several miles in length, were dug to bring water from tributary streams at a sufficiently high elevation to wash these dumps of pay-dirt from the benches.

The methods of mining adopted on this terrace, or so called "hill-side" claims, were for the most part very similar in character to those used in underground mining in the creek claims. An adit was run along the top of the bed-rock to the rear boundary of the claim, or as far as pay-gravel could be found, and drifts were driven at regular intervals at right angles to it. The intermediate pillars were then taken out, a certain amount of timbering being usually necessary to support the roof while the pay-gravel from these pillars was being recovered. In most of these mines, the ground was frozen and had to be thawed with steam points; but in some cases, generally where the overburden of barren gravel was more than 200 ft. thick, the ground was not frozen. In some instances, however, the claim which the miner desired to work did not extend to the rim, so that it could not be worked from an adit, and in that case it was necessary to sink a shaft and mine in the same manner as in the bottom of the valley, the chief differences being that the shaft was usually deeper, and the expense of obtaining water for washing the gravel was very much greater.

BLOCK RIFFLES, ADAMS HILL.

In other instances, after the value of the gravel in these bench deposits had been proved by tunneling, water was pumped up from the creek in the bottom of the adjoining valley to hights of from 50 to 100 ft. above the level of this gravel, and was then delivered against it through hydraulic giants, thus washing it off the rocky bench on which it lay, the water with its load of gravel being directed in its flow through cuts in the bed-rock, and then through sluice-boxes. The enormous expense of installing such a pumping plant in a region so remote and difficult of access, and the great cost of fuel after the plant had been installed, soon proved that such a method of mining was too expensive, even for the very rich ground that was being operated upon; but it also proved that hydraulic methods of mining were quite feasible in the Klondike, and that the frost in the ground was no bar to the employment of such methods.

Ditches

Attention was then turned to the problem of obtaining a supply of water by gravity sufficient to enable the miners to carry on effective hydraulic operations on these benches. Most of the ditching accomplished up to the present time has been erratic and disjointed, and has supplied water to the hydraulic giants for but a few weeks in each season; but this correct principle has been recognized, that the proper supply of water is the run-off from the adjoining higher country, and that the most economical way of obtaining water is by collecting this run-off and storing it in reservoirs in the gulches, from which it can be drawn when required.

The average annual precipitation in the Klondike region is between 10 and 12 in., about 4 in. of this being in the form of snow. Experience has shown that about three-quarters of the snow on the ground in March, and about one-half the rainfall can be figured on as run-off, or, say, in all about 6 in. in the year, equal to 13,939,200 cu.ft. of water to each square mile of catchment-area, or 6452 twenty-four-hour miner's inches of water. With a duty of 5 cu.yd. to the miner's inch, which is rather below the average so far attained in that country, this quantity of water will wash down 32,260 cu.yd. of gravel.

The area of the watershed of Bonanza creek is roughly 90 square miles, two-thirds of which, or 60 square miles, is well above the level of the highest of the bench deposits, and the run-off from this extensive tract, if caught and fully utilized, would thus be sufficient to hydraulic away nearly 2,000,000 cu.yd. of gravel. If to this were added the run-off from 40 square miles of hills drained to the Yukon river, which could readily be brought round into the valley of Bonanza creek at

A SMALL HYDRAULIC INSTALLATION

a considerable elevation, the total quantity of water so made available would be sufficient to wash down more than 3,000,000 cu.yd. of gravel each year.

Dredging

One other plan of gravel-mining on a large scale, dredging, is only applicable to the low-lying alluvial deposits in the bottoms of the valleys. There are now five dredges in the Klondike, all built on the bucket principle, and [illegible] installed. They handle all the gravel, and, if properly managed, save very nearly all the gold, at a cost which is less than the material can be handled by any other way, except with a hydraulic giant, where there is abundance of water and dumping ground. They are under the disadvantage, however, of not being able to work in frozen ground. In one case, this difficulty was overcome by thawing the ground with long steam-points in front of the dredge, but this added enormously to the cost of the work, and practically excluded the possibility of mining very much of such low-grade ground as would pay handsome profits elsewhere. The absence of large boulders makes the gravel very easy to move with a dredge when it is free from frost, and the air will quickly take the frost out of the gravel, if the muck which almost everywhere covers it is removed.

The cost of alluvial mining in the Klondike has gradually decreased from the time of the discovery of the camp ten years ago until now, and mining claims that were once valueless have two or three years afterward, with improved methods of mining, yielded fortunes to their owners. He would be a rash man indeed who would say that even the best methods of placer mining now in use cannot be improved upon, and it is not improbable that ten years hence, when the enormous cost of the mining of the past few years has been forgotten, and when methods of handling gravel are still further improved upon, men will wonder that miners could have ever passed over and neglected such rich gold-bearing deposits as are now lying unworked in the Klondike.

Origin of the Nickel Ore Deposits of the Black Forest

By A. W. G. Bleeck*

In the south of the Black Forest, in the grand duchy of Baden, two occurrences of peridotite with 12 per cent. of nickel were formerly worked, one near the village of Horbach, the other at Temeos. As the demand for nickel has grown considerably and prices are very high, both deposits have attracted especial notice of late and E. Notton, of Cologne, has prepared a company which will shortly be [illegible] operations. The ore seems to occur over a wide area and mining ought to pay well.

E. Weinschenk, professor of practical geology at the Ludwig-Maximilian University of Munich, and the writer were recently called upon to report on the ore and its mode of occurrence. The result of these investigations will shortly be published by E. Weinschenk in a detailed treatise—a treatise which will command considerable interest, as similar deposits of pyrrhotite occur near Sudbury, Canada, and at Roeros, Norway, which are being worked with considerable profit. The similarity of all these occurrences is so marked that the explanation given by E. Weinschenk on the geological origin of the deposits may undoubtedly be applied to all and will be welcomed as the most satisfactory one yet published.

Nature of the Deposits

The ore, the so called horbachite, together with flakes of copper pyrites, is disseminated in a norite or occurs in real veins and pockets of various sizes in the same rock. The norite has been penetrated from all sides by a multitude of veins of pegmatite, aplite and granite and forms irregular masses of various sizes embedded in the granite.

Evidently these masses of older eruptive rock were torn from their original positions by a later intrusion of granite, the molten magma closing round them. It will be readily understood that these detached portions of norite show a highly altered condition, owing to contact-metamorphism. E. Weinschenk has made a careful study of the altered rocks and gives a detailed description in his treatise.

Genesis of the Ore

On examining the granite with the microscope, pyrrhotite in various quantities was found disseminated through it. Pieces of granite taken from near the contact with the norite showed a considerable amount of ore; others taken from various places contained but few grains.

Evidently the ore formed part of the granitic magma. Before or during the eruption a differentiation within the magma itself took place, the greater part of the ore being separated from the granitic matter. After the intrusion of the granite, but before the aplites and pegmatites forced their way through, the ore invaded the all but solidified granite and filled up the fissures in the norite.

There can be no doubt as to the molten state of the ore at this time. The component minerals of both granite and norite show unmistakable signs of magmatic corrosion by the ore. The latter seems to be most closely disseminated in the norite wherever conversion of pyroxene into uralite has taken place, in other words, wherever the norite has been altered by contact-metamorphism.

It is remarkable that such large quantities of ore should have concentrated round the masses of basic eruptive rock. There can only be one explanation of this phenomenon. These rocks are very ferruginous, containing such accessory minerals as ilmenite and magnetite in considerable quantities. It is quite possible, therefore, that the local concentration of the pyrrhotite around the norite was brought about by magnetic currents which were excited in and around the detached portions of norite by the intrusive masses.

Practical Conclusions

The practical conclusions to be drawn from this investigation are, in short: when working on an ore deposit of the Horbach type, the ore should be looked for around and in the basic eruptive rock, more especially in the areola of the contact between granite and this rock.

*Mining engineer, Ballygunge, Calcutta, India.

Mining in Chile

Consul A. A. Winslow reports from Valparaiso that the mining interests of Chile are very extensive and are growing rapidly.

This is especially true in the extreme southern part, where about $400,000 worth of American mining machinery, in the shape of dredges and steam shovels, is employed in extensive placer mines. Many of the claims are rich, and the deposits cover a strip of country 50 by 150 miles, extending over into Argentina and to and upon the island of Tierra del Fuego. This country is rich in copper deposits, which are just beginning to be developed, and the future of this part of the republic seems particularly promising, since extensive deposits of lignite are found in close proximity to both the copper and gold deposits. In one case the bed of lignite was found to be 15 ft. thick. Punta Arenas is the center of this mining country, and is growing very rapidly. It now has a population of about 10,000, a gain of about 3000 during the past year.

Metal Production of Wyoming

According to the preliminary report of the State Geologist of Wyoming the production of metals for the years 1905 and 1906 was as follows:

	1905	1906
Copper, pounds	2,420,629	50,000
Gold, value	$23,100	$25,000
Silver, ounces	2,700	2,000
Iron, tons	534,879	600,000

The falling off in copper production in 1906 was due to the burning of the reduction works of the Penn-Wyoming Copper Company at Encampment in March, 1906 (this being the only producing plant in the State at the present time), the amount given being returns from test shipments from various properties. Repairs are in active progress and the smelting department will be blown in in January, 1907, and an active campaign inaugurated for next year.

Several other mills are seriously considered and it is confidently believed that this year touched the low water mark and now begins a steady yearly increase.

The Mineral Industry of Brazil

The Government is Seeking Means to Increase Interest in Mining Gold, Manganese Ore and Diamonds Now Constitute Chief Products

BY M. ARRAJADO R. LISBOA*

Brazil has been known as a country of varied and abundant mineral resources since its discovery. The country was opened and explored by adventurers seeking mineral wealth, and for some centuries it was Brazil that provided Europe with the greater part of its gold and diamonds. Many and complex causes have prevented the extraordinary activity of the early colonial times from developing into an important mineral industry.

The question of the development of the industry has recently been discussed in the Brazilian Parliament. Deputy Pandiá Calogeras presented a bill for the establishment of a new mining law and an exhaustive study of the mineral industry of the country.† This work is a source of information which will be of advantage to all those interested in the mineral industry of Brazil.

WASHING DIAMOND GRAVEL AT AGUA FRIAS

Gold

The most important auriferous region in Brazil extends from Bahia to Goyaz, occupying an enormous area of the state of Minas-Geraes. Auriferous districts of more or less importance exist also in the States of Matto-Grosso, Rio Grande, S. Paulo, Paraná, Ceará Pará, and Maranhao and in Brazilian Guiana.

The state of Minas has been the center of the gold-industry activity in the country. Gold here appears in alluvial deposits or in several types of veins and rocks.

At Campanha and S. Gonçalo, districts of southern Minas-Geraes, gold occurs in gneiss. Some veins of the district of Ouro-Preto, having the appearance of ordinary quartz veins, are considered by Dr. Hussak as auriferous granitic apophyses. The same type of auriferous lode is found at Diamantina (S. Joao da Chapada, Bandeirinha). At Gongo-Socco, Maquiné, etc., gold occurs in a soft hematitic quartz schist (micaceous iron ore) named locally *jacutinga*. The auriferous jacutinga of Candonga, at S. Miguel de Guanhaes, is considered by Dr. Hussak to be characteristic contact-metamorphic, auriferous deposit. At Morro Velho gold occurs in lode of sulphides and carbonates. The S. Joao del Rey Gold Mining Company, which works this lode, is the most important mining enterprise in the country.

The Morro-Velho mine has been worked since colonial times. Exploration by the present English company began in 1834, and is, therefore, the oldest gold mine in actual operation in the world. It experienced two great disasters, each of which necessitated the complete abandonment of the workings and a financial reorganization of the company. The dividends between 1842 and 1867 were at the rate of 25 per cent., the capital being £135,000. Between 1875 and 1881, after the first disaster, dividends amounting to 30 per cent. per annum were declared. After the reopening of the mine in 1886 dividends were declared varying between 10 and 5 per cent. per annum. The capital of the company now is £646,000.

Other companies such as the Ouro-Preto Gold Mines of Brazil and Sao Bento Gold Estates explore auriferous veins of different characters with less satisfactory results. The gold-dredging industry is beginning to attract attention. In Matto-Grosso a dredge is working on the river Coxipo with profit. In Minas at present there are two dredges at work on the Rio das Mortes and Ribeirao do Carmo. The impulse that the industry may gain in the country depends largely upon the result of these operations.

The Guiana placers have furnished great quantities of gold, but lately the production has fallen off.

Diamonds and Carbons

With the discovery of diamonds in South Africa and the development of the industry in that region diamond mining in Brazil has suffered greatly and has been almost paralyzed. The Brazilian diamond is recognized as superior to the South Africa product. As yet, the matrix of the mineral has not been encountered. In central Brazil it occurs in ancient conglomerates.

The diamantiferous district is very large. It extends from Matto-Grosso to Bahia, crossing the states of Goyaz and Minas-Geraes, which is the principal center of the industry. A French company until recently explored the Boa-Vista mines, near Diamantina, and at present an English company operates the Agua-Suja mines, Bagagem, but operations are still in the installation stage.

Lately several diamond-dredging claims of Brazil, on the river Jequitinhonha, the diamantiferous river, have been examined by American companies. On the river Coxipo, in Matto-Grosso, many diamonds have been gathered with the gold, and with appropriate plant, diamond dredging may offer very satisfactory results, when competently directed.

Carbons exist in the diamantiferous district of Bahia, named Chapada Diamantina. There is no systematic exploration, the diamonds being found by the *garimpeiros, or* washers, who employ primitive

*Mining and civil engineer, Rio de Janeiro, Brazil.

†João Pandiá Calogeras, "As Minas do Brasil e sua legislação."

processes. Carbons being of comparatively high value, their presence in the diamantiferous alluvials of Bahia with the diamond has given an added importance to these deposits during the last few years

Manganese

The manganese industry is a new one which has recently taken great strides. As there is not in the country a metallurgical industry, all the ore is exported to Europe and North America.

The principal exportation centers are in Minas-Geraes and Bahia, but the industry in this last State still awaits development. In Minas there are two districts. That of Burnier, located 500 km. from the sea by railway, contains manganese deposits included in the metamorphic rocks and associated with limestones and iron ores. The ore exported yields from 50 to 55 per cent. metallic manganese, and contains from 10 to 20 per cent. water. It is comparatively free from phosphorus.

The Lafayette district has an ore of a different nature; it appears in fissure veins and has been formed by the decomposition and leaching of a rock containing manganiferous garnets. The ore exported gives from 49 to 51 per cent. metallic manganese, 3 per cent. silica and 0.08 phosphorus.

In Burnier the manganese deposits are worked by underground operations. Timbered levels are driven into the ore. In the Lafayette district the workings are open-cast. Morro da Mina at Lafayette and Uzina Wigg at Burnier are the two most important manganese mining properties of the country, both worked by native capital. Besides these there are explorations in Piquiry, now exhausted, and at S. Gonçalo. Other installations are being made at Entre Rios, all in the district of Lafayette.

A large manganese ore deposit was prospected in Matto-Grosso, near the Bolivian frontier, by the same firm that explored the Piquiry mine. This deposit is situated some miles from the river Paraguay and offers favorable working and transportation conditions. An exploration will enable one to form an opinion as to the importance of the deposit and the real value of the ore. There are said to be many millions of tons in sight.

Iron

Iron deposits are abundant in Brazil. Oxides of iron constitute one of the common derivative in the metamorphic grounds of Minas, Bahia, Goyaz and Matto-Grosso, and there is no doubt that these deposits constitute one of the greatest iron-ore reserves in the whole world.

For lack of mineral fuel the iron industry is not developed. Iron is manufactured by direct methods in a small way in the interior of the country, but there is only one blast furnace in the country, producing from 2 to 5 tons of pig iron daily with charcoal fuel. When the manufacture of iron by electricity becomes an economic reality, no country in the world will offer more advantageous conditions for the development of the industry, not only because of the abundance and superior qualities of the ores, but also because of the available sources of hydraulic power.

Kilburn Scott is of the opinion that Brazilian iron ores could be exported to England and the United States at a profit, providing mining were done on a large scale and the handling of the ore were carried out in the economical way which obtains in the Lake Superior region.

Coal

A considerable area in the south of Brazil, and limited areas in the north and west, are covered by Permian rocks containing coal beds. For many years the occurrence of coal in the south has been known and more than one exploration has been attempted, but without important results. Lately, by the initiative of the minister of industry, Dr. Lauro Muller, the attention of the government has been called to this industry and an American expert, I. C. White, has been engaged to study the subject. The results thus far have been promising.

Professor White studied the carboniferous basins in south Brazil and made experiments concerning the preparation of the coal in briquets. It is already known that the carboniferous basins in south Brazil constitute one single basin, which is therefore extensive, stretching from S. Paulo to Rio Grande do Sul. The most promising beds are situated in the State of Sta. Catharina and Rio Grande, and drilling operations undertaken by the government appear to give very encouraging results. Professor White thinks the briquets manufactured from Brazilian coal can compete with the Cardiff product.

Brazilian coals briquetted in Germany gave the following results: 77 to 79.27 per cent. carbon; 0.7 to 0.9 per cent. sulphur; 8 to 9 per cent. ash; calorific power, B.t.u., 13,669, determined by calorimeter, and 13,903 calculated.

Copper

Copper ores have been encountered in many places in Brazil. However, only in Rio Grande do Sul have deposits been the object of small explorations. In this State the principal copper deposit is that of Camaquan, explored by a Belgian company. According to H. Kilburn Scott one of the lodes of the Camaquan mine contains copper pyrites, the gangue being quartz with heavy spar. The other deposits are similar, with copper-glance near the surface, and bornite, copper pyrites and some iron pyrites lower down. Some tons of ore sent to England gave from 28 to 30 per cent. copper. Near Caçapava is another copper deposit, the Primavera mine, a quartz vein containing copper-glance and pyrites. At Cerro Martino there is a copper deposit, 86 miles from Rio Negro, giving, according to Mr. Scott, from 7 to 25 per cent. copper. Copper ores are also found at Cerro do Geraldo, Lavas and Quarahim.

In the State of Bahia, in the district of Villa Nova da Rainha, copper ores have recently been encountered in an eruptive decomposed rock as carbonates of copper. In Ceará, Maranhao and Paraná, copper ores are found, but no study by a competent expert on these occurrences has been made.

Monazitic Sands

Rich deposits of monazitic sands are found along the Atlantic ocean. These deposits are situated on the Federal foreshores and the explorations are monopolized by two concessioners. The beach sands contain 70 to 80 per cent. of monazite. A plant was recently erected for the concentration of monazitiferous gravel found in quantity along the banks of the Rivê Parahyba. This treatment of river ground is entirely a new industry and if successful will revolutionize the Brazilian trade in monazite. The following minerals and metals occur in Brazil: Tourmalin, precious beryl, cymophane and triphane, topaz, garnets, in the State of Minas-Geraes; oxide of zirconium and other rare earths at Bahia, Minas Espirito-Santo and Rio de Janeiro; galena, in Minas-Geraes; palladium associated with gold in Goyaz and Minas; platinum in Minas and Pernambuco; mica and asbestos in Minas and Bahia.

Testing Slate

Methods of testing the elasticity, absorption, fissility, and resistance of roofing slates have been in use for many years. In recent years, however, more exact methods have been devised. All such methods have been brought together in the bulletin (No. 275) on the slate deposits and slate industry of the United States which T. Nelson Dale, of the United States Geological Survey, has recently prepared.

Tests are given for determining the sonorousness, cleavability, cross fracture or "sculping," character of cleavage surface, presence of lime, the color and discoloration, the presence of clay, of marcasite, of magnetite, the strength, toughness or elasticity, density or specific gravity, the porosity, hardness or abrasion, and the corrodibility of slates.

One of the most satisfactory and decisive tests of slate is the microscopic analysis. A thin section of slate examined under the microscope will suffice to show the character of the cleavage, the presence of false cleavage, if any, the probable durability, or indurability of the color, as well as the presence of any mineral constituents likely to determine its other qualities. Mr. Dale quotes Merriman to the effect that chemical analyses give only imperfect conclusions regarding the weathering qualities of slates and do not satisfactorily explain their physical properties.

Placer Mining in French Guiana

Dredging for Gold on the Elysee Placer Has Been Highly Successful. A New Installation Promises Still Better Results

BY LEON DELVAUX*

The French colony of Guiana, which for a long time was considered suitable only for a convict settlement, is now attracting increased attention in Europe as a gold-producing country. Taking into account the very crude methods used so far in French Guiana, the present output, which averages 4000 kg. a year, all derived from alluvial workings, shows clearly how rich the ground is and leads one to the belief that, with the aid of capital, mechanical appliances and proper management, French Guiana could become in a few years an important gold producer.

MACHINERY ON THE WAY TO ELYSEE PLACER.

Native Methods.

Until last year the whole of the alluvial gold produced in the colony was obtained from sluicing. It has been told again and again how this device is ineffective, specially as it is applied in the Guianas. The sluices are of the simplest design, with but a few wooden riffles, and they are very short. There is no regularity in the feed of water and gravel. The clay leaves the sluice nearly in the same state as it enters. In fact, the wonder is that the miners are able to catch any gold at all by such methods. Moreover, the so called prospecting only consists of a few pannings made at random. The miner who depends upon the salt meat and flour which he has brought with him must return to the coast as soon as he has exhausted his supplies. As a consequence he is not inclined to lose even a few days in prospecting work.

Another disadvantage of the crude methods used is that they can be applied only during a short period of the year. In the dry season most of the workings have to be stopped as a result of the scarcity of water. On the other hand, in the hight of the rainy season the paddocks are often flooded and the sluices are often carried away. Even during the most favorable season of the year only a small part of the ground can be washed. In the upper portions of the creeks no water is available for the natives, who never use either pumps or long flumes. In the lower part the gravel is covered with water and therefore beyond the reach of the shovel.

The capacity of these native plants is very small. A party of 12 workers, including four diggers, do not treat more than 6 to 8 cu.yd. per day. Still, the values are so high that I saw such a party getting in one day 860 grams (about 29 oz.) of gold in a place which is in no way exceptional in Guiana. And I do not speak of remote valleys, where such a yield would leave but a small margin for profit.

The means of transportation are in no way better. There is no road, not even a mule trail, and scarcely any hunters' tracks. All the supplies, food, tools, etc., have to be brought from the coast up the

*Mining engineer, 4 Rue de Rome, Paris, France.

rivers in canoes which carry from one to two tons. This system, besides being very expensive, involves constant delay and great loss by dampness, theft, etc.

Dredging

These difficulties are common to most of the countries in South America, and they would not be worth mentioning if we [illegible] that they have been overcome, and that a new era of industrial development seems open for French Guiana.

Various attempts had been made previously to replace the old and obsolete sluicing plants by mechanical contrivances, among others by dredges. One dredge, built by D. Levat, on the Courcibo river, had given for some time steady and satisfactory returns, but was sunk during a flood, through the carelessness of the people in charge.

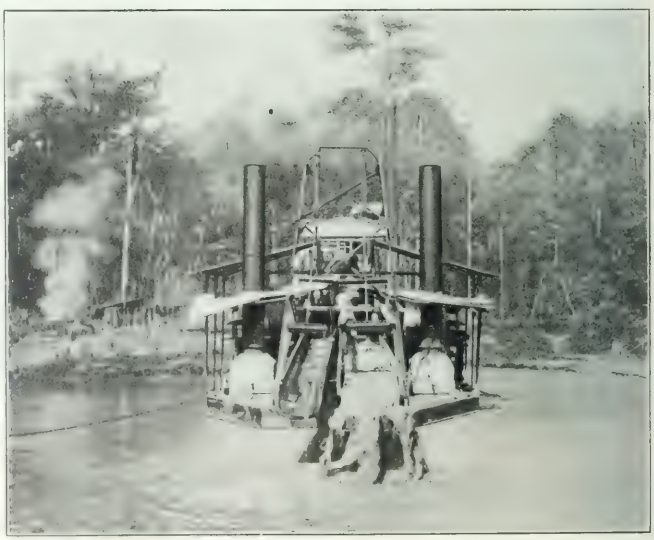
All attempts had been unsuccessful, mostly for lack of sufficient capital and honest and able management; and it was commonly asserted that successful dredging was impossible in French Guiana, when the South American Goldfields, an English company mainly supported by French capital, started its operations. A dredge was built in Holland, in sections, the heaviest weighing only 600 kg., and carried to the Elysee placer, on the Lezard river, about 120 miles from the coast.

It was erected and started in July, 1905. It has been in service since, and although the washing plant was not so effective as could have been desired, and some alterations had to be made, it has afforded the absolute proof that gold dredging is not only a possibility in French Guiana, but a paying industry.

Elysee Dredge, No. 1

The Elysee No. 1 dredge is of the bucket type, the buckets having a capacity of 2 cu.ft. They are of the open-connected type. There are two water-tube boilers, of 35 h.p. each; a vertical compound engine; a belt-driven centrifugal pump with a horizontal engine and a Worthington pressure pump. The fuel used is wood, supplied in any quantity by the surrounding forest. The discharge of the buckets is made through a revolving screen to a sluice fitted with riffles. The revolving screen is the only part that gave trouble, but it gave a lot. It was much too light in construction, and the bearings were not protected at all against the sand and the water. The hull was made of timber, now being replaced by steel. It should be borne in mind that this machine, designed in 1902, represents an early type, and that the new dredges will undoubtedly show great improvement and be much better adapted to local requirements. But in spite of the small capacity of the buckets, and of the defects of the washing plant, the output averages in normal run 45 grams (1½ oz.) per hour. Returns of 500 grams per day of 10 hours were not infrequent. The yield actually recovered from the ground (including gravel and overburden) exceeds six francs per cu.m. (about $0.90 per cu.yd).

ELYSEE DREDGE NO. 1



REAR VIEW OF ELYSEE DREDGE NO. 1

Nature of Deposit

The gold is very coarse and as a consequence very easy to save. As a matter of fact, the washing plant of the dredge in its first state was so defective that all fine gold was certainly lost, but I do not believe that the fine gold formed any important part in the total. The coarseness of the gold is not surprising, if we consider that the reefs which, by their disintegration, formed the alluvial deposits are only from 500 to 1000 yd. from the dredging field. Nuggets weighing from 10 grams up to 45 (⅓ to 1½ oz.) were found almost daily.

Some logs were found buried in the ground; but, although they caused some delay (from 5 to 30 or 40 minutes each), they were never of such a size or hardness as to cause damage, and they could be handled easily with the crane placed on the forepart of the dredge.

Boulders were fairly uncommon, and of a comparatively small size. The bed-rock consists of white or bluish clay, derived from the decomposition of the diorite. The first inch or so on the top of the bed-rock is very rich and must be carefully washed. The clay is fairly sticky,

but its disintegration in the screen is hastened by the friction with the quartz pebbles contained in the gravel bed.

Above the bed-rock, which is usually found at a depth of 12 to 16 ft., lies a bed of loose gravel, quartz, pebbles, etc., mixed with coarse sand, and containing most of the gold. This bed, easily removed by the buckets, varies in thickness from a few inches up to 2 ft., and is covered with sand or soil, barren or nearly so. The yields mentioned above are average yields referring to the total depth. The yield in the gravel is much higher.

Quartz and Black Sand

In addition to the free gold actually recovered from the gravel, recent tests and experiments have shown that a further quantity of gold can be obtained from the quartz pieces found in the gravel and also from the black sands which in some parts are very abundant (up to one-tenth of the total quantity of alluvium). From the quartz pieces eliminated through the screen only the pebbles showing visible gold were selected by hand and crushed in a prospecting stamp mill; and they frequently yielded in gold 1/10 of the value recovered through the sluice from the fine sands during the same time. As to the black sands, some samples were assayed by Morin Brothers, assayers to the Bank of France, and yielded from 1½ oz. up to 15 oz. to the ton. Experiments are now going on in order to collect them in quantity.

for a new dredge, with 3-cu.ft. buckets and steel hull 80x28x6 ft., was drawn up for the same company by the writer with the assistance of Gerard Dufour and L. C. de la Marlière. The work was entrusted to Lobnitz & Co., of Renfrew (Scotland), and the whole of the plant is now on its way to French Guiana. The bucket chain is of the open-connected type, the maximum dredging depth being 20 ft. The main engine is of the horizontal compound "Marshall dredging" type. There are one Babcock & Wilcox boiler, one dredging winch with seven drums, one warping winch for driving the logs to the shore by means of a wire rope and a jack pulley; one 10-in. centrifugal pump, directly connected with a vertical compound engine, and sending the water to the screen through the condenser; and two Worthington pressure pumps for breaking by means of a strong jet the lumps of clay in the screen, and washing the soil out of the tree roots before lifting the trunks.

TRANSPORTING SECTIONS OF THE SCREEN

SLUICING PLANT ON THE ELYSEE PLACER

The dredging field on the Elysee placer consists not only of the bed of the Lezard river, which is from 5 to 9 yd. wide, but of the entire width of the valley, which ranges from 100 to 400 yards.

The results of that dredging experiment were so encouraging that a specification

The screen is of the adjustable Lobnitz pattern; the useful length is 16 ft., the diameter 4 ft. 6 in., and the holes range from 2/8 in. at the upper end to ⅝ in. at the lower. The screen discharges the fine material on ten tables (five on each side) fitted with cocoa matting and expanded metal, and the oversize material to a nugget collector and thence to an elevator of the bucket type.

The dredged material, falling out of the buckets, can be sent either to the revolving screen or to a sterile shoot, when it is barren overburden. This is done by means of a moving plate, mounted on an axle and driven by an outside lever. In the latter case the screen is stopped and the soil is led through the sterile shoot directly into the elevator buckets.

The Elysee Placer

The Elysee placer, where the first dredge was erected, and for which the second one is also destined, aggregates 7500 hectares (about 15,000 acres) and according to the prospecting work already done affords a field sufficient for at least ten dredges. While it is known as one of the rich claims in French Guiana, it is by no means an exception, and the great amount of gold that has been taken out of all districts in the colony by means of the very crude methods previously alluded to, leads one to the belief that most of these districts will afford valuable dredging fields.

The unsatisfactory state of affairs outlined at the beginning of these notes, as regards transportation, can be improved at a comparatively small expense. We put a steam launch in commission on the Mana river about eighteen months ago, and we are now able to perform in two or three days a journey which consumed thirteen days on my first voyage. The launch can ply on the river during seven or eight months each year, reducing to about one-third, not only the length of the journey, but also the cost of the freight. A petroleum launch for passenger traffic, and also [illegible] freight boats, is now being added to the "fleet."

The Production of Cement in Great Britain

A correspondent of *Cement Age*, a well known cement engineer of London, writes as follows concerning the cement industry:

"New works, designed and laid out throughout with every detail in accordance with latest ideas and unincumbered with having interest to pay on obsolete kilns, buildings and plant, stand a far better chance of dividend-earning capacity than the older factories.

"Four new works have been erected and will be in full operation by the end of the year, and are placing about 12,000 more barrels weekly on the home market, and there at least two other works projected on a larger scale which will produce, if started, over 30,000 bbl. weekly to add to the same overflooded sale area.

"To show how the English market is already over supplied, we may note that the total number of cement firms with works at the present time in England (treating the Associated Company with 24 companies as only one) is 119, and the total average present annual production of the lot may be taken as 18,826,000 barrels.

"In addition to this, the total barrels imported by Great Britain during the past 12 months has been 1,140,276, or 315,342 less than during the preceding year, due in all probability to the country of origin being busy and getting better prices elsewhere than when dumping their surplus stuff here, and which may, unless English prices drop too low to prevent it, again begin to increase when the boom ends.

"The total exports for the past 12 months ending Oct. 1 have amounted to 3,659,710 bbl., which is a substantial but only temporary increase over the figures of the last few years, and must certainly not be looked upon as permanent.

"If the total make is 18,826,000 bbl. as stated above, and the imports for the past 12 months are 1,140,276, it makes a total of 19,966,276 bbl. to be disposed of. From this deduct 3,659,710, the total barrels exported during the past 12 months, and it leaves 16,306,566 bbl. for home consumption."

MAP OF FRENCH GUIANA SHOWING THE LOCATION OF THE ELYSEE PLACER

Vein Mining

In these brief notes I have not referred at all to the reefs. The reason is that they have scarcely been looked for, all the interest being centered, as it is usually the case in undeveloped countries, in placer mining. But reefs exist in French Guiana. Very promising work has been done on some of them, notably at Adieu-Vat, Elysee and St. Elie, and a thorough investigation would undoubtedly lead to interesting discoveries.

The Traylor Iron Jig

In the progress made in recent years in mining and milling machinery, there are few machines, formerly accepted as standard, which have not been improved upon in one way or another. The old Hartz jig, which has remained practically unchanged for generation after generation, seems to have been one of the exceptions, considered by the average mill man as incapable or unworthy of improvement.

The efficiency of the old jig was never questioned. In fact it was rarely, if ever, known. The machine was used principally in an intermediary capacity, treating the coarser minerals, recovering such values as came within its province, and passing the finer materials to concentrating tables, vanners or stratifying tables. It never seems to have occurred to anyone that the jig could be made to fill a position of prime importance and that it could be used in almost every concentrating plant for treating ores varying in size from ¾ in. to as fine as 60 mesh, realizing a high percentage of recovery.

In the plant now being installed by the Utah Copper Company, in Utah, jigging machinery has been given the consideration which it deserves. The plant will be equipped with seventy-two standard all-iron jigs supplied by the John A. Traylor Engineering Company, Denver, Colo.

In principle the Traylor jig does not differ from the Hartz type. It merely embodies the principles of jigging in every detail, discarding the bulkiness of the old form and doing away with its rocking, cradle-like plunger. The floor space covered by a single, three-compartment Traylor jig is 8 ft. ½ in. x 3 ft. 3 in., whereas a Hartz jig of three compartments requires 9 ft. x 5 ft. 6 in. floor space. The Hartz jig in hight is ordinarily from 5 ft. to 6 ft. to the top of the hutch or tank, and 7 ft. to 8 ft. from the floor to the plunger shaft, whereas in the Traylor, the top of the hutch is 3 ft. from the floor and the center of the shaft is only 4 ft. 3 in. from the floor. The iron jig is entirely accessible to an operator standing on the floor, and there is no need of a step ladder to see the bed.

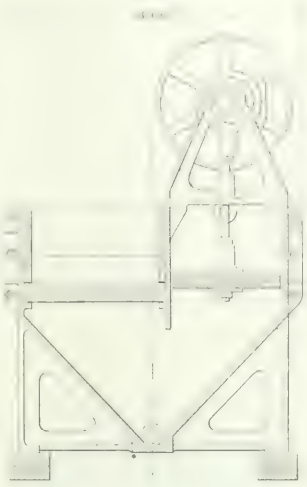


FIG. 1 SHOWING ECCENTRIC AND PLAN OF TRAYLOR JIG

The old Hartz jig has an eccentric rod attached rigidly to the center of the plunger, which cannot, therefore, lower or lift the plunger in a horizontal position, its motion being irregular, and the sides striking the walls of the plunger compartment. The result of this movement gives an irregular jigging effect upon the screen bed, a defect which may be observed in treating fine ore containing talc, a mass of compact material forming in the corners and along the sides of the screen cloth.

In the Traylor Standard iron jig the plunger's motion is controlled by guides, which insure a uniform movement. Every portion of the screen bed is uniformly agitated and the plunger may be made to fit very snugly in its compartment, thus utilizing all the water beneath the plunger floor and reducing the quantity of fresh water required. Less power is also required, owing to the fact that the plunger is not allowed to touch or drag against the sides.

The iron jig is equipped with a parallel adjustable eccentric in such a way that the length of the stroke may be increased or diminished without disturbing the alinement. The bearings are long, and are fitted for ring oiling, with an oil chamber having the capacity of a pint. The journal bearings are extra long, supporting a heavy shaft, and are rigidly supported to an extra heavy pedestal, which is bolted securely to the iron hutch.

A number of mills are now installing this improved jig, which is said to operate on 10 per cent. less power, to require from 5 to 15 per cent. less water, and to handle

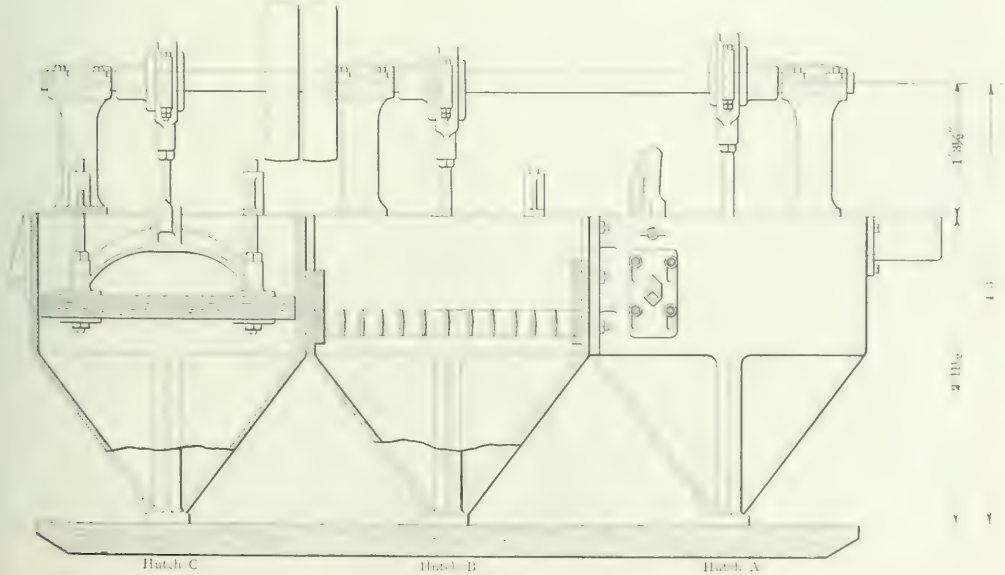


FIG. 2 SHOWING PLUNGER AND GUIDES OF IRON JIG

from 10 to 25 per cent. more ore than the [illegible]

In the illustrations, Fig. 1 represents a vertical cross section of the new jig; Fig. 2, a vertical longitudinal section; and Fig. 3, a horizontal section. The plunger and guides are shown in Fig. 2.

Method of Smelting Cobalt Ores *

[illegible]

The smelting of the cobalt ores and the recovery of the valuable metals has proved a difficult problem. This paper is submitted with the object of inducing the smelting of these ores in Canada.

Miners, being by nature suspicious of smelters who will not pay the full market value of the metals, have attempted to treat their ores with the hope of recovering greater profits. The success of this plan is doubtful as the many conflicting interests naturally become restive unless immediate results are obtained and cash returns follow the shipments of ore.

The nature of the problem will not admit of such results, and the time necessary for the treatment of the ores as well as their great value necessitates a locking up of a large amount of working capital. This is not satisfactory to the average mine promoter who wishes to pay dividends on a large capitalization in order that he may sell stock to the public and "get rich quick" from the profits on the stock.

Method Proposed

The writer's experience in custom smelting business suggests a system of smelting these ores based on well established principles, which is herewith submitted:

1. The ores should be sorted and the metallic silver separated for direct smelting by cupellation with lead or melted in crucibles and poured into bars to be sold to refiners.

2. The ore should be ground in a dust-proof ball mill to such a fineness that it can be accurately sampled.

3. The ground ore should be roasted in a suitable furnace to expel the arsenic and sulphur.

4. The gases from this roaster should pass through a long sheet-iron dust chamber in order to cool them, and then be passed through a bag house, where all the dust and volatilized arsenic will be recovered.

5. The roasted ore should then be briquetted with a strong bond of red clay and lime water and dried or frozen, after which it should be smelted in a blast furnace with about an equal weight of galena or lead concentrates containing about 50 to 60 per cent. lead. The necessary iron and lime would have to be added to the charge to produce a slag of the proper composition.

The sulphur for matte formation would be supplied by the galena and the arsenic remaining in the ore will form some speiss.

The base bullion resulting from this smelting could be sold to lead refiners, or refined to separate the silver.

The matte and speiss will contain all the nickel and cobalt that can be recovered from the first smelting and also some lead and silver. This matte and speiss should be accumulated until sufficient for a special run and then ground in the ball mill, roasted and smelted separately with more lead to free it from silver. The resulting bullion could be sold or refined.

The second matte should be run into a converter and converted to free it from iron. In the process of converting, the lead and most of the cobalt will oxidize at the same time as the iron and go into the converter slag, except that portion of the lead which is volatilized along with the remaining arsenic. These will pass off with the flue gases and should for safety be passed through the bag house as they are both poisonous.

The converter slag will, therefore, contain the greater portion of the cobalt as oxide, and in order to recover, it should be resmelted in a separate blast furnace with a portion of the briquetted flue dust from the roasting of the ore.

The flue dust highest in arsenic should be used, as the recovery of the cobalt would depend upon the formation of a cobalt speiss or arsenide of cobalt.

This would be separated from the slag in the same manner as the matte and its further treatment for cobalt would be by chemical methods after roasting to expel the arsenic, which should be recovered in the bag house in the same manner as first described.

The flue dust containing arsenic would have to be roasted separately to sublime the arsenic which should be recovered in a separate flue and bag house provided for that purpose.

The arsenic would be marketed as white arsenic.

Advantages of the System

By the scheme outlined, the silver would be produced either as silver or in base lead bullion.

The nickel would be produced as high-grade nickel matte containing some cobalt suitable for further refining by the Orford, Mond, or other processes; the cobalt would be produced as cobalt speiss, and the arsenic as white arsenic.

As regards the percentage of metals that could be recovered by all these various smeltings and resmeltings, it is not possible to make any statement based on actual results.

The smelters who have bought these

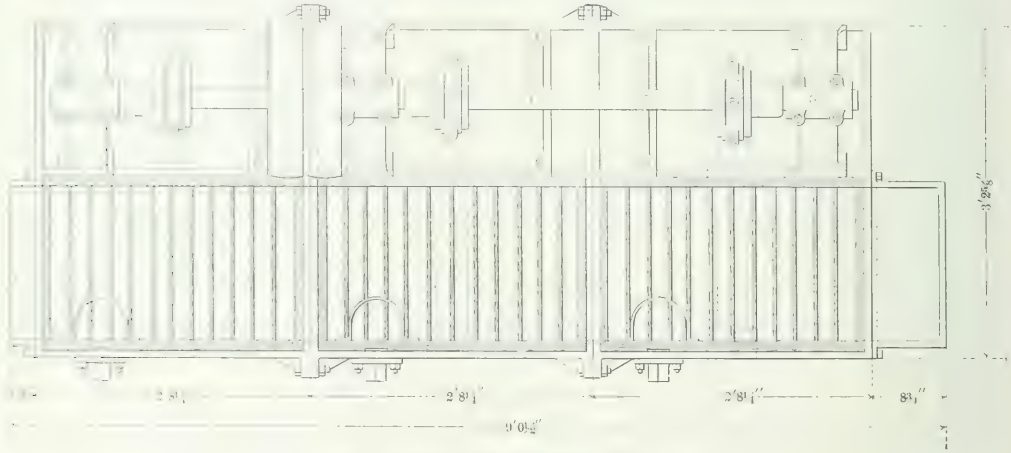


FIG. 3. PLAN OF THREE-COMPARTMENT TRAYLOR JIG

*Paper to be presented for discussion at the Toronto meeting, 1907, of the Canadian mining Institute.

[illegible] Ontario.

ores have not seen fit to give out any information, but the fact that they have allowed nothing for nickel, cobalt or arsenic is significant. To make even an attempt at a partial recovery of each of the metals is a long, tedious process and the most complicated, from a metallurgical standpoint, that has been presented for solution. Under these conditions any association of miners attempting to smelt their own ores is hardly likely to succeed.

For the economical working of this plan the smelter should be located at North bay, where lead concentrates from the western mines can meet the ores. A working capital of at least half a million dollars would be necessary and the plant would cost at least two hundred thousand dollars.

The Verschoyle Pocket Transit

By W. [illegible]*

There are few mining engineers who have not, at one time or another, had occasion to use a pocket instrument. In the experience of everyone and especially those whose practice has taken them outside the pale of civilization, the prismatic compass, the Abney level, the Brunton transit have had a place.

After traveling long distances to look at a prospect in some out-of-the-way place, it usually pays to obtain all the information possible, even though at the time it may appear that such information will be of little use. Thus when the locality is reached it gives little extra trouble to jot down in a note-book every change of formation encountered, the bearing and dip of cleavage, veins, dikes, etc., the bearing of prominent distant points, and the surface grades encountered. The information thus obtained in one or two traverses of any ordinary group of claims, when roughly plotted, will often enable valuable deductions to be made as to the geological conditions, which in conjunction with observed topographical considerations, may often enable an experienced man to make valuable suggestions, after a merely cursory examination.

I remember [illegible] point. It was a prospect situated in one of the roughest parts of New Zealand, which contained outcrops of very good ore. The owners had run a cross-cut about 200 ft. from a point below the principal outcrop, with the intention of cutting the lode at a vertical depth of about 50 ft. They had done this without opening out or sinking on the outcrop. The writer was sent up by a development company, with instructions to examine and if good to bond and to lay out prospecting work. When on the ground I decided at once that the prospect was worthy of attention. I tra[illegible]

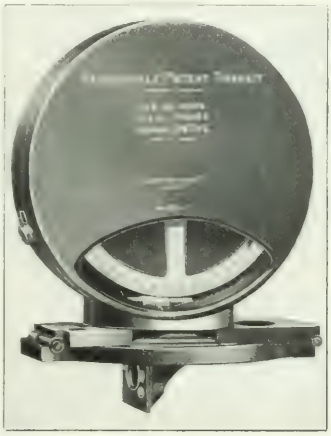
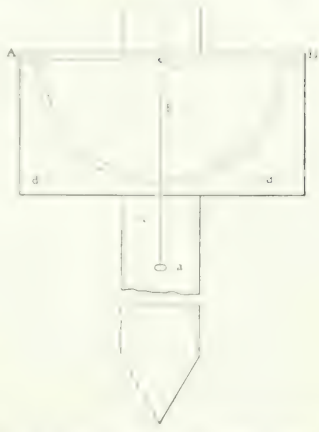


FIG. 1. VERSCHOYLE TRANSIT

hour, and found that the cross-cut was roughly paralleling the lode, and with a prismatic compass and an Abney level laid off a cross-cut which eventually cut the lode in about 50 ft., at a vertical depth of over 40 ft., disclosing 10 ft. of ore worth about 18 dwt. The work was done by the owners themselves, who used the direction



[illegible]

A B, sight line; a, stone; b, string; c, 2-in. nail; d, 1-in. board, which can be rotated about [illegible] stake.

they having refused the terms offered.

In keeping a set of mine plans, particularly where it is customary or convenient to "post" the mine at certain intervals, say once a week or once a month, a rough approximation of the direction of some particular work is often required, and this can generally be obtained, with sufficient accuracy, by means of a pocket instrument. The results, when penciled in on the plans, show the position without having to make a special trip with the theodolite, or having to wait for the ordinary exact survey.

It often occurs that, in opening a mine the question of expense, together with the smallness of the operations, are decisive arguments against the investment in an instrument of great accuracy. The pocket instrument fills the bill for the time being, and in this stage of a mine when there is not much steel about to effect the needle, remarkably close work can be done with it.

The Verschoyle Pocket Transit presents certain novel features. Fig. 1 shows the instrument folded, as it would be carried in the pocket or in its sling. In Fig. 2 it is ready for use. The sight arm can be rotated through any vertical angle, and is held at any point by the friction of its bearings. The magnetic bearing is readable in the face of the prism at the same time that the target is visible along the line of sight, and at the same time just below the figures appearing in the prism a small level bubble is visible which on being centered, and the needle coming to rest, the work of obtaining the bearing and vertical angle of any distant point is finished, one observation alone being necessary.

The most important new features are that while weighing and costing little more than an ordinary prismatic compass, any angle, vertical or horizontal, can be observed with ease, and both are obtained

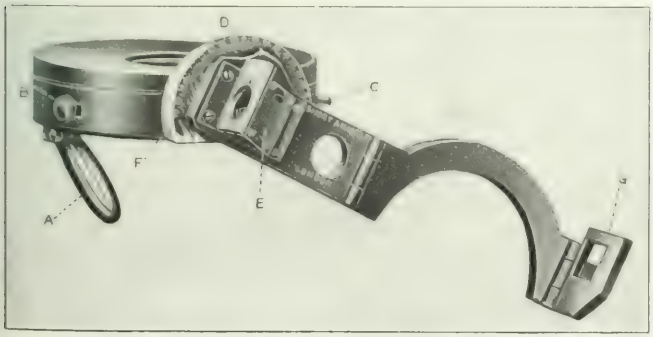


FIG. 2. VERSCHOYLE TRANSIT, OPENED [illegible]

A, thumb loop; B, needle lifter; C, needle-brake; D, back sight hole; F, prism box; F, vertical arc; G, fore-sight.

*Mining engineer, Tantago, Sligo, Ireland.

with one observation. The illumination for underground work is excellent, and a surface line can even be turned down a vertical shaft, if necessary. It is arranged for use as a level for grading, and as a clinometer, and in a few seconds it can be fixed to a tripod, upon which there is a divided plate for measuring angular degrees.

The writer remembers being caught without an instrument many years ago in an outlying camp, where a survey was urgently needed. He fortunately had a pocket-book, which contained the necessary tables, and with the help of a pocket compass for the horizontal angles, and the device illustrated in Fig. 3 for the vertical, he made the necessary traverse, which was only 10 inches out, when the work was completed. It is a long step from this rough device to the pocket transit, and yet it is very doubtful whether had this instrument, or even a high-priced theodolite been at hand, the survey would have been more accurate or more satisfactory.

Thawing Dynamite

In "Blasting Talks No. 1" the Aetna Powder Company of Chicago discusses the thawing of dynamite and suggests a thaw house which is of simple construction.

Dynamite freezes at 42 to 50 deg. F. and will freeze hard at times when water or moist earth does not freeze at all. Sometimes it will not freeze until the temperature is down to about 35 deg. owing to the protection of the boxes and to the fact that the absorbents used for holding the nitroglycerin are poor heat conductors. For the same reason it sometimes does not thaw readily at a temperature of 50 or even 60 deg.

When dynamite is completely frozen the cartridges are hard. In this condition it may refuse to explode at all, even when a strong cap is used, and it surely will not develop anything like full strength. It must be carefully and thoroughly thawed to make sure that it will explode and do good work.

At temperatures considerably above the freezing point, dynamite will chill and must be slightly warmed in order to do satisfactory work; and the blaster should make sure that it does not again become chilled or frozen while being carried to the drill holes and loaded.

It is well known that dynamite can often be burned in open air without explosion; but practically all the accidents which have happened in thawing can be traced to a mistaken idea that dynamite can be safely burned under all conditions and that any exposure to heat, short of actually setting fire to the cartridges, is safe. It is true that a dynamite cartridge can be ignited with a match and completely burned without explosion, "most always," and this is because only the part of the cartridge that is burning becomes hot; the gases pass away freely and the

Causes of Explosions

balance of the cartridge remains cool. If this same cartridge were laid against a hot steam pipe or smoke stack the chances are that it would explode before it could take fire. It is absolutely certain that if allowed to get really hot, it would explode from the slightest jar or from the blow of a tamping rod. Cartridges heated in sand have been known to explode from simply rolling them about in the sand. Cartridges set on end around a fire have been known to explode from falling over. A bunch of cartridges laid on top of a brick-covered boiler to thaw, took fire and exploded when struck by the end of a board in the effort to knock them off the boiler.

All these accidents were the result of using a heat which could not be controlled, and the cartridges reached a very high temperature before the man in charge became aware of it. The remedy is to use a source of heat which cannot possibly rise above 100 deg. even when neglected.

Chemists tell us that dynamite begins to undergo a change at 158 deg. F. and from above that temperature becomes more and more sensitive to shock, until at a temperature of about 356 deg., it will explode simply from the heat.

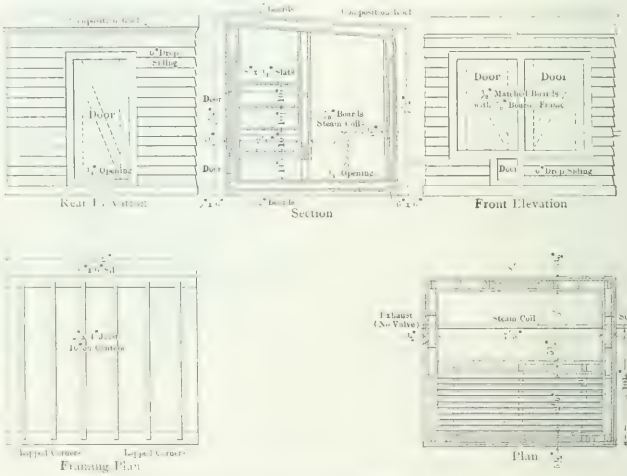
Dynamite Not Waterproof

Another mistaken idea is that dynamite is water proof, and therefore any amount of soaking or steaming will not injure it. Many blasters will deliberately soak dynamite in hot water for a half an hour, or thaw with live steam, under the supposition that such treatment does not injure it.

Dynamite soaked in hot water for fifteen minutes and then allowed to steam for half an hour has been found to have taken up over 10 per cent. of water, an amount that would possibly make it non-explosive. Certainly it would reduce the explosive force by half.

Dynamite left for a day in a thaw house filled with escaping steam has been found to have taken up 18 per cent. of moisture. It is not known exactly how much water is required to render dynamite non-explosive, but 5 per cent. of water greatly reduces the explosive force of any dynamite, and cartridges which contained 12 per cent. of moisture have been rendered non-explosive.

For thawing quantities of ten or fifteen pounds of dynamite at a time, the well known "Rundle" pattern of thawer is most suitable. The cartridges are inserted in tubes and the thawer filled with hot water, which completely surrounds each cartridge. The cover assists in retaining the heat and the dynamite may be carried to the work in the thawer and kept in good condition for hours. On no account



PLAN AND ELEVATION OF THAW HOUSE FOR DYNAMITE

should the thawer be placed over a fire, or should any attempt be made to heat water in the thawer while there is dynamite in it. It is better not to heat water in it at all.

A good thawer, with a capacity for a case of dynamite at a time, can be made by burying a box in a pit filled with green manure which should be rammed hard and must be occasionally renewed. An iron pipe is used for a ventilator as well as a handle for lifting the cover. Such an arrangement will thaw dynamite in the coldest weather. Dynamite should not be stored in it longer than necessary for thawing, because the dampness from the ground and manure would in time injure the dynamite.

Dangerous Practices

The majority of blasters who find such apparatus as described too small, use some kind of a thawing arrangement which is either dangerous or likely to damage the

dynamite. Some place the cartridges in a barrel and cover with hot water, or even use live steam; others employ a low-lying box, covered with earth or manure, and heat it with exhaust steam or live steam. Still others provide a building that is excellent for the purpose if properly used, but will permit the house to be used by the workmen as a workshop, or as a place to prepare primers, or as a loafing room.

EXCLUSION OF TOOLS

Tools should never be permitted to be used in a building where dynamite is being thawed, for it is almost impossible to prevent small particles of the explosive from being scattered about and a blow would explode them under certain conditions. Primers should never be prepared in a thaw house; even the most careful man will sometimes leave a cap where it may cause trouble. A thaw house should be so arranged that the floor can be kept clean and occasionally scrubbed with hot lye. The slats or shelves on which cartridges are laid should be removable and subjected to the same treatment. The wood will, in the course of time, take up some nitroglycerin which may be much more dangerous than the dynamite.

SYSTEM FOR HEATING

The heating system can easily be so arranged that dangerous temperatures can never be reached; it can be kept clean so that there will be little or no danger from this source. The pamphlet gives plans and elevations for a thaw house, having two compartments, one containing shelves upon which the dynamite is placed through doors opening directly outside and the other containing the coils for heating with steam or hot water.

The heating compartment containing the coil of pipe is the only part of the building that a man can get into and this can be prevented, if the superintendent wishes, by keeping the back door locked, to be opened only for the purpose of cleaning the floor or looking after the steam pipes. A strict rule should be made requiring all dynamite to be removed from the thaw house and the building thoroughly cleaned before attempting any repairs of any kind. Frequent sweeping of the floor should be required. A good thermometer should be placed where it would be seen every time the front doors are opened.

This thaw house, if built of wood, might be exploded by a rifle ball. Whether or not there is danger from this source depends on local conditions. If such an accident is feared, the building should be made of concrete or brick and either with iron doors or an earth barricade in front of the doors.

The house has a normal capacity of about 500 lb. of dynamite at a time, when the cartridges are laid out on the shelves, although 1000 lb. or more can be crowded in if the dynamite is not taken from the boxes. It is inadvisable to crowd the capacity of the house and the cartridges will thaw more satisfactorily if they are spread out on the shelves instead of being piled high or left packed in boxes. If the structure is not large enough it is better to build a larger house. The design is such that it can be built the same width and hight, but twice as long.

The plan of air circulation provides for the heated air rising until it fills the space above the pipes, then overflowing under the partition, passing upward between the cartridges and out through the ventilator just beneath the roof.

The use of the steam coil is optional A hot-water coil may be used or the ordinary form or radiator such as is used in dwellings may be put in. If steam heat is used there should be no valve at the outlet, for someone might close it. An opening should be left in the exhaust end of the pipe just large enough so that the steam pressure can never rise above 10 lb.

The floor may be made double as shown in the plan or a single floor may be used; in the latter case it is better to fill the space below the floor with cinders.

White Pass & Yukon Railway Company

The statement of earnings of the White Pass & Yukon Railway Company for the fiscal year ended June 30, 1906, is of a more satisfactory character than that for the previous year. There was an all-around increase in receipts. The company's railroad service carried 14,157 passengers during the year, as compared with 11,773 in 1905, and the freight amounted to 34,119 tons, as compared with 33,225 tons in the preceding period. The company's river steamers carried 900 passengers more during the period reviewed than in the corresponding period in 1095. There was also an increase of 3000 tons shown in the river-freight returns.

The year 1905 was marked by greater progress in the development of the mineral resources of the Yukon territory and Alaska than any previous year since the discovery of the Klondike goldfields. In Alaska the output and population of the Tanana goldfields almost equaled that of the Klondike, and the numerous smaller mining camps along the river all showed increased activity, while many new ones sprang into existence. These camps contributed satisfactorily to the company's traffic, notwithstanding that they are more easily reached than Dawson is from the mouth of the river.

On the Canadian side of the boundary the change from hand to machine work for the recovery of the gold made steady progress, and particular attention has been paid to dredging where the ground is suitable. The company transported the material for a number of large dredges in 1905, and some of them were in successful operation before the close of the season and gave a great stimulus to this method of gold recovery. The railway connecting Dawson with the chief mining creeks was commenced in 1905 and it is hoped may be completed and opened to traffic in 1906.

The other Canadian placer goldfields have all shown increased activity, especially Atlin, which district is now almost entirely on a machine basis, with a largely increased output.

By far the most important and interesting feature in the development work of 1905 was in the Windy Arm district, between Lake Bennett and Windy Arm, a peninsula about 18 miles in length and 10 to 12 in width. Silver and gold ores of great extent and running high in values have been discovered at many places in this peninsula and a large amount of work has been done on a number of these properties, demonstrating large orebodies. An aërial tramway was installed at one mine to carry ore down to the lake, and a number of others are contemplated. It seems probable that, should equally encouraging results be obtained in 1906, a large smelter will be built at some point on the lake, and it will become necessary for the company to take active measures to be properly equipped to furnish adequate and satisfactory service to these mines. With this in view, surveys have already been made for alternative lines from Log Cabin and from Caribou to the Windy Arm mines.

Gold Nuggets with Concentric Structure

At a meeting of the Royal Society of New South Wales, Dec. 5, 1906, Professor Liversidge described two gold nuggets from New Guinea, showing a concentric structure. The nuggets presented the usual external appearance, but when sliced, polished and etched with aqua regia they showed in parts a concentric structure, but no macro-crystalline structure. Out of a very large number of gold nuggets examined for several years past, these two are the only ones which have shown a lamellar structure. Apparently the layers of gold were deposited within a cavity, in the same way as agates are built up by the deposition of layers having been deposited around a central nucleus. The gold in one was 88.95 per cent., and silver 1 per cent., and the other 88.25 per cent., and silver 1.05 per cent.

A. P. Low, director of the Dominion Geological Survey, in an account of a trip to Ungava, on Hudson bay, reports the discovery of large areas of iron ore similar to those of the Lake Superior district. Mining will be easy and cheap, and ample water power is available.

Coal Mine Gases and Barometric Pressure

Changes in Atmospheric Pressure seem to be a Common Cause of Colliery Explosions. Why Many Accidents Occur on Monday

BY FLOYD W. PARSONS

Since the publication of collected data tending to establish the possibility of concurrent action on the part of mine gases and fluctuations in atmospheric pressure, I have continued to investigate and discuss the subject with coal-mine managers and find a generally accepted belief in the ideas advanced. The serious explosions of the past few weeks afford an opportunity to collect detailed data which may add weight to the deductions previously drawn.

Two Recent Explosions

On Jan. 29, at the Stuart mine in Fayette county, West Virginia, occurred one of the most serious disasters recorded in recent years. The terrific force of this explosion was probably due to the presence of inflammable dust, for which this field is famous. The accident, however, was probably initiated by the firing of a quantity of gas.

As to the action of the barometer at this mine, the rough figures will sufficiently explain: On Jan. 26 an area of rising barometer was moving toward this district, and on the 27th and the morning of the 28th the barometer had risen from 30.16 to about 30.55. The pressure fell during the day; the explosion happened in the afternoon. Late that same night (the 28th) the barometer had fallen to 30.29.

Early on the morning of Feb. 4, at one of the Davis Coal Company's mines, near Thomas, West Virginia, another serious explosion occurred, resulting in the death of many miners. The barometer on Feb. 2 was 29.82; the reading at 8 a.m., Feb. 3, was 30.16; the pressure at 8 p.m. on Feb. 3 had risen to 30.41; on the morning of the explosion, Feb. 4, there was a release in pressure, the barometer dropping to 30.29, while on the following day the barometer readings showed a pressure of 29.92. Basing conclusions on the foregoing data, it seems reasonable to believe that both these explosions were largely influenced by atmospheric pressure.

Why Many Accidents Occur on Monday

The principal argument contradicting the connection between barometric pressure and the increased outflow of gas in a mine, thus causing an explosion, is based on the fact that a mine fan creates artificial pressure in the workings, and that atmospheric changes are secondary to the fluctuations caused by the mechanical ventilator. Observation seems to show that, although the pressure in a mine is somewhat different from that outside, the variations in this pressure, both underground and on the surface, are uniformly the same. Several conditions act to cause this difference in underground and surface pressure; one important influence is due to the loss of moisture sustained by the intake air as it passes along the main airway, the moisture being taken up principally by the dust accumulated on the sides and roof of the gangways.

With a fan running at a constant speed, as is usually the case, it is evident that the heavier the air, the more its tendency to drag and the greater the friction along the airway. Although greatly exaggerated, we might compare the flow of heavy dry air in a mine to the movement of molasses (eliminating the quality of viscosity) when pumped through a pipe. Also the travel of light air with much humidity could be likened to the flow of water when pumped in a similar manner; in the former case it is plain that the pressure on the sides of the containing pipe would be greater.

Galloway's Observations

An important research dealing with the relation of gas outflows and barometric pressure was made some years ago by Professor Galloway and Robert Scott, in Great Britain. The results were published in the *Quarterly Journal* of the British Meteorological Society for October, 1874. The total number of explosions under observation was 294, while the number of lives lost was 163. The following table based on the data collected shows concisely the part played by atmospheric pressure in precipitating explosions:

Year.	Total Number of Explosions	Percentages Due to Changes in		
		Pressure.	Temperature.	Other Causes.
1868–70	550	49	22	29
1871	207	55	19	26
1872	293	58	17	25

The more important of the conclusions and advance opinions drawn from these investigations follow:

First, it is the initial disturbance of pressure after a period of high barometrical readings that causes most explosions.

Second, the atmospheric changes which occur on a Sunday, when the mines are idle, cause an exceptionally dangerous state, when the workings are entered the following morning. This accounts for some of the fatal explosions which have occurred on Monday mornings.

Third, the areas of barometrical depression are usually more or less circular in shape, and vary in diameter from 50 to perhaps several hundred miles. Over the whole region covered by such a system of depression, the barometer falls according to the character of the disturbance, and according to the position of the respective station or colliery, as the case may be, with regard to the path taken by the center of the storm, or points of lowest pressure; the fall being necessarily greater the more central the situation of the mine.

Fourth, all motion of the air takes place between areas of low and high pressure, termed respectively "cyclonic" and "anti-cyclonic." The air is either whirling into a cyclonic area, or whirling out of an anti-cyclonic area. It is evident, therefore, that a southerly wind may make its appearance either on the east side of a cyclonic area, or on the west side of an anti-cyclonic area. In the former case, it will be accompanied by a low and falling barometer, a high temperature and a large amount of moisture in the air; while in the latter case, the several conditions will be more or less directly reversed.

Fifth, the examination of the reports of any single mine in which fire-damp is found only occasionally, appears to show that the gas comes and goes in a seemingly unaccountable manner; and when the variation of the barometer during the period over which the report extends has been carefully studied beforehand, it is found that sometimes a sudden fall of atmospheric pressure has taken place without causing gas to appear, and sometimes gas has suddenly appeared in considerable quantity when the pressure was high and steady. If, however, the reports of a number of mines are placed side by side, so as to eliminate the influence of local causes as far as possible, and compared with the state of the atmospheric pressure during the period to which they refer, it is found that there is a remarkable correspondence between the appearance and disappearance of fire-damp and the fall of the barometer.

The results of Mr. Galloway's observations are shown graphically in Figs. 1 and 2 which accompany this article. These diagrams seem to prove conclusively the coincidence between the recorded explosions and the changes of pressure and temperature.

The diagram shown in Fig. 1 may be interpreted as follows: The dark line is the curve of the barometer, the faint line that of the thermometer. The explosions

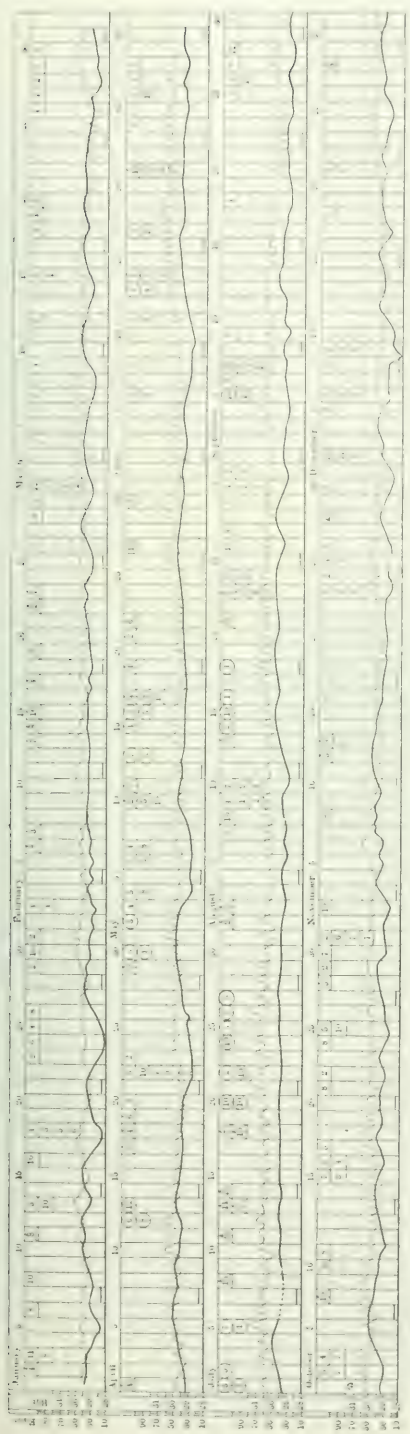


FIG. 1. COLLIERY EXPLOSIONS COMPARED WITH THE BAROGRAM AND THERMOGRAM

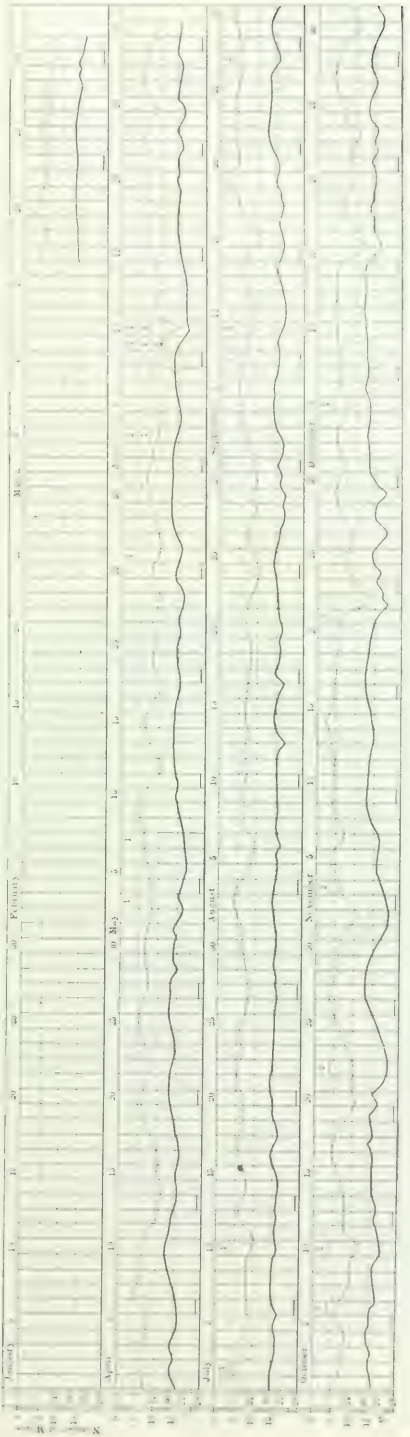


FIG. 2. THE BAROGRAM COMPARED WITH THE OCCASIONAL APPEARANCE OF FIREDAMP IN 32 MINES

by squares, while the district in which the respective explosions occurred are indicated by figures. The explosions which are apparently due to a rise of temperature are shown by circles. Those accidents which are not caused by either agency are shown by triangles. The bar across the symbol for an explosion indicates that it was fatal. Sundays are marked by a line near the base of the diagram.

It will be noticed that the sudden fall of the barometer on Jan. 18 produced four explosions on the 19th, while the more gradual depression of the 24th caused four accidents distributed over as many successive days. The barometric depression at the end of February resulted in four explosions on March 1, while the general depression on the 21st of April was followed by six explosions on the 22d. These latter explosions, occuring on Monday morning following the atmospherical changes of Sunday, go to verify the statement previously made.

The data from which the chart in Fig. 2 was made were taken from the report books of 35 coal and iron-stone mines in the coal measures. The investigators rejected 59 other books that were thought unadaptable because fire-damp was mentioned as being always present, or as only occurring at long intervals.

A glance at the diagram is sufficient to show that notwithstanding the want of care with which many of the earlier reports were made up, the curve of fire-damp for the first 5½ months from the beginning rises and falls to a certain extent with the barometric curve; but it is believed that the correspondence between the variations of the two curves during the last four months is so unquestionably apparent as to prove conclusively that the variations of atmospheric pressures have a marked influence on the rate at which fire-damp escapes from the fissures.

An investigation was carried on which covered the circumstances under which twenty non-fatal explosions and one choke-damp accident took place in mines whose reports are embodied in the chart. Each accident has been entered at its proper date in the diagram, and is represented as a square, with the number of men injured marked on it. Two of the accidents—May 7 and Nov. 2—took place on the second day after the barometer had reached its lowest point, and was again rising; 13 took place when the barometer was falling fast, and the remaining 6 when the decrease of pressure was only slight.

The Action of Occluded Gases

In considering the foregoing facts two incidents showing the peculiar action of those gases occluded in coal are of interest. Some time ago at one of the Delaware, Lackawanna & Western Coal Company's collieries, a miner entered a pocket, where the coal was dumped after being mined, and previous to loading into the railroad cars. The workman carried a lighted torch, which fired a quantity of gas which had accumulated; he was severely burned by the explosion which followed. In another case, experiments were being carried on to determine the specific gravity of a certain coal, and the difference shown by the results obtained caused more careful investigations to be made. A quantity of finely powdered coal was placed under a hood, closed securely air-tight, and connected with a vacuum pump. It was found that under the hood a quantity of gas would still accumulate which was undoubtedly released by the powdered coal. These experiments go to show in what close confinement the gases in certain coals are held.

When experiments carried on in a practical way at certain mines have been completed, it is to be hoped that further conclusive data will be available, and will help to clear away many of the disputed points. In the meantime superintendents, managers and engineers who are interested in the investigations should frankly express their opinions. A discussion of experiences would certainly prove of great value at a time when efficient remedies are sorely needed.

Air-tight Dam for Underground Mine Fires*

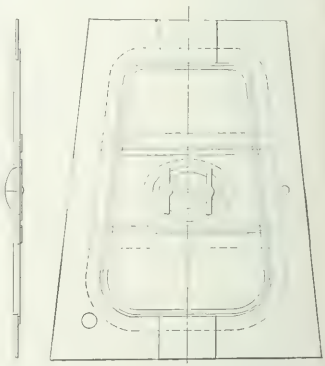
By M. Delafosse

The frequent occurrence of fires in coal mines, has made it necessary to provide proper means for sealing off the affected portion of the workings; in carrying out this work, the stopping that is built should not only be of a permanent character, but it must also be installed easily and rapidly.

The dam, shown in the accompanying illustration, consists essentially of two portions, one fixed and the other movable. The fixed part comprises a trapezoidal frame of boiler-plate about 12 mm. in thickness, measuring for the main entries 1.40 m. in width at the top, 2 m. at the base, and 2.40 m. in hight. The frame is provided with an opening, of similar shape, but with the angles rounded, 1 m. wide at the top, 1.30 m. at the level of the floor, and 1.80 m. high. This opening is for the purpose of allowing traveling to continue on the road with the frame in position, an arrangement which may be advisable in seams likely to fire. In such a case the frame is installed in a groove in the side, floor, and roof of the gallery varying from 0.15 m. to 0.20 m., care being taken to choose points where the surrounding strata are of a solid character.

The center portion fits into the opening in the frame, and is secured by butt joints. It is locked by means of bolts and rendered airtight by the application of red lead, after which the frame is reinforced by means of quick-setting cement. Should it be necessary to isolate the district, the three sections comprised in the movable portion of the dam can be fitted and secured in the frame in a very short space. Each of these three sections is constructed with flanges on the inner surface, extending 12 cm. in each direction; they are further reinforced round their outer circumference by angle irons 40x40 mm., destined at the same time to contain the mastic material by which an airtight cover is provided.

Each section is 0.60 m. in hight, the middle section being inserted last of all and secured by means of a butt joint, 0.10 m. in hight, on the sections already placed in position, the workmen up to then being on the inner side of the dam in order to place the bolts in position. The center section is for this purpose provided with



ELEVATION OF AIR-TIGHT DAM

a man-hole 0.50 m. by 0.35 m. to provide an exit for the men after this has been effected. It is then locked in position by a self-closing plug similar to that employed in steam boilers, and finished off with a mastic joint.

The dam can be provided, if necessary, with two holes as shown in the illustration, the upper hole to enable the introduction of compressed air to force back the noxious gases; the lower hole to permit the passage of water until the dam is finally closed. The holes are then plugged off.

For a gallery 1.70 m. in hight, using, in the construction of the frame, plates 12 mm. in thickness, and in that of the inner sections, plates 8 mm. in thickness, a total weight of about 412 kg. of iron will be used. It is believed that the dam can be secured in position, under the most adverse conditions, in the space of five or six hours.

* Abstract of paper read before the Société de l'Industrie Minérale, Paris.

The British consul at Tunis calls attention to the importance of iron-ore deposits in that country.

Use of Electricity in Anthracite Mining

Considerable Saving of Power Results From Use of Series and Parallel Controller; Rheostat Does Not Overheat and Life is Prolonged

BY H. M. WARREN*

The Woodward Mine Installation

The electrical equipment of the Woodward mines at Kingston, Penn., which is a typical example of an isolated direct-current station, is so arranged that bare copper cables run from the feeder panel of the switchboard on poles for about 400 ft., where they connect to lead-covered paper-insulated cables suspended in a borehole. These cables loop in at each vein to a dry place, where they are connected to distributing bus bars from which the various feeders are controlled. The combined weight of the cables in this borehole is approximately seven tons.

*Electrical engineer, Delaware, Lackawanna & Western Railroad Company, Scranton, Penn.

The electrical equipment in the mine consists of ten electric locomotives, nine electrically operated hoists and six electric pumps. The total rated h.p. is 1796. Two types of locomotives are used, one weighing about 13 tons, the other about 6½ tons. The heavier one is equipped with two 50-h.p. (railway rating) motors controlled by series and parallel controller. It will develop a drawbar pull of 4500 lb. at a speed of about 7½ miles per hour when the motors are operated in multiple and 5200 lb. for a short period with the rails sanded.

When the motors are operated in series the speed is approximately 3.2 miles per hour at the rated drawbar pull. The use of a series and parallel controller eliminates a considerable loss of power which would otherwise be lost in heating the rheostats when it was necessary to operate at half speed or lower, and therefore increases the life of the rheostats. These locomotives are used for long and heavy haulage on the main gangway.

Gathering Locomotives

The 6½-ton locomotive is equipped with two 25-h.p. (railway rating) motors with series and parallel controller, and, in addition, has an automatic reel device, which is used when the locomotive collects from and delivers cars to the chambers. Lightweight rail, usually about 25 lb. to the yard, is used in the chambers, but standard

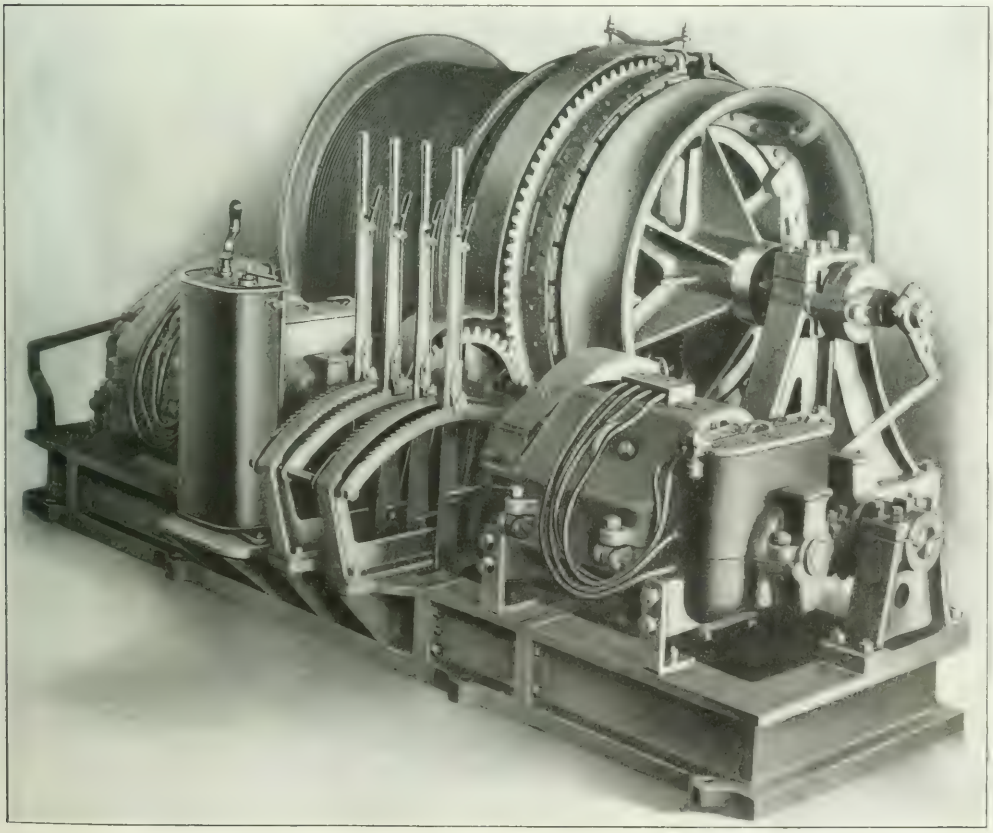


FIG. 1. 200-H.P. MOTOR HOIST

FIG. 2. GATHERING LOCOMOTIVE

ley wire, as the cable on the reel is used instead. This reel contains about 500 ft. of insulated cable and when it is desired to run into a room the free end of the cable is hooked over the trolley wire in the gangway and the locomotive runs into the chamber, unreeling the cable as it goes. When the locomotive comes out, the cable is automatically reeled up.

This locomotive will exert a drawbar pull of 2500 lb. The speed with the motors in multiple is approximately 7 miles per hour at the rated drawbar pull. With the motors in series the speed is approximately 3.8 miles per hour and the momentary drawbar pull with the rails sanded about 2700 lb. Fig. 2 shows this type of locomotive

The first gathering locomotive of this type was installed in the Cayuga mine of the Lackawanna Company, in June, 1902, where it was given a thorough trial. The results were so satisfactory that orders were placed for others, and this company has now about 80 of them in operotion.

As an indication of what may be expected of them in actual operation, the conditions under which two of these are working will not be out of place. One is handling the cars between the foot of the shaft and a branch about 4000 ft away, and distributes the cars to twelve chambers, some of which vary from 5 to 17 per cent. to the rise, and others 8½ per cent. to the dip. Five cars are delivered to each chamber per day.

The other locomotive handles the cars from 15 chambers, the grade of which varies from 2 to 6 per cent. to the dip. At night this same locomotive tends twelve of the above places.

The maximum grade on which these locomotives have been used is 17 per cent. If the grade exceeded this, there was danger in operating the locomotive due to the fact that if the power was shut off, the motorman was likely to set the brakes too hard and skid the wheels, causing a runaway.

Electric Hoists

Electric hoists are of various sizes and makes, ranging from 25 to 200 h.p. capacity. When operated by direct current, a railway type of motor is used as the load is intermittent and the series motor is particularly adapted for the duty it has to perform. When the station capacity is reasonably large, hoists up to 80 h.p. are usually equipped with one motor; while, for larger capacities, two motors are usually employed, with series and parallel controller, owing to the small current required when starting the load and making up trips. After the trip is started and up to speed, the motors are thrown in multiple and the resistance gradually cut out.

In changing from the series to the parallel position, however, the circuit is not broken entirely, but one motor momentarily carries the entire load to prevent too great a strain on the rope due to the sudden change in speed which would otherwise occur. Figs. 6 and 7 show typical single- and double-motor hoist equipments. The rope speed is usually from 450 to 500 ft. per min., but in hoists used for sinking slopes when few cars are to be handled per day, it is desirable to use a lower rope speed, thereby reducing the h.p. of the motor required.

According to a statement in *Fuel* of Feb. 5 and 7, the recent coal famine has made it evident that railroads in the Northwest cannot depend upon private capital to develop coal properties from which to supply the railroads with fuel. Prospecting parties have shown that the Harriman and St. Paul systems penetrate rich coal fields, and probably these roads will go into the coal-mining industry.

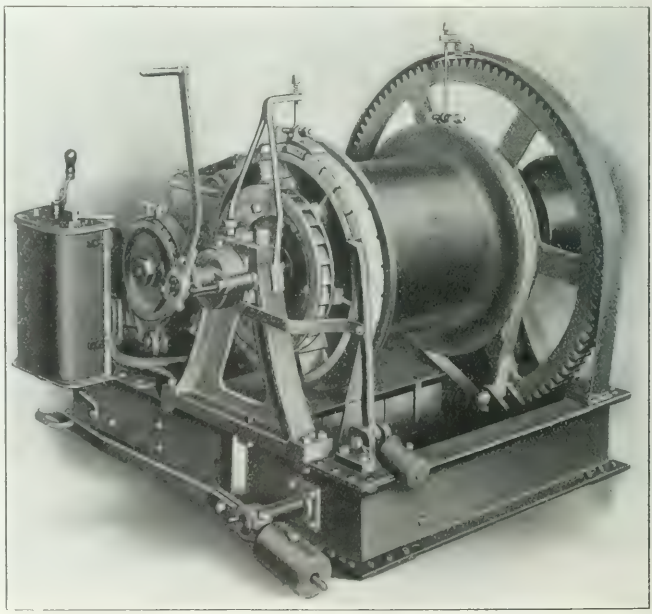


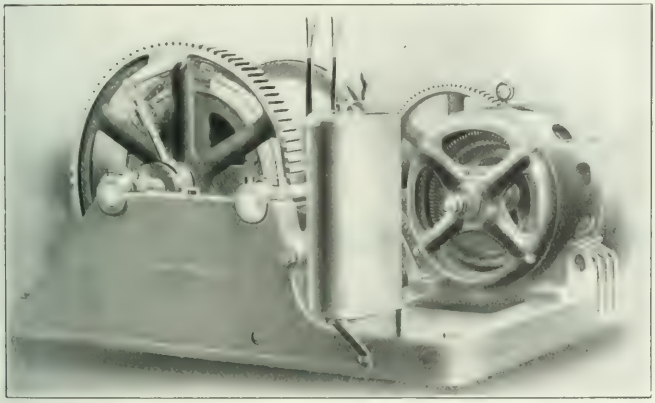
FIG. 3. SINGLE-MOTOR HOIST

Allis-Chalmers Electric Hoist

The Allis-Chalmers Company has recently put upon the market a line of standard electric hoists designed to work under approximately the same conditions as its well known small steam-driven hoist. The single-drum electric hoists are of 15, 25, 35, 50 and 75 h.p. capacity, and double-drum hoists are made in 30, 50, 75, 100, 125, and 150 h.p. sizes.

The drum, or drums, and motor are mounted upon a bed plate of box section, with broad bearing surface on the foundation. The bearings are carried on pedestals cast in one piece with the bed plate. The bed plate and pedestals are of cast iron, and of ample proportions to withstand the shocks and strains incident to rough usage. The bearings of each hoist are all of the same length and diameter, lined with babbitt metal.

The drum runs loose upon the shaft and is made in one piece, of cast iron. The spider hubs are fitted with bronze bushings, which can be readily replaced in case of wear. The drum spiders have strongly ribbed arms, and the drum shell is reinforced by deep circular ribs. The hole in the shell through which the rope passes for fastening has a long radius curve, thus avoiding any sharp bend in the rope and doing away with rope breakage at this point. The face of the drum is straight, and the flanges are of ample depth.



ALLIS-CHALMERS SMALL ELECTRIC HOIST

The brake is of the steel-band type, with wide face, and is provided with turnbuckle adjustment for taking up the wear on the brake blocks. One end of the brake band is anchored by eye bars around the operating shaft, and the other end has a turnbuckle attachment to the lever on the operating shaft controlled by the operator's hand lever.

The main gear, keyed on the drum shaft, forms the driving member of the clutch, which is of the band-friction type. The fixed end of the band is anchored to the driving gear and has suitable adjustment to compensate for wear. The movable end of the band is actuated by a simple arrangement of toggle lever, motion to which is imparted by a collar sliding on the drum shaft and controlled by the operator's hand lever. When the clutch is thrown in, the band is tightened around the drum shell by the toggle motion, and the pull of the rope on the drum tends to still further tighten the grip of the band on the shell. Both band-friction clutch and band brake are hand operated, the operating levers being provided with quadrants and locking pawls. Both drum and intermediate shafts are made extra large in diameter.

The gears are cast of a special mixture of iron with heavy rims, arms and hubs. The pinions are of cast steel. The teeth of both wheels and pinions are cut. When desired, the pinion on the motor shaft will be made of rawhide. For driving, either direct or alternating-current motors wound for the usual voltages are used, and if alternating current, either 25-cycle or 60-cycle machines. The controllers used are of the drum type, similar to those in common use in street-car service. On all single-drum hoists the motor is not reversed, but on double-drum hoists the handle or lever of the controller not only controls the speed but also reserves the motor, and is locked in the off position. The controller is attached to the frame of the hoist.

Coal Miners' Relief Fund

For many years operators and miners in the anthracite region have been discussing the organization of a miners' relief fund. The first step was taken this week by the Erie company, which controls the collieries of the Pennsylvania Coal Company and the Hillside Coal and Iron Company, the statement of the plans and methods of operation having been made public. This is the first real effort in the anthracite region to establish such a fund, and, if successful, it will, no doubt, be followed by many others throughout the region. That such a fund is sorely needed goes without debate, but hitherto there has always been difficulty about the sources of revenue.

Efforts have been made from time to time to secure some legislation to tax coal to provide a revenue, but this failed. The Erie company has arranged to pay into the treasury an amount equal to the contributions of all the employees, or in other words to subscribe one-half of the revenue needed. The plan has been well received and the principal feature is that every employee shall pay into the fund, when ever a call is made, a sum equal to one day's earnings, and at the same time the company shall pay in a sum equal to all that paid by the men. Whenever this money is exhausted by the payment of relief funds another call is to be made, so that no more money will be raised than will be actually needed. Every employee is eligible to membership, but no one will be entitled to benefits unless he has contributed to the last call made.

The relief proposed is as follows: In case of death following an accident, $75 shall be paid for funeral expenses, and $3 per week shall be allowed the widow for the period of one year, provided that she remains unmarried during that time, and $1 per week shall be paid for each child under the age of 14 years for the period of one year. In case of injury following an accident while at work, the rate of relief will be as follows:

Persons who are paid 15c. an hour shall receive $1 a day during the period that relief is allowed, and those earning less than 15c. an hour shall be allowed 50c. a day. There are other interesting features. The Erie company was the first to organize the first-aid societies which have been so successful in the anthracite region.

Canadian Pig Iron

The following table, prepared by the American Iron and Steel Association, gives the total production of pig iron, including spiegeleisen and ferromanganese, in Canada, from 1894, in gross tons

1894	44,594	1901	244,627
1895	57,859	1902	311,861
1896	60,030	1903	265,418
1897	55,106	1904	268,842
1898	68,726	1905	90,000
1899	71,929	1906	41,487
1900	82,450		

During 1906 Canada had 13 furnaces in blast. In the first half of 1905 it had 13 furnaces in blast, and during the last half of the year 12 furnaces. It will be observed that in the two years from 1904 to 1906 the production of pig iron in Canada more than doubled. The average output per furnace for the year 1906 was 41,689 tons.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

This page of Colliery Notes has been published weekly in the JOURNAL for nearly a year, and from the expressions of opinion that we have received, we feel that it has fulfilled the purpose intended. We realize that many of the ideas advanced herein have not met, and could not meet, with the unqualified approval of every reader, and consequently we have welcomed comment and criticism when there has been a difference of opinion. We hope that our readers will continue to favor us with their criticisms. Much of the information which has been presented in this department has been collected first-hand at the mines. We feel that the department would increase in importance if the mine foremen, superintendents, engineers, and managers would send us brief notes describing any new idea or successful methods which come under their observation. As a new feature, we shall publish as colliery notes, brief answers to practical questions in coal mining, when such are suitable for this page.

It would be well if all safety lamps were so constructed that they could not be put together, ready for use, unless all the gauzes were in. The fault here lies in the fact that such lamps generally have bonnets or shields, and if a gauze should be left out after cleaning, the defect may not be noticed, and the lamp taken into the mine, at the risk of causing a serious explosion.

In fighting a mine fire, each man should be provided with a lemon or two (not one of the kind now being handed around, but instead, the real fruit) and when he feels he is being affected by the gas, should cut a slice off each end of the lemon, and suck the juice; in this way, he can proceed with the lemon held over his mouth, as breathing through the sour moist pulp seems to purify the air inhaled.

Carbon dioxide gas in a mine is one of the most difficult gases to remove from the workings. It is formed principally by the combustion of illuminants, the respiration of men and horses and by the rotting of mine timbers. This gas is about one-half again as heavy as air, and therefore tends to accumulate in the low places or dip workings of a mine. The fortunate conditions connected with the presence of this gas are its peculiar taste and its inability to support combustion. These evidences largely eliminate its dangerous qualities, as the men are sufficiently warned to escape in time.

Among the many advantages resulting from splitting the air current, may be mentioned the fact that by this method a greater quantity of air can be propelled by a given power. When splitting the air is resorted to the rubbing surface is increased, and as a consequence, the pressure, which varies directly as the rubbing surface, is also slightly increased; on the other hand, splitting the current will reduce the velocity with the same pressure, and since the pressure varies in proportion to the square of the velocity, the reduction in this latter element more than balances the effects of the increased surfaces of contact.

In providing for the safety of men, some of the larger mines of Austria have prepared a so called safety chamber underground, which is a strongly constructed retreat having a single entrance with a door that can be made tight against air and water by means of rubber fittings. Each chamber has three cylinders of oxygen, sufficient to enable 30 men to breathe three days. Respiratory apparatus is here at hand for parties leaving the chamber to reconnoiter or signal. In the safety chamber there are foods, medicines, and first-aid appliances. The standard room as here built will accommodate 24 men for a reasonable time while awaiting rescue.

In the anthracite field where it is often customary to work several different seams, or where the coal bed is pitching, so that it must be worked in lifts, some operators follow the plan of tapping the water in the upper vein to the lower seam through large bore holes, and thus collecting the water in one general sump, so that it may be handled by the main pumps. This method saves the cost of installing several underground pumping plants, besides reducing the cost of maintenance; however, such a system frequently overburdens the pumps besides requiring the consumption of an enormous amount of steam to lift the water to a greater hight.

One ton of anthracite or good bituminous coal is equal to about one and one-half cords of dry mixed wood, chiefly white oak. It requires about two cords of soft wood, such as yellow and white pine, hemlock, etc., to equal one ton of anthracite coal. Some of the western bituminous coals are so inferior as a fuel, that a ton of the coal is hardly equal to a cord of average wood. Dry white oak weighs 3500 lb. per cord, or one and a half tons, while a cord of dry white and yellow pine or hemlock only weighs about nine-tenths ton. Perfectly green wood just cut weighs one-fifth to one-quarter more than partially dry wood. Green wood as a fuel results in a great loss of heat.

One of the problems that has puzzled many mining men is the continued upheaval of the bottom of some of the gangways in the mines of many districts. At one anthracite mine, for several months past, the mine officials have been confronted by the problem of having the floor in one of the haulways continually being forced or squeezed up, the rise often amounting to several inches during the night. It has generally been thought that the upheaval of bottom in such cases is due to the pressure of the overlying strata on the surrounding pillars, or to the action of water; careful investigation has led to the belief that in many instances this bulging or raising of the entry floor is due to the great pressure of the gases contained in the strata underlying the coal seam.

In the use of concrete nothing is more important than to properly select the proportions of the elements entering into the mixture. It has been proved that the strength of concrete may be increased fully 100 per cent. by simply changing the proportions of sand and stone. In order to obtain satisfactory results the sand should be so screened that the diameter of the largest grains will not exceed one-tenth of the diameter of the largest stone; the stone should also be required to be of one size. The larger the stone used the coarser the sand must be; on the other hand, when small stones are used the sand must be fine and a larger proportion of cement must be mixed. Investigation shows that the denser the concrete the less permeable it is to water, and the more durable it is. Practical experiments indicate that genrally the proportion of cement to sand and stone should be as 1 to 2 to 6.

In underground surveying, the work is rendered more difficult by the darkness and the dirt present. The liability to error being thus increased, the practice of having each measurement checked is advisable. In carrying out this plan, the rear-chainman, back-sight, or transitman, as the case may be, holds the zero mark of the tape, or some even foot, at the station or instrument head; the fore-chainman or fore-sightman, catches the measurement; this reading is recorded by the front-chainman, after which the tape is again stretched and the measurement caught at the transit or point where the instrument is set up. The recorded measurements are not compared until the day's work is completed, or at least until both parties have written the figures. This system not only eliminates the frequent errors of measurement that occur, and the consequent re-running and re-calculating that ensue, but requires at a maximum not more than from 25 to 35 min. per day.

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Mine Inspection in Pennsylvania

[illegible] certificate as mine foreman eligible as a [illegible] is about to be introduced at Harrisburg by a representative of the miners of the anthracite region. The proposed legislation, so directly affecting the interests both of operators and miners, is bound to become a topic of serious discussion. Before entering into the merits of the question it is necessary to explain the present method of appointing the mine inspectors, and the limitations in the exercise of their duties.

Formerly the mine inspectors were appointed by the Governor from a list of eligibles, but under the present law the office is elective. The judges of the county courts appoint examining boards, composed of three reputable coal miners in actual practice, and two reputable mining engineers. These boards conduct examinations of candidates for the eligible list. For admittance to this examination, the law requires five years' actual experience in the mines, and previous employment in mines which are subject to noxious and explosive gases. The nature of these examinations is thoroughly practical. The applicants who answer successfully 90 per cent. of the questions are given certificates of competency, and then become eligible for nomination for the post of mine inspector in the regular political way. The law requires that the examinations be held each year, at least six months before the date of the general election in November.

Certificates of eligibility for employment as mine foreman are issued in a similar way, but although the law requires that mine foremen also shall have had five years' practical experience in the mines, including experience in gaseous mines, the examination for such qualification is much less severe than for the office of mine inspector. Obviously, the enactment of the proposed law would further let down the bars which safeguard the important office of mine inspector by making it more generally elective than it is at present.

It was a great mistake ever to make this office elective. Even under the present conditions, the inspectors are hampered by political influences, which prevent them from doing their duty thoroughly, and in the way they would like to, if let alone. In so far as the operators interfere in that way, they are severely culpable, and shortsightedly act against their own best interests, as well as those of the miners whom they employ. However, it is the miners who are most directly concerned, because while the operators are risking only their property, the miners are risking their lives.

The present movement originated among the miners themselves. Nothing could be more mistaken. Instead of cheapening the office of mine inspector, and rendering it more subject to political influence than it is even now, their own best interests demand that they advocate an increase in the dignity and power of the office. If there be any office which ought to be removed entirely from the political field, and put under strict civil service rules, it is that of mine inspector, upon whose ability, intelligence and faithfulness the safety of life and limb of many thousands of workers depends.

We do not believe that the majority of the miners of the anthracite region desire the change in the law which is now advocated. They are being misled by self-seekers. They should unite in demanding the withdrawal of the present project, and in its place they should demand a law which will improve the ability of the mine inspectors to care for their own interests. Their own honest leaders will give them the same advice.

How Metals are Sold

We have received inquiries as to the manner and terms of selling the important metals, other than iron and steel. We have many times printed articles on these subjects, but as new persons are constantly coming into the business, who are unfamiliar with it, there is ample reason for republishing information that is well known to the majority.

Gold is, as is well known, the standard of value, its price being fixed at the British Mint at 77s. 10.5d. per oz. troy of 0.925 fineness; and at the United States Mint at $20.6718 per oz. troy. These mints receive unlimited quantities at those prices. However, there is nothing to prevent a private banker from bidding higher, if he chooses. Of course, no one will pay much above the coinage rate, because gold can always be obtained from the mints on the basis of 77s. 10.5d. and $20.6718 per oz.

respectively, but gold coin loses something by abrasion and is subject to further loss in shipment, wherefore there is a margin for bidding on gold bullion. In December, 1903, the price for gold bullion was 78s. 0.5d., the highest of recent years. Shipments of bullion to London by the gold-mining companies are received by their banks. On the day of arrival, bids are asked from the Bank of England and from foreign banks which may want the gold for export. The highest bidder gets it. The market for gold is intimately associated with the banking transactions whereby international balances are settled. In the purchase of ores, and for all ordinary purposes, gold has only the fixed coinage value.

The silver market is also intimately connected with banking transactions, large exports being made from London to the far East in settlement of balances. The silver market of the world, more than any other metal market, is determined by London. The silver brokers of London meet daily at 2 p.m. and fix a price for that day. They are bound to sell at the price thus fixed any quantity required, but are not bound to take any quantity that may be offered. If the quantity offered is more than can be disposed of, it necessarily goes over to the day following and then has an effect in fixing the price for that day. The London quotation is for standard silver, i.e., 0.925 fine.

The New York price for silver fluctuates generally in correspondence with the London price, being lower than the London price by an amount representing commissions, expressage, insurance, interest and other charges between the two markets, and also is affected by fluctuations in the rate of exchange. Occasionally the New York price foreshadows the London price for the following day, wherefore the difference between the two markets is not absolutely constant. The New York price is established by the firm of Handy & Harman, which handles the great bulk of the silver bullion business of the United States, most of the large refiners selling their product through it. Silver is commonly sold in ingots a little upward of 1000 oz. in weight, 0.999 fine, for cash, immediate delivery. The quotation above referred to is frequently called the "official price," and is commonly adopted in business and by the press and is the quotation which is published in the JOURNAL. Occasionally there are quotations for "commercial bars," which are a little higher than the "official price." These represent the retail business that is done with jewelers, manufacturers of silverware, etc., a business into which the large refiners do not enter. The large transactions in silver are rather complicated, and as stated above, are closely involved with banking. This is illustrated by the transactions of the U. S. Mint in 1906, when it purchased 6,158,725 oz. of silver. Before inviting tenders publicly, last August, the Treasury Department, anticipating that such invitation might have an effect upon the market, bought about 2,500,000 oz. on the London market for future delivery. These purchases were afterward exchanged for metal in this country, which was delivered at the several mints as required. The remainder was purchased directly in this country. The American purchases cost, in lots of about 100,000 oz., from ⅜ to ½c. more than the quotations for the same day. However, the prices paid by the Government included delivery, and also interest which sellers have to reckon on account of delay in securing Government settlements.

Because of the fact that about 70 per cent. of the world's output of copper is produced in North America, the New York market is the leading and governing one in this metal, although it is always strongly influenced by the London market, inasmuch as a large part of the American production is sold for export. Practically all of the copper produced in North America is sold by seven concerns, but of these two are extremely small factors. On the other hand, the great bulk of the domestic consumption is by a few manufacturing concerns. Under these circumstances, the transactions are generally in large lots on a contract basis. There is no business to speak of done on any metal exchange, and little or no speculative business done in any way. Small requirements for copper are supplied by brokers, who purchase from the large selling agencies, and do a retail business, so to speak, which is quite distinct from the great wholesale business.

The quotations which are reported in the JOURNAL represent the bulk of the transactions as made with consumers, basis, New York, cash. The quotations are based on transactions which represent a very large proportion of the total copper sold. No distinction is made among copper sold as "spot," "prompt," or "future," but all the sales are taken as made for consumption and averaged as nearly as possible. The small lots sold at premiums figure almost disappearingly small when averaged in the great bulk of the transactions. It is aimed to represent the average actually received by the producers for their whole output, as is shown at the end of the year by their official reports. It is a common practice, nowadays, for copper to be sold on the basis of 30 days, delivered, which means that the seller pays the freight to the point of consumption and waits for the money 30 days after delivery, or else discounts the bill for cash. This is commonly ignored in many casual and inaccurate reports of the price of copper.

The spelter market is quoted in the same manner as the copper market. In the quotations for copper and spelter, two prices are commonly given, in order to represent the range of the market, but the full range is seldom shown precisely, because the mean of the figures given is intended to represent the average, which would not always be practicable by giving the extreme ranges.

Upward of 90 per cent. of the lead produced from domestic ores is refined and sold by three interests, chief among which is the American Smelting and Refining Company. The market for pig lead is largely controlled by the latter company, and at present the price is controlled by it, inasmuch as the selling price fixed by it is adopted by the other large producers. The price established by the American Smelting and Refining Company is for nearby shipments of desilverized lead in 50-ton lots, or larger. The bulk of all the lead produced goes into consumption on that basis, the large consumers making contracts for their supply and paying for it at the average of the settling prices for the month. A small amount of lead has been sold during the last year out of warehouse by independent dealers at a premium, giving rise to quotations higher than those of the trust, but the total volume of this business is insignificant in comparison with the great production of lead which is marketed on the terms stated above.

Readers Who Will Not Read

The mail is continually bringing us letters requesting information which the writers could and should have found in

the columns of the JOURNAL. The requests frequently refer to matters which have been discussed in detail in issues less than a month old. Many will inquire about the source and scope of statistics pertaining to their own particular field of interest, when the qualifying statement sought had been placed as near the original figures as mechanical limitation would permit.

This failure to read is everywhere in evidence. Capitalists employ experts to investigate enterprises involving thousands of dollars and then calmly refuse to read the report presented, preferring to base a decision upon a few hurried verbal statements. Newspapers of sedate and hallowed traditions fairly shout at one when they have anything really important to say, and the magazines are quite as vociferous in their clamor for attention.

What is the matter with the reading public nowadays? Is the rush and turmoil of this busy age destroying the good old habit of reading, once considered the mark of an inquiring and informed mind, or are the sensational papers spoiling us all? Must everyone be coaxed, or bribed, or bullied into reading what he knows he ought to read? It is as true today as it was in Bacon's time that "Reading maketh a full man," and never has familiarity with the printed page been of greater importance to the professional worker. The technical periodicals have never offered so fine an array of practical material nor presented it more attractively than those of the present year. Yet the readers will not read.

The specialist will read—scanning every line. Those who can afford to hire specialists do not suffer. But the ordinary reader seldom knows how much directly valuable material he misses. The trouble, it seems to us, is largely the failure to recognize the technical paper as a tool of the trade.

America Through Foreign Eyes

Observations, criticisms and comments on foreign conditions and practice are always of interest, frequently of remarkable value. Such are Mr. Bryce's work on "The American Commonwealth" and the great works of M. Leroy Beaulieu on Russia. The superlative accuracy of these and others of their class emphasizes the peculiar inability of many travelers and writers to observe and learn the facts about the foreign countries they visit. These remarks are inspired by a paper on the treatment of zinc-lead ores, which we read recently in one of the leading French mining and metallurgical journals. The author, who is an engineer, had evidently visited America. Yet he puts on record such misinformation as the following:

"The zinc smelteries of the United States are supplied by the immense deposits of zinc ore of Joplin, Peoria, etc., in Missouri, Kansas, Illinois, Indiana, Pennsylvania, etc., and the coal fields of Pennsylvania." Further on we are told that in the manufacture of zinc oxide by the Wetherill process, the zinc oxide passing out of the furnaces is condensed in towers down which water is showered.

Many of the author's statements and conclusions as to his general subject are discriminating and sound, but how he could derive such false knowledge as that which we have cited as examples is beyond our comprehension. We wonder if American observation of things in France and Germany is equally defective. We think not. On the other hand the failure of many foreigners to learn our geography, spelling of proper names, and general conditions is a source of never ending mystification.

Iron-mine Records

The report of individual mine shipments of iron ore from the Lake Superior region is now complete for 1906, and shows some remarkable achievements in the handling of great quantities of material. The old ranges in Michigan are less conspicuous in this respect; but many of the mines did well, considering that they are nearly all underground workings, of considerable depth.

Thus on the Marquette range, the Cleveland-Cliffs group, which includes several openings, shipped 1,339,944 tons. One other mine passed half a million, the Lake Superior, with 635,671 tons. On the Menominee, the greatest shipper was the Chapin with 943,425 tons, while three others neared half a million each—the Penn, 496,582; the Pewabic, 493,891; and the old Aragon, 431,000 tons. On the Gogebic, the Norrie group, with several shafts, sent out 1,244,468 tons, the Newport coming second with 549,745 tons. On the Vermillion range, in Minnesota, also a district of deep mines, the big shipper was the Pioneer, with 766,853 tons.

It was on the Mesabi range, however, that the great records were made last year, when eight mines passed a million tons each. The leader was the Mountain Iron, which shipped 2,536,249 tons. The other seven, in order, were the Morris, 1,809,743; the Hull-Rust, 1,690,311; the Fayal, 1,634,853; the Burt, 1,377,076; the Mahoning, 1,274,232; the Adams, 1,238,350; and the Stevenson, 1,014,500 tons.

It must be remembered that these records are made in seven months of actual working, the mines being practically closed down through the winter. At the Mountain Iron, for instance, the monthly average reached 362,321 tons, or about 12,000 tons a day.

ROBERT N. BELL, State inspector of mines of Idaho, is exemplary for his promptness in publishing his annual reports of the mining industry of Idaho, His report for 1906 is now at hand. Other State officials would do well to imitate his policy. Information quickly available is far more valuable than ancient history, a fact which many officials lose sight of in the desire to correct figures to the last decimal, which often are incapable of absolutely correct presentation anyway. Mr. Bell's reports are admirable not only for their promptness, but also for the interest and value of the information which they give. We hope that the people of Idaho will continue to reëlect him so long as he wants the post, and that the legislature of the State will promptly provide him with an adequate appropriation, which at present he has not got.

WITH A SINGULAR fatuity, the Government is going to appeal the zinc-ore case, the acting Secretary of the Treasury having given directions to that effect under date of Feb. 16. There may possibly be some question, yet, as to the dutiability of sulphide ore, but as to the status of the silicates and carbonates there can be but one decision, namely that which has already been rendered by the Board of General Appraisers. Of course, the buyers of zinc ore will go right on with their importations, as heretofore, but it would be a pity, and unfair, if in the face of the decision recently rendered the Government should go ahead levying duties and holding up the money of importers under protest.

Canadian Mining Institute

will be held in Toronto, Ont., March 6, 7 and 8. The opening session will be held in the banquet hall of the King Edward Hotel, on Wednesday, March 6, at 10:30 a.m., and will be devoted to business detail. Sessions for the reading of papers will be held as follows: Wednesday, March 6, 3 p.m., and 8 p.m; Thursday, March 7, 10:30 a.m., 3 p.m., and 8 p.m.; Friday, March 8, 10:30 a.m. The annual dinner will be held at the King Edward Hotel on Friday, March 8 at 8:15 p.m.

The following papers are announced for this session: Presidential address, George R. Smith, Thetford Mines, P. Q.; "The Iron Ores of Canada," Prof. C. H. Leith, Madison, Wisconsin; "Magnetic Separation by the Gröndal Process," F. A. J. Fitzgerald and P. McN. Bennie, Niagara Falls, N. Y.; "The Iron Ore Deposits of Temagami District, Ontario," Alfred E. Barlow, Ottawa; "Supplies and Reserves of Iron Ores," John Birkinbine, Philadelphia, Penn.; "The Geology of the Cobalt District," C. R. Van Hise, Madison, Wisconsin; "Smelting of Cobalt Ores," Hiram W. Hixon, Victoria Mines, Ont.; "The Cobalt Ores Deposits," M. T. Culbert, Cobalt, Ont.; "The Cobalt Mining District," Dr. Robert Bell, Ottawa; "Notes on Some Additions to the Map of Cobalt," W. G. Miller, Toronto, Ont.; "New Discoveries in Northern Quebec," J. Obalski, Quebec; "Microscopic Examination of Nickeliferous Pyrrhotite," Dr. Willian Campbell, Columbia University, New York; "The New Tilbury Oil Fields, Ontario," Eugene Coste, Toronto; "The Minerals of Alberta," D. B. Dowling, Ottawa; "Further Observations on the Copper Deposits of British Columbia, the Yukon and Alaskan Coast," W. M. Brewer, Victoria, B. C.; "The Marble Bay Copper Deposit, Texada Island, B. C.," O. E. Leroy, Ottawa; "The Geology of the Franklin District Ore Deposits, B. C.," R. W. Brock, Kingston, Ont.; "Some Notes on the Economic Geology of the Skeena River," W. W. Leach, Ottawa; "Notes on Recent Developments in Quartz Mining in the Yukon," D. D. Cairns, Ottawa; "Recent Mining Conditions in the Yukon," R. G. McConnell, Ottawa; "Canadian Graphite," H. H. Brumell, Buckingham, Que.; "Carbon Minerals of New Brunswick," Dr. R. W. Ells, Ottawa; "Undeveloped Coal Areas of Nova Scotia," Dr. J. E. Woodman, Halifax, N. S.; "Mineral Resources of the Province of Quebec," Fritz Cirkel, Montreal; "Undeveloped Mineral Resources of the Dominion," Dr. Frank D. Adams, Montreal; "History of the Bruce Mines, Ont.," H. J. Carnegie Williams, Bruce Mines, Ont.; "Ownership of Mineral Deposits," Frederick Hobart, New York; "Mining Royalties," J. M. Clark, Toronto; "Some New Points in the Geology of Copper Ores," Prof. J. F. Kemp, Columbia University, New York; "Magmatic Waters," Hiram W. Hixon, Victoria Mines, Ont.; "The Use of Graphic Formulas in Metallurgical Calculations," D. H. Brown, Copper Cliff, Ont.; "Copper Deposits at Yerington,, Nevada," E. P. Jennings, Salt Lake City, Utah; "The Status of Mining in Canada," J. C. Gwillim, Kingston, Ont.; "Reflections on Mines and Mining in Canada," N. Daru, Geological Survey, of India; "Fifty Years of Mining and Metallurgy in Eastern Canada," Major R. G. Leckie, Sudbury, Ont.; "Sir William Logan and Our Geological Survey," Dr. Robert Bell, Ottawa; "Diamond Mining in South Africa," Dr. J. Bonsall Porter, Montreal; "Electric Furnaces," Dr. A. E. Stansfield, Montreal. Other papers, the titles of which are not yet received, are promised by Frederick Keefer, Greenwood, B. C.; S. S. Sorenson, Monterey, Cal.; and W. F. C. Parsons, Londonderry, N. S. Scotia.

Osceola Consolidated Mining Company

The Osceola Consolidated Mining Company owns one of the best known properties in the Lake Superior copper district. Its report is for the year 1906. The capital stock is $2,500,000, of which 3850 shares are in the treasury, leaving 96,150 shares, of $25 par value, outstanding. The statement shows, as of Dec. 31, 1906, cash, accounts receivable and copper, $1,994,985; supplies and fuel at mines, $204,750; wood lands, $37,309; Mineral Range Railroad stock, $145,800; Lake Superior Smelting Company stock, $60,000; total assets, $2,442,844. Bills and accounts payable were $528,780; dividend declared, $576,900; total liabilities, $1,105,680, leaving a surplus balance of $1,337,164. Dividends declared during the year were $12 per share, or $1,153,800 in all.

The total rock stamped during the year was 1,016,240 tons, from which was saved 24,227,281 lb. of mineral. The refined copper obtained was 18,588,451 lb., or 18.3 lb. per ton of rock stamped. The total cost of mining and stamping was $1.60 per ton; cost of stamping, 13.83c. per ton.

The earnings and expenses for the year were as follows:

	Amount.	Per Lb. Cop per. Cents.
Copper sold	$3,511,273	18.89
Interest, etc	135,538	0.73
Total receipts	$3,646,811	19.62
Running expenses at mine	$1,623,511	8.73
Smelting, transportation, etc	244,629	1.32
Construction expenses	155,482	0.84
Total expenses	$2,023,622	10.89
Net earnings	$1,623,189	8.73

After paying $1,153,800 in dividends, there was a surplus of $469,389 for the year.

Improvements in progress at the mines include more systematic discarding of waste rock, and the substitution of mechanical haulage for hand tramming. The use of the compound stamp and re-crushing rolls have reduced the cost of treating rock.

The directors' report says: "The cost of operations has been kept down, notwithstanding an increase of 10 per cent. in labor and higher prices for all supplies. The compound stamps and re-crushing rolls have more than fulfilled all that was expected of them as to efficiency, and, in addition, the losses in the tailings from the mill have also been lessened. The percentage of copper in the rock is slightly less than for last year. This was caused through treating a poorer grade of rock, which was justified by the high price of copper.

"The fire at No. 1 shaft North Kearsarge was doubly unfortunate as it rendered useless the expensive repairs just completed, and necessitated duplicating the cost of these repairs. As these fires are liable to occur in all incline shafts through friction of the rollers used to support the hoisting rope, there is furnished a fresh argument, if one were needed, for the use of concrete stringers, for with these there would be no wood to burn in the shaft.

"An improvement long contemplated was the furnishing Lake Superior water to the Osceola mine location. This has been made possible, through an arrangement with the Tamarack Mining Company, from its Lake Superior pumping plant. The location now has efficient fire protection which was at once followed by a general reduction in all insurance rates. No heavy construction outlay seems called for during 1907."

Mining Enterprise in Turkey

It is announced from Constantinople in *Echo des Mines*, Jan. 17, that since the promulgation of the new Turkish mining laws greater interest has been evinced by foreigners in the mineral wealth of the empire. Recently an English company purchased from a Turkish subject, extensive lead and silver mines in the province of Usknob. The seller was paid £4000 in cash and £100,000 in privileged shares of the Kraiowa Proprietary Mining Company, to be established shortly with a capital of £400,000. An Anglo-French syndicate, supported by the embassies, is endeavoring to obtain a grant of the Kesvhan collieries. The Porte at present opposes the idea for so called political and strategical motives. The collieries are near the Black sea and Russo-Bulgarian frontier. The company, however, thinks that diplomacy will be able to remove the scruples of the Porte.

F. M. Guye, in the *Northwest Mining Journal*, reports the discovery of a large body of magnetite near Snoqualmie pass, in the Cascade range.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

Blacksmith's Forge as an Assay Furnace

A short time ago I had occasion to make some fire assays on a quartz copper-bearing ore to see if it carried any gold or silver. We had an old, home-made, single-muffle furnace, but the firebox was so small and the draft and coal so poor, that it would not get up enough heat after six hours of firing.

I therefore took a large crucible and, putting in the ore, flux, etc., placed it in the fire of an ordinary blacksmith's forge. After 10 minutes the fusion was complete and in 5 minutes more the crucible was poured. The slag was very clean and glassy and the button soft, considering the copper in the ore.

After running several crucibles, two and often three at a time, we cupeled them in an old crucible, with a hole ½ inch in diameter in the bottom. The crucible was placed on its side on top of the fire and half-burnt coal piled loosely over it. The hole in the bottom was to let the air circulate through as in an ordinary muffle.

Two cupels were run at a time, while the bellows were pumped to give just the heat desired. This kind of furnace is available to every prospector who has a forge for sharpening his drills. The heat can be raised and lowered at will, and a very high heat can be generated when desired.

With a pocket button balance costing from $15 to $20, a few crucibles, some litharge, bone ash, soda, flour and salt for a cover, a little acid and a couple of test tubes, rough assays can be made almost anywhere.

A cupel mold is handy, but not absolutely essential. Cupels can be molded by hand when necessary. A pocket button balance will weigh within 1/10 of a mg., and by using two assay tons in a charge, or combining two buttons if the crucibles are not large enough, you can come within one dollar of the gold per ton.

No prospector can make much of a hole in the ground without a place to sharpen his tools, so that an engineer can generally get a fairly good idea of the run of the ore on the spot, and this may save him the trouble of packing samples of lean ore to civilization to get it analyzed.

The pocket balance, crucibles, etc., can be packed in a small box, say a 25-lb. powder box as the largest, and even in a 10-lb. powder box if properly packed, and only a few crucibles are taken. These can be used over again until they break. A mold into which to pour the crucibles can be made out of a piece of sheet iron, which is bent into a cone and riveted.

W. R. [illegible]

Silver City, New Mexico.

Increase of Moisture in Coke Shipped in Sealed Cars

In your issue of the 16th inst. "Steel," writing on the above subject, asks certain questions, which I take pleasure in answering in the order named:

In the test described the coke was sampled on the yard as it was drawn from the ovens, and the moisture determined in the laboratory of Dr. Henry Froehling, analytical chemist. As a further test 100 pounds of the same coke was placed on the top of a battery of boilers, and after the third day it was carefully weighed for the loss, which was less than one per cent. Upon reaching destination at Louisville, Kentucky, samples were taken from the cars before unloading, and analyzed by a chemist of Dennis Long & Co., who found 12 per cent. of moisture.

The usual laboratory methods were employed by expert chemists in both cases.

The coke was watered in the ovens and allowed to dry before drawing. The temperature of the coke when drawn, and of the ovens from which it was drawn, exceeded 212 deg., and toward the last the brick in sides and crown of ovens showed a dull red heat. No water was thrown on the coke outside of the oven, and there was no excess of water used in the oven.

Different cokes have different capacities for water, depending largely upon the cells and structure, but I should say that a lump of coke might contain 8 or 10 per cent. of moisture, and still look dry on the outside. In this particular case a test for absolute capacity was made by Dr. Froehling in his laboratory.

I have no particular theory, but merely a suggestion made in search of information.

Wm. N. Pyle

West End, W. Va., Feb. 13, 1907.

State Geological Survey of Wisconsin

In the Feb. 9 number of the JOURNAL you state that Wisconsin is considering the establishment of a State Geological Survey. I wish to call your attention to a list of the publications of the present State Geological Survey, which is the second survey which the State has had.

This survey has been in operation for some time and is still very much alive, which is indicated by the fact that there is a strong probability that the legislature will increase its appropriation by $20,000 per year for the extension of its work. This bill is probably what led to the error in your editorial.

W. O. HOTCHKISS.

Madison, Wis., Feb. 19, 1907.

Rapid Method for the Determination of Iron in Slag

The following method for the estimation of iron in slag will give results in 10 minutes:

To 0.5 gram chilled slag in a casserole add 10 c.c. hydrochloric acid. Boil a minute or two to expel H_2S, stirring well to break up lumps of silica; remove from heat; add about 5 grams zinc dust; stir; add 20 c.c. sulphuric acid (1 to 5), stir well, and filter quickly through a folded filter. Dilute to 300 c.c. with cold water; add 5 c.c. syrupy phosphoric acid and titrate with $KMnO_4$. GEO. B. HOUGH.

Chicago, Ill.

The Production of Mica in India

The total production of mica in India during the year 1905 amounted to 25,641 cwt., of the value of $421,975. In the same year the exports of Indian mica rose to 133,159 cwt., as against only 18,250 in 1904. The total value of the exports, $710,040 against $415,915, did not rise in 1906 in the same ratio, owing to the fact that in Bengal the mica now being mined is of very inferior quality. Present production is chiefly confined to Bengal and Madras, but 2760 cwt. were produced in the Ajmere district of Rajputana during the year. Mica of fair quality has also been reported to occur in the Kishengarh State of Rajputana, but does not appear to have been mined as yet. The prevailing prices of mica in Calcutta ranged during 1906 from $1.78 per pound for one shipment of clear ruby down to 13c. per pound for shipments of stained ruby.

It is reported in *Coal and Iron* (Jan. 23, 1907) that Cumberland coal miners from England are going to Vancouver, B.C., in large numbers to work in the mines there, the mine owners having advanced their [illegible]

Personal

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Dr. R. W. Raymond sailed for Jamaica, Feb. 16. He will be absent until about the middle of April.

Benjamin B. Lawrence has been chosen vice-president of the British Columbia Copper Company.

Ellsworth Daggett, mining engineer, of Salt Lake City, Utah, has been visiting in New York this week.

Hudson H. Nicholson, of Chicago, passed through Denver recently on his way to Nevada on professional business.

Col. W. C. Greene has resigned from the presidency of the Greene Consolidated Copper Company, being succeeded by W. D. Thornton.

J. B. Ferguson of the Western Oil and Coal Consolidated Company, of Canada, has gone to England in the interests of the company.

Washington B. Vanderlip has left Nevada, where he has been making mine examinations, for Butte, Mont., on professional business.

T. I. Crane, of Pilling & Crane, Philadelphia, has sailed for Cuba on business connected with iron-ore deposits owned by the firm on the island.

H. Vincent Wallace left Nogales, Arizona, last week for Guanajuato, Mexico, on professional business. From that place he expects to go to Durango.

Henry Harris, who has been assistant superintendent at the works of the Hall Mining and Smelting Company, at Nelson, B. C., has resigned that position.

L. W. Trumbull, of Laramie, Wyoming, has returned from the Missouri zinc district, where he has been examining a mining property on behalf of Pittsburg clients.

Edward S. Wiard, of Wiard & Brown, mining engineers, of Denver, Colo., is at present in Mexico, on business connected with the American Smelters Securities Company.

Edward A. Nis has completed his professional work at Greenwater, Cal., and is on his way to San Juancito, Honduras, to take the position of mine superintendent for the New York & Honduras Rosario Mining Company.

H. Z. Bixler has tendered his resignation as chief engineer of the Republic Iron and Steel Company, to take effect March 1. Since his promotion to that position he has had charge of the building of the rail mill, two new furnaces, and other work in the vicinity of Youngstown, Ohio.

Samuel W. Traylor, of New York, consulting engineer for the Tri-Bullion Smelting and Development Company, left this week for a trip to the mines at Magdelena, N. M., with the object of perfecting plans in connection with the operations of the company. The company intends to build large smelting works.

Dr. Howard T. Barnes has been appointed to the chair of physics in the faculty of applied science, at McGill University, Montreal, recently vacated by the resignation of Dr. Ernest Rutherford. Dr. Barnes graduated at McGill in 1893; he became assistant professor in physics in 1902, and associate professor in 1906.

Edgar A. Collins, who has been in charge of the Combination Mines Company's property, at Goldfield, Nev., as superintendent, since the purchase of the property, in 1903, has resigned, to take effect on March 1, when the active control of the property is taken over by the Goldfield Consolidated Mines Company. Mr. Collins has accepted the superintendency of the Montana Tonopah Manufacturing Company, at Tonopah, Nev., and will enter upon his new duties very shortly.

Obituary

T. Burrell Bewick, mining engineer, of London, died recently at the age of 50. He was the son of T. J. Bewick, the founder of the firm of Bewick, Moreing & Co. He retired from that firm a few years ago.

John Ryan, who has been for some time in charge of the mining interests in Mexico owned by his father, Patrick Ryan, of Salt Lake, Utah, died at Guadalajara, recently, after a brief illness. He was 27 years old.

Industrial

Rapid work in blast-furnace construction was accomplished by the Carnegie Steel Company in rebuilding stack No. 3 of the Duquesne group of furnaces, which was recently blown in after just 53 days of idleness. During that time the furnace was completely rebuilt. When the furnace was blown out it had been in continuous operation from the time that it was built four years ago.

In addition to building a new blast furnace at Lorain the National Tube Company will reconstruct furnace No. 2, giving the company two new furnaces out of the appropriation allowed it by the United States Steel Corporation. Work on the new furnace, which will be known as No. 5, is well under way. The National Tube Company has also started work on its new galvanizing plant in Lorain, Ohio.

The business hitherto carried on by John A. Caldwell, New York, in fuel-saving devices, has been merged into the Sarco Fuel Saving and Engineering Company. This company has been incorporated under the laws of New York, with a capital of $100,000, to take over the American interests of Sanders, Rehders & Co., Ltd., of London and Manchester, England, and to manufacture on this side their various apparatus. Offices will be in the West Street building, New York. Mr. Sanders, chairman of the above-named firm, is the president, and Mr. Caldwell general manager.

Societies and Technical Schools

Minnesota School of Mines Society—H. V. Winchell, geologist for the Great Northern Railway Company, delivered an address before this society Feb. 14, his subject being: "The Geological Department of the Amalgamated Copper Company."

Engineers' Club of Philadelphia—At the regular meeting, Feb. 16, a paper was read by Howard W. DuBois, on "Hydraulic Gold Mining in British North America." The paper was fully illustrated by lantern slides, and its presentation was followed by the exhibition of a large number of colored slides showing the scenery and characteristics of the country.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Ingersoll-Rand Company, 11 Broadway, New York. Catalog No. 46. Rand Rock Drills. Pp. 84, illustrated; paper, 6x9 in.; 1907.

The Risdon Iron Works, San Francisco, Cal. Catalog No. 17. Gold Dredging Machinery. Pp. 59, illustrated; paper, 7x10 in.; 1906.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1407. The Bennetts Pouring Spoon. Pp. 4, illustrated; paper; 8x10½ in.; January, 1907.

Construction News

Quinnimont, West Virginia—Coal-mining machinery will be needed by the Export Coal Company, which is preparing to open a mine. J. E. Beury, Charleston, W. Va., is president.

Colfax, Washington—The Gold Bug Mining Company is preparing to put in a hoist and drilling plant. L. F. Smith is president, his address being Colfax, Whitman county, Washington.

Cartersville, Georgia—Arrangements are being made to work manganese mines near this place. Machinery for mining and concentrating will be needed. J. C. Mallonie, Box 305, Savannah, Ga., is manager.

Nicholasville, Kentucky—Parties representing the Pittsburg Barytes Company have purchased property and propose to put up plant for mining barytes and preparing it for market. W. J. Wyman, Honaker, Va., is manager.

Special Correspondence

San Francisco Feb. 20

Although the supervisors of Sutter county, and the executive committee of the Anti-Debris Association have decided to bring suits against the dredging companies at Oroville, Butte county, the supervisors of Yuba county have taken no steps in that direction. The dredge operators have appointed a permanent committee to represent their interests in future controversies, consisting of J. H. Leggett, Karl Krug, Chas. Helman, G. J. Carr and J. J. Hamlyn. An engineer of the Anti-Debris Association and a representative of the Sutter county supervisors have been in the Oroville field recently, and it is expected that after they have carefully examined the conditions a conference will be held with the dredge operators. It is probable that the differences will be settled without bringing them into court.

There will be no appeal by the Home Mining Company against the decision of the court in favor of the Champion Mining Company of Nevada City. The Champion has acquired the Home Company's holdings, paying a small amount therefor. The Champion Company now owns three miles of mining ground at Nevada City, including some 15 or 16 quartz claims. The Champion was awarded $25,000 damages by the recent decision and the Home people thought best to give up and sell out, instead of carrying on further litigation.

M. J. Cooney, formerly of South Africa, is prospecting for diamonds about two miles north of Oroville, Butte county. He has had a few men at work for some time and has been engaged in the operation for over 18 months. Several diamonds were found where the ground was hydraulicked years ago for gold. Had the overburden of 20 to 60 ft. of gravel boulders not been washed off there would have been no visible indication of diamondiferous material as the bedrock would of course still be hidden. Finding the ground favorable in appearance he sunk 50 ft. and came on to "blue" which he asserts is identical in appearance with that of the South Africa mines. He has found numerous "chips" or small diamonds and says there is a record of two diamonds one of which weighs 1½ carats and the other ½ carat, from this locality. Mr. Cooney has found menasconite, olivenes, zircons, spinels, garnets, etc. With few exceptions the crystals sieved from this locality are small. The piece of ground taken up is some 50 acres in extent, and is the washed-off bedrock of an old hydraulic mine. Some 1400 cu.yd. have been taken out ready for washing. This is entirely a private enterprise, and merely a prospecting one, though the indications are favorable.

Activity in the new copper camp of Hartoum, near Needles, San Bernardino county, is said to be increasing with many new strikes reported. On the Amors mine, where a ledge more than 15 ft. wide with rich surface outcroppings is in evidence, a shaft is to be sunk. Several leases are to be made soon.

In the Blue Ledge district in Siskiyou county, on the Oregon border, some 500 men are now at work in the mines or on wagon roads. The district is quite large and lies 40 miles from Yreka and an equal distance from Medford, Oregon. The Siskiyou county supervisors are building a trail, to be widened into a road, from Oak Bar to Hutton, the principal settlement in the district. The ores are of copper, carrying some gold and silver, and there are six mines which development has proven to be of value, and there are also numbers of prospects.

The Mountain Copper Company has changed its plan for building a railroad from the Hornet mine to the Boulder Creek station on the Iron Mountain leading to the smelter at Keswick. The entire branch will be built for locomotive traction. Originally it was designed to build an electric road from the mine down the mountain to a point 400 ft. above the terminus of the spur to be built up Boulder creek. Ore was to be dumped down a chute from the road to the Iron Mountain. It has now been decided to build the railroad direct from Boulder creek to the Hornet and operate it throughout by steam. The Hornet has a larger body of copper ore than has the Iron Mountain mine, but it is of lower grade. It is to smelt this low-grade ore that the smelter at Keswick is being rehabilitated.

Salt Lake City Feb. 22

At a meting of the directors of the American Flag Mining Company operating at Park City, G. H. Rathman, of Sioux City, Ia., was elected president to succeed the late T. F. Singiser. J. H. Keene, of Chicago, was added to the directorate.

Dividends have been ordered by five Utah mining companies for payment this month, as follows: Grand Central, $15,000; Victoria, $10,000; Beck Tunnel Consolidated, $40,000; Utah, $3000; Century, $3000. Plans are well advanced looking toward a consolidation of the Star Consolidated and Black Jack mines in the Tintic district. It is proposed to organize a new company with 1,000,000 shares; 800,000 shares to be divided equally among the shareholders of each company, with the balance to go into the treasury. It is understood that Jesse Knight, of Provo, will be elected president of the consolidated company.

There are two Bingham consolidations being arranged. One between the Bingham Central and Bingham Standard Copper companies, which will give the merger company about 500 acres of mineralized territory, near the Boston Consolidated, Utah Consolidated, and Bingham-New Haven mines. The Copper Glance and Illinois mining companies also propose to join issues, and a new company formed to be known as the Bingham Amalgamated Copper Company. Samuel Newhouse will be president of the new concern, of which the Standard and Bingham Central properties will form the basis.

A syndicate of Salt Lake mining men have organized the Red Metal Mining Company, which will develop a property recently acquired by the promoters in the Walker River Indian reservation country, in Nevada. The officers are: Lemuel U Colbath, president; W. J. Craig, vice-president and manager; who, with W. R. Wightman, William Pischel, and Dr. John T. White, are directors. Alex. Colbath, of Salt Lake, is secretary.

A strong syndicate of Salt Lake mining men and capitalists has completed the organization of the Yerington Consolidated Copper Company, with the Copper Deposit and Copper King groups of claims in the Yerington, Nevada, district, as the basis The capital stock is 1,000,000 shares of the par value of $5 each. The officers are: Frank J. Hagenbarth, president; Windsor V. Rice, vice-president; Walter C. Orem, treasurer and manager; J. H. Turner, secretary; who, with E. A. Wall, John Dern and William Keyting are directors.

Official announcement has been made of an agreement having been reached between the American Smelting and Refining Company, and the 400 odd farmers who appeared as plaintiffs in the smelter smoke cases, tried in the Federal court, and which resulted in a decree of court prohibiting the treatment of any one or combination of ores containing an excess of 6 per cent. sulphur. Accordingly, the court will be asked for a stipulation modifying the decree of the court to meet the condition upon which the late contention has been settled. The smelter people have shown to the satisfaction of the farmers that the fumes can be arrested through the interposition of a system of bag houses and cooling chambers. The company, however, will compensate the farmers who were plaintiffs in the smoke cases to an amount aggregating $60,000, whenever they conclude the signing of smoke easements to their lands. With the foregoing program carried out the lead smelter at Murray will continue in operation. It is understood that officials of the United States Smelting Company are endeavoring to come to a similar understanding with the farmers.

Considerable interest is being taken in the development of the antimony deposits of Garfield county, and several shipments of ore have been made to California. The mines are situated about 60 miles south of Marysvale, the southern terminus of the Rio Grande Western Railroad, in Utah.

Denver Feb. 23

The new mill of the Camp Bird mine near Ouray, which was completed a short time ago, is evidently doing some model work. During the month of December, which was the first month that it was in full operation, nearly 7000 tons of ore were treated, the value of the bullion and concentrates amounting to $271,568, nearly 80 per cent. of which is reported to have been clear profit. A large amount of high-grade ore was milled, which had accumulated during the construction of the plant, and the average amount of profit in the future cannot come up to the above figure.

A strong effort is being made by interested parties to secure an appropriation for a geological survey for Colorado.

The Denver & Rio Grande system may before long be run by electric power. Investigations are being made in regard to the feasibility of the project. The probability is that the experiment will be made between Denver and Pueblo first.

From present appearances San Juan and Ouray counties will before long become large producers of copper ores. The former county is credited with over 4,000,000 lb. of copper last year and the development in that line has only just commenced. The Red Mountain district promises especially well and an active season is probable in that vicinity.

The trial which is at present in progress in Idaho of the alleged murderers of Governor Steunenberg is being watched with a good deal of interest in this State. Last Sunday a large meeting was held at Miners' Union Hall at Victor, in the Cripple Creek district, in sympathy with the three prominent members who are accused of participation. No disturbance took place. The minority opinion of Justice McKenna, of the United States Supreme Court, in regard to the alleged illegal extradition of Moyer, Haywood and Pettibone, was read and a resolution denouncing the action of the governors of Colorado and Idaho was adopted.

An important meeting of the tunnel board for the construction of the new drainage project in the Cripple Creek district was held in Colorado Springs, Feb. 21, and a committee, composed of President Bernard, Frank G. Peck and F. F. Costello, was appointed to purchase the necessary machinery and commence operations at once. A cash assessment of $40,000 was levied on the subscribers. Up to date the total amount of subscriptions for this great enterprise is $400,000, which is expected to complete the bore to the contact.

Scranton

The Conciliation Board, this week, ordered the strikers at the Morea colliery, of the Dodson Coal Company to return to work before their grievances were considered. The men, without filing any [illegible] and presented the company from securing other employees. The matter came before the board upon the complaint of the company that their employees, including firemen and others necessary to protect the property, had quit without giving notice. The board went on record as stating that the action of the men was in direct violation of the terms of the award of the commission and calling upon them to return to work and to file their grievances within five days after doing so. The representatives upon the board mentioned that they did not think that the men would obey the order.

The board also went on record in declaring that it had the right to adjust and make rates of compensation for collieries which were opened after the date of the award of the commission, this action being taken in connection with the grievances of the employees at the Mary D. colliery of the Wentz Coal Company.

The report of Mine Inspector P. J. Moore, for the first anthracite district for the past year shows a decrease of 50 per cent. in the fatalities. The synopsis of the reports of the entire region, for the year, shows that there were 87 less fatal accidents than in the previous year. Falls of coal are given as the cause of most of these accidents. The decrease in the number of accidents is attributed to greater care in safeguarding the miners; the establishment of first-aid societies and the demand by the employers upon the men to observing more strictly the mining laws.

Toronto, Ont. Feb. 25

The official returns of the Timiskaming & Northern Ontario Railway of the shipments of Cobalt ore for the week ending Feb. 16 were as follows: Trethewey, 179,648 lb.; Nipissing, 101,585; Nova Scotia, 30,000; O'Brien, 64,000; Total, 375,233 lb.

A large number of Cobalt companies have recently ordered machinery. In all 56 plants have been put in or are under order since last spring. Recent orders for plants have been placed by the Victoria Cobalt, the Hunter Cobalt, the Buffalo, the Nancy Helen, the Provincial mines, the Kerr Lake (Jacobs) and others.

The North American Refining and Smelting Company has decided to build its plant at Thorold, on the Welland canal, where a suitable site has been secured. The plant, which will have a capacity of from 25 to 40 tons daily, will cost $250,000.

At the annual meeting of the International Portland Cement Company at Hull, P. Q., Feb. 19, the president, Sir Sandford Fleming, presented a report showing that the orders received last year called for twice as much cement as could be supplied. During 12 months the net earnings were $261,953 or over 26 per cent on the capital. A resolution in favor of the enlargement of the plant was adopted.

London Feb. 16

The report of the Exploration Company for the year 1906 exhibits an unfortunate recurrence of the necessity for writing down the value of the assets which has characterized the history of the company before. Four or five years ago the company went through an acute crisis of this sort, which was duly recorded in your columns at the time. The only way to get rid of the incubus of depreciating investments, and to put the concern on its legs again was to split the company into two parts, one of which should acquire the assets of doubtful value, and the other the satisfactory investments. This was accordingly done just three years ago, and the new Exploration Company then launched. The first year's profits were £30,000, and the second £67,000, so things were beginning to look much brighter. The report for the third year of its new life, 1906, has thrown quite a damper on its progress, for though a profit of £97,973 was realized, yet it has been found necessary to write down the profit and loss account by £98,726 on account of the serious depreciation of the company's South African holdings. The total profits of the three years amount to about £195,000, and the losses to £98,726. Out of the net profit dividends at the rate of 5 per cent. on the capital, £750,000, were paid during the second and third years, absorbing £75,000, and leaving £22,000 as balance to be carried forward to the year 1907. The directors are naturally hopeful that the South African holdings will improve again. The most promising part of the Exploration Company holdings are the Mexican properties such as El Oro, Somera, etc., and the American copper properties that it has recently acquired interests in. Let us hope that the company will easily recover from this second setback.

Le Roi No. 2, Ltd., has done remarkably well during the past year, as disclosed in the official report for the year ended Sept. 30 last. A profit of £41,600 was made, after all expenses were paid, and £16,000 allowed for exploration work and depreciation. The year commenced with £20,700 on hand, so that there was £62,300 available for distribution on September 30. Out of this £31,500 has been distributed as dividend and £30,800 carried forward. The mine is still producing well, and the recently discovered lode is promising. It is deemed prudent, however, to look for other properties, as the mine, though containing much ore, is not one of permanent promise. An option has been acquired on the Vancouver mine, at Slocan and the company has taken an interest in the Cloncurry Syndicate, which is the parent of the Queensland Exploration Company. The development of copper properties in North Queensland is arousing interest here, of which more on a subsequent occasion.

General Mining News

Lake Superior Iron Ore Shipments.—The rail shipments of iron ore from the Lake Superior region, now completely reported, exceeded all the estimates, having been 1,008,544 tons in 1906, against 876,552 in 1905, and 596,175, in 1904. The total shipments, by ranges, were as follows for two years' past, in long tons:

Range	1905	1906	Changes	
Marquette	4,210,522	4,056,187	D.	154,335
Menominee	4,495,151	4,109,088	I.	613,937
Gogebic	3,595,207	3,641,285	I.	63,222
Vermillion	1,027,180	1,292,456	I.	116,169
Mesabi	20,330,680	23,592,282	I.	3,639,083
Baraboo	111,891	128,742	I.	17,391
Total	34,356,456	38,522,140	I.	4,168,085

The total increase was 12.1 per cent. The figures do not include the ore from the Michipicoten range in Canada, which was 121,555 tons last year. The proportions of the total furnished by the different ranges in 1906 were: Marquette, 10.5 per cent.; Menominee, 13.3; Gogebic, 9.5; Vermillion, 4.6; Mesabi, 61.8; Baraboo, 0.3 per cent.

ARIZONA

Yavapai County

Humboldt & Verde Valley Railway—James H. Purdy, the promoter of this company, states that the necessary capital is assured, and that preliminary work will be commenced soon. The proposed line extends from Humboldt to the Verde Valley, and passes through a rich mineral country.

Logan Copper Company—This company has temporarily abandoned work on account of the increased flow of water. As soon as the necessary machinery can be installed it will resume work.

New England-Arizona Gold and Copper Company—This company will resume operations soon. It has been shut down for over a month for the purpose of installing a steam hoist and other machinery.

Triangle Mines Company—This company has resumed operations at its mines at McCabe, after a shut-down of about two months.

ARKANSAS

The preliminary report of Martin Rafter, State mine inspector, shows that 1,971,144 short tons of coal were mined in 1905, and 1,875,569 tons in 1906; a decrease of 95,575 tons. There were 4411 men employed, of whom 3027 were miners. The average time worked was 154 days. The average coal mined per employee was 447 tons for the year. The average daily tonnage per miner was 4.02 tons. The number of men killed during the year was 11, being 2.49 per 1000 employees; or 0.016 per 1000 days' work.

CALIFORNIA

El Dorado County

El Dorado Water and Deep Gravel Company—This company has been for some time doing underground work in the Excelsior drift mine, and some 6000 ft. of drifts have been run. The work has proven the value of the property, which was formerly a hydraulic mine, and it is now to be rehabilitated. A new 10-stamp mill to be run by water power, has just been completed. The main tunnel is in 3000 ft., where a fine body of gravel is found. A. Baring-Gould is superintendent.

Inyo County

Ubehebe District—The properties in this district recently bought by John Salsbury, are to be shortly transferred to Eastern men. The Mairs property of seven claims is under bond to Haywards & Pugh, of Goldfield.

White Mountain Mining Company—This company, which recently acquired the Roberts property at Pine Mountain, near Laws, has let a contract for a 600-ft. tunnel to tap the third ledge. They have a team haul of 16 miles to Laws, but will begin shipping ore as soon as the Bishop-Goldfield road is free from snow. It is learned that the price of the property was $90,000.

Mariposa County

Mount Gaines—This mine at Hornitos was at one time a large producer. It is being reopened by Los Angeles men.

Nevada County

Antimony—Robert Johnson has found on his ranch, seven miles south of Grass Valley, a deposit of antimony ore.

Greenman—A bad cave at the top of the shaft of this mine, Canada Hill, Nevada City, admitted the water from Little Deer creek, and the mine is again flooded. It is only a short time since the mine was unwatered and shaft sinking was about to begin.

Orange County

Santa Ana Tin Mining Company—This company, at Trabuco cañon, is about to build a smelter which is to be operated by some new process.

Silverado Cañon—Los Angeles men have filed on and recorded 35 mining claims in this district.

COLORADO

Lake County—Leadville

Ibex—Over 200 lessees are at work on the Little Jonny, employing 450 men, and with few exceptions all are shipping ore. The property is being worked from No. 1 to No. 4 shafts, and rich ore is frequently encountered in places where it was thought no ore existed; during the week four different sets of lessees opened pockets of such ore. Some interest is being taken in the lease worked at the 1300-ft. level of No. 4 shaft, which is in a fissure country. When the lessees started to work they drifted to the south 150 ft. following at first a small streak of ore that ran high in gold; this widened out to 5 ft., but so low grade that it could not be shipped. An upraise was started about the middle of the drift and carried up for 40 ft., when a streak of ore on the hanging wall was opened about 4 in. wide and at first carried values amounting to 5 oz. gold, 37 oz. silver and 5 per cent. copper; since then the values in gold have increased and the silver and copper values are the same. Alongside of this streak are three others about the same width that run $40 per ton, and the balance of the vein about 3½ ft., is still low grade.

Yak Tunnel—The big bore is being gradually driven ahead into the South Evans country to connect with the Ollie Reed. Arrangements are on foot to have the tunnel driven to the New Monarch group of claims, and, when perfected, three shifts will be put on and the tunnel driven as quickly as possible.

New Monarch—The ground in the Cleveland shaft is changing with the opening of a body of ore, and the progress made is more satisfactory. The ore now covers the whole of the shaft; in character it is lead sulphide and will run in the neighborhood of $20 per ton. From its general appearance and the trend it is a different shoot from that found in the Winnie; no work will be done on it until the shaft is sunk the extra lift, then it will be thoroughly developed.

Breece Hill—This section of the district is shipping more ore at present than it has done for a number of years, and the ore is all of good grade. Several months ago the parties who had a lease on the Elk, adjoining the Little Jonny to the south quit, as they were unable to make it pay. Two months ago Leadville men took hold of it, installed a good plant of machinery and started work from the lower level. Last week a large body of ore was found and shipments are going out at the rate of 30 tons daily.

MARYLAND

Allegany County

Maryland Coal Company—This company's report for the year 1906 shows 209,350 tons coal mined; 188,709 tons from the company's mines in Maryland and 20,641 tons from those in West Virginia. The total is a decrease of 35,344 tons from 1905. The net profits for 1906 were $155,630, from which dividends amounting to $150,776 were paid, leaving $4854 to surplus account.

MASSACHUSETTS

Norfolk County

For years there has been talk of the presence of gold in the rock ridge in the southeast part of the town of Wrentham, near the Rhode Island line. Stringers of quartz are found in the granite, which carry some iron pyrites, and assays have

with the pyrite. A syndicate composed of people from Providence and Pawtucket, R. I., has taken options on some land on the ridge and is erecting a plant, consisting of crushers, rolls and cyanide tanks, to work the rock. No exploration work seems to have been done, beyond sampling the outcropping quartz stringers.

MICHIGAN

Iron River Range—Iron

Rolling Mill—This mine, under operation by the Jones & Laughlin Company, is being opened rapidly. Four drifts are being extended from the bottom of the shaft, which is 643 ft. deep. The drifts are going east, west, south and north, respectively, and all have encountered ore. Each is upward of 300 ft. long, and will be continued to a length of 400 ft. before the season of navigation opens. Two drifts are already opened into the main orebody. The shaft will be sunk to greater depth and additional levels opened later in the season. The new hoisting plant is working satisfactorily, and the new air compressor will be ready to go into commission in two weeks. A spur 1000 ft. long is being extended to the property by the Lake Superior & Ishpeming Railroad.

Jackson—The Cleveland-Cliffs Iron Company is making good progress with the improvements it has under way at this property, where two open pits are to be operated during the coming summer. The water is nearly all out of the old pit west of the tram-road, and rapid progress is being made in the construction of the shaft house and trestle. A crew will be put to work as soon as the water is out, cleaning out the bottom, laying rails, etc., so that mining operations can be started as soon as the shaft-house is completed. The trestle will be 700 ft. long, extending to a spur being put in by the Lake Superior & Ishpeming Railroad at the South Jackson location. The ore will be raised from the pit in skips, dumped into cars at the shaft-house, and trammed by power to the pocket at the spur.

MONTANA

Butte District

North Butte—The ore production of North Butte was 5000 tons less during January than in December, but only first class was mined and the gross proceeds and net profits were greater than in any one month since the company was organized.

Coalition—Two bodies of ore have been discovered recently in the Minnie Healey mine, owned by this company—one by way of a crosscut from Boston & Montana property at a depth of 1400 ft., and the other by Red Metal, the operating company, at another point, 1300 ft. deep.

Anaconda—The company has struck a body of high-grade ore in one of the lower levels of the Mountain Consolidated mine and is developing it. The company is now operating all of its mines, having resumed full blast in the Neversweat, Feb. 10. Its railroad car service is now good.

Boston & Montana—The company is now mining its customary quantity of ore, but is operating only three of its five blast furnaces at the plant. Cause, coke shortage.

Butte Lode Extension—This is a new company, organized to operate the St. Angus group of four claims 12 miles northeast of Butte. Its officers are: President, John MacGinniss; vice-president, Charles S. Warren; secretary, John M. Murphy; treasurer, C. J. Kelly. These men and Joseph Russell are the directors. The company has opened a body of copper ore at 90, 120 and 150 ft. in the St. Angus and will add 150 ft. to the shaft and crosscut the veins, two, at the bottom. The veins have an east and west course, and the property is located in the section in which Walter Harvey Weed, of the Geological Survey, predicted that a continuation of the veins of Butte would be found.

NEVADA

With the view of remedying some of the evils arising from the Southern Pacific's monopoly of the railroad systems in Nevada, the State senate has under consideration a railroad-rate bill which has been introduced by Senator Payne, of Esmeralda. The bill limits freight rates to 3c. per ton-mile in all cases, a minimum charge of 35c. per ton on short hauls being allowed. Passenger rates are limited to 3c. per mile.

Esmeralda County—Goldfield

Frances-Mohawk—The shaft is now approaching the water zone at a depth of 290 ft. The ledge at that point continues to assay from $15 to $25 per ton, but the ore is beginning to carry heavier sulphides.

Rochester—The shaft in this property has recently penetrated country rock which carries stringers of quartz. Some of this quartz is highly auriferous.

Florence—The Goldfield Leasing syndicate has erected a new hoist on its lease. The shaft has been sunk to 170 ft. and will be sunk deeper.

Nye County—Tonopah

Ore Shipments—Shipments over the Tonopah Railroad for the week ending Feb. 14 were: Tonopah Company, 1381; Montana Tonopah, 436; Tonopah Midway, 213; West End, 44; Tonopah Belmont, 250; Tonopah Extension, 300; total, 2624 tons. Additional shipments were 30 tons from Lone Pine and 2600 tons from Goldfield, making a total of 5254 tons.

PENNSYLVANIA

Anthracite Coal

Anchor Coal Company—This company is sinking several slopes at the Anchor colliery, Heckerscherville valley, to determine whether the method adopted to quench the mine fire is successful. For the past four months the company has been boring holes and filling them with silt, believing that the crevices are thus made practically air-tight, and smother the fire.

SOUTH DAKOTA

Lawrence County

Henry Roos—The most important strike for some time was made on this ground when a 30-ft. vein of copper rock, showing up well in the pan, was crosscut in the tunnel. The second wall has not yet been encountered and it is impossible to tell how much wider the vein may be. The vein matter consists of red slate, streaked with white quartz and carrying a quantity of iron pyrites. The vein runs with the formation.

Pennington County

Coats Tin Property—A deal has just been closed whereby this property, consisting of over 100 acres, was sold to Frank B. Cook, of Philadelphia, for $5000. This claim was considered one of the most valuable of the tin properties. The new owners will put a force of men at work early in the spring.

Mica—A mica factory which will give employment to from 60 to 75 people will be installed in Keystone. In will handle about 5 tons of mica a day. Several other properties will also furnish material. The mica will be trimmed, sorted and prepared for shipment.

UTAH

Morgan County

Carbonate Gem—This company is installing new mine equipment, and will begin regular shipments of lead-silver ore soon. H. A. Van Patten, of Ogden, is manager.

Carbonate Hill—This property has developed into quite a large producer of lead-silver ore. The principal ownership is vested in John A. Creighton and John M. Daugherty, of Omaha, Neb. Col. M. A. Daugherty, of Salt Lake, is manager.

Salt Lake County

New England Gold and Copper—This Bingham company has begun the enlargement of its mill, and the installation of new slimes equipment through which it is expected that a closer saving in the tailings will result. The present extraction is about 87 per cent.

Bingham New Haven—The management of this Bingham mine is having new ore bins built to meet present needs, as a consequence of the striking of a large orebody in the lower tunnel. This orebody has not been cross-cut for the reason that it has been necessary first to provide means for taking care of the ore. No definite plans regarding the construction of a smelter have been announced.

Foreign Mining News

CANADA

ONTARIO—COBALT DISTRICT

Amalgamated Cobalt Mines—A large amount of preparatory development work has been done on the location, which is centrally situated near the Trethewey and other leading mines. A shaft has been sunk between two veins, and is now 100 ft. down. When the 150-ft. level is reached crosscutting will be done to tap both veins. A 60-h.p. boiler, four-drill compressor and a steam hoist have been put in and 16 men are at work. A. L. Fowler, superintendent, is in charge. The company is also sinking a shaft on a calcite vein to the north of the Silver Leaf property.

Cobalt Chief—This property in the Portage bay extension, Cobalt, was formerly known as the Moore & Hare claim and has lately changed hands. Active operations have been pushed under the direction of Superintendent J. T. Fee. A shaft is being sunk at the junction of the main vein and another vein crossing it, and is down 30 ft., with promising results. A shaft-house and powder-house have been erected and a Rand-Jenckes steam plant installed.

ONTARIO—MANITOU LAKE

Laurentian—A visit of inspection to this mine, Manitou lake, and other valuable properties in the district recently acquired by the Hugo von Hagen Exploration Company, of New York, was recently made by Dr. Hugo von Hagen, president of the company, J. T. Kirby, of New York, and Anthony Blum. The object was to make arrangements for development.

MEXICO

COAHUILA

Mexican Coal and Coke Company—On Monday evening, Feb. 18, a violent explosion occurred in this company's shaft No. 7, at Las Esperanzas, killing 50 men. In addition 11 men were saved, all badly injured. Edwin Ludlow, the general manager, had gone to South McAlester, Ind. Ter., just before the accident.

AFRICA

TRANSVAAL

Gold production in January was 537,638 oz. fine, or $11,112,977; an increase of 89,000 oz. as compared with January, 1906. During the month there was an increase of 2336 Kafir laborers employed. The total number at the close of the month was 83,567 Kafirs and 53,828 Chinese.

RHODESIA

Gold production reported in January was 47,048 oz. bullion, an increase of 3695 oz. over January, 1906. The bullion reported this year was equal to 41,873 oz. fine gold, or $865,515 in value.

NEW CALEDONIA

Exports of minerals from the colony are reported by the *Bulletin du Commerce*, of Noumea, as below, in metric tons, for the full year:

Nickel ore	[illegible]	[illegible]	I. [illegible]
Cobalt ore	[illegible]	[illegible]	D. [illegible]
Copper ore	[illegible]	[illegible]	[illegible]
Chrome ore	[illegible]	[illegible]	I. [illegible]

There were increases in all items, except cobalt ore, which shows a heavy decline.

Coal Trade Review

NEW YORK, Feb. 27

No change in the coal markets in the West is reported, except that there is some improvement in transportation conditions. This is not great, but operators are ready to welcome even the slightest change for the better.

In the East the markets are generally quiet, the cold spell showing signs of passing over too soon to have any permanent effect on the demand for domestic coal. Steam and gas coals are in steady demand, and there is no over-supply. In fact, there is almost a scarcity of anthracite steam sizes in the seaboard cities.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Feb 16 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	684,600	660,884	D. 23,806
Bituminous	4,846,080	4,794,401	D. 51,679
Coke	1,670,982	1,765,145	I. 94,163
Total	7,201,752	7,220,430	I. 18,678

The gain so far this year has been entirely in coke.

The coal and coke traffic of the Norfolk & Western Railroad for the full year is reported as follows, in short tons:

	Coal.	Coke.	Total.
To Line points	[illegible]	2,109,453	10,493,102
To Tidewater	2,983,140	162,341	3,065,461
Total	11,286,709	2,271,794	13,558,503
Total, 1905	10,206,916	2,406,459	12,613,375

The total increase last year was 945,188 tons, or 7.5 per cent. Of the total tonnage in 1906, there was 22.6 per cent. carried to tidewater, and 77.4 per cent. delivered to points on the line of the road.

Receipts of coal at Chicago for the full year, with shipments to other markets, are reported as follows:

	Received.	Shipm'ts.	Balance.
Anthracite	[illegible]	[illegible]	[illegible]
Bituminous	10,758,318	2,772,594	7,984,724
Coke	[illegible]	[illegible]	[illegible]
Total	12,495,719	3,573,164	[illegible]
Total, 1905	[illegible]	[illegible]	8,137,672

The balance represents, approximately, the consumption of the city. The bituminous receipts were from the following sources: Pennsylvania, 925,237 tons; Ohio, 856,833; West Virginia, 914,420; Indiana, 2,961,926; Illinois, 4,968,102 tons.

The coal tonnage of the Baltimore & Ohio Railroad for the full year was as follows, in short tons:

	1905.	1906.	Changes.
Anthracite	[illegible]	[illegible]	D. [illegible]
Bituminous	[illegible]	[illegible]	I. [illegible]
Coke	[illegible]	[illegible]	I. [illegible]
Total	[illegible]	[illegible]	I. [illegible]

The total increase in 1906 over the previous year was 12.8 per cent.

New York Feb. 27

ANTHRACITE

There is very little to report concerning the situation in the anthracite market; demand continues strong and producers report that they are able to take care of their orders for prepared sizes, but that the demand for small steam sizes is far in excess of the supply. The local retail dealers are busy, but their profits have been materially cut down on account of the heavy hauling and the injury to horses on account of the recent storms. Prices remain unchanged at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are quoted nominally at $3 for pea, $2.25@2.50 for buckwheat, $1.50 for rice, $1.40 for barley; all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade is moving quietly, cleaning up the balance of coal on old contracts. There is some demand from out-of-the-way points to get cargoes on the way as soon as ice conditions will permit. Contract prices have not yet been named. The embargo of the Pennsylvania Railroad on all shipments of soft coal is being felt in the shortage of coal for the moment at New York harbor ports. This condition has been shown by a stiffening of prices, which are today $2.75 f.o.b. New York harbor shipping ports, for fair grades of steam coal.

Trade in the far East is nearly all old contract business; the loading and discharging clause on bills of lading is preventing shipments at this time, there having been several cases where vessels took so long to load on account of the badly frozen condition of coal in the cars that by the time the vessel was loaded the time allowance had been used up and the vessel was on demurrage. The loading and discharging clause has been the cause of severe criticism recently on account of the failure of vessels to arrive at the date promised. It has been suggested that allowance should be made for loading and unloading when a vessel fails to arrive as per schedule.

Trade along the Sound has been using a fair amount of coal. New York harbor trade is short of coal at the present time on account of the embargo, but this is not serious. All-rail trade shows a little demand, with prices strong. Transportation from mines to tide is fairly good; car supply is dependent upon main-line roads, the Baltimore & Ohio furnishing from 10 to 25 and the Pennsylvania from

wise vessels are in sufficient supply for all demands. Philadelphia quotes freight rates to Boston, Salem and Portland at [illegible] charging clause included.

Birmingham Feb. 25

[illegible] slowly, as the railroads begin to furnish [illegible] 10 miles long is under construction to reach undeveloped coalfields. Development will also be pushed in Tuskaloosa county and in the lower part of Jefferson county. In Walker county there is considerable investigation being done. The Birmingham Iron Company has experts at work drilling for veins of coal in the southwestern part of Jefferson county on the line of the new Atlanta, Birmingham & Atlantic Railroad.

Coke is still in demand and a high price is obtained. A hearing on the new mining law is given by the legislative committee [illegible] Birmingham.

Chicago Feb. 25

[illegible] coal market continues weak and there has been much coal on tracks in the last week that was sold at a sacrifice. Efforts are being made to restrict shipments from the mines of Illinois and Indiana, but it will take a week to clear the accumulation on tracks.

Anthracite business from now until April 1 will be in small lots. Chestnut is scarce, most orders being filled by all-rail consignments. Other sizes are in [illegible] supply at the dock yards.

The demand in Illinois and Indiana coals is mostly for run-of-mine. Lump and egg sell for $1.75@2.65, run-of-mine for [illegible] and screenings for $1.25@1.50.

Of coals from east of Indiana smokeless run-of-mine is strongest, the cause being short supplies. Smokeless run of mine [illegible] Hocking lies [illegible] mak[illegible] Pittsburg N[illegible] at Straitsville [illegible] [illegible] [illegible] [illegible] tracks. Cannel coal continues in good demand at $5.40@5.75 per ton.

Cleveland Feb. 26

[illegible] made sales at about the same prices as ruled last year. The one factor in the situation which seemed uncertain was a possibility that the railroads in this territory would increase the rate from the mines to the lake ports, having had an [illegible] [illegible] [illegible] [illegible] from the Ohio coal to Chicago.

[illegible] to form the basis for an advance in rates of about 16 2/3 per cent. The railroads held back, fearing the effect upon public sentiment. Another possible [illegible] [illegible] the fact the river combine of mines would desert its river territory, and come into the lake trade. The [illegible] of such a [illegible] [illegible] by the knowledge the company would not have over 500,000 tons to ship by lake, out of a possible total of more than 15,000,000.

Prices in local territory have not changed. Mine-run steam coal has held at $1.15@1.20 at mines for Ohio, and $1.10@1.15 for Pennsylvania. Ohio slack has been selling at $1.10@1.15; Pennsylvania around $1.

The coke market is strong for immediate delivery; for delivery during the last half of the year it is a little easier. The 72-hour foundry coke is $4 for immediate delivery. Furnace coke is $3.60@3.75 for immediate shipment, and $3.25 for second-half.

Pittsburg Feb. 26

Coal—Some large annual contracts have been closed this week and most of them were on a basis of $1.15 a ton for mine-run, f.o.b. mine. Sales for prompt shipment are at $1.20. There is no shortage of railroad cars and nearly all the mines are in full operation. The Monongahela River Consolidated Coal and Coke Company yesterday closed several important contracts aggregating about $1,000,000. The largest was placed by the Southern Pacific Railroad and Steamship Company and calls for 250,000 tons to be delivered at its wharves in New Orleans. The annual contract from the St. Louis Gas Company was also placed and calls for from 175,000 to 200,000 tons. Cold weather has checked the rise in the rivers and the big tows that were ready to go out have been held up.

Connellsville Coke—The coke market remains about the same as a week ago. Prices are firm, strictly Connellsville furnace coke, prompt shipment, being quoted at $3.50@3.60 and for all year at $3.10@3.25. Prompt foundry is quoted at $3.90@4.10 and for deliveries extending through the year at $3.75. The *Courier* gives the production for the week in the Connellsville region at 268,628 tons, and in the Lower Connellsville region at 141,275 tons. The shipments totaled 15,017 cars distributed as follows: To Pittsburg, 5184 cars; to points west of Connellsville, 8868 cars; to points east of Connellsville, 965 cars.

Foreign Coal Trade

Feb. 27

Coal production in Belgium for the year was 21,841,200 metric tons in 1905, and 23,010,740 tons in 1906, an increase of 1,769,540 tons last year.

Imports of fuel into France for the year were, in metric tons:

	1905.	1906.	Changes.
Coal	10,507,064	14,354,320	I. 3,847,256
Coke	1,632,841	2,257,860	I. 625,019
Briquets	398,397	547,250	I. 148,853
Total	12,538,302	17,159,430	I. 4,621,128

The larger imports were from Great Britain and Belgium.

Exports of fuel from France for the year, including steamer coal, were as follows:

	1905.	1906.	Changes
Coal	1,657,123	1,372,870	D. 284,253
Coke	243,053	178,380	D. 63,673
Briquets	89,234	130,510	I. 41,276
Total	1,988,410	1,681,760	D. 306,650

Steamer fuel included 133,252 tons and 32,686 tons briquets in 1905, against 121,800 tons coal and 96,090 tons briquets last year.

The preliminary report for the Nord and the Pas-du-Calais, the two more important coal-mining districts in France, is as follows, in metric tons:

	1905.	1906.	Changes.
Nord	6,729,840	6,243,086	D. 486,754
Pas-du-Calais	17,543,215	15,828,688	D. 1,714,527
Total coal	24,273,055	22,071,774	D. 2,201,281
Coke made	1,772,793	1,678,825	D. 93,970
Briquets made	972,129	956,333	D. 15,796

The heaviest producer in the Nord last year was the Anzin company, with 3,102,465 tons; in the Pas-du-Calais the Lens, with 3,030,258 tons.

Iron Trade Review

New York, Feb. 27

There is little change to report this week. So far as pig iron is concerned, the market remains quiet. Some buyers talk of a tendency to make concessions on future business, but makers are generally firm in their views, and are not inclined to recede from present quotations.

In finished material there is some new business coming in, especially in structural material. The pressure for deliveries on contracts continues, and mills are fully occupied. Most of them are anticipating new orders in plenty next month, when the approach of spring usually brings out new trade. In the meantime they have quite enough to do to keep up with the specifications received.

Baltimore Feb. 26

Imports of spiegeleisen at this port for the week were 1199 tons; of ferro-manganese, 870 tons. Imports of iron ore were 11,150 tons, from Cuba.

Included in the exports were 2022 tons steel rails and 104 tons splice-bars, to Buenos Aires.

Birmingham Feb. 25

A few small lots of spot iron were sold in the Birmingham district during the past week at $23 per ton, No. 2 foundry. A few sales of iron for delivery during the latter part of the year were booked during the past week $18.50 per ton, No. 2 foun-

dry, being the minimum price reported. No iron has been sold this year under $18 per ton. Charcoal iron sold during the past few days at $27 per ton, with a lively inquiry for more of the product. The railroad car situation is a little improved. The advance of 25c. in freight rates will go into effect March 2, from this territory to the Ohio river. Above the Ohio river the 20c. per ton advance has been on for 30 days already.

The 50-ton charcoal furnace of the Eagle Iron Company at Attalla, Ala., has been blown in and orders are in hand for the product for some time. Raw material is on hand for a couple of months' opera-

Chicago Feb. 25

The market for pig iron continues uncertain. There seems neither strengthening nor weakening of prices, and sales are still of the quick-delivery sort chiefly. Southern dealers are asserting that the price of $18.50 has been, and will be, firmly maintained as a minimum for No. 2 iron. Northern iron, being relatively stronger, is unaffected in price and the short-order condition affects it but slightly. Northern furnaces being well sold up. The minimum on Northern is $23.50 as st week. On the Birmingham price of $18.50 for second-half deliveries the local price becomes $22.60. For quick deliveries there is a premium of $1@3.

The beginning of the week is marked by inquiries tending to show the intention of many melters to make contracts much more freely than in the last two or three weeks.

Cleveland Feb. 26

Iron Ore—The movement of iron ore from the lake docks to the furnace stock piles has been heavy. A few sales are being made off the stock piles at Lake Erie ports, the price being unchanged from those prevailing for this year's delivery.

Pig Iron—The market for the immediate future is strong. For the present there is such a good demand for all grades of material that prices are hold ing steady. On foundry iron, for imme diate shipment, the price is unchanged at $25@26 in the valleys. For second-quarter delivery the price is $23@24 in the valleys. For second-half delivery iron is selling at about $22 in the valleys for No. 2. Southern prices are about steady. Bessemer and basic are about $20 at furnace for second quarter and for second half.

Finished Material—The market is strong along all lines. There is a good

gainst old contracts, as well as a better demand for material on new contracts. The market is especially strong for plates

Pittsburg Feb. 26

and the steel market remains strong. The recent rumors that some railroads are likely to cancel many large orders owing to inability to secure funds have been practically dissipated and it is now regarded as certain that all contracts placed will be filled. The mills have enough business on the books to keep them going steadily until the fourth quarter, and there are large tonnages in sight on which negotiations are pending. New business is light, for the reason that deliveries cannot be guaranteed The Pittsburg Steel Company, the leading independent, last week began the erection of eight open-hearth steel furnaces and will continue to add to its capacity. Demand for wire products is in excess of production. The National Tube Company has put the Youngstown department in operation after an idleness of over a year. This company has ordered an advance of two points, or $4 a ton, in 2¾- to 5-in. boiler tubes. The large plate mills are badly congested and cannot promise deliveries on contracts inside of four months; 1.70c. is the absolute minimum. Eastern mills that can make deliveries have no difficulty in getting 2c. for prompt shipment. There is no decline in the big demand for sheets. On blue annealed sheets an independent concern is quoting No. 16 gage at 2.40c., or $7 a ton above the "official" price.

Pig Iron—The market is still quiet, with no sales for last half. Both foundry and bessemer iron for prompt delivery have declined, sales of carload lots of No. 2 foundry having been made at $24, Valley furnaces; a sale of 3000 tons of bessemer was made at $22 for second-quarter delivery. For prompt, $22.50 can be done. A sale of 2000 tons of basic for prompt delivery is reported today at $22. Gray forge has dropped about $1 a ton; sales at $21, Valley, or $21.85, Pittsburg, for

Steel—There is a better supply of billets this week, but prices remain firm at $29@29.50 for bessemer and $32 for open-hearth. Plates remain at 1.70c. and merchant-steel bars at 1.60c.

Sheets—The mills all are from three to four months behind in deliveries. Black sheets remain at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—There is no change in the market and prompt ferro continues to be quoted at $73 to $74, and for late delivery $70 is quoted.

Cartagena, Spain Jan. 26

Barrington & Holt report for the week: Shipments were one cargo, 3900 tons dry ore, and one cargo, 3900 tons manganiferous ore, to Great Britain; one cargo, 5300 tons dry ore, to Rotterdam; one cargo, 5200 tons dry ore to Philadelphia; a total of 18,300 tons. Both output and

Quotations are, f.o.b. shipping port: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; special low phosphorus ore, 10s. 9d.; specular ore, 55 per cent. iron, 12s. 6d. Manganiferous ore, 35 per cent. iron and 12 per cent. manganese, is 14s. 6d., same terms; no higher grades offered.

Iron Pyrites—Pyrites, 40 per cent. iron and 43 sulphur, are 11s. 9d. per ton, f.o.b. Cartagena.

Metal Market

NEW YORK, Feb. 27

Gold and Silver Exports and Imports.

United States Port of

Metal.	Exports.	Imports.	
Gold:			
Jan. 1907...	$	$	
" 1906 ..	5,741,665		Exp. 3,135,956
Year			Imp. 761,016
"		2,605,709	Exp.
Silver			
Jan. 1907...		3,620,888	Exp. 1,145,986
" 1906 ..	7,516,668	4,086,711	2,829,957
"	4,766,874	3,620,888	1,145,986
1906 ..	7,516,668	4,086,711	2,829,957

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Feb. 23 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week....	$	$ 11,150	$1,105,115	$
1907.....	1,115,350	1,532,243	4,338,656	
1906	3,008,350	302,866	13,657,569	
1906.	29,456,190	714,423	5,681,440	177,153

Exports of gold for the week were to the West Indies; of silver to London and Paris. Imports of gold for the week were from Germany and Mexico; of silver from Mexico and South America.

The joint statement of all the banks in the New York Clearing House for the week ending Feb. 23 shows loans, $1,083,463,400, a decrease of $8,600,600; deposits, $1,045,021,700, a decrease of $12,524,500, as compared with the preceding week. Reserve accounts show:

Specie	$	$
Legal tenders		
Total	$265,700,400	$265,565,000
Surplus	$5,125,725	$4,309,875

The surplus over legal requirements shows a decrease of $121,475, as compared with the previous week.

Specie holdings of the leading banks of the world on Feb. 23 are reported as below, in dollars:

	Gold.	Silver.	Total.
France	529,072,740	$197,047,820	726,120,560
Germany			
Russia	27,717,000	28,980,000	56,697,000
Italy			
Sweden	590,255,000	23,675,000	613,930,000
Total			

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

follows, for the year to Feb. 14:

			Changes	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Straits	[illegible]	[illegible]	D	[illegible]
Total	[illegible]	£1,514,410	D	£1,112,590

Imports for the week were £47,000 from New York, and £150,000 from Shanghai; a total of £197,000. Exports were £738,000 in bars and £162,000 in Mexican dollars; £900,000 in all, to India.

Indian exchange is still strong, and the Council bills offered in London were taken at an average of 16.09d. per rupee. There has been some buying of silver for the Indian Government.

The gold and silver movement in France for the full year is reported as follows:

	1905.	1906.
Gold:		
Imports	Fr. 577,648,000	Fr. 430,473,000
Exports	141,144,000	165,087,000
Excess, imports....	**Fr. 648,154,000**	**Fr. 265,386,000**
Silver:		
Imports	104,909,000	156,619,000
Exports	109,669,000	134,718,000
Excess, imports....	**Fr. 4,440,000**	**Fr. 21,901,000**

Imports of copper and nickel coins were 157,000 fr. in 1905, and 122,000 fr. in 1906; exports were 308,000 fr. in 1905, and 290,000 fr. last year.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.531	$0.55
Peruvian, old, and Chilean	0.484	0.49
English sovereigns	4.854	4.87
Twenty francs	3.86	3.89
Scottish [illegible]	4.78	4.80

SILVER AND STERLING EXCHANGE

February	Sterling Exchange	Silver. New York, Cents.	Silver. London, Pence.	February	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
[illegible]	[illegible]	[illegible]	31⅞	25	[illegible]	[illegible]	31⅛
[illegible]	[illegible]	[illegible]	32	26	4.84⅜	[illegible]	32
[illegible]	[illegible]	[illegible]	32⅛	27	[illegible]	[illegible]	32⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

February	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]

	Per Lb.
Cadmium, 99.5% f. o. b. Hamburg	1.40@1.46
Chromium, pure (N. Y.)	.50
Copper, red oxide	.50
Ferro-Chrome (70)	11.00
Ferro-Vanadium (7% carbon) per lb. Cr.	1.50
Ferro-Chrome (1% C) for each 1% Cr.	11.50
Ferro-Chrome (60-64% Cr., 3-4% C.)	12.00@
Ferro-Chrome (66-70% Cr., 1% C.)	.18
Ferro-Molybdenum (50%)	1.00
Ferro-Titanium (20%)	.80
Ferro-Tungsten (67%)	.90
Ferro-Vanadium (25.50% per lb. vana-dium contents)	$5.00
Magnesium, pure (N. Y.)	1.50
Manganese, pure (98.99% N. Y.)	.70
Manganese-Copper (80-90% N. Y.)	.15
Molybdenum (99.2% N. Y.)	$1.75
Phosphorus, foreign red (f. o. b. N. Y.)	.60
Phosphorus, American yellow (f. o. b. Niagara Falls)	.12
Tungsten (steel) pound lots	1.25
Ferro-Silicon (50%) spot. Ex. ship Atlantic ports	$97@100 ton.

Variations in price depend chiefly on size and conditions of orders.

A movement has recently been on foot in Germany to create a metal exchange, either at Berlin or Hamburg, with the object of making its prices the standard for German ore and metal contracts, which now are based on the transactions of the metal exchange at London. The project will probably come to nothing, inasmuch as the headquarters of the largest concerns in the metal trade of Germany are at Frankfurt and Halberstadt, while furthermore the zinc producers of Silesia have declared that they will under no circumstances have anything to do with any Berlin or Hamburg metal exchange.

Chemicals

New York, Feb. 27

Copper Sulphate—The market remains steady, with a good demand. Prices are unchanged, at $7.25 per 100 lb. for carload lots, or over; $7.50 per 100 lb. for smaller parcels.

Nitrate of Soda—The market is firm and tends to advance in price on account of the small production and deliveries during February. We quote 95 per cent. at $2.42½ and 96 per cent. at $2.50 for all positions during the year. For 1908 delivery the prices are $2.40 for 95 and $2.47½ for 96 per cent.

Missouri Ore Market

Joplin, Feb. 23

The highest price reported paid for zinc ore was $53.50 per ton, the assay-basis price being quoted at $47 to $50 per ton of 60 per cent. zinc. The average price, all grades, was $48.06.

The highest price reported paid for lead was $87.50, with ores carrying 80 per cent. lead selling at $84@86. The average is $84.04 per ton. Lead buyers announce a weaker market at the close, with a further decline probable for next week.

The new purchasing agents for the Mineral Point Zinc Company's works at DePue, Ill., are now taking zinc ore and shipments are being made to the Lanyon-Star works at Bartlesville, Oklahoma. Shipments to William Lanyon's new works at Deering, Kan., are expected to be started at an early date. Thus, with the old buyers in the field for their customary allotments, it is seen that the demand keeps pace with the larger supply of this year. For the two months the shipment has been increased over the two months of 1906 by 8220 tons of zinc and 821 tons of lead, and the output has shown even a greater increase. The stock in the bins approximates 7600 tons of zinc and 700 tons of lead, practically all sold.

Following are the shipments of zinc and lead from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,585,160	451,320	$87,518
Joplin	2,418,540	387,890	76,087
Galena-Empire	1,167,470	149,940	33,896
Duenweg	1,065,450	143,840	31,611
Badger	1,058,400	....	26,460
Alba-Neck City	768,990	....	19,224
Prosperity	196,920	289,500	16,880
Spurgeon	364,500	84,750	10,945
Granby	150,000	72,000	10,450
Oronogo	316,430	15,690	8,721
Sherwood	266,450	25,040	7,712
Aurora	300,530	....	7,284
Baxter Springs	223,560	5,820	5,484
Carthage	147,560	....	3,689
Carl Junction	124,400	7,150	3,480
Zincite	67,430	12,440	2,182
Springfield	50,750	....	1,218
Reeds	34,130	....	819
Totals	11,880,600	1,635,150	$354,300
Two months	93,337,700	12,738,440	$2,707,454
Zinc value, the week, $285,588; 2 months, $2,170,694			
Lead value, the week, 68,712; 2 months, 506,760			

The following table shows the average monthly prices of zinc and lead ores in Joplin, by months; the average for zinc being based on the prices of assay basis ores carrying 60 per cent. zinc:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.58
February	47.37	47.11	February	72.84	84.04
March	42.68	....	March	73.73	....
April	44.63	....	April	75.13	....
May	40.51	....	May	78.40	....
June	43.83	....	June	80.96	....
July	43.25	....	July	74.31	....
August	44.50	....	August	75.36	....
September	42.58	....	September	79.64	....
October	41.55	....	October	79.84	....
November	44.14	....	November	81.98	....
December	44.68	....	December	81.89	....
Year	43.24	....	Year	77.40	....

Wisconsin Ore Market

Platteville, Feb. 23

The market has been steady this week, with no material change. The camps of the district loaded ore as follows for the week ending Feb. 23:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	233,710	....	....
Buncombe-Hazel Green	593,102	....	....
Linden	280,000	....	....
Highland	264,000	11,400	....
Rewey	180,000	....	....
Galena	115,800	10,000	....
Benton	125,840	....	....
Mineral Point	74,160	....	....
Cuba City	67,740	....	....
Livingston	50,000	....	....
Total for week	2,184,472	164,400	....
Year to Feb. 23	12,060,487	48,420	96,480

The zinc-ore shipments for the week exceeded 2,000,000 lb., being above the average for this year.

Mining Stocks

New York, Feb. 27

The general stock markets are still depressed, and it can hardly be said that liquidation is over. The markets, moreover, are largely professional, the public, apparently, taking little interest.

On the New York curb mining stocks were rather inactive, and the tendency of prices was downward. Arrangements are being made to list some of the copper stocks on the exchange, which will reduce the importance of the outside market.

On the exchange one sale of Homestake, of South Dakota, was recorded, the first for several weeks. A lot of 100 shares changed hands, at $85 per share.

Boston

Feb. 26

Events the past week show that the Calumet & Hecla management is in a particularly aggressive mood and seeks to hold its supremacy in the Lake Michigan mining world. It now controls La Salle, Centennial and Allouez, and will control the Osceola at the latter's annual meeting, March 14. A contest for proxies is now going on, but there is little doubt that Calumet & Hecla will win out against the present Osceola management, as it was in the field early soliciting proxies both here and in Michigan. On Wednesday last the Calumet had transferred to its credit 20,000 shares of Osceola, which it had purchased in the open market. This means that Calumet is investing its surplus money in going mines and mineral lands and aims to control the output in that section of the country. For the present, at least, the corporations will be maintained separately and the Calumet will benefit as developments progress and yield the company income. It stands in the light of a holding company with a majority of the stocks.

Marketwise conditions have been unfavorable, although the week included but four days, Friday and Saturday being holidays. Trinity was again in the front with pretty violent fluctuations, both up and down. From a closing at $30.87½ a week back it rose to $38, but in 24 hours' time its price had broken to $28.50. Today's closing was $31.62½. A financial statement issued as of Feb. 19, 1907, shows a cash balance in the treasury of $123,714. Several Lake stocks had moderate flurries after the Calumet's new acquisition.

Calumet & Hecla directors declared another $20 dividend last week, the same as the previous two payments, and the stock touched $940, ex-dividend, selling at $900 today. Last week, it will be remembered, it touched $1000. Osceola made its best record at $181, but is now off to $171. Amalgamated fell $3.25 to $110 during the week, closing tonight at $111.

It is said that an attempt will be made to take control away from the present

Franklin mining management at the annual meeting, April 17.

As a rule, mining shares are from $1 to $2 lower than they were a week ago. The curb continues to grow and finds more and more followers.

Colorado Springs Feb. 23

Trading on the local stock exchange has been dull and featureless for the entire week. The lack of interest in the projected tunnel by a number of the large mine-owners has a depressing effect. Prices remain stiff, holders declining to sell, except at an advance. Work has been the most active and sold from 15 up to 19½c. this week.

STOCK QUOTATIONS

Name of Comp.	Clg.
Buffalo Cobalt	2½
Butte Coalition ..	34½
Cobalt Contact ...	½
Greene G. & S	2
Furnace Creek...	17½
Mitchell Mining..	5¼
Am. Agri. Chem...	74
Am. Smelt. & Ref.	97
Bethlehem Steel	
Colo. Fuel & Iron..	
National Lead, pf.	
Pittsburg Coal ...	
Republic I. & S....	11
Sloss-Sheffield ..	
U. S. Steel, pf	
Va.-Car. Chem. ..	

Name of Comp.	Clg.
Atlanta	15
Calumet & Ariz ..	110
Isle Royal	23
North Butte.....	114
Old Colony.....	
Old Dominion....	50½
Osceola*.....	171
Rhode Island.....	10½
United Cop., com.	...
U. S. Oil	12
U. S. Smg. & Ref .	62½
U.S.Sm.& Re.,pd.*	47½
Utah Con.	10½
Utah Copper Co..	46
Va.-Tenn. Coal ..	12
Va.-Tenn. Iron ..	16

BOSTON CURB

Name of Com.	Clg.
Ariz. Com.....	32
Black Mt	7
Stratton's Ind.	
Camp Bird ..	
Columbia ..	
Coal ..	
Utah Apex ..	
Ariz. Cop., def..	3 12
St. Joe	25 .22

S. FRANCISCO	Feb. 21
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	15
Best & Belcher..	1.05
Caledonia	.50
Challar.....	.16
Con. Cal. & Va....	1.05
Crown Point ...	.07
Exchequer	.09
Gould & Curry ..	.12
Hale & Norcross	.82
Mexican	.32
Ophir	2.65
Overman.....	.20
Potosi	.18
Savage	.89
Sierra Nevada ...	.70
Union	.78
Utah	.01
Yellow Jacket ..	1.05
TONOPAH STOCKS	
Golden Anchor ..	.07
MacNamara ..	.01
Montana-Pitts.ex	.25
North Star.	.06
Rescue	.29
GOLDFI'D STOCKS	
Black Wells	.12
Blue Bell	.01
Columbia Mt	1.00
Comb. Frac	1.02
Conqueror	.01
Daisy	.22
Florence	3.15
Frances-Mohawk.	.07
Goldfield Con.	.75
Grandma	.03
Great Bend	1.57
Red Hills	.29
St. Ives.....	1.05
BULLFROG STOCKS	
Amethyst	.05
Bullfrog Gold	.15
Mayflower Con....	.49
Montgomery Mt	.01
Original	.21
MANHATTAN STOCKS	
Gold Wedge	.16
Manhattan Mg ..	.15
Pine Nut	.24
Ruby Wonder.	....
Stray Dog	.10
Yellow Horse	.07

NEVADA	Feb. 27
(Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg
Tonopah Mines of N.	17.00
Tonopah Exten....	4.50
Montana Tonopah	3.72
Belmont	5.25
Tonopah Midway	2.04
West End Con. ..	1.00
Jim Butler	1.04
GOLDFIELD STOCKS	
Sandstorm	.71
Kendall	.50
Red Top	4.00
Jumbo	4.30
Goldfield Mining.	1.57
Dia'dfield B. B. C.	.50
Atlanta	.82
Montana	18.75
Silver Dyke ..	1.46
Laguna	1.75
BULLFROG STOCKS	
Mont. Shoshone C.	13.25
Tramps Con.	1.75
Gold Bar	1.22
Bullfrog Mining..	.31
Bullfrog Nat. B.	.50
Homestake Con..	1.30
MANHATTAN STOCKS	
Manhattan Con..	.85
Manhat'n Dexter.	.50
Jumping Jack	.25
Stray Dog	.07
Indian Camp	.72

COLO. SPRINGS	Feb. 23
Name of Comp.	Clg.
Acacia.....	12
Black Bell	
C. C. Con.....	50
Dante.....	2
Doctor Jack Pot..	7
Elkton	62½
El Paso	55
Findley.....	70
Gold Dollar.....	
Gold Sovereign....	1
Isabelle	21½
Index	7
Jennie Sample. .	
Jerry Johnson....	
Mary McKinney.	66
Pharmacist	63
Portland	1.20
Un. Gold Mines.	8
Vindicator	94
Work	197

New Dividends

Company.	Payable.	Rate.	Amt.
American Coal, Md	Mar. 1	$7 50	$375,000
Am. Smelters Securities, A.	Mar. 1	1.50	255,000
Am. Smelters Securities, B	Mar. 1	1.25	375,000
Butte Coalition	Mar. 19	0.50	500,000
Calumet & Hecla, Mich	Mar. 22	20.00	2,000,000
Federal Mg. & Smelting	Mar. 15	5.00	300,000
Federal Mg. & Smelt., pfd.	Mar. 15	1.75	210,000
General Chemical	Mar. 4	2.00	140,206
Greene Con. Copper	Mar. 25	0.40	346,600
McKinley-Darragh, Ont	Mar. 1	0.02	40,000
National Lead, pfd	Mar. 15	1.75	260,820
North Butte, Mon	Mar. 28	2.00	400,000
Parrot, Mon	Mar. 12	0.25	57,462
Philadelphia Co., pfd	Mar. 1	1.25	143,620
Quincy Copper	Mar. 11	4.50	486,446
Red Metal, Mon	Mar. 1	4.00	
Republic Iron & Steel, pfd	Apr. 1	3.75	795,634
Shannon Copper	Mar. 30	0.50	150 000
Sloss Sheffield, S. & I.	Mar. 1	1.25	93,750
Standard Oil	Mar. 15	15.00	14,000,000
U. S. Red. & Refining	Apr. 1	1.50	59,187
U. S. Steel Corporation	Mar. 30	0.50	2,941,513
U. S. Smelt., Ref. & Mg	Apr. 1	0.87½	1,875,000

Assessments

Company.	Delinq.	Sale.	Amt.
Butler-Liberal, Utah	Mar. 30	Apr. 1	$0.01
Clark-Virginia, Utah	Mar. 5	Mar. 12	0.005
Deer Lodge, Utah...	Feb. 18	Mar. 11	0.05
Etna-King, Cal.....	Mar. 1	Apr. 3	0.01
Nevada-Utah, Nev.	Mar. 1	May. 1	0.05
Prince of Wales, Utah	Mar. 15	Mar. 30	0.001
Jennie Lind, Cal....	Mar. 5	Mar. 25	0.03
Johnnie, Utah	Feb. 25	Mar. 15	0.01
Nevada Nat., Utah		Apr. 1	0.03
Nevada-Utah, Utah	Mar. 18	Mar. 11	0.02
Oro Blanco, Cal.....	Feb. 24	Apr. 25	0.05
Quincy, Jr., Idaho..			0.10
Savage, Nev.....	Mar. 15	Apr. 1	0.25
Silver Queen, Utah	Feb. 25	Mar. 18	0.10
St. George, Utah	Mar. 4	Mar. 25	0.01
Uncle Sam, Utah	Feb. 6	Mar. 11	0.05
Wabash, Utah	Mar. 12	Apr. 3	0.01
West Century, Utah.	Mar. 1	Mar. 25	0.01

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65,288	68,673	30.113	31.769
February	66,108		30.464	
March	64,597		29.854	
April	64,765		29.984	
May	66,976		30.968	
June	65,304		30.185	
July	65,105		30.113	
August	65,949		30.529	
September	67,927		31.483	
October	69,523		32.148	
November	70,813		32.671	
December	69,050		32.003	
Year	66,791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	New York.				London.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869		18.116		78.147	
March	18.361		18.641		81.111	
April	18.375		18.688		84.783	
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
Septemb'r	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403		August	40.606	
March	36.692		September	40.516	
April	38.900		October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464		16.031	
March	5.350		15.922	
April	5.404		15.959	
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.525	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075		5.924		25.844	
March	6.209		6.056		24.563	
April	6.078		5.927		25.781	
May	5.995		5.846		27.000	
June	6.000		5.948		27.728	
July	6.000		5.856		26.800	
August	6.057		5.878		26.938	
September	6.216		6.056		27.563	
October	6.259		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

CHEMICALS, MINERALS, RARE EARTHS, ETC. CURRENT WHOLESALE PRICES.

ABRASIVES—
Bort, good drill quality, carat .. $85.00
Carborundum, f.o.b. Niagara Falls, powd. lb .05
Grains, " " .10@.17
Corundum .07@.10
Crushed Steel, f.o.b. Pittsburg .05¾@.06
Emery, in kegs: Turkish flour .01@.02½
Grains .03@.04
Naxos flour .01@.02
Grains .04@.04
Chester flour .01
Grains .03@.04½
Peekskill, f.o.b. Easton, Pa., flour .01½@.01¾
Grains, in kegs .02@.02½
Garnet, per quality .. ton 25.00@35.00
Pumicestone, Am. Powd. 100 lb. 1.00@2.00
Italian, powdered " .01½@.01¾
Lump, per quality .02@.20
Rottenstone, ground .02@.04
Lump, per quality .05@.25
Rouge, per quality .05@.30
Steel Emery, f.o.b. Pittsburg .07½@.07¾

ACIDS
Acetic 28% .02½@.02¾
Boric .03½@.10
Hydrofluoric, 30% .023¼@.03
" 48% .04
" 60% .10@.10½
Hydrochloric acid, 20°, per lb. ... 1.25@1.50
Nitric acid, 42° .. per lb. 1.25@1.50
Sulphuric acid, 60°, bulk, per ton. $12 up.
60°, 100 lb. in carboys .85@1.12½
60°, bulk, ton,..... 16.00@18.00
66°, 100 lb. in carboys 1.00@1.25
66°, bulk, ton 18.00@20.00
Oxalic .08½@.09

ALCOHOL—Grain .. gal. 2.46@2.
Refined wood, 95@95% " .70@.75

ALUM—Lump 100 lb $1.75
Ground " 1.85
Chrome Alum lb .03½@.03¾

ALUMINUM—Sulphate, com. . 1.25@1.60

AMMONIA—24 deg. lb..... .04½@.05½
" 26 " " .04¾@.05¾

AMMONIUM—
Bromide lb .23
Carbonate .07½@.08
Muriate grain .06¾@.06¾
Lump .09½@.09¾
Sulphate, 100 lb. 3.10@3.15
Sulphocyanide, com. .30
" " chem. pure .40

ANTIMONY—needle, lump lb.... .13½@.14

ARSENIC—White, nominal .07½@.08
Red " .06¾@.07

ASPHALTUM—
Barbadoes per ton. 40.00@80.00
West Indies " 20.00@60.00
Egyptian lb. .06@.07
Gilsonite, Utah, ordinary per ton. 50.00
Trinidad " 30.00@40.00
California .. 20.00@30.00

BARIUM—
Carb. Lump, 80@90%.....sh. ton. 30.00@35.00
Powdered 80@90%..... lb. .02@.02½
Chloride com'l.....ton. 37.50@40.00
Nitrate, powdered, in casks..lb. .06
Sulphate (Blanc Fixe) .02¾

BARYTES—
Am. Ground sh. ton. 14.50@21.00
Floated " 22.00
Foreign floated " 17.50@22.50

BISMUTH—Sub-nitrate..... lb. 1.50

BLEACHING POWDER—35%, 100 lb. 1.30@1.50

BLUE VITRIOL—(see copper sulphate), carload, per 100 lb 7.25

BONE ASH .02½@.03

BORAX .07½@.07¾

CALCIUM—Acetate, gray 2.35@2.40
Acetate, brown 1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. sh. ton 65.00
Chloride, f.o.b. N. Y " 13.00@15.00

CEMENT—
Portland, Am. 500 lb. bbl 1.55@1.60
Foreign " 2.25@2.
Rosendale, 300 lb. " .85
in sacks .65
Slag cement .75@1.25

CHROME ORE—
New Caledonia 50% ex. ship N. Y. per lg. ton 17.50@20.00
Bricks, f.o.b. Pittsburg, M.. " 175.00

CLAY, CHINA—Am. common ex-dock, N. Y .. $ 6.00@8.00
Foreign " 11.50@17.50

COBALT—Oxide..... lb. 2.25

COPPERAS—Bulk 100 lb. $ .75
In bbls .75
In bags .85

CRYOLITE..... lb. .06½

FELDSPAR—Ground best..sh. ton. 7.00@15.00

FIRE BRICK.
American per M 20.00@25.00
Imported " 25.00@30.00
St. Louis No. 1... " 16.00
" No. 2 " 14.00
Extra " 20.00@23.00

FIRE CLAY.
St. Louis mill, ...per ton 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump.....sh. ton. 8.00@10.00
Ground " 11.50@13.50
Gravel " 4.00@5.00
Foreign, f.o.b. N. York " 9.00@12.00

FULLER'S EARTH—Lump..100 lb. .80@.85
Powdered " .85@.90

GRAPHITE—
American, ore, common.... lb. .01@.10
Artificial " .06
Ceylon, common pulv .02@.03½
Best, pulverized .04@.06
German, com. pulv .01½@.01¾
Best, pulverized " .01¼@.02
Italian, pulverized .01@.02

GYPSUM—
Fertilizer 7.00
Rock.....lg. ton. 4.00

INFUSORIAL EARTH—
Ground Am. best.....lb. .01¾
French.....lg. ton. 66.00
German lb. .02@.03

LEAD—Acetate (sugar of)..... lb. .07¾
Nitrate, com'l " .08½@.09

MAGNESITE—Greece.
Crude 66% lg. ton. 7.00@8.00
Calcined powdered sh. ton 50.00@55.00
Bricks, domes, per qual. f.o.b. Pittsburg ... M. 160@200

MAGNESIUM—
Chloride, com'l.....100 lb. .90@1.25
Sulphate (Epsom salt)...100 lb. .90@1.25

MANGANESE—
Crude powdered:
70@75% binoxide lb. .02
75@85% binoxide .02½
85@90% binoxide .04
90@95% binoxide .05
Ore, 80%-85%..... sh. ton. 27.00@35.00

MARBLE—Flour .....sh. ton. 9.50@10.00

MINERAL WOOL—
Slag, ordinary " 18.00
Selected 25.00
Rock, ordinary 32.00
Selected " 40.00

MONAZITE SAND—
Guar. 9%, with 6% Thorium oxide, nominal..... lb. .08 and up.

NICKEL—
Oxide, crude, lb. (67%) for fine metal contained.. .47
Sulphate, single.....lb, .16@.20
" double .10@.12

NITRATE OF SODA—100 lb. 96% for 1907 2.45
95% for 1908 2.35
95% for 1909 2.30
96% is 5c higher per 100 lb.

OZOKERITE—best..... lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered .07½@.07¾
English glassmakers'.... " .06½@.06¾
Lith-sperge .04@.05
Metallic, brown sh. ton 19.00
Red " 16.00
Ocher, Am. common.... " 8.50@9.00
Best..... " 16.00
Dutch, washed..... lb. .02½@.03
French, washed..... " .01½@.02
Paris green, pure, bulk..... " .21@.23
Red lead, American .06½@.07
Foreign ..... " .08½@.08¾
Turpentine, spirits bbl., per gal. .70@.71
White lead, Am., dry..... lb. .06½@.06¾
American, in oil .07
Foreign, in oil .07@.07½
Zinc white, Am. extra dry.. " .05½@.05¾
Foreign, red seal, dry.. " .07¼@.07¾
Green seal, dry .07@.07½

PHOSPHATES—Acid..... .65@67½c per unit
*Fla., hard rock 7.50
land pebble 68% 4.50
†Tenn., 78@80% 6.00@7.00
78%..... 5.50
75% 5.00
68@72%.... 4.50
‡So. Car. land rock..... 6.00
" river rock.....

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—
Bicarbonate (crystal) lb $0.[illegible]
Powdered or granulated .04@.04½
Bichromate, Am. .08½@.08¾
Crystals .11
Bromide .16
Carbonate (80@85%) .04@.04½
Caustic, ordinary .04@.04½
Lump .05@.05½
Chloride (muriate), 80@ 1.30
Chlorate, powdered .09@.09½
Crystals .08@.09
Cyanide (98@99%) .18@.19
Kainite, f.o.b. N. York, 8.50, bags, 9.50
Permanganate lb. .12@.13
Prussiate, yellow .16@.17
Red .20
Sulphate 100 lb. 2.00@2.25

PYRITE—
Domestic, non-arsenical, furnace size per unit .11@.11½
Domestic, non-arsenical, fines, per unit .10@.10½
Imported non-arsenical, furnace size, per unit .11@.11½
Imported, arsenical, furnace size, per unit .12½@.12¾
Imported fines, arsenical, per unit. .8½@.9c.
" " non-arsenical, per unit .10@.10½c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.18
N. Y. agricultural.....sh. ton. .60@.80

SALTPETER—Crude 100 lb. 7.00@7.50
Refined, crystals " 8.25@8.75

SILICA—
Ground quartz, ord'ry...sh. ton 13.00@15.00
Silex " 18.00@20.00
Lump quartz " 2.50@4.00
Glass sand " 2.75

SILVER—Nitrate, crystals..... oz. .43½@.45⅜

SODIUM
Acetate.....lb. .04@.04¾
"Alkali," per 100 lb., 58/48..... .80@.87½
Bicarb. soda, per 100 lb..... 1.20@1.50c.
Soda, caustic, per 100 lb., 76/60... 1.80@1.90
" powdered .02¾@.03
Salt cake, per 100 lb..... .65@.85
Soda, monohydrate, per lb. .04@.04½
Bichromate lb. .06¾@.07
Bromide " .16
Chlorate, com'l .08@.09
Cyanide, ("100% KCN")..... " .18@.19
Hyposulphite, Am. 1.60@2.
German " 1.60@1.70
Phosphate 100 lb. 1.80@1.90
Prussiate " 11@12
Sal soda, f.o.b. N. Y ... 100 lb. .70@.75
Foreign, f.o.b. N. Y " 1.00@1.10
Silicate, com'l.....100 lb. .75@1.10
Sulphate, com'l, (Glauber's salt) 100 lb. .47½ up
" " calcined .65@.85

STRONTIUM—Nitrate..... lb. .08½@.08¾

SULPHUR—
Louisiana (prime) to New York, Boston or Portland.....lg. ton 22.12½
To Philadelphia or Baltimore.... " 22.50
Roll 100 lb. 1.85@2.15
Flour " 2.00@2.10
Flowers, sublimed..... " " 2.20@2.60

TERRA ALBA—French & Eng. 100 lb. .90@1.00

TALC—Domestic.....sh. ton. 15.00@20.00
French, best " 25.00
Italian, best " 35.00@40.00

TIN—Bi-chloride, 50% lb .12½ up
Crystal .04@.04½
Oxide, lb. .44

URANIUM—Oxide 3.50

ZINC—Metallic ch. pure " .15
Chloride solution, com'l.... " .02½@.04
Chloride, granular " .04½@.04¾
Dust " .05½@.06
Sulphate 3.00

Note.—These prices are for what [illegible] in New York unless otherwise specified. Rates generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to notify this office promptly of any [illegible] needed, or to suggest additions which they may consider advisable.

DIVIDENDS.

Metal and Mining Companies—U. S.

Name of Company and Location.	Author-ized Capital.	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska, M....	$1,000,000	180,000	$ 5	$1,[illegible]81	Jan. 1907	$ .50
Alaska Treadwell, g....	5,000,000	200,000	25	[illegible]	Jan. 1907	1.00
Alaska Yukon, g....	1,000,000	180,200	5	306,340	Jan. 1907	.030
Arizona Copper, c....	Mont.	155,000,000	1,550,879	100	47,523,030	Feb. 1907	2.00
Am. Sm. & Ref., pf....	U. S.	30,000,000	300,000	100	9,375,000	Jan. 1907	1.75
Am. Sm. & Ref., pf....	U. S.	30,000,000	300,000	100	23,466,558	Jan. 1906	1.75
Am. Smelters, pf. A....	U. S.	17,000,000	170,000	100	1,430,000	Mar. 1907	1.50
Am. Smelters, pf. B....	U. S.	30,000,000	300,000	100	2,025,000	Mar. 1907	1.25
Anaconda....	Mont.	30,000,000	1,200,000	25	32,760,000	Jan. 1907	1.00
Arizona Local Co., g....	Ariz.	5,000,000	50,000	100	465,061	July 1905	.50
Arizona....	Ariz.	8,775,000	1,462,520	6	6,182,301	Apr. 1906	.05
Atlantic, c....	Mich.	2,500,000	100,000	25	930,000	Feb. 1905	.02
B. & H., l. z....	Mo....	400,000	400,000	1	40,000	Dec. 1905	.01
Bingham Con. & M., g....	Utah	1,000,000	1,000,000	1	235,000	Jan. 1907	.04
Bingham Con. & M., g....	Utah	2,000,000	226,000	5	22,600	Sept. 1906	.10
Bonanza & Montana....	Mont.	3,750,000	150,000	25	47,875,000	Nov. 1906	12.00
Bull Hill & Argentine, g....	Utah	1,000,000	200,000	5	2,518,421	Oct. 1906	.10
Bunker Hill & Sull....	Ida.	3,000,000	300,000	10	8,226,000	Feb. 1907	.60
Butte Coalition, c....	Mont.	15,000,000	1,000,000	15	1,000,000	Mar. 1907	.50
Calumet & Arizona....	Ariz.	2,500,000	200,000	10	7,000,000	Mar. 1907	5.00
Calumet & Hecla, c....	Mich.	2,500,000	100,000	25	100,350,000	Mar. 1907	20.00
Camp Bird, g., s....	Colo....	5,000,000	820,000	5	3,382,500	Feb. 1906	.24
Carisa, c.g....	Utah....	800,000	800,000	1	55,000	Nov. 1906	.01
Central Eureka, g....	Cal....	400,000	400,000	1	778,924	Jan. 1906	.07
Columbus Con. c....	Utah....	1,500,000	300,000	5	45,000	Jan. 1907	.15
Combi'tion Co. G'f'd	Nevada.	400,000	320,000	1	688,000	Sept. 1906	.15
Con. Mercur, g....	Utah....	1,000,000	1,000,000	1	1,205,000	Dec. 1906	.02½
Continental, z....	Mo....	550,000	22,000	25	286,000	Jan. 1907	.50
Copper Range Con.	Mich....	38,500,000	383,781	100	3,791,334	Dec. 1906	2.00
Creede United, g....	Colo....	2,000,000	1,625,000	1	214,053	July 1906	.003
Cripple Creek Con. g	Colo....	2,000,000	2,000,000	1	180,000	Mar. 1906	.003
Daly Judge, g. s. l....	Utah....	300,000	300,000	1	112,500	Jan. 1907	.37½
Daly West, g. s. l....	Utah....	3,600,000	180,000	20	5,499,000	Dec. 1906	.60
De Lamar, g. s....	Ida....	400,000	67,180	5	2,926,370	May 1905	.72
Dill'n, g....	Colo....	1,250,000	1,250,000	1	21,875	July 1905	.01
Doctor Jack Pot....	Colo....	3,000,000	3,000,000	1	268,000	July 1906	.00½
Doe Run, l....	Mo....	10,000,000	59,062	100	943,000	May 1906	.50
Elkton Con., g....	Colo....	3,000,000	2,500,000	1	1,581,000	Jan. 1907	.01½
El Paso, g....	Colo....	2,500,000	2,500,000	1	1,022,750	June 1906	.01
Fed. Sm., com....	Idaho	10,000,000	60,000	100	2,048,750	Mar. 1907	5.00
Federal Sm., pf....	Idaho	20,000,000	120,000	100	2,051,250	Mar. 1907	1.75
Findley, g....	Colo....	1,250,000	1,250,000	1	325,000	Aug. 1906	.01
Florence-Mercur, g....	Nevada.	1,000,000	1,000,000	1	141,000	Dec. 1906	1.10
Gemini-Keystone....	Utah....	500,000	5,000	100	1,850,000	July 1906	10.00
Gold King, g....	Colo....	5,750,370	5,750,370	1	1,407,504	May 1907	.01
Gold Sovereign, g....	Colo....	2,000,000	2,000,000	1	10,000	Jan. 1905	.003
Grand Central, g.	Utah....	250,000	250,000	1	1,131,000	Jan. 1907	.06
Gwin Mine, Dev., g.	Cal....	1,000,000	100,000	10	35,000	Mar. 1906	.25
Hecla, s....	Idaho	250,000	1,000,000	0.25	850,000	Jan. 1907	.07
Homestake, g....	S. D.	21,840,000	218,400	100	15,534,550	Feb. 1907	.50
HornSilver, g.s.c.z.l	Utah....	10,000,000	100,000	25	5,522,000	Dec. 1906	.05
Iron Silver, c....	Nevada.	12,000,000	87,415	100	624,490	Feb. 1907	1.50
Jack Pot, silver....	Colo....	500,000	500,000	50	3,900,000	Jan. 1907	.20
Jamie, g....	Cal....	3,000,000	300,000	10	258,970	Jan. 1907	.03
Jerry Johnson....	Cal....	2,500,000	2,500,000	1	61,700	Apr. 1906	.03
Kendall, g....	Mont.	2,500,000	500,000	5	1,050,000	Jan. 1907	.03
Liberty Bell, g. s....	Colo....	700,000	140,551	5	110,857	Jan. 1906	.15
Lightner, g....	Cal....	125,000	102,255	1	295,694	Aug. 1905	.05
Mammoth, g. s. l....	Utah....	10,000,000	400,000	25	2,000,000	Oct. 1906	.05
Mary McKinney, g....	Colo....	1,500,000	1,304,252	1	762,000	Nov. 1906	.05
Mohawk, c....	Mich....	2,500,000	100,000	25	900,000	Jan. 1907	4.00
Moon-Anchor, g....	Mont.	2,500,000	80,833	25	9,447,274	Jan. 1907	15.00
Mountain, g....	Colo....	300,000	300,000	1	27,124	Apr. 1905	.01
New Century, z., l..	Mo....	300,000	300,000	1	211,500	Nov. 1906	.01
New Jersey, z....	Cal....	500,000	100,000	5	880,000	Jan. 1907	.20
New Jersey Zinc....	Pa....	10,000,000	100,000	100	8,400,000	Feb. 1906	3.00
North Butte....	Mont....	5,000,000	400,000	25	4,200,000	Mar. 1907	2.00
North Star, g....	Cal....	2,500,000	250,000	10	1,286,989	Dec. 1906	.40
Northern Light, g.s.	Utah....	2,000,000	400,000	5	20,000	Feb. 1904	.05
Old Dominion, c....	Ariz.	7,500,000	281,589	25	280,843	May 1906	.50
Old Ironsides, g....	[illegible]	2,101,150	2,101,150	1	10,506	Mar. 1906	.05
Ophir, g. s....	Nevada.	302,400	100,800	3	1,797,400	July 1904	.25
Osceola, c....	Mich....	2,500,000	96,150	25	6,362,600	Jan. 1907	6.00
Parrot, c.s....	Mont....	2,300,000	229,800	10	6,666,000	Jan. 1907	.25
Pennsylvania, g....	[illegible]	5,150,000	51,500	100	284,925	July 1905	.10
Platteville, l. z....	Wis....	20,000	500	40	89,500	Oct. 1905	10.00
Portland, g....	[illegible]	3,000,000	3,000,000	1	7,537,086	Jan. 1907	.04
Quincy, c....	Mich....	2,500,000	108,099	25	16,956,446	Mar. 1907	4.50
Rex, g....	Nevada.	15,000	15,000	1	9,600	May 1906	.03
Rocco Homest'k, l.s.	Nevada.	500,000	500,000	1	112,000	Dec. 1905	.02
Sacramento, g, q....	Utah....	5,000,000	1,000,000	5	259,000	Jan. 1907	.10
Salvator, g. s. l....	Utah....	300,000	6,000	50	6,500	Aug. 1904	.01
St. Joseph, l....	Mo....	20,000,000	1,000,000	10	4,658,357	June 1906	.15
Silver Hill, g. s....	Nevada.	108,000	108,000	1	59,400	Feb. 1906	.05
Silver King, g. s. l.	Utah....	3,000,000	150,000	20	10,325,000	Oct. 1906	.35
Tennessee, c....	Ariz.	3,000,000	300,000	10	300,000	Mar. 1907	.50
Showdown, s. l....	[illegible]	1,500,000	1,500,000	1	135,000	Jan. 1907	.03
Spearfish, g....	S. D....	1,500,000	1,500,000	1	1,765,000	Jan. 1905	.01
Standard Con., g. s.	Cal....	2,000,000	1,999,994	10	4,222,772	Dec. 1906	.10
Stratton's Independence, g....	[illegible]	5,580,000	1,000,000	5	4,895,865	Apr. 1906	.12½
Tamarack, c....	Mich....	1,500,000	60,000	25	9,180,000	Jan. 1907	3.00
Tennessee....	Tenn....	5,000,000	175,000	25	1,093,750	Jan. 1907	1.25
Tom Reed, g. s....	[illegible]	[illegible]	[illegible]	5	900,000	June 1906	.48
Tonopah of Nev....	Nevada.	1,000,000	1,000,000	1	2,650,000	Jan. 1907	.45
Tonopah Belmont....	Nevada.	2,000,000	2,000,000	1	259,000	Jan. 1907	.10
Tonopah Extension....	Nevada.	1,000,000	998,450	1	278,530	Apr. 1906	.15
Tonopah Mining....	Nevada.	1,000,000	1,000,000	1	300,000	Jan. 1907	.05
Uncle Sam, g. s. l....	Utah....	500,000	50,000	1	130,000	Oct. 1906	.01
United Cop....	Mont.	75,000,000	450,000	100	4,387,500	Jan. 1907	1.75
United, c. pf....	Mont.	5,000,000	50,000	100	1,350,000	Nov. 1906	3.00
United, z. l., com....	Mo....	500,000	20,000	5	27,450	Oct. 1903	.05
United, z. l., pf....	Mo....	500,000	19,550	25	247,687	Jan. 1907	.50
United, (Cripple C'k)	Colo....	5,000,000	4,000,100	1	280,071	Apr. 1905	.00½
United Verde, c....	Ariz.	3,000,000	300,000	10	17,085,322	Dec. 1904	.75
Un. States, pf. g. a. c.*	Utah	37,500,000	750,000	50	2,625,000	Jan. 1907	.87½
Utah Apex, c....	[illegible]	4,000,000	80,000	50	4,000	Apr. 1907	1.50
Utah Con., g....	Utah....	1,000,000	100,000	10	243,000	Jan. 1907	.03
Utah, c....	Utah....	1,500,000	300,000	5	6,036,000	Jan. 1907	3.00
Victoria, Utah....	Utah....	250,000	250,000	1	77,000	Jan. 1907	.04
Vindicator Con., g.	Colo....	1,500,000	1,500,000	1	1,560,000	Jan. 1907	.03
Wolverine, c....	Mich....	1,500,000	60,000	25	3,450,000	Oct. 1906	9.00
Work, g....	Colo....	1,500,000	1,500,000	1	75,000	Dec. 1906	.02
Yankee, g....	[illegible]	500,000	500,000	1	140,000	Jan. 1907	.03

*Preferred dividends $1,462,250 were divided.

Coal, Iron and Other Industrials—United States.

Name of Company and Location.	Author-ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Ala. Con., C. & I., pf.	Ala....	$2,500,000	24,638	100	$905,265	May 1906	$1.75
Allis-Chalmers, pf....	U. S....	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
Amer. Ag. Chem., pf.	U. S....	20,000,000	181,530	100	6,831,280	Oct. 1906	3.00
American Cement....	Pa....	2,000,000	200,000	10	1,028,000	Jan. 1907	.40
American Coal....	Md....	1,500,000	50,000	25	2,195,000	Mar. 1907	7.50
Associated Oil....	Cal....	21,000,000	21,000,000	1	630,000	Aug. 1906	.01½
Bethlehem Steel, pf..	Pa....	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel....	Pa....	50,000,000	900,000	50	8,212,500	Feb. 1907	.62½
Caribou Oil....	Cal....	100,000	80,000	1	56,000	July 1906	.07
Central C. & C., com..	Mo....	5,125,000	51,250	100	1,845, 00	Jan. 1907	1.50
Central C. & C., pf....	Mo....	1,875,000	18,750	100	1,242,188	Jan. 1907	1.25
Central Oil....	W. Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil....	Cal....	500,000	450,000	1	88,500	June 1905	.01
Col. & Hock. C. & I....	Ohio	7,000,000	69,244	100	173,086	Feb. 1905	.25
Consolidated Coal....	Ill....	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal....	Md....	10,250,000	102,500	100	8,801,650	Feb. 1907	3.50
Crucible Steel, pf....	Pa....	25,000,000	250,000	100	1 000,000	Sept. 1906	1.50
Empire & L., pf....	N. J....	5,000,000	25,000	100	537,000	Jan. 1907	3.00
Fairmont Coal....	W. Va.	12,000,000	120,000	100	1,384,000	Feb. 1907	3.00
Four Oil....	Cal....	500,000	300,000	1	105,406	July 1906	.01
General Chem. Com....	U. S....	12,500,000	74,103	100	1,745,125	Mar. 1907	2.00
General Chem., pf....	U. S....	12,500,000	100,000	100	4,375,178	Jan. 1907	1.50
George's C'k Coal....	Md....	2,500,000	22,000	100	1,188,000	July 1904	3.00
Home Oil....	Cal....	100,000	100,000	1	507,500	Oct. 1904	.02½
Hl. Cities & L., pf....	Cal....	200,000	200,000	100	12,500	Dec. 1906	.01½
Imperial Oil....	Cal....	1,000,000	100,000	100	880,000	July 1905	.20
International Salt....	[illegible]	30,000,000	182,280	100	927,060	Dec. 1906	1.00
Jeff & Cl'f C. & I., com	Pa....	1,500,000	15,000	100	330,000	Aug. 1905	5.00
Jeff. & Cl'f. C. & I., pf	Pa....	1,500,000	15,000	100	825,500	Aug. 1906	2.50
Kern River Oil....	Cal....	2,000,000	20,000	100	39,500	May 1905	.13
Lehigh Coal & Nav....	Pa....	14,345,650	346,897	50	24,920,891	Nov. 1906	2.00
Maryland Coal, pf....	Md....	2,000,000	18,800	100	1,537,100	Dec. 1906	4.00
National Carbon, pf....	U. S....	10,000,000	100,000	100	3,154,945	Jan. 1906	.97
Monte Cristo Oil....	Cal....	500,000	500 000	1	120,000	July 1905	.01
National Carbon, pf....	U. S....	4,500,000	45,000	100	2,047,500	May 1905	1.75
National Lead, com....	N. Y....	15,000,000	149,054	100	1,788,648	Jan. 1907	1.00
National Lead, pf....	N. Y....	15,000,000	149,040	100	16,062,508	Mar. 1907	1.75
Nat'l Steel & Wire, pf.	N. Y....	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal....	Md....	1,000,000	50,000	20	1,583,505	Mar. 1905	1.25
New River Coal, pfd..	W. Va.	4,000,000	3,761,700	100	564,255	Nov. 1906	.40
Pacific Coast Borax....	Cal....	2,000,000	19,000	100	2,086,500	Aug. 1905	1.00
Peerless Oil....	al....	1,000,000	92,000	10	396,320	May 1905	.14
Penna. Salt....	Pa....	3,000,000	60,000	50	13,988,000	Oct. 1905	3.00
Penna. Steel....	Pa....	25,000,000	168,214	100	7,026,995	Nov. 1906	3.50
Phila. Gas, com....	Pa....	28,953,029	579,061	50	6,684,142	Nov. 1905	.75
Phila. Gas, pf....	Pa....	5,744,813	114,896	50	1,583,505	Mar. 1905	1.25
Pittsburg Coal, pf....	Pa....	32,000,000	297,010	100	11,434,963	Dec. 1906	1.75
Pocahontas Coll., pf..	W. Va.	1,500,000	15,000	100	437,500	Feb. 1907	1.50
Republic I. & S., pfd.	Ill....	25,000,000	204,169	100	4,136,612	Apr. 1907	3.75
Sloss-Sheffield, com..	Ala....	7,500,000	75,000	100	750,250	Oct. 1906	2.50
Sloss-Sheffield, pf....	Ala....	20,000,000	67,000	100	3,157,250	Mar. 1907	1.25
Standard Oil....	U. S....	100,000,000	970,000	100	334,035,000	Mar. 1907	15.00
Tenn. C. & I., com....	Tenn....	22,553,600	225,536	100	2,906,425	Feb. 1907	1.00
Tenn. C. & I., pf....	Tenn....	2,480,000	24,800	100	2,480	Feb. 1907	1.00
Texas & Pacific Coal..	Texas....	2,000,000	20,000	100	1,930,000	Mar. 1905	2.00
Thirty-three Oil....	Cal....	500,000	100,000	5	430,000	July 1905	.10
Union Oil....	Cal....	10,000,000	100,000	100	1,118,766	May 1905	.50
U. S. Steel Corp., com.	U. S....	550,000,000	5,083,025	100	65,500,925	Mar. 1907	.50
U. S. Steel Corp., pf..	U. S....	360,281,100	3,603,141	100	174,844,308	Feb. 1907	1.75
Va. Carolina Ch., pf..	U. S....	20,000,000	180,000	100	11,460,869	Jan. 1907	2.00
Westmoreland Coal....	Pa....	3,000,000	60,000	50	8,580,000	Oct. 1906	2.50

Canada, Mexico, Central and South America.

Name of Company and Location.	Author-ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia.	Mex....	$480,000	9,600	50	$258,064	Jan. 1905	$1.71
Buffalo, s....	Ont....	1,000,000	900,000	100	14,000	Jan. 1907	.03
Butters' Salvador, g.	Salv....	750,000	150,000	5	600,000	Apr. 1905	.25
Caribou McKin'y, g.	B. C....	1,250,000	1,250,000	1	546,837	Feb. 1904	.04
Consolidated M. & S.	B. C....	5,500,000	48,338	100	473,255	Feb. 1907	2.50
Copiapo, c....	Chile....	1,125,000	112,500	10	3,000,000	Oct. 1904	1.20½
Crow's Nest Pass....	B. C....	3,000,000	140,000	25	1,581,148	Apr. 1906	.62½
Dominion Coal, com.	N. S....	15,000,000	150,000	100	1,050,000	Dec. 1903	1.75
Dominion Coal, pf....	N. S....	3,000,000	30,000	100	3,330,000	Jan. 1905	4.00
Dos Estrellas, g. s....	Mex....	150,000	3,000	50	1,020,555	July 1905	13.65
El Oro, g. s....	Mex....	5,750,000	1,080,000	5	2,708,800	July 1904	.15
Esperanza, s. g....	Mex....	2,275,000	456,000	5	2,520,449	Jan. 1907	2.52
Foster Cobalt, s....	Ont....	1,000,000	1,000,000	1	20,000	Jan. 1907	.05
Granby Con....	B. C....	15,000,000	1,350,000	10	1,763,630	Dec. 1906	.30
Greene Con. Copper....	Mex....	8,640,000	864,000	10	5,814,200	Mar. 1907	.40
Greene Con. Gold....	Mex....	5,000,000	500,000	10	300,000	July 1905	.20
GreenGold-Silv'r, pfd	Mex....	4,000,000	300,000	10	120,000	Feb. 1907	.40
Guanajuato....	Mex....	3,000,000	540,000	5	74,250	Oct. 1906	.07½
Guggenheim Expl....	Mex....	17,000,000	105,000	100	2,310,000	Jan. 1907	2.00
LeRoi No. 2, g....	B. C....	3,000,000	120,000	25	687,500	Jan. 1907	.48
McKinley-Darragh....	Ont....	2,500,000	2,000,000	1	100,000	Mar. 1907	.02
Mexican Coal & Coke	Mex....	5,000,000	50,000	100	600,000	Dec. 1905	3.00
Mex. Con. M. & S. Co.	Mex....	2,500,000	240,000	10	360,000	Feb. 1907	.50
Mines Co. of Am....	Mex....	2,000,000	2,000,000	1	2,425,000	Dec. 1906	.02
N. Y. & Hond. Ros....	C. A.	1,500,000	150,000	10	2,257,000	Feb. 1907	.20
Nipissing, s....	Ont....	6,000,000	1,200,000	5	780,000	Jan. 1907	.25
North Star	B. C....	1,500,000	1,300,000	1	1,951,000	Dec. 1904	.10
N. S. St. & Coal, com.	N. S....	5,000,000	49,763	100	788,600	Nov. 1904	2.00
N. S. St. & Coal, pf....	N. S....	1,030,000	10,300	100	329,600	July 1906	2.00
Penoles*....	Mex....	250,000	2,500	100	7,813,375	Dec. 1906	20.00
Platanillo....	Mex....	500,000	206,989	1	5,580	Sept. 1906	.00½
Rossland, g. s. l....	B. C....	1,000,000	958,000	1	327,082	Apr. 1906	.02
Silver Queen....	Ont....	1,500,000	1,500,000	1	138,000	Jan. 1907	.08
Sliced Star....	B. C....	500,000	500,000	1	575,000	Dec. 1904	.06
Sn. Eugenie Con....	B. C....	3,500,000	3,202,000	1	402,120	Oct. 1905	.02
Tezutlan Copper....	Mex....	1,000,000	10,000	100	[illegible]	Jan. 1907	2.00
Tilt Cove....	N. F....	1,000,000	89,000	2	21,360	Jan. 1905	.48
Tretheway, s....	Ont....	1,000,000	1,000,000	1	40 000	Dec. 1906	.04
Tyee....	B. C....	340,000	180,000	5	136,800	Dec. 1903	.24

*Mexican Currency.

THE MINING INDEX.

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

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ALUMINUM

2526—ALUMINUM. Aluminio en Vez de Cobre en las Instalaciones Electricas. C. T. de Polentino. (Revista Minera, Jan. 16, 1907. 1 p.) A short article, comparing the relative advantages of copper and aluminum as conductors of electricity, and giving a summary of the saving to be made by using aluminum on a line 30,000 meters long. 40c.

2527—SOLDERING. The "Shoop" Process of Aluminum Soldering. (Electric Accumulator, Jan., 1907; 1 p.) Discusses this new method of aluminum soldering, which is based upon the fact that aluminum becomes soft at certain temperatures, in which condition it may be joined by hammering to another piece of aluminum heated to the same temperature. Tests upon joints welded in this fashion are tabulated with the article. 40c.

ANTIMONY

2528—IDAHO. The Antimony Beds in the Cœur d'Alenes. J. J. O'Leary. (Eng. & Mg. Jl., Feb. 9, 1907.) Describes the development which has taken place upon the six antimony claims of this field, and gives a brief account of a crude method of smelting which was practiced temporarily. 20c.

CEMENT

2529—CEMENT—Ueber den Einfluss einiger Bestandtheile auf Portland und Schlacken zement. H. Renezeder. (Oest. Wochenschrift für den öffentlichen Baudienst, Jan. 19, 1907; 3½ pp.) A long account of the effect of different solutions and of sea water on the properties and quality of cement. 40c.

2530—ONTARIO—Cement Industry of Ontario. (Report of Ont. Bureau of Mines, Vol. XIV, Part 1; 66 pp.) Describes briefly the marl deposits of Ontario, and discusses in considerable detail the apparatus used in making cement. Also enumerates the principal cement producers of the province.

2531—SPECIFIC GRAVITY of Portland Cement. D. B. Butler. (Paper No. 3625 before the Brit. Instn. of Civil Engrs., Session 1905-1906; 6 pp.) Sums up the results of tests made to determine the correctness of the theory that specific gravity is a criterion of proper calcination. The conclusion is reached that specific gravity is no indication of this whatever, and that it depends solely upon age of the cement.

CLAY

2532—KAOLIN MINING in Georgia. Otto Veatch. (Eng. & Mg. Jl., Feb. 9, 1907; 1½ pp.) Gives an account of the kaolin deposits at several places in Georgia, and describes the open-cut method of mining; also the method used in preparing the kaolin for market. 20c.

COAL AND COKE

2533—BRITISH COLUMBIA—Coal Measures of the Telkwa. (B. C. Mg. Rec., Dec., 1906; 1¼ pp.) Describes briefly the geology of these coal deposits and the development which the various companies have done upon their claims. 20c.

2534—BROWN COAL MINING—Die Verwendung von Baggern zur Abraumarbeit auf den Braunkohlenbergwerken der Provinz Sachsen. M. Tornow. (Zeit. f. Berg., Hütten u. Salinenwasen, Band 54, 5 Heft; 26½ pp.) A very complete account of the use of bucket dredges for stripping and working deposits of brown coal in Saxony. Many examples of cost keeping under different mining conditions are given, and the entire subject is fully discussed from a theoretical as well as practical point of view.

2535—CHINA—Coal Mining in China. N. F. Drake. (Mg. Wld., Feb. 16, 1907; 2 pp.) The primitive methods of coal mining in use in China are discussed briefly, and the occurrence of coal, province by province, in the Empire is summarized. 20c.

2536—COAL of the United States. F. Z. Scheilenberg. (Proceedings, Engrs. Soc'y of W. Penn., Jan., 1907; 25 pp.) The characteristics of the various coal fields of the United States are outlined, and the subject of dust and gas explosions in mines is briefly considered. 40c.

2537—COAL CONSUMPTION—Efficiency in Coal Consumption. M. Brown. (Sci. & Art of Mining, Jan. 26, 1907; 1 p.) First instalment, dealing principally with the various ways in which energy is spent during steam generation. 40c.

2538—COAL FORMATION. Maximum Rate of Deposition of Coal. G. H. Ashley. (Econ. Geology, Jan.-Feb., 1907; 13 pp.) Contains an account of the investigations undertaken by the author with a view to determining the maximum rate of deposition of coal to obtain a basis for estimating the time involved in the process. 60c.

2539—COAL MINE FIRES. R. V. Norris. (Eng. & Mg. Jl., Dec. 9 and 16, 1907; 4 pp.) Lecture before the students at Columbia University, revised by the author, giving an account of the methods used to extinguish fires in the Big Lick and Warrior Run collieries, and containing comments and precautions to be observed in other standard methods of fighting mine fires. 20c.

2540—COAL MINE SAMPLING, The Value of. M. R. Campbell. (Econ. Geology, Jan.—Feb., 1907; 9½ pp.) Gives a brief resumé of the results of fuel testing at the St. Louis exposition, and discusses the results obtained with reference to the manner in which the sample was taken. Gives also proposed methods of mine sampling to eliminate the personal equation as much as possible. 60c.

2541—COAL MINING, A Single-room System. H. S. Gay. (Mines & Min., Feb., 1907; 3 pp.) Paper read before the Coal Mining Institute, Dec. 19, 1906, giving the results obtained by the author in applying the longwall system of mining to moderately thick coal seams, with special reference to the hydraulic props which were used. 20c.

2542—COAL MINING—Early Coal Mining in the Lackawanna Valley. W. H. Richmond. (Mines & Min., Feb., 1907; 1 p.) Gives a history of the development of the mining industry and transportation in the Lackawanna valley coal district. 20c.

2543—COAL MINING—The Technics of Coal Mining. Geo. H. Winstanley. (Mg. Engineering, Feb., 1906; 2¼ pp.) Continuation of article previously indexed, containing in this instalment a consideration of the various types of faults which are met with in coal mining, together with a few examples in tracing out the new location of the seam, which has been lost by faulting. 40c.

2544—COAL TESTING—Testing and Purchasing Coal for Steam Plants. A. O. Doane. (Eng. News, Feb. 7, 1907; 1 p.) Discusses the importance of knowing the composition and calorific power of coal for heating purposes, and discusses various means of making tests necessary for the above determination. 20c.

2545—COAL TESTING—The Testing of Coal. A. Bement. (Jl. Western Soc'y of Engrs., Dec., 1906; 39 pp.) Reprint of the above paper which was read before the Western Soc'y of Engrs. Oct. 3, 1906, together with discussion of the same by various members of the Society. 40c.

2546—COKE—Increase of Moisture in Coke Shipped in Sealed Cars. T. F. Farrell and W. N. Page. (Eng. & Mg. Jl., Feb. 9 and 16, 1907.) Contains various theories as to the reasons for the presence of moisture in fresh coke which was transported only in sealed cars, the prevalent opinion being that chemical action resulted in the absorption from the air. 20c.

2547—COKE OVEN MATERIALS. J. M. McKinley. (Mines & Min., Feb., 1907; 1 p.) Paper read before the Coal Mining Inst., Dec. 19, 1906. The effect of the physical conditions of the coke oven upon the coke produced is discussed and special account is taken of the brick used for lining, crown brick and the shape of the oven. 20c.

2548—COKE OVENS—Eine neue Kabelwinde für Kochofentüren, System F. G. L. Meyer-Bochum. (Glückauf, Jan. 19, 1907; 1 p.) Describes and illustrates a new device for raising and lowering doors on coke ovens, making use of a counterbalance to obtain the necessary power. 40c.

2549—COLLIERY EXPLOSION—The Stuart Colliery Disaster. F. W. Parsons. (Eng. & Mg. Jl., Feb. 16, 1907; 1 p.) Discusses the explosion at this colliery with regard to the effect which the character of the coal and the method of operation may have had upon the cause of the disaster. 20c.

2550—GERMAN COAL SYNDICATES. Das Verhältniss der Grossisten untereinander, ferner zum Bergbau, Detailhandel und Konsum. (Deutsche Kohlen-Zeitung, Jan. 26, 1907; 1 p.) Discusses a few considerations which have bearing upon the organization of syndicates for controlling the coal industry of Germany.

2551—ILLINOIS—Coal Mining in Eastern Illinois. F. W. Parsons. (Eng. & Mg. Jl., Feb. 16, 1907; 2½ pp.) The general practice of coal mining in eastern Illinois is described by reference to the methods employed by the Dering Coal Co., whose equipment and plan of working are outlined. 20c.

2552—ILLINOIS COALS.—The Economic Value of Illinois Coals. L. P. Breckenridge. (Clay Rec., Jan. 30, 1907; 6 pp.) A very valuable contribution upon the coals of Illinois, comparing their occurrence with other coal fields of the United States, and giving the results of many analyses and boiler tests made upon them. 20c.

2553—KENTUCKY COAL MINE. R. B. Colton. (Yale Sci. Monthly, Jan., 1907; 4 pp.) A very brief account of the conditions at Pine Ridge, and a short description of the methods in use for breaking down and hoisting the coal. 10c.

2554—LIFE SAVING APPARATUS—Das Verwendungsgebiet der Schlauch- und Sauerstoffatmungsapparate bei der Grubenbrandgewältigung. F. Hagemann. (Glückauf, Jan. 12, 1907; 1500 w.) Discussion of the application of respirators and hose to rescue work after explosions in mines, dealing with the necessity of having such apparatus easily accessible in the workings, and describing also actual mines where the devices were used to aid in removing accumulations of gas. 40c.

2555—LIFE SAVING APPARATUS—Les appareils de sauvetage. (Comptes Rendus mensuels des Réunions de la Société de l'Industrie minérale, Feb., 1907; 10 pp.) A summary of the principal types of apparatus in use in gaseous mines in England for rescue work, dealing especially with compressed air, pneumatic and various kinds of portable devices.

2556—LIGNITE of Northeastern Wyo-

[illegible] Mining in Mexico. M. Wal. Feb. 9, [illegible] meas[illegible]ures of Michigan, and the developments that have taken place during 1906. 20c.

2558 -MINE GASES—The Action of Coal-mine Gases. Richard Lee. (Eng. & Mg. Jl., Feb. 9, 1907; ½ p.) Brief review of the characteristics of carbon monoxide, fire-damp and after-damp, with tests for detecting the presence of each. 20c.

2559 — MINING STATISTICS. J. W. Parker. (Mines & Minerals, Feb., 1907; 1 p.) Paper read before the Coal Mining Institute, Dec. 19, 1906, discussing some of the principles which must be kept in mind in the collection of statistics, with notes on the great increase in coal tonnage during recent years. 20c.

2560—PEAT DEPOSITS of New Jersey. H. B. Kümmel. (Econ. Geology, Jan.-Feb., 1907; 10 pp.) Describes briefly the occurrence of peat in this State, and sums up the results of analyses, calorimeter and coking tests on the peat. 60c.

2561—SAFETY LAMPS—Galliford's Patent Reflector. (Sci. & Art of Mining, Feb. 9, 1907; 2 pp.) Describes with considerable detail this invention, which consists essentially of an arrangement whereby the light from a safety lamp may be reflected to any part of the working as becomes necessary.

[illegible] Coal Mines in Kolberghau. (Tonindustrie Zeitung, Feb. 2, 1907; 1 p.) Describes a method of using concrete in some French coal mines as supports for timbering, to the end that more of the coal may be won with greater safety.

2563 — TRANSVAAL.—The Coals of the Transvaal. F. A. D. H. Mosely. (Jl. Transvaal Inst. Mechan. Engrs., Jan., 1907; 3 pp.) Describes briefly the occurrence of coal in a few districts of the Transvaal, and gives the results of ultimate analyses and determinations of calorific powers upon samples from the producing mines. Continuation of article previously indexed. 60c.

2564—VENTILATION in Flat Coal Seams. A. H. Stow. (Eng. & Mg. Jl., Jan. 26, 1907; 4 pp.) A technical consideration of various methods of ventilation in this type of coal seam, giving many practical examples of brattice construction and maintenance. 20c.

2565 —VIRGINIA—The Richmond Coal Basin. E. K. Judd. (Eng. & Mg. Jl., Feb. 9, 1907; 1 p.) A description of the coal occurrences of this Virginia district, and an account of the sinking of shafts on the property by an air-hammer drill. 20c.

COPPER

2566 — ANALYSIS of Industrial Copper. Messrs. Holland and Bertiaux. (Mg. Jl., Feb. 9, 1907; ½ p.) Translation from [illegible] *couragement de l'Industrie*, July, 1906, giving in detail procedures for determining the principal impurities which occur in industrial copper, and giving very brief comments upon some of the steps in the manipulation. 20c.

2567 —ARIZONA—Copper Mining at Bisbee, Arizona. R. B. Brinsmade. (Mines & [illegible]s taken place, and describes the [illegible]thods of mining and the equip[illegible]e of the principal mines of the

2568—ARIZONA—The Production of Copper in Arizona during 1906. James Douglas. [illegible] principal operations that [illegible] the various copper dis[illegible] and discusses the output [illegible]cipal producers. 20c.

2569 BLAST FURNACE VS. REVERBER[illegible]ATORY. H. L. Charles. (Mg. & Sci. Press, [illegible]pp.) A discussion of the [illegible] blast-furnace practice in

2570 — [illegible]IFORNIA—Notes on the Foot[illegible] of the University of Californ[illegible] Geol., Vol. IV, No. 17; 13 pp.) [illegible] copper camps of this region of the Sierra Nevadas are enumerated and brief mention is made of the occurrence of ore and the character of the country rock in each district. 20c.

[illegible] Jousal, Chile. J. Muro. (Bull., Internat'l Bureau of Amer. Republics, Dec., 1906.) Gives a brief description of the occurrence [illegible] from this district. 20c

2572 COPPER MATTES. The Constitution of Mattes Produced in Copper Smelting. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 2½ pp.) Discussion of the above [illegible] Alban Eddy and R. C. Phalp, which was previously mentioned in the Index.

2573 — COPPER REFINING — Relative Elimination of Iron, Sulphur and Arsenic in Bessemerizing Copper Mattes. E. P. Mathewson. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 7½ pp.) Paper to be read at the April, 1907, meeting of the A. I. M. E., giving in tabular form the results of analyses of samples taken from copper converters during the refining of the matte, and while the blast was on.

2574 — ELECTROLYSIS OF COPPER — [illegible] das Acetatkupfer (das sogen. allotrope Kupfer). Carl Benedicks. (Metallurgie, Jan. 22, 1907; 11 pp.) Continuation of article previously indexed, this instalment dealing with the effect of different current densities upon the quality of the copper produced; it also gives an account of experiments undertaken to determine the electric conductivity of the "acetate copper." 40c.

2575—IDAHO—Oprations at White Knob Mine. Robt. N. Bell. (Eng. & Mg. Jl., Jan. 26, 1907.) The character and occurrence of the ores at this mine are described briefly. 20c.

2576 IDAHO The Snowstorm Copper Mine. Robt. N. Bell. (Eng. & Mg. Jl., Feb. 9, 1907.) A very brief description of the ore-[illegible] [illegible] [illegible] 20c.

2577 — NEVADA — Mining Conditions at Ely, Nevada. E. W. Ralph. (Mg. & Sci. Press, Jan. 26, 1907; 2 pp.) Briefly outlines the geological features of this camp in Nevada, which promises copper production in the future. 20c.

2578—SECONDARY ENRICHMENT of Copper-Iron Sulphides. (Bi-monthly Bull., Amer. Inst., Mg. Engrs., Jan., 1907; 3 pp.) Discussion of the paper by T. T. Read of the above title, which was previously mentioned in the Index.

2579—SPAIN—Les Gisements de Cuivre de la Region de Ferrol, Province de Corogne (Espagne). (L'Echo des Mines, Jan. 31, 1907.) Describes the location and mode of occurrence of copper ore in this Spanish province, with notes on future prospects.

2580—TESTING of Copper by the Consumer. (Brass World, Jan., 1907; 4 pp.) Discusses the advantages resulting from testing copper by the consumer, and describes the principal methods of testing in use, giving directions for carrying them out. 20c.

GOLD AND SILVER

2581 AFRICA. Gold Mining in West Africa. W. Fischer Wilkinson. (Eng. & Mg. Jl., Jan. 26, 1907; 1 p.) The mines of the Gold Coast and Ashanti districts are briefly enumerated and described, and some space is devoted to the banket occurrence, and working costs. 20c.

2582 — AMALGAMATION — L'Etat actuel de la Soudure électrique. E. Guarini. (Revue univ. des Mines, Dec., 1906; 2500 w.) A second contribution by the author to the art of silver amalgamation. This article discusses the theory and chemistry of the Patio process, giving the reactions which take place, ending with a brief summary of the present state of knowledge of the chemistry [illegible]

2583—ARIZONA—The Weaver Mining District, Arizona. W. A. Root. (Mg. Wld., Feb. 16, 1907; 1 p.) The equipment of some of the principal mines in this district is briefly described, with a few notes on the cyanide and milling practice of the camp. 20c.

2584—ARSENICAL ORES—Notes on the Treatment of Arsenical Ores. C. F. Lee. (Northwest Mg. Jl., Jan., 1907; 1 p.) Discusses briefly the occurrence of arsenical ores in the Cascade Range of Washington, and considers the relative advantages of water concentration, cyaniding and roasting as regards the best method of extracting the arsenic. 20c.

2585 — ASSAYING — Etude Pratique des Minerais aurifères principalement dans les Colonies et Pays Isolés. N. Dégoutin. Bull. de la Soc. de l'Industrie minérale, Tome V, IV livraison, 1906; 143 pp.) Continuation of lengthy paper previously indexed, the present chapter containing a very thorough discussion of the assaying of gold ores in all its branches, dealing in great detail with scorification, crucible fusion, cupellation, etc.

2586 BLACK SAND. J. M. Nicol. (Mg. & Sci. Press, Jan. 19, 1907; 2½ pp.) Gives the ideas of the author as to the best methods for working up black sands for the gold contained, and outlines briefly some of the precautions which must be observed through-[illegible]

[illegible] Pacific Slope, in 1905. D. T. Day and R. H. Richards. (Advance Chapter from Mineral Resources of the U. S., Calendar Year 1905; 84 pp.) Contains the long expected report of the investigation of the black sands of the Pacific coast, and gives the methods used in collecting samples, concentrating, assaying, determining their mineralogical character, and tabulates the results of tests on all the samples submitted.

2588—BRITISH COLUMBIA—Operations of the Berry Creek Mining Company in 1906. (B. C. Mg. Rec., Dec., 1906; 4½ pp.) Describes the present condition of this mining company with regard to its equipment and operations during 1906. This property is interesting because of the occurrence of platinum and similar metals among the black sands which occur sparingly on the property. 40c.

2589—CALIFORNIA—Geology of the Exposed Treasure Lode, Mojave, California. C. DeKalb. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 10 pp.) Paper to be read at the April, 1907, meeting of the A. I. M. E., giving an account of the geology of this Californian lode, and describing the relations of the rocks to each other; also the periods of faulting which have occurred.

2590 — COBALT — The Mines of Cobalt. Reginald Meeks. (Eng. & Mg. Jl., Jan. 26, 1907; 2½ pp.) Several of the principal mining companies of this camp are described in detail as to their equipment, and the underground development which they have so far carried through. 20c.

2591 COBALT. The Nipissing and Foster-Cobalt Mines. R. Meeks. (Eng. & Mg. Jl., Feb. 9, 1907; 2½ pp.) An account of the two larger mines of this Ontario district, showing how primitive methods are being abandoned, and describing briefly the method of hydraulic prospecting which is used here. 20c.

2592—COBALT DISTRICT, Ontario. H. W. Hardinge. (Mg. Wld., Feb. 9, 1907; ½ p.) An account of a visit by the author to this mining district, describing briefly the geology of the region and the occurrence of the ore, and showing that little actual development has been done, making it essential for investors to insist upon definite reports upon properties before investing. 20c.

2593 — COLOMBIA — A Mining Enterprise in Colombia. F. C. Nicholas. (Mg. Wld., Feb. 9, 1907; 2 pp.) The general conditions which have developed placer properties in this South American republic are discussed, and the conclusion is reached that all mining which is to be carried on in this region must be done with the aid of considerable capital. 20c.

2594 — CYANIDATION — Cyanide Sand Handling Systems of the Witwatersrand. A. F. Crank. (Jl. Transvaal Inst. Mechan. Engrs., Jan., 1907; 21 pp.) Describes the evolution of the methods and machinery used in handling sands on the Rand, and outlines the present equipment of the principal plants of the district. 60c.

2595—CYANIDATION of Raw Pyritic Concentrates. F. C. Smith. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 5 pp.) Gives the results of a series of tests upon concentrating a pyrite ore and cyaniding the concentrates, ending in the decision to treat the concentrates raw after grinding through 100-mesh screen.

2596—CYANIDATION—The Butters Cyanide Plant, Virginia City, Nev. C. T. Rice. (Eng. & Mg. Jl., Feb. 9, 1907; 4½ p.) A very complete account of the labor-saving devices which are in use in this Nevada mill, giving an especial account of the methods of filtering the solution and precipitating the gold. 20c.

2597—CYANIDATION—The Butters Filter. M. R. Lamb. (Mg. & Sci. Press, Feb. 2, 1907; 2 pp.) Describes the operation and construction of this filter, which claims to be very efficient in extracting precious metal from slimes not amenable to treatment by any other method, as well as from sands which are now treated by percolation, but which will be ground much finer and treated by agitation and filtration. 20c.

2598—CYANIDATION—The Butters Slimes Filter at the Cyanide Plant of the Combination Mines Company, Goldfield, Nevada. M. R. Lamb. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 10 pp.) A description of the construction of this filter, showing its economy in erection, and giving the cycle of operations through which it is run during working. Paper to be read at the April, 1907, meeting of the A. I. M. E.

2599 CYANIDATION. The Moore and Butters Filters. F. L. Bosqui. (Mg. & Sci. Press, Feb. 2, 1907.) Discussion of the relative advantages of stationary and movable frames for filter presses, showing that the operating cost of the Butters-Cassel is less than that of the Moore filter. 20c.

2600—CYANIDE PRACTICE on Boulder Co. Ores. F. Leonard. (Western Chemist and Metallurgist, Jan., 1907; 4½ pp.) Describes a [illegible] run made upon ores from Boulders Co., Colo., giving the methods of handling the pulp, and the details of cyaniding. 60c.

2601 DREDGING. A Powerful Dredge

Equipped with a Cable Storage Drum. Eng. News, Feb. 7, 1907; 1¼ pp.) Describes the method and method of operating the cable-supply locomotive designed and used at Michigan-on-Cascade coaling station. 20c.

2602—DREDGING and Hydraulicking in Arizona Westbrook. (Min. & Sci. Press, Jan. 5, 1907; 1 p.) Describes the utilization of the tailings pile at Folsom, California, where the company has erected a rock-crushing plant to [illegible] where the land which has been covered with [illegible] and is being cultivated. 20c.

2603—GOLD AND PYRITE—Some Associations of Gold with Pyrite and Tellurides. W. J. Sharwood. (Min. & Sci. Press, Jan. 26, 1907; 3 pp.) Gives the result of a series of microgrophical studies of thin rock sections, with special reference to the relation of gold to pyrite and tellurides. 20c.

2604—HYDRAULIC MINING—Recent Practice in Hydraulic Fill Dam Construction. (Proceedings Amer. Soc'y Civil Engrs., Jan., 1907; 35 pp.) Discussion by W. I. Butcher and T. G. Dabney of the above paper which was previously mentioned in the Index.

2605—IDAHO—South Mountain, Idaho. Robt. N. Bell. (Eng. & Mg. Jl., Feb. 9, 1907; 1 p.) The geology of the silver-lead district of South Mountain, Idaho, is described in an interesting manner, and the mixture of minerals which occurs here is commented upon. 20c

2606—MILLING—Design and Working of Gold Milling Equipment, with Special Reference to the Witwatersrand. G. A. Denny. (Paper No. 3623 before the British Instn. of Civil Engrs., 1906; 61 pp., 2 plates and numerous figures.) A very complete consideration of the principles which underlie the design of mills and the methods of treatment to be adopted for various classes of ore.

2607—MILLING—Regulating Mill Returns in the Transvaal. A. Selwyn-Brown. (Eng. & Mg. Jl., Feb. 9, 1907; 1 p.) Brief account of the way in which the fluctuating character of the ore of the Transvaal has forced the managers to adopt a process of "sweetening" poor ore in order to obtain a sufficiently high average assay value. 20c.

2608 — MILLING — Single-stamp Mills. J. W. Pinder. (Mg. & Sci. Press, Feb. 2, 1907; 1 p.) Discusses the possible substitution of single stamps for batteries in milling practice, and argues that classification of pulp immediately after stamping is a necessity for efficient recovery of values. 20c.

2609—MILLING—Test of Lane Mill Run Side by Side with Five-stamp Battery. J. A. Stewart. (J. A. Mg. Rev., Jan. 26, 1907.) An interesting account of simultaneous tests of the Lane system of crushing and stamp crushing, giving screen analyses of concentrates and tailings, showing a superior fine grinding power for the Lane mill. 20c.

2610—RAND METALLURGICAL PROGRESS and Recent Innovations. G. A. and F. W. Denny. (Jl. So. Afr. Assn. of Engrs., Dec., 1906; 14½ pp.) Note by D. Simpson of his experience with the Denny method of working at the New Goch gold mine. $1.

2611—SOUTH AFRICA—Review of Mining in South Africa in 1906. O. Letcher. (Mg. Wld., Jan. 26, 1907; 1 p.) Brief review of developments in the mining industry of South and Central Africa during the past year. 40c.

2612—SOUTH AMERICA—Mining in South America in 1906. M. A. Denegri and K. C. Farish. (Mg. Wld., Jan. 26, 1907; 2 pp.) Review of mining conditions in Peru and Colombia during 1906. 40c.

2613—TRANSVAAL—Ancient Workings in the Northern Transvaal. J. M. Calderwood. (S. Afr. Mines, Jan. 26, 1907; 1 p.) Gives a brief description of the method of working these abandoned prospects of the Northern Transvaal, and predicting the renewing of mining operations as soon as the completion of railways allows reduction of transportation charges. 40c.

2614 — TUBE MILLS — Grinding in Tube Mills at the Waihi Gold Mine, Waihi, New Zealand. E. G. Banks. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 4 pp.) A summary of tests which extended over a long period of time, with a view to determining the suitability of tube mills to supplement stamps, and ending in the decision to install the tube mills.

2615 — VIRGINIA GOLD MINE. E. K. Judd. (Eng. & Mg. Jl., Feb. 16, 1907; ½ p.) Outlines the present state of development and methods of operation in this one active Virginia mine in the Virginia copper district. 20c.

2616—WESTERN AUSTRALIA — Individual Records of Kalgoorlie Producers. R. Stokes. (Mg. Wld., Feb. 2, 1907; 1½ p.) Present state of development of several of the principal mines of the Kalgoorlie district is briefly described, including character of ore treated, methods of treatment and percentage of extraction. 20c.

2617—WESTERN AUSTRALIA—Magmatic Processes in the Gold Deposits of Western Australia. W. Lindgren. (Mg. Jl., Feb. 2 and 9, 1907; ½ p.) Study of the ore deposits and country rocks of Western Australia, with reference to the probable process by which the orebodies were formed. 60c.

IRON AND STEEL

2618—ALABAMA—New Source of Supply in Alabama. T. P. Gross. (Mg. Record, Feb. 7, 1907; 1½ pp.) Description of the natural resources of Alabama in iron ore, and a discussion of the conditions which have hitherto made it impossible to develop these resources in the manner which they deserve. 20c.

2619—AUSTRIA—Die Eisen- und Stahlgewinnung in Innerösterreich, speziell am steirischen Erzberge im Mittelalter. A. Müllner. (Oest. Zeit. f. Berg- u. Hüttenw., Feb. 2, 1907; 4½ pp.) An interesting account of the metallurgy of iron and steel in Austria, dealing in this instalment with the primitive devices which were used in early times for smelting the ores. 40c.

2620—BLAST FURNACE PRACTICE at Blaenavon. G. F. Martin. (Iron & Coal Tr. Rev., Jan. 18, 1907; 1½ pp.) Paper read before the So. Wales Inst. of Engineers. Describes the equipment for smelting at this plant and pays especial attention to the regulation of the hot blast and the smelting of calcined sulphides. Interesting tables showing the efficiency of furnaces under different conditions of blast are given. 40c.

2621—BLAST FURNACES—Le Charge ment des Hauts Fourneaux, d'après les Méthodes Américaines. C. Dantin. (Génie Civil, Jan. 19, 1907; 3 pp.) An illustrated description of the best American systems for charging blast furnaces automatically; also an account of the installation of an automatic charging system at Aumetz, Lorraine. 40c.

2622—CAR WHEELS—The Manufacture of Cast Iron Car Wheels. (Iron Trade Rev., Feb. 7, 1907; 6 pp.) A very detailed review of the development of the circular floor, straight line and continuous systems, as applied to the manufacture of cast-iron wheels, together with description of various new and important labor-saving devices which are now used in this industry. 20c.

2623—CARBON ESTIMATION—The Estimation of Carbon in Iron and Steel by Oxidizing the Borings, with the Use of a Single Bunsen Burner. J. A. Aupperle. (Iron Age, Jan. 24, 1907). Gives the procedure for a method of determining carbon in steel by the direct ignition of the borings with a Bunsen burner, the claim being made that this method of determination will occupy ten minutes from the time the one-gram sample is laid out. 20c.

2624—COLORADO FUEL AND IRON COMPANY—The Blast Furnaces at the Minnequa Steel Works. Lawrence Lewis. (Eng. & Mg. Jl., Jan. 26, 1907; 3½ pp.) Continuation of a series of articles on the operations of this company, this article dealing with the blast furnaces and the power plant for operating the mechanism connected with them.

2625—ELECTRIC FURNACE—Ueber die Fortschritte in der Elektrostahl-Darstellung. (Stahl u. Eisen, Jan. 16, 1907; 7 pp.) Conclusion of article previously indexed, this instalment dealing with the induction process of electric steel production, discussing the theory of the reduction and describing briefly various procedures. 40c.

2626—ELECTRIC SMELTING—Implantación de la Electrosiderurgia en Espana. El Horno Kjellin de Araya. (Revista Minera, Jan. 16, 1907; 1 p. and 1 plate). Brief account of the introduction of electric furnace smelting into Spain, describing the operation and working of the steel plant at Araya. 40c.

2627—ELECTROMETALLURGY OF IRON—Die Fortschritte der Elektro-metallurgie des Eisens. A. Neuburger. (Zeit. f. ange. Chemie, Jan. 18, 1907; 11 pp.) A long contribution on the more important aspects of recent progress in the electrometallurgy of iron, reviewing the results obtained by the chief investigators of this subject. 40c.

2628—FOUNDRY IRON—Die Verwendung des Flammofens in der Giesserei, insbesondere [illegible] Gellenkirchen. (Stahl u. Eisen, Jan. 16, 1907; 4 pp.) Conclusion of article previously indexed, this instalment considering the effect of the carbon content upon the iron and discussing the question of temperature, and how it enters into foundry practice. 40c.

2629—GOGEBIC RANGE—Some Gogebic Mines as Seen in 1906. Iron Tr. Rev., Jan. 31, 1907; 4½ pp.) Gives a comparison of the output of various districts of the Gogebic range, and describes the awakened activities and the new developments at the principal mines of this region. 20c.

[illegible] Hüttenwesen. [illegible] dredths Per Cent. of Carbon. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; [illegible] the above paper by C. E. Corson, which was previously read before the Institute.

2631—MARTIN PROCESS—Die Metallurgie des Martinprozesses. T. Naske. [illegible] Jan. 26, 1907; 3½ pp.) Investigation of the theory of the process of making Martin steel, and an attempt to trace the chemical reactions which take place. This instalment deals especially with the various condition which determine whether manganese in the steel bath will be oxidized or reduced. 40c.

2632—MECHANICAL EQUIPMENT FOR STEEL WORKS—Maschinelle Einrichtungen für das Eisenhüttenwesen. F. Frölich. (Zeit. des Vereines deutscher Ingenieure, Jan. 12 and 19, 1907; 9 pp.) Continuation of lengthy [illegible] charging appliances for various furnaces. Many drawings and detailed descriptions are given. 60c.

2633 — NICKEL STEEL — Aciers Nickel Silicium. L. Guillet. (Revue de Metallurgie, Dec. 1, 1906; 19½ pp.) Gives results of a long series of tests upon the properties of nickel steel and silicon steel; descriptions of micrographical tests, mechanical properties, etc., are given; also a list of conclusions drawn from a study of results. $1.

2634—NITROGEN IN STEEL—Undersökning Utförd vid Motala Verkstad Öfver Kväfve Järn och Stal. H. Braune. (Jern Kontorets Annaler, 1906, 16 pp. [illegible] thor shows that the bad qualities of certain classes of steel are caused by the presence of nitrogen. 80c.

2635—ONTARIO—Boston Township Iron Range. W. G. Miller. (Report of Ontario Bureau of Mines, Vol. XIV, Part 1; 7 pp.) Describes the physical and geological features of this iron range, with a brief account of the rock outcrops.

2636—ONTARIO—Iron Ranges of Michipicoten West. J. M. Bell. (Report of Ontario Bureau of Mines, Vol. XIV, Part 1, 1905; 77 pp.) Outlines the physiography of these iron ranges, and gives full account of the general stratigraphy of the district.

2637—PENNSYLVANIA—The Iron Mines at Cornwall, Pennsylvania. W. E. Ford. (Yale Sci. Monthly, Jan., 1907; 7 pp.) Gives a brief description of the occurrence of iron ore in this Pennsylvania district, and describes the present condition of open-pit mining there, as carried on by the steam shovel. 40c.

2638—RAIL SPECIFICATIONS—Comparison of American and Foreign Rail Specifications, with a Proposed Standard Specification to Cover American Rails Rolled for Export. (Bi monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 20 pp.) A discussion of the paper by A. L. Colby, which was previously mentioned in the Index.

2639—ROLLING IRON AND STEEL, Improvements in. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 4 pp.) Discussion by members of the Institute of the above paper by J. E. York, which was previously mentioned in the Index.

2640—RUSSIAN STEEL MAKING—Das Hüttenwerk der Metallurgischen Gesellschaft zu Taganrog. L. Fortunato. (Oest. Zeit. f. Berg- und Hüttenw., Jan. 12, 19, 26 and Feb. 2, 1907; 9 pp.) Continuation of article previously indexed. Enumerates the charging lifts, converters, furnaces, etc., and gives tables of capacities, operating details, and also some account of the daily working of the plant. $1.

2641—SHEET IRON—La Fabrication des Plaques de Blindage aux Forges nationales de [illegible] (Génie Civil, Jan. 26, 1907; 4 pp.) A very complete description of the equipment of the national works at Guerigne, France, for the manufacture of thin sheet iron and steel. 40c.

2642—SMELTING IRON ORE—Concentration et agglomeration des minerais de fer. L. Campredon. (La Métallurgie, Jan. 30, 1907; ½ p.) Gives a description of a few [illegible] ting iron-ore concentrates in preparation for smelting, paying special attention to the con[illegible] where the fritting takes place. 40c.

2643—STEEL PLANT—New Plant of the Detroit Steel Casting Co. (Iron Tr. Rev., Feb. 14, 1907; 5½ pp.) Interesting account of the equipment of the new plant of this company, which manufactures open hearth and converter-steel castings. 20c.

2644—STEEL WORKS—The Krupp Works. (Engineer, Lond., Feb. 8, 1907; 3 pp.) Brief but interesting description of these famous steel works, with several photographic views of the shops. To be continued. 40c.

2645—STRESSES IN STEEL—The Resist-

and form a very valuable contribution to the

2647—TEXAS—Iron Ore Development in ... W. C. Read. (Manufacturers' Record, Feb. 14, 1907; 1 p.) An outline of the different reasons which have prevented iron ore development in Texas, and a description of the present status of the iron industry in this State. 20c.

2648—THERMIT PROCESS—Method and Cost of Welding Rails by the Thermit Process. (Engineering-Contracting, Feb. 13, 1907; 1 p.) The methods of making the molds which are used in this process of re... rails are described, and the cost of ... given, together with a list of pre... which must be observed to get best results. 20c

LEAD

2649—CARBONATE OF LEAD—Deposit ... Lead Carbonate at Viola Mine, Idaho. R. N. Bell. (Eng. & Mg. Jl., Jan. 26, 1907.) A very brief description of the occurrence of lead ore at this mine in Idaho, giving some assays of the ore. 20c.

2650—CARMICHAEL-BRADFORD PROCESS—W. M. Hutchings. (Eng. & Mg. Jl., Jan. 26, 1907.) Gives some of the views of the author as to the reactions which take place between CaSO and PbS in the Carmichael-Bradford and the Huntington-Heber processes. 20c.

2651—IDAHO—Development in the Cœur d'Alenes. (Lead and Zinc News, Jan. 14, 1907; 2¼ pp.) Describes briefly the copper belts and the lead and silver districts in this mining region, showing how present mining developments are rapidly increasing. 20c.

2652—IDAHO—The Gilmore Mine, Idaho. Robt. N. Bell. (Eng. & Mg. Jl., Jan. 26, 1907.) Brief summary of the equipment of this lead mine, giving the shipments for 1906. 20c

2653 — LEAD REFINING — Tredinnick's Process for Desilverizing Lead. T. S. Austin. (Mg. & Sci. Press, Jan. 26, 1907; 1½ pp.) Describes an improvement on the Luce-Rozan method of refining base bullion, whereby the melting pots and steam cranes required to raise the bullion are done away, and a train of ... bottles substituted. The method of operating this new plant is described in brief. 20c

2654—LIME ROASTING—Laboratory Experiments in Lime Roasting a Galena Concentrate with Reference to the Savelsberg Process. H. O. Hofman, R. P. Reynolds and A. E. Wells. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 15½ pp.) Paper to be read before the April, 1907, meeting of the A. I. M. E. An account of several laboratory tests made on several different mixtures of galena ... and lime, with a view to eliminating the sulphur by blowing

NICKEL

2655—MALLEABLE NICKEL—The Manufacture of Malleable Nickel. E. S. Sperry. (Brass World, Jan. 1907; 7 pp.) Very interesting account of attempts to produce ... by manganese and magnesium as components of the alloy to be produced, and a full description of the ... of producing malleable nickel as now practiced. 20c

PETROLEUM

2656—CALIFORNIA—Review of Conditions in the California Oil Fields during 1906. (Pac. Mg. & Oil Reporter, Jan. 5, 1907; 1 p.) ... a brief account of the recent develop... and discusses the per... ... and the additional equip... ... the oil producers. 20c

2657—GULF COASTAL OIL FIELDS IN ... (Mg. Wld., Jan. 19, 1907; 1 p.) Discusses the condition of the oil industry in the fields of Texas and Louisiana, and gives the ... of some of the wells in ... 10c

2658—ONTARIO—Petroleum and Natural ... (Report of the Ont. Bu... Mines, Vol. XIV, Part 1, 28 pp.) Describes the location of petroleum and natural-gas fields, discusses the various theories now in force as to the origin of natural gas and petroleum, and describes all the geological formations which are associated with oil-bearing horizons.

2659—PETROLEUM INDUSTRY—A Review of American Developments during 1906. (Petroleum Rev., Jan. 19, 1907; 2 pp.) Discusses the developments and production of oil in American fields, and cites some of the new discoveries and failures during prospecting operations. To be concluded. 40c.

2660—RUSSIAN PETROLEUM INDUSTRY during 1906. (Pet. Rev., Jan. 19, 1907; 1 ... pp.) Reviews the conditions of the Russian petroleum industry during 1906, commenting briefly upon the conditions which have had bad influences upon the production of these oilfields. Prospects for the year 1907 are briefly discussed. To be continued. 40c.

2661—STANDARD OIL COMPANY, The Methods of. Report of Interstate Commerce Commission. (Eng. News, Feb. 7, 1907; 1 p.) Contains many very interesting extracts from the Report of the Interstate Commerce Commission, showing how the Standard Oil Co. maintained and developed its monopoly. 20c

SALT

2662 — POTASSIUM SALTS — L'industrie des sels de potasse. E. Bœufve. (Travailleur Afrigain, Jan. 15, 1907; 1 p.) A short account of the salt deposits at Stassfurt, Germany, giving a review of the present condition of the industry there. 40c.

SULPHUR AND PYRITES

2663—ROASTING OF PYRITES—Le Grillage des Pyrites au Moyen de Fours mécaniques. L. Pierron. (Revue de Chimie industrielle, Jan. 15, 1907; 10 pp.) Very thorough article dealing with the mechanical roasting of pyrites. All the principal types of roasting furnaces are described and commented upon, and the features entering into the question of adopting roasters and their best arrangement are discussed. 40c.

2664—WYOMING—Sulphur Mining and Refining in Wyoming. L. W. Trumbull. (Mines & Min., Feb., 1907; 1½ pp.) The sulphur-bearing area of Wyoming is described briefly, an account of the genesis of the deposits is given, and the apparatus and method used in handling the material and preparing it for market are described in detail. 20c.

ZINC

2665—MISSOURI—Sheet Ground Mining in the Webb City District. O. Ruhl. (Mg. Reporter, Feb. 7, 1907; 2 pp.) The method of mining these horizontal deposits of zinc ore is described briefly, and a short account of the milling practice in this district is given. 20c.

ECONOMIC GEOLOGY—GENERAL

2666—AZURITE—Il giacimento di azzurrite del Castello di Bouvei presso Mara (Sardegna) con alcune osservazioni sulle formazioni dei carbonati di rame naturali. (Rassegna Mineraria, Jan. 21, 1907; 2 pp.) A short discussion upon the deposit of azurite in Sardinia, Italy, with notes on the location and character of the mineral. 40c.

2667—DIKES. J. F. Kemp. (Mg. & Sci. Press, Jan. 19, 1907; 3½ pp.) Summary of the present condition of knowledge as to the occurrence and structure of dikes throughout various sections of the country. 20c.

2668 — FAULTS — How Should Faults be Named and Classified? T. A. Jaggar, Jr. (Econ. Geology, Jan.-Feb., 1907; 4 pp.) Discusses briefly various forms of faulting, and points out several defects in the present method of describing and identifying these faults. 60c.

2669—FOSSILS—North American Index Fossils. A. W. Grabau and H. W. Shimer. (School of Mines Quart., Jan., 1907; 72 pp.) Continuation of a lengthy monograph, which has been previously indexed. 60c.

2670—GENESIS OF ORE DEPOSITS—The Need of Field Work in the Study of Ore Genesis. A. P. Coleman. (Eng. & Mg. Jl., Feb. 9, 1907.) A discussion of an article on the genesis of ore deposits by Messrs. Campbell and Knight, reviewing their results, and showing how necessary it is to distinguish between the actual original source of the ore and the theory of its source as indicated by the particular method of investigation pursued. 20c

2671 — MEXCIO — Geological Aspects of Mexico. R. T. Hill. (Mg. Wld., Feb. 2, 1907; 1 p.) Continuation of article previously indexed, this instalment giving a general description of the surface features of the southern Sierras, their foothills, and the surrounding country from which they rise. 20c

2672—ONTARIO—Explorations in Abitibi. J. G. McMillan. (Report of the Ontario Bureau of Mines, Vol. XIV, Part 1, 1905; 28 pp.) Gives at great length an account of explorations in this region, and describes the agricultural resources of the district.

2673—ORE DEPOSITS at the Contacts of Intrusive Rocks and Limestones; and their Significance as Regards the General Formation of Veins. J. F. Kemp. (Econ. Geology, Jan.-Feb., 1907; 13 pp.) Paper read before the Mexican meeting of the International Geological Congress, Sept. 10, 1906, discussing the influence of moving underground waters in the formation of ore deposits when they come in contact with limestones and igneous rocks. 60c.

2674—ORE DEPOSITS—Experiments on the Action of Various Solutions on Pyrite and Marcasite. H. N. Stokes. (Econ. Geol., Jan.-Feb., 1907; 9½ pp.) An account of an uncompleted set of experiments with the hope of throwing some light on the understanding of the formation and decomposition of sulphides by circulating alkaline waters. 60c.

2675—QUEBEC—Report on the Chibougamau Mining Region in the Northern Part of the Province of Quebec. A. P. Low. (Geological Survey of Canada, No. 923; 61 pp. and map.) In this report there is a very long discussion of the physical and geological features of the district, but the report upon the economic minerals is treated in a very sparing manner. The principal conclusion of the report is that active work in the district must await the completion of projected railways.

2676—UNDERGROUND WATER—Ueber die Bewegung von Grundwasser. F. Wünnemann. (Journal für Gasbeleuchtung und Wasserversorgung, Jan. 26, 1907; 9½ pp.) A very detailed consideration of all the factors which relate to the amount, distribution and movement of underground water, explaining the various methods in obtaining results, and giving good descriptions of various types of apparatus employed.

2677—WYOMING—Geologic Atlas of the United States. Cloud Peak-Fort McKinney Folio. (U. S. Geological Survey, 1906.) Illustrated description of the area, accompanied by topographic maps, areal-geology maps, economic-geology map, structure-section sheets, columnar-section sheet.

MINING—GENERAL

2678 — ALASKA — Prince William Sound Copper District, Alaska. L. L. Bales, A. W. Tibbitt, W. N. Robeson and T. W. Blakney. (N. W. Mg. Jl., Jan., 1907; 3 pp. and 1 map.) Enumerates the various properties in this Alaskan district, and describes briefly some of the physical features of the region. 20c.

2679—AUSTRALIA—Mining in Australia in 1906. John Plummer. (Mg. Wld., Jan. 26, 1907; 2 pp.) A review of the mining industry in Australia, dealing principally with the conditions which prevail in the gold, silver, lead and copper districts, and discussing only briefly tin and coal mining. 40c.

2680—BELGIUM—L'industria minerale del Belgio nel 1905. L. Dejardin. (Rassegna Mineraria, Feb. 1, 1907; 1½ pp.) Reviews briefly the progress of mining and metallurgy in Belgium during 1905, and gives some tables of production. 40c.

2681—BRITISH COLUMBIA. E. Jacobs. (Eng. & Mg. Jl., Jan. 26, 1907; 1 p.) The principal mineral products of British Columbia are described individually and the chief features attending their production during 1906 are briefly discussed. 20c.

2682—BRITISH COLUMBIA—Annual Review of Mining in British Columbia. E. Jacobs. (B. C. Mg. Rec., 1906; 8½ pp.) Discusses the production of the various metals that are mined in British Columbia, with comments on the various causes which have led to increase and decrease in production. 40c.

2683—BRITISH COLUMBIA in 1906. A. Wheeler. (Can. Mg. Rev., Feb., 1907; 5 pp.) Reviews of the progress in mining and the output of the chief mining districts of British Columbia. 40c

2684—BRITISH COLUMBIA—Mining on Vancouver Island in 1906. (B. C. Mg. Rec., Dec., 1906; 4 pp.) Describes the progress in mining on this island by districts, and enumerates the producers within each district. 40c.

2685—CALIFORNIA Mines and Minerals. Compiled by C. G. Yale. (California State Mining Bureau, Bulletin No. 44; 52 pp.) Contains the usual statistics of mineral production in this State, classified by kind and by counties; gives also mining maps of the various counties of the State. 20c.

2686 — CANADA — Mining in Canada in 1906. "British Columbia," by A. Wheeler; "Ontario," by F. C. Loring. (Mg. Wld., Jan. 26, 1907; 1½ pp.) In British Columbia the chief events of 1906 are briefly discussed and developments and shipments of some of the principal mines are given. In Ontario the conditions of the Cobalt mining district are

outlined, and several of the newer developments in this province are briefly mentioned. 10c.

2687—DIAMOND DRILLING, PRACTICAL. O. H. Reinholt. (E. & Mg. Rev., Feb. 2, 1907; 1 p.) Describes some of the different types of diamond drilling which are now extensively appreciated, and gives some principles of cost estimation, with especial reference to the high labor charges of the West. 20c.

2688—EXPLOSION. Die Dynamitexplosion in dem Bohrturme bei Zappendorf am 4. Mai, 1906. (Zeit. d. Berg-, Hütten- u. Salinenwesen Band 54, Heft 5, 14 pp.) An account of an explosion of dynamite in a drill-hole at Zappendorf, Germany, discussing the various causes which could have been responsible for the accident.

2689—JAPANESE MINING LAW. Loi Minière du Japon. (Bull. de la Soc. de l'Industrie minérale, Tome V, IV livraison, 1906; 20 pp.) A complete transcription of the mining laws of Japan, giving general and special rights of miners, surface customs, mining police, and penalties for infractions.

2690—LAW OF THE APEX. Do the Geological Relations of Ore Deposits Justify the Retention of the Law of the Apex? C. H. Shamel. (Econ. Geology, Jan.-Feb., 1907; 15 pp.) Reviews the reasons which caused the adoption of the present Federal apex mining law, and discusses various changes in belief as to the character of ore deposits the issue of which changes in the law are now being agitated at the present time. 60c.

2691—LIME AND MARL DEPOSITS.—Wie wird bei Anlage eines Kalksandsteinwerkes die Investierung unter Kalksandsteine gewährleistet? W. Drakebush. (Tonindustrie Zeitung, Jan. 10, 1907; 1 p.) A discussion of the factors which must be investigated and established in order to insure the profitable exploiting of a lime and marl deposit. 40c.

2692—MEXICO—Mining in Mexico in 1906. (Mg. Wld., Jan. 26, 1907; 12 pp.) A review of the mining industry in Mexico in 1906, divided as follows: "Copper Mines of Cananea," by G. A. Newett; "Chihuahua," by W. D. Pearce; "Northern Mexico," J. A. Robertson; "Jalisco, Sinaloa and Tepic," by A. C. Brady; "Velardena and Mapimi," by H. Williams; "Mining Investments in Mexico," by T. C. Graham; "Electricity as a Mining Power in Mexico," by C. V. Allen. 40c.

2693—MINE MODELS. Concrete Mine Models. W. R. Crane. (Mines & Min., Feb., 1907; 2½ pp.) Very interesting account of the use of concrete mine models to illustrate the various methods of mining and timbering now in use. 20c.

2694—MINE SURVEYING. A. R. Long. (Mines & Minerals, Feb., 1907; 1½ pp.) Reprint from Proceedings of the Engineering Assn. of the South, describing an improved method of keeping mine-survey notes, with specimen pages from the note book. A few methods of picking up the survey are also given. 20c.

2695—MINING INDUSTRY.—Review of Mining in the United States in 1906. (Mg. Wld., Jan. 26, 1906; 30 pp.) A review, by various authors, of the mining progress which has been made in the various States and Territories of the Union. 40c.

2696—MINING LAW.—Weak Points of the Federal Law in Relation to Mineral Lands. G. W. Riter. (Eng. & Mg. Jl., Jan. 26, 1907; 1 p.) The present unsatisfactory condition of the Federal mining law is described, with special reference to the Flagstaff case, and suggestions for preventing abuses in the future are made. 20c.

2697—MINING METHODS.—Old Mexican Methods. B. MacDonald. (Mg. & Sci. Press, Jan. 26, 1907; 3 pp.) Interesting illustrated account of the old mining and milling practice of the Guanajuato district. 20c.

2698—MINING PROGRESS.—World's Mining Progress Since Early Times. C. C. Schatterback. (Mg. Wld., Jan. 26, 1907; 27 pp.) A review of the world's mining progress in all branches of mineral production, but dealing especially with gold and silver in the United States, and giving only brief summaries of the mining situation in South and Central America. 40c.

2699—MINING TERMS.—Spanish-American Mining Terms. H. E. West. (Mg. & Sci. Press, Feb. 2, 1907; 1½ pp.) Interesting article giving the equivalents or translations of various Spanish terms relating to mining, prospecting, etc., with which the general reader is not familiar. 20c.

2700—NEW MEXICO Mining in 1906. R. V. Smith. (Ores & Metals, Feb. 5, 1907; 2½ pp.) Discusses the progress of mining development in New Mexico during 1906, giving an account of the preparatory work which in the future will give New Mexico an important place among metal producers. 20c.

2701—NEW SOUTH WALES Industrial Conditions at Broken Hill. R. Stokes. (Mg. Wld., Feb. 16, 1907; 2 pp.) Outlines the progress in the mining industry in this Australian district, with special reference to the character of the ore deposits. 20c.

2702—ONTARIO.—Mines of Eastern Ontario. E. T. Corkill. (Report of the Ontario Bureau of Mines, Vol. XIV, Part 1; 12 pp.) Brief account of the location, equipment and development of all the producing mines of eastern Ontario, classified by nature of mineral produced.

2703—ONTARIO.—Mines of Western Ontario. W. E. H. Carter. (Report of the Bureau of Mines of Ont., Vol. XIV, Part 1; 33 pp.) Brief account of the situation, equipment and development of all the producing mines of western Ontario, classified by nature of mineral produced.

2704—ORE HANDLING.—The Transportation and Shipment of Ore. (Engineering, Jan. 25 and Feb. 8, 1907; 3 pp.) A detailed description of the facilities for handling of ore at the Alquife mines in Spain, where the existing railway and port necessitated the extension of the railway seaward in the form of a pier. 60c.

2705—SAMPLING.—Metallics in Sampling Work. F. A. Thompson. (Western Chemist & Metallurgist, Jan., 1907; 3 pp.) An interesting account of the difficulties met with in attempting to get a correct assay of an ore containing metallic particles, giving the methods used in sampling the ore, and the final procedure which was agreed upon mutually by the sampling mill and the seller of the ore. 60c.

2706—SHAFT SINKING.—Einiges über das Zementierverfahren beim Abteufen und Ausbau von Schächten in wasserreichem Gebirge. J. Divis. (Oest. Zeit. f. Berg- u. Hüttenw., Jan. 19 and 26, 1907; 7 pp.) A review and summary of various successful applications of this tubbing process for sinking shafts in water-bearing strata. Describes the method of sinking, handling the cement, and overcoming the various difficulties as they presented themselves. 60c.

2707—SHAFT SINKING.—Nouvelle Méthode de Creusement des Puits de Mine par la Congélation. (Revue univ. des Mines, Dec., 1906; 300 w.) Describes and illustrates a new method of applying the freezing process to shaft sinking, whereby it is not necessary to keep a freezing mixture at work when the shaft is completed, but allows a concentration of cold upon a given zone. 60c.

2708—SHAFT SINKING with the Aid of Pumps through Heavily-watered Strata. S. Dean. (Mg. Engineering, Feb., 1907; 1 p.) Continuation of article previously indexed, dealing with the application of pulsometers and bucket-lifts to removing water from the shaft, and showing the advantages in favor of the lift. 40c.

2709—SOUTH AMERICA in 1906. J. P. Hutchins. (Eng. & Mg. Jl., Jan. 26, 1907; ½ p.) Reviews the conditions of South American mining in 1906, discussing briefly the gold, silver and platinum producetion, and showing that the past year was not one of very general success and the promises for 1907 are not very attractive. 20c.

2710—SURVEYING.—Adaptation of the Stadia to Small Scale, Reconnaissance Surveys. R. H. Chapman. (Mg. & Sci. Press, Jan. 19, 1907; 1 p.) Gives a new method for running reconnaissance surveys by a stadia in a flat country, where wheel traverses and aneroid barometer could not be used. 20c.

2711—TAPPING WATER IN MINES. (Eng. & Mg. Jl., Jan. 26, 1907.) Describes two experiences of the author in tapping water from old workings under rather unique conditions. 20c.

2712—TECHNICAL EDUCATION.—The Technical School and the University. W. H. Burr. (School of Mines Quar., Jan., 1907; 8 pp.) Outlines the evolution of technical education, showing that technical schools are an integral part of academic education. 60c.

2713—TIMBER Used in Metal Mines. R. S. Kellogg. (Circular 49, Forest Service, Dept. of Agriculture, Dec. 20, 1906.) Gives various tables showing the kinds and quality of timber used in mines. The tables are classified as to iron, coal and metal mines, and the timber, as to whether it is sawed or round. 20c.

2714—WASHINGTON.—Mining in Eastern Washington in 1906. M. H. Joseph. (Eng. & Mg. Jl., Jan. 26, 1907; 1 p.) The condition of the mining industry in this State is described, county by county. 20c.

ORE DRESSING

2715—CONCENTRATION. Fritz Cirkel. (Can. Mg. Rev., Feb., 1907; 4 pp.) Address before the Mining Soc'y of McGill University, outlining the progress of ore concentration, with a long discussion of its importance to the mining engineer and geologist. 40c.

2716—FLOTATION PROCESS.—Theories Concerning the Flotation Process. G. Haglund. (Eng. & Mg. Jl., Feb. 16, 1907; ½ p.) Discussion of the theory of this process of ore concentration, pointing to the conclusion that it is always advisable to have a carbonate present in the ore, although carbon dioxide gas is not essential for the success of the process. 20c.

2717—SLIME [illegible] A Device for Removing Flouting Material. E. S. Wiard. (Mg. & Sci. Press, Feb. 2, 1907; 1 p.) Describes the design and operation of a unique device built by the author in a mill in northern Idaho to remove particles of floating [illegible] in a water tank which distributed pulp to tables and vanners. 20c.

METALLURGY GENERAL

2718—ALLOYS of Aluminum and Copper. (Engineering, Jan. 25, Feb. 1 and 8, 1907; 6 pp.) An abstract from the 8th Report of the Alloys Research Committee and read before the British Institution of Mechanical Engineers, dealing with various methods of preparing copper-aluminum alloys, and giving the results of many different tests of the physical and chemical properties of the alloys. 60c.

2719—BRITISH COLUMBIA.—Kootenay and Boundary Smelting Works. (B. C. Mg. Rec., Dec., 1906; 3 pp.) Describes briefly the progress at the principal smelting works of the interior of British Columbia, and discusses the processes used at the plants. 40c.

2720—MANGANESE COMPOUNDS.—Sur un nouveau Silicure de Manganese. G. Gin. (L'Echo des Mines, Jan. 28, 1907.) A short and interesting note of the production in the electric furnace of a proto-sulphide of manganese which is not reducible by carbon, but which holds that element in solution. 40c.

2721—METALLURGICAL PROBLEMS.—Unsolved Problems in Metallurgy. R. A. Hadfield. (Lecture delivered before the British Instn. of Civil Engrs., May 2, 1906; 36 pp.) Discusses the general nature of various metallurgical problems which now demand solution, and takes up the special consideration of investigations which have to do with alloys.

2722—OPEN HEARTH FURNACE.—Metallurgical Calculations. J. W. Richards. (Electrochem. & Met. Industry, Feb., 1907; 4 pp.) Continuation of this series of articles, dealing in the present instalment with gas producers and regenerators, and giving the solution of specific problems relating to open-hearth furnace practice. 40c.

2723—ROASTING of the Argentiferous Cobalt-Nickel Arsenides of Timiskaming, Ontario, Canada. H. M. Howe, W. Campbell and C. W. Knight. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 9 pp.) Gives the results of an investigation of the behavior of an argentiferous cobalt-nickel arsenide from Ontario during roasting, with the idea of learning the temperature at which the arsenic is most rapidly expelled, the efficiency of the roasting through prolonged heating, and the effect of adding charcoal at different times during roasting.

2724—SILVER.—Zur Kenntnis des kolloidalen Silbers. A. Gutbier and G. Hofmeier. (Zeit. f. Anorg. Chemie, Band 45, Heft 1; 4 pp.) Describes briefly four allotropic forms of silver, giving their chief characteristics, and methods for producing them.

2725—SULPHIDES.—The Constitution of Ferro-Cuprous Sulphides. H. O. Hofman, W. S. Caypless and E. E. Harrington. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 12 pp.) Paper to be read at the April, 1907, meeting of the A. I. M. E., discussing the results of an investigation to determine the constitution of ferro-cuprous sulphides by means of cooling curves. Description of the apparatus used and details of the microscopical examination of some of the products obtained are included.

MINING AND METALLURGICAL MACHINERY, ETC.

2726—AIR COMPRESSOR.—A High-duty Air Compressor. O. P. Hood. (Proceedings Amer. Soc'y of Mechan. Engrs., Feb., 1907; 2 pp.) Discussion by W. L. Saunders of the above paper, which was previously mentioned in the index.

2727—AIR COMPRESSORS.—Factors Affecting Compressor Capacities and Efficiencies. (Pract. Engineer, Feb., 1907; 2 pp.) A brief analysis of the various conditions which affect the capacity and efficiency of an air compressor. 20c.

2728—CABLES.—Recherches Expérimentales sur la Résistance et l'Elasticité des Cables d'Extraction. L. Denoel. (Revue univ. des Mines, Dec., 1906; 10,000 w.) Continuation of article previously indexed, this instalment giving results of tests to determine the relation between the modulus of elasticity of hemp cables as found with test pieces and as found on cables in actual use; also results of experiments on cables of great length and account of tests on metallic cables. $1.

2729—CENTRIFUGAL PUMP.—Bemerk-

...ory, Design and Performance. R. C. Williams. (Eng. & Mg. Jl., Feb. 16, 1907; 3 pp.) ... design and performance of centrifugal pumps, and discusses the design especially from a mathematical point of view; gives also tests upon pumps to determine their mechanical efficiency. 20c.

2731—FANS—Contribution a l'Etude des Ventilateurs Centrifuges. H. Bochet. (Annales des Mines, Tome X, 10 livraison de 1906; 56 pp.) A very thorough account of many tests upon centrifugal fans, and a discussion of the conclusions drawn from the re...

2732 — GAS ENGINE PRACTICE. (Bi-monthly Bull., Amer. Inst. Mg. Engrs., Jan., 1907; 12½ pp.) Discussion by various mem... ... papers by H ... Westcarth, and K. Reinhardt, which ... the London July 1906) meeting of the Institute.

2733—GAS ENGINES—Essai d'un Moteur a Gaz de Haut-Forneau. H. Hubert and A. Veltz. (Revue univ. des Mines, Dec., 1906; 9500 w.) An introduction giving an historical account of the defects of early gas engines utilizing low-quality gas, and their development. Also a very excellent and thorough account of an exhaustive series of tests ... gas engine. $1.

2734 — GAS ENGINES — Large Size Gas ... on the Continent. A. Gandenwitz (Engineer, Feb. 15, 1907; 3 pp.) Discusses the application of large-size gas engines to iron works and collieries, and gives a brief account of gas generation, and purification of the producer gas. 20c.

2735 — GAS POWER — The Evolution of Gas Power. F. E. Junge. (Proceedings, Amer. Soc'y Mechan. Engrs., Feb., 1907; 16 pp.) Continuation of the discussion on the above paper which was previously read by the author before the Society.

2736 — GAS PRODUCER — Die Entwicklung des Sauggasbetriebes. Ein Studienbeitrag ... für den Hüttenbetrieb. Ing. Gille. (Zeitschrift für das Berg-, Hütten- und Salinenwesen, Heft 1, 1907; 11 pp.) Illustrated description of a gas producer using anthracite coal. To be continued. 40c.

2737 — GAS PRODUCERS — The Use of Suction-gas Producers for Power Purposes. N. T. Harrington. (Jl., Assn. of Eng. Societies, Jan., 1907; 22 pp.) A very complete consideration of the design and operation of suction-gas producers, and discussing many of the weaknesses and defects of such systems and the method by which they are overcome. 40c.

2738 — HAULAGE. Compressed Air versus Electric Haulage. G. B. Hodges. (Coal, Jan. 24, 1907; 1 p.) A reply to an article on electric haulage published in the January issue of *Coal*, enumerating the various advantages of compressed-air traction over electric haulage, and giving some of the disadvantages of electricity when used for transmission in mines. 20c

2739—HOISTING — Elektrische Förderanlage der Zeche Zollern II. W. Vortkort. (Bergbau, Jan. 31, 1907; 2½ pp.) A de... ... hoisting appliances at the works of the Gelsenkirchen Mining Co. in Germany, giving an account of the ligner system of regulating the machines as applied to this installation. To be continued. 40c.

2740—HOISTING—Ermittlung des Dampf... Zwillingstandemanordnung. (Glückauf, Jan. 12, 1907; 1½ pp.) Gives the results of two efficiency tests of three and five hours, respectively, ... Friedrich-Wilhelm mine at Mülheim, Germany. 40c.

2741 -HYDRO-ELECTRIC POWER—British Hydro-electric Installations. A. H. Bridge. (Elec. Rev., Feb. 9, 1907; 2 pp.) Describes the construction and equipment of the power plants at Loch Leven, Scotland, which are to furnish increased facilities for the production of aluminum by the British Aluminum Co. 20c

2742 -HYDRO-ELECTRIC POWER — The Pueblo and Suburban Traction and Lighting Company's Hydro-electric Plant. (Elec. Rev., Jan. 26, 1907; 5 pp.) Describes the construction of the power plant, the station and transmission equipment of this company, which is to supply the Cripple Creek district and the city of Pueblo. 20c.

2743 — LOW GRADE FUEL — Burning ... G. F. Hutchins. (Elec. Wld., Jan. 5, 1907; 2½ pp.) Discusses the principles of stok... ... several types of mechanical stoker applied to this type of fuel. 20c.

2744 — LUBRICATING OIL. — The Purification of Lubricating Oil. J. L. Grant (Elec. Wld., Jan. 5 and Feb. 2, 1907.) Continuation of rticle previously indexed, giving a description of several types of filters for oils, and discussing the advantages of using ... oil. 10c

2745 — MINE WAGONS — An Appliance for Automatically Stopping and Restarting Mine Wagons. W. Galloway. (Trans., No. of England Inst. of Mg. & Mechan. Engrs. Vol LVII, Part 1; 1½ pp.) Describes, with working drawings, the construction of this mine wagon and describes its method of operation.

2746—MINING PLANTS—Mistakes in the Design of Mining and Reduction Plants. S. A. Worcester. (Mg. & Sci. Press, Feb. 2, 1907; 1½ pp.) Cites several instances where lack of foresight in designing and altering plants has resulted in excessive cost of operation, and points out the advantages of having such designing done by a competent engineer. 20c.

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Revival of the Mining Industry in Cornwall

New Enterprise and Modern Methods Are Likely To Restore Many of the Old Abandoned Properties to the List of Producers

BY EDWARD WALKER

Up to within the last few years Cornish mining was in the hands of Cornishmen. The mines were financed and managed by natives of the district and the profits were disbursed within the confines of the shire. Ten years ago, for the first time almost, capital was imported from London, so that the interest in Cornish affairs began to spread.

By far the most important move in this direction is the purchase of the mining rights of Mr. Basset, the leading landlord in Cornwall, on the part of a London syndicate. This development of affairs may lead to many alterations in the methods of handling Cornish mines, and may possibly be the first chapter of a new epoch in history.

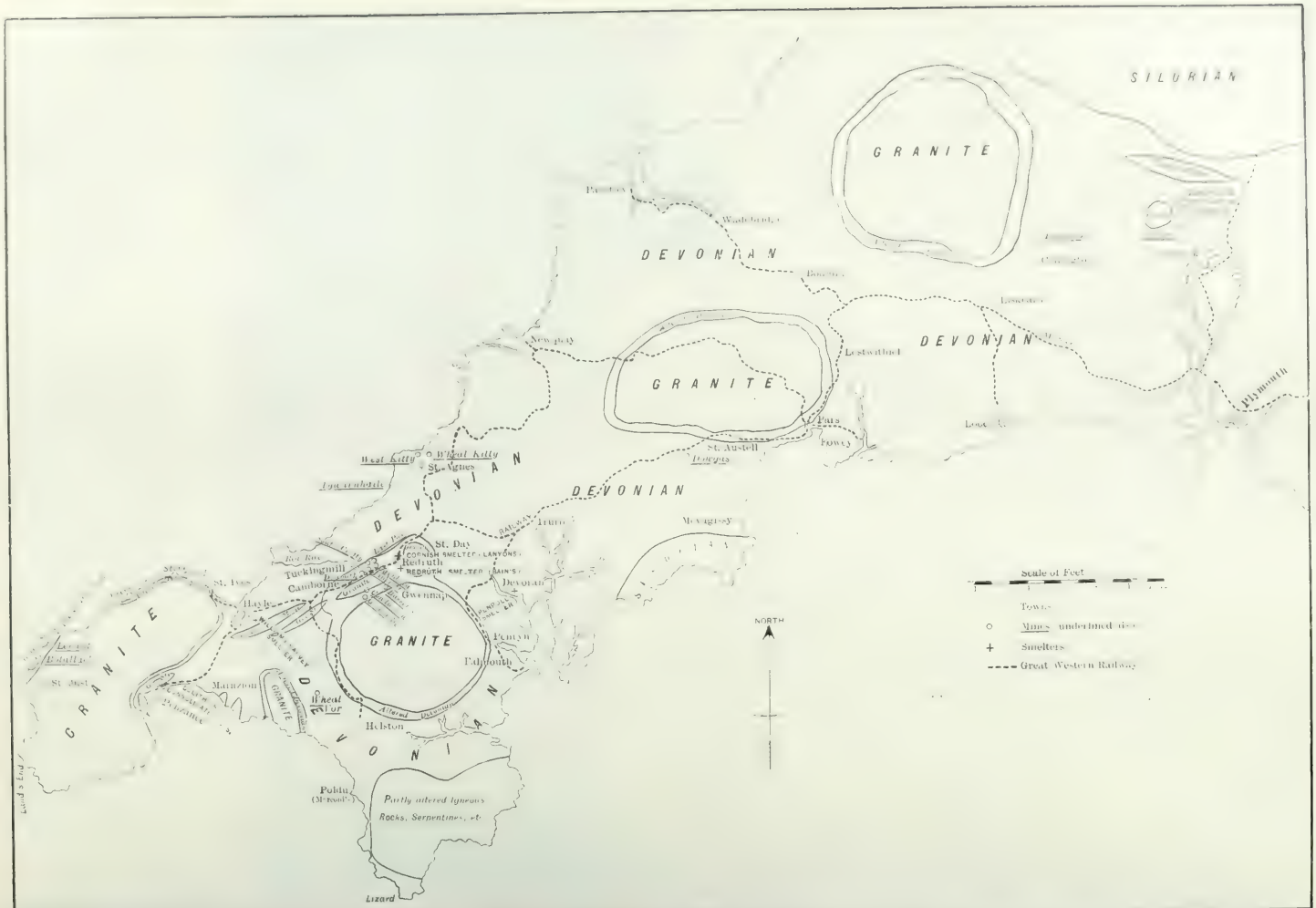
REDRUTH, CORNWALL.—RUINS OF CARN BREA CASTLE ON RIGHT

GEOLOGY OF CORNWALL.

In the accompanying map, I have drawn an outline of the southern part of the county, and I have included Plymouth and Tavistock, which are over the border in Devonshire. This map covers the mining area of Cornwall and Devon. A glance at the map will show that the country is composed of Devonian slates through which large bodies of granite and other eruptive rocks have intruded. There are four chief granite intrusions; one, north of Liskeard; a second, north of St. Austell; a third, split into three separate parts, in the district between Redruth, Camborne, Helston and Falmouth; while the fourth covers the paw, from St. Ives to Lands End. These four granite areas form the highest parts of the county which range from 400 to 1000 ft. above the sea.

In addition to the granite there are intrusions of diorite, called greenstone locally, at hundreds of different places. I have only marked the more extensive ones. These will be seen near St. Just, St. Ives, Penzance, between Hayle and Camborne, and near Tavistock. Other geological features marked on the map are the serpentines and partly altered igneous rocks near the Lizard, and Silurian rocks near Mevagissy and to the north of Tavistock. Where the granite comes through the Devonian much of the latter has been altered by heat, and I have accordingly marked them as altered Devonian.

In addition to the intrusive rocks already mentioned there are numberless dikes of porphyry coming up through the granite and Devonian slates. These are locally known as elvan dikes. They are of later date than the granite, as they pass from the granite to the slates without a



GEOLOGICAL MAP OF CORNWALL

break. They are narrow and long and they can be traced from north-east to south-west.

In the west the mineral veins run veins. They also run for the most part in the same direction as the granite and through the dikes, but otherwise there is no connection between the two. The veins are most commonly found in altered granite and they contain tin, copper, arsenic, wolfram, and iron. When in the slates the mineral contents are chiefly copper, and when in the granite tin preponderates. The copper deposits are, however, mostly exhausted.

There is also another set of veins appearing here and there; these are of much less importance. They outcrop almost at

amounts of copper, wolfram, arsenic and iron. In some cases as at Dolcoath and Grenville, near Camborne, these other constituents are at a minimum. At other mines, such as Great Devon Consols near Tavistock, arsenic is the chief product. At Tincroft, copper and arsenic ore is produced in addition to tin, while at East Pool and Clitters, the wolfram is a commercial by-product.

At Levant, a good deal of copper occurs with the tin. The tin occurs as grayish buff crystals of oxide of tin hardly distinguishable by the naked eye, and the vein matter through which it is distributed is a very hard granite not easily distinguished from the country rock.

It is obvious, therefore, that the paying

iron is in the form of pyrites, but it does not occur in this form at all the mines. Iron is also present as a chemical constituent of the rock. The total amount of iron present in either form in the tin mines is not at all large, but it is sufficient to color the slimes a brilliant red, and to win the Red river its name. In some places iron ores occur in larger quantities and at one time they were worked as [illegible] they did not pay. Before passing from this note of principal minerals I ought not to omit mention of the great kaolin industry in the neighborhood of St Austell, the paving-stone industry at various points of the greenstone outcrops, and the building-stone industry at the granite quarries.

VIEW OF BOTALLACK MINE, CORNWALL

right angles to the main line of outcrop or the others, and they are, therefore, called cross-courses. They contain lead, zinc, and silver, but they are not worked to any extent, as the values are low.

The Mineral Deposits

The mineral veins all dip at a steep angle, so that mining has to be done chiefly by shaft. The conformation of the country does not lend itself to adit work, for the hills rise gently. In most parts there is plenty of agricultural work and woods abound. In other parts nearer the coast and on the high grounds the land is barren and stony. The water supply is small. In fact the climate is warm and moist and the springs and streams give a [illegible] supply.

The principal system of mineral veins [illegible] veins are by no means easy to follow and that the hardness of the rock makes prospecting a difficult matter. The diamond drill is valueless for exploration through these rocks.

The amount of tin oxide in the veins is small and the mines are really low-grade propositions. The average rock extracted will run about 30 lb. of tin oxide to the long ton. Fifteen years ago, the average was higher and at many mines 60 lb. was being extracted. At the present time there are several mines where there is plenty of ore of this value now being worked, but owing to the fact that the largest producers are now working on much lower-grade ore than formerly, the average contents throughout the district are much lower than they used to be.

As already mentioned, there is a certain amount of iron in the veins. Part of this

Camborne and Redruth

Although the county is dotted all over with mineral veins, there are certain parts where the production is greatest, and these form the chief mining centers. By far the most important of these is the district lying between and around Camborne and Redruth. There are here a number of strong and persistent lodes with parallel outcrops. The Dolcoath, Tincroft and Carn Brea are leading producers along the main lode, and there are other mines on the same lode, not worked at present, such as Cooks Kitchen.

Parallel with these mines and about half a mile to the north there are lodes which are worked by South Crofty and East Pool, while to the south there is another series consisting of the Basset Mines and Wheal Grenville, which are

The above-mentioned producing mines account for quite three-quarters of the total output of Cornwall at the present time. The other districts are centered around St. Just, St. Agnes, St. Austell, St. Ives, Liskeard, and Tavistock. In the old days St. Just was a very flourishing center, but the Lavant mine is the only important producer at present. The Botallack is in this district. It closed down twelve years ago, and is now being reopened. At St. Ives there is practically no mining being done nowadays, and the Providence mine is the only one that is

will run over 60 per cent. metallic tin and the remaining 1000 tons are slimes containing less than 50 per cent. metallic tin. The Dolcoath mine nowadays produces about 1600 tons of high-grade concentrates. Carn Brea and Tincroft, which are worked together, produce about 600 tons of concentrates, while Grenville, Basset, East Pool, South Crofty produce from four to five hundred tons of concentrates per annum. Levant, West Kitty and Clitters produce rather less.

These figures are not the official statistics, but they serve the purpose of the present article better than pages of exact figures. Until about fifteen years ago the output was more than double.

Representatives from all the mines and smelters attend this function. In the old days dinners and drinks played an important part at the ticketings, but nowadays they are dry and colorless occasions, and their reason for existence is not very obvious. In fact it seems to me to be a cumbrous method of doing business. For one thing a smelter has no chance of revising his bid. Not knowing what his rivals are bidding he may get left with either more or less ore than he wants.

In the extreme case, a particular smelter may get all or none of the thirty parcels of ore offered. Surely he should have the opportunity of rebidding or negotiating with his rivals, for it would be better

DOLCOATH MINE, SHOWING HEADGEAR OF NEW MAIN SHAFT

In the district of St. Agnes, West Kitty is the only big producer, but before long it should be joined by other mines that were prosperous in earlier times, and are on the verge of becoming producers once again.

Clitters is the noticeable feature of Tavistock district, and is really the only Cornish mine reopened during the last few years that is at the present time an important producer. At Liskeard the Phœnix group used to have a fine record, and steps are now being taken to put things in motion once more. At St. Austell there are no regular producers at

into the list before long.

The present production of Cornwall is about 7000 tons of concentrates per annum. About 6000 tons of concentrates

Tin Ore Ticketings

The Cornish mines do not do their own smelting. They sell most of their concentrates by open competition every fortnight at the tin ticketings held at Tabbs Hotel, Redruth. A small amount of concentrates is sold by private contract and practically the whole of the slimes recovered from the streams are disposed of privately.

The ticketings account for the most important part of the production. Every fortnight the principal mines announce what parcels they intend to sell at the next ticketings and the representatives of the smelters make a tour to sample the lots. Their bids are sent in and at the ticketing they are publicly opened and compared. The highest bidder gets the parcel and if two bids are the same the parcel is divided or tossed up for.

to pay half a crown per ton more for his ore than have his plant running short.

Also I should have thought that the output could be tendered for privately yet competitively. It seems like using a steam hammer to crack a nut, to summon the mines and smelters together once a fortnight for the purpose of going through this routine. In the old days the price of tin was influenced at these ticketings, but nowadays Cornish production has nothing to do with the price, and the prices to be paid by the smelters for fortnightly parcels could be adjusted equally well privately as publicly.

The only reason why the ticketings are retained is that there is a good deal of jealousy among the shareholders in the mines. The owners of the smelters have interests in the mines, and the negotiations

have to be conducted publicly in order to disarm criticism. At Dolcoath it used to be the practice to sell half by private contract and half at the ticketings, an arrangement which was advantageous to the mine and to the smelters, for smelters would often give a better price for early delivery when they were short of ore. Eventually, however, the mine was forced to sell all its output at the ticketings, because innuendos were made about directors of the company being also owners of smelters.

Tin Smelters

There are five smelters in Cornwall: Bolitho's, at Chyandour, Penzance, called the Consolidated Tin Smelting Company; Williams Harvey & Co., at Hayle; the Cornish Tin Smelting Company, at Redruth, belonging to the Lanyons; the Redruth Tin Smelting Company, at Redruth, owned by the Bains; and the Penpoll, at Devoran, belonging to Mr. Strauss. Up to within the last few years, Bolitho's and Lanyon's have been the most important. Recently, however, Williams Harvey & Co. have made up leeway and now occupy a leading position. This development has been due to the influence of Dr. Richard Pearce (once of Colorado), who has put money and brains into the concern.

All these five smelters could not make a living out of Cornish ores, and they [illegible] large quantities from foreign parts, especially from Bolivia and Australasia. Probably the Penpoll lives entirely on foreign ores. There are a number of Cornish companies financed by smelters and other local people operating tin mines in all parts of the world. The produce of some of these is brought to Cornwall for smelting, but that of others, especially on the Straits, is treated on the spot. The bulk of the imported ores is, however, bought in the open market. It should be added that no Cornish ores are ever exported.

Ore Dressing

The usual method in dressing tin ores is to reduce in Cornish stamps and to recover the tin by buddling and by passing over frames. The first concentration takes out the greater part of the tin and other metallic constituents. These concentrates are calcined to drive off sulphur and arsenic, and to reduce the compounds of the other metals to a form which will permit them to go into the tailings at the second buddling operation. In this way by means of the two buddlings with an intermediate calcination very high-class concentrates are obtained.

The tailings from the first concentration are passed continuously over varying forms of buddles and subsequently go over series of "frames." The tailings in all cases eventually find their way into the rivers and streams. Other people work the streams over again and make a profitable living by the use of the "frame." In all mining camps we are accustomed to seeing people making profits out of tailings discarded by the big companies, and even in Tasmania, where the dressing plant is near perfection, the Chinaman handles the tailings with profit. In Cornwall it must be confessed that the losses are considerable, and that it is not the frugal Chinaman but white men who make profits out of the tailings.

The Red river, which flows down from the high ground on the south of Camborne, through Dolcoath and adjoining estates, is full of stream tin works at which the waters containing the tailings from the various mines are passed over inclined tables. About 10 per cent. of the whole Cornish output is due to this work.

The greatest opening for improvement seems to lie in more accurate study of extractions. There does not appear to be any systematic sampling of the ore or of the products at the several points of the dressing process, and the managers seem to have no definite idea of the amounts lost. Not that there is any careless or prodigal waste, but I think that considerable improvements could be made in the extraction if modern tables of all sorts were studied systematically.

DOLCOATH TIN MINE, VALLEY PORTION, SHOWING STAMP MILL AND VANNER HOUSES

[illegible]

The institutions and societies in Cornwall connected with the mineral industries are of considerable interest.

[illegible] Mining Institute [illegible] the Royal Institution [illegible] Chamber of Mines could make a similar boast. Cornish mining men and people in London felt that there should be some central body [illegible] records of mining operations and this Chamber was the outcome of the agitation.

Unfortunately the Chamber has been supported very badly by the people whose interest it was intended to serve, and if it were not for the exertions of J. H. Collins, the honorary secretary, it would have died a natural death before now. In former days, the Miners Association and Institute did good work in looking after the [illegible] in many ways, but it is now practically defunct. It is a pity that there should not be some source of codified information about Cornish mines. There is no record of producing mines, or abandoned mines, and if a London Syndicate is desirous of putting money into Cornwall, it has no means of finding out which of the abandoned mines are worth reopening.

Education

The education of mining men in Cornwall is well looked after. There are three mining schools at Redruth, Camborne and Penzance, respectively. That at Camborne is by far the most important. They have a mine called the King Edward, which was once part of the Condurrow, and the details of mining, surveying and dressing are taught there. Until recently William Thomas was the head of this school. When he resigned in order to undertake the reopening of Botallack, the committee of governors invited James G. Lawn to take his place.

The other two schools are of less importance. For myself, I do not see why there should be more than one school. If the energies of the various schools were united, it would make for the good of the community at large. I am also of opinion that the Royal School of Mines, of London, should work with the Camborne School.

As it is, no consolidation of the interests of London and Cornish schools seems within the range of practical politics, so the best policy for Cornishmen to pursue is to amalgamate their own mining schools. If this were done, money would be forthcoming from various quarters for the extension of the school.

The greatest service that such a remodeled school could do would be the systematic study of the concentration problem. Each individual mine has not the means nor the time to study out the duty of the numerous tables. Such study should be undertaken by the community generally. The work could not be done better than by a united and well endowed mining school.

Methods of Finance

The method of finance employed by Cornish companies is interesting. The old system, which is still the preponderating one, is what is called the cost-book system. Accounts are made up every three or four months and the profits divided up to the bit. If there is a loss, the shareholders have to pay up. Even now the mines under purely local influence continue the plan and loudly resent any outside criticism. Like the man in the [illegible] "He was the bravest man in France, he said so, and *he* ought to know."

In spite of the impatience of criticism displayed by Cornishmen, I would point out that this division of profits up to the bit is the worst possible form of finance. Quite apart from the question of the limiting of liability, the drawback of the cost-book system is that the company is entirely without reserve. What is the good of dividing profits if an assessment has to be made next month? If, every time any expenditure has to be made or should be made on improving the mine or the methods of treatment, the shareholders have to be asked to subscribe, it is obvious that improvements get pushed on slowly, if at all. As regards the question of limited or unlimited liability, nothing can be said theoretically against the cost-book system on this point, as long as the shareholders thoroughly understand the business in hand. In order to attract outside capital from people who are not practical miners this system of unlimited liability will not do, and even Cornishmen have to admit that if they want London money to come into the county.

New Developments

As yet very little new development work has been done. When tin fell in price 15 years ago, a great number of mines had to close down, and only those with large cash resources could hold their heads above water.

Ten years ago Dolcoath was near collapse, owing to the poor lookout underground and the low price of the metal. London came to the rescue and by the provision of further working capital for the purpose of developing the mine and putting up a more modern plant, placed it once more on a paying basis. Carnbrea & Tincroft also adopted limited liability, but owing to the continued low grade of ore has not made any profit these eight years. Other mines can tell the same tale.

With tin once more at a high price, the former owners of many mines that closed down would be only too glad to start again. Want of capital is one of the preventatives and scarcity of labor is another. When the mines closed down the miners emigrated in search of work in other countries. Now that the mines are to be reopened it is impossible to attract them back. It is easier to fall off a wall than to climb upon it.

Of new work undertaken during the last few years Clitters is, as already mentioned, the most interesting. Wheal Kitty, near St. Agnes, has been reopened by Mr. Collins. The Cornish Consolidated (the new London syndicate) has bought and developed South Crofty, and has reopened Botallack at St. Just, and South Phœnix, at Liskeard. The Dolcoath people have started to reopen Wheal Vor, which is between Marazion and Helston, and about six others will before long again become producers.

Some months ago the news was circulated widely that electric power was to be introduced in a large scale. So far these schemes are in abeyance. The electric power company that runs the cars between Camborne and Redruth has contracted to supply power to South Crofty, and the Duchy Development Company is putting in an electric pump to unwater Wheal Vor. At Dowgas a plant is being erected to generate electric power by gas engines.

Leasing System

The most important development in Cornish mining has been the purchase of Mr. Basset's mineral rights by the group of financiers centered round the Cornish Consolidated Company. All mines in Cornwall are leased from ground landlords who have almost as many different methods of treating the lease-holders. In the main the terms consist of a percentage of the gross output, varying with the amount of profit made by the companies. In addition to receiving this income, the landlords have absolute right to say what work the lease holders shall undertake.

The London company soon found out that they must buy out the landlords' mineral rights, for there would not be room in Cornwall for both. Whether the mines will do any better with a London syndicate as a landlord than with a Cornish landowner as their governor remains to be seen. The manager of one of the chief mines said to me: "The new régime could not be worse than the present," and on the whole this view reflects the feeling in Cornwall.

I believe there are tin lodes in Cornwall not yet discovered. Most of the lodes were discovered by their outcrop in the slates where the mineral was chalcopyrite with an iron cap. At depth these lodes go into the granite where the chief constituent is tin. A tin lode is most difficult to prospect, in Cornwall at any rate, and I doubt whether prospectors have ever cared to tackle the granite districts in search of tin outcrops. I firmly believe, therefore, that there are tin lodes in Cornwall that have never yet been located. One day their discovery will lead to the enrichment of the mineral produce of the county.

Conditions Met in South African Mining

The Costs of Supplies, Transportation and Labor Are High. Yet the Low-grade Gold Deposits Are Made to Yield Enormous Profits

BY J. H. PITCHFORD

South Africa extends from the Cape to the Zambesi river, about 1700 miles, covering an area of 1,400,000 square miles. It takes in Rhodesia, the Transvaal, Swaziland, Basutoland, Natal, Orange River Colony, Cape Colony, Zululand and Bechuanaland. The native population, including that of Portuguese territory, is about 5,000,000. The area of Rhodesia is 750,000 square miles. The Transvaal is 126,000 square miles in area, about four-fifths the area of California.

The Transvaal.

The most important gold discoveries have been made in the Transvaal, where now one-third of the total gold output of the world is produced from a stretch of gold-bearing ledges 60 miles in length. The Transvaal was a bankrupt country in 1877, but it is now producing gold at the rate of $120,000,000 per annum.

The white population of the Transvaal is about 300,000, about 114,000 of this total being located in the vicinity of the mines. There are 100,000 natives and 53,000 Chinese employed on the mines of the Witwatersrand, and there are about 50,000 natives employed in other occupations in and near the mining towns. The 114,000 white people of various occupations on the mining area of the Witwatersrand are supported directly or indirectly entirely by the mining industry and their numbers have increased proportionally as the mining industry has progressed. When the mines were first discovered, only the high-grade ore was mined and treated. At the present time the average value of the ore mined and treated is only $8.50 per ton. It requires economical management to produce $10,000,000 per month from ore going $8.50 per ton in a country where living expenses are twice as high as they are in the United States, and to pay interest on capital invested. The skilled labor is performed by white men and the unskilled labor by negro natives or Chinese under the direction of white men.

Cost of Mining.

The white miners and mechanics, not including officials, are paid $4 to $5 per day and the colored labor costs from 75c. to 80c. per day, including food. White contractors make from $150 to $500 per month on rock-drill work. Over 55 per cent. of the mining costs is paid out for wages, and three-fifths of this amount is for white labor, including staff officials and clerks. All white labor could not be used for mining $8 ore so as to pay for supplies and interest on capital invested, where the conditions are such that it takes four people to mine and extract the gold from a ton of ore. A mine crushing 500 tons per day is sometimes capitalized at $2,500,000.

Working expenses vary from $5 to $8 per ton. The natives and Chinese are fairly good workmen when properly managed. The principal work they do underground is single-hand drilling, shoveling, tramming and assisting white rock-drill men and other miners. Some of them are proficient at single-hand drilling; they put down a 3-ft. hole in quartzite in from 2½ to 3½ hours, which is considered a shift's work and entitles them to a day's pay.

The Witwatersrand.

The gold mines of the Transvaal are located in a district known as the Witwatersrand, with the town of Johannesburg, at an altitude of 5500 ft., in the center. Mining operations are carried on along a zone 60 miles long. There are over 60 producing mines, and some of these pay 20 to 25 per cent. on the capitalization. The capital expenditure on some of the mines will average $24,000 per stamp equipment. The equipment of a mine on a basis of 200 stamps costs from $10,000 to $15,000 per stamp, and the balance of expenditure goes for development and claims.

A quartz-mine claim in the Transvaal is 150 ft. long on the line of strike of the ledge and 400 ft. wide. The Government claim license to be paid continuously is $1 per claim per month. In addition to this the Government takes 10 per cent. of the net profit on the gold produced. The Boer Government used to take 5 per cent. of the net profit.

It does not pay to organize and equip a mine having much less than 100 claims under the mining conditions in the Transvaal. The ledges can only be followed within perpendicular lines of the claim boundaries. This arrangement prevents many lawsuits. Overlapping claims are not recorded.

The talent of mining engineers from all parts of the world has been brought to bear on working the Johannesburg mines and no expense has been spared to obtain [illegible] equipment.

Costs and Ratios.

Very complete statistics are kept on all the mines on a basis of costs per ton mined and milled, and rigid comparisons are made between mines working under similar conditions so that each manager or superintendent is held accountable to his directors for any excess in his costs per ton over that of his neighbors.

The costs are subdivided as follows: Mining, hoisting, pumping, transport, sorting, crushing, milling, cyaniding, electric power and lighting, maintenance, development and office expenses.

The combined costs per ton of ore mined range from below $5 to $8 at the present writing. Fourteen years ago the total costs per ton averaged $2 more than now, and a still further reduction may be looked for if the people who read about the natives in missionary books 6000 miles away will allow the white people living in Africa who understand natives and other local conditions, to manage their own affairs.

At the present time one-third of the unskilled labor is Chinese, one-third negroes imported from Portuguese territory and one-third negroes accumulated from British colonies, extending over a distance of 1700 miles. All this unskilled labor has to be fairly dealt with and properly controlled in order to carry on a large industrial enterprise such as is being conducted at Johannesburg. The natives as a rule prefer to stay on their land, or to work in stores or houses.

It is significant that under the present working conditions 55 per cent. of the working costs is paid out for labor, and that nearly three-fifths of this is for white labor. About 11 per cent. of the working costs goes for explosives, and 8 per cent. for coal. The remaining 26 per cent. goes for stores and maintenance.

The average gold output of the Transvaal mines for 1906 was $10,000,000 per month, and the average value of the ore treated was $8.50 per ton. Some of the richest mines, such as the Robinson, produce ore up to $15 per ton. Underground mining costs run from $2 to $14 per ton, exclusive of winding, depending on thickness of ledge, angle of dip, depth of working, water, etc. Veins worked vary from 1 in. to 15 ft. in thickness. Milling the ore costs from 40c. to 65c.; cyanide and slimes treatment, 50c. to 75c.

Note.—From an address delivered before the mining students of the University of California.

*Late manager, Randfontein Deep Mine, Johannesburg.

per ton. Stoping is contracted for at [illegible] per fathom [illegible] per day. [illegible] quartzite are driven by contractors at the rate of $7 to $8 per linear foot. Out of this [illegible] per day for the natives they employ, 30c. per lb. for the gelatine, $3.25 per box for candles, 10c. per coil for fuse, 75c. per box for caps, and 3c. per point for each drill sharpened. [illegible] of dynamite for each ton of ore blasted in driving and crosscutting. Ten to 18 lb. per ft. sunk is used for shaft sinking and for the total tons of ore mined 1½ to 2 lb., the larger portion of the rock being quartzite. Each ton of ore mined takes about 300 lb. of coal.

Nature of Witwatersrand Deposits

There are three ledges paralleling each other in the Witwatersrand, but the distances between them and their respective thicknesses vary. The gold-bearing conglomerate is termed banket, and consists of elliptical pebbles imbedded or cemented in quartzite. Sometimes the pebbles are clear and vitreous and sometimes milky or black, and they are frequently surrounded by pyrites in the matrix. The ledges vary in thickness from 1 in. to 15 ft. The specific gravity of banket varies from [illegible] to 12 cu. ft. make a ton of ore in place. The workable tonnage in these mines has been doubled in the past 14 years in consequence of the reduction of $2 per ton in working costs effected during that time.

The value of the ore which can be profitably mined under existing conditions varies from $6 to $20 per ton, and the average value of the ore milled in 1906 was $8.50 per ton.

Advantages of Ore Sorting

Suppose a mine contains 7,200,000 tons of ore that will mill and cyanide to yield $10 per ton. The capacity of the mill is 1000 tons per day; the hoisting capacity is greater. The cost of mining and surface expenses is $6 per ton; that of treatment, $1. The net profit remaining will be $3.

The 7,200,000 tons at $3 yields $21,600,000 profit for 20 years' work. The rate of profit per year will be about $1,080,000.

Now $1 per year invested at 5 per cent. compound interest for 20 years would be $33,066. Hence $35,711,280 equals total profit of operations at the end of 20 years without sorting.

If now 15 per cent. of the ore that goes $1 per ton is sorted out there will remain 6,120,000 tons to be milled yielding $11.588 per ton. The total cost and profit will be:

[illegible] tons at $6.00	$43,200,000
Sorting 7,200,000 tons at 5c.	360,000
[illegible]	[illegible]
[illegible]	[illegible]
Product, 6,120,000 tons at $11.588	70,920,000
[illegible]	[illegible]

Or the net profit equals $1,249,411 per year for 17 years. Now $1 per year at 5 per cent. compound interest for 17 years equals $25.84. Hence the profit of the $1,249,411 for 17 years will be $32,284,780. At end of 3 years $32,284,780 would amount to $37,372,861, the total profit at the end of 20 years for the sorting system. The difference would be $1,061,681, which represents the increased profit at the end of 20 years for the sorting over the non-sorting system.

But as the mine would have been worked out in 17 years the mine plant could have been sold three years earlier or used for three years on other property.

These figures are based on sorting after the ore is brought to the surface. Ore sorted underground would save the cost of hoisting.

Sampling

It is customary to sample the stopes from which the ore is being taken for the mill in order to keep the mill grade even and the monthly output regular. The development drives and winzes are sampled every 5 ft. in short sections over the stoping width of the ledge. The results are recorded on the assay plans in inches and pennyweights, which is about the same as inch dollars.

By having the assay value and the width of the ledge all round a block of ore, the tons and value per ton can be estimated. The Ingersoll drill company has a device for taking samples and dust out of a rock-drill hole by means of an air ejector. This will also prevent the dust from getting into the miners' lungs. In these mines development work on three sides is sometimes considered enough for estimating the contents and values. Some mines have as much as two years' development work done in advance of a 200-stamp mill crushing at the rate of 6 or more tons per stamp day. Development work in drives, winzes and raises costs from 50c. to 90c. per ton for the ore blocked out. This is added to the mining and milling costs or is written off periodically. Fully half these mines have recently been valued by Ross E. Browne, M. E., formerly of the University of California.

Cost of Equipment

The expense of equipment for one of these mines on a basis of a life of 15 or 20 years is considerable, and involves shaft sinking at a cost of $100 to $150 per foot, winding engines, air compressors and rock-drill plant, electrical power and lighting plant, pumping machinery, mills, cyanide works, furnace and melting houses, buildings for natives and whites, stores and offices, water reservoirs and water-supply installations, and transportation facilities.

Some of the larger mine equipments have cost over $5,000,000. The enter[illegible] have invested millions for the development of these mines deserve great credit for the sportsmanlike nerve they have shown in combating difficulties and in running risks for the purpose of building up the industry.

Shaft Sinking

Most of the shafts sunk on the Witwatersrand have five compartments. Some are sunk on the dip of the ledge, which varies from 70 to 35 deg. in different mines, the tendency being for the steeper dips to flatten to about 35 deg. as the depth increases. Most of the shafts are vertical. Some new vertical shafts for working the deep levels have seven compartments.

Most of the sinking is in quartzite and Leslie Simson, a graduate of the University of California, holds the world's record for sinking a vertical shaft 28x7 ft. in quartzite at the rate of 203 ft. in one month. The average rate of sinking eight shafts on the Consolidated Gold Fields mines 7x28 ft. to depths varying from 1300 to 3700 ft. was about 100 ft. per month, and the average cost $134 per foot. Two of these shafts, more than 3000 ft. deep, were each sunk at the rate of 152 ft. per month for six consecutive months. The time on the work was subdivided as follows:

	Hours
Hand drilling with Kaffirs	3.07
Winding rock	3.26
Winding men and tools	1.17
Blasting	0.50
	8.00
Hand drilled holes per shift	20 to 21
Lb. dynamite per ft.	16 to 18
Lb. coal per shift	2400 to 2800
Buckets of rock hoisted	34 to 36

The deepest shaft is the Catlin shaft, about 4200 ft. A seven-compartment shaft to go 6000 ft. deep is being sunk on a mine that is managed by R. H. Robertson.

The shafts are usually timbered with 8x8-in. timbers of pitch or Oregon pine, and lagged with 2- or 3-in. plank. In the winding compartments the guides are of Oregon pine 4x6 in. to 5x8 in. Some steel guides are channels; others are tees with extra thick members for the shoes to run upon. There are bearer sets resting on hitches cut in the rock every 100 ft., or less. In some cases steel girders forming the dividers are used for bearers.

Each ladder starts from a platform in the pump and electric-cable compartments and the mining regulations stipulate that they must all be inclined. They are made of 2x4-in. or 3x3-in. Oregon pine with round-iron or gas-pipe steps about 11 in. apart.

Head Frames

The term "head frame" or "head gear" is used in preference to "gallows frame"; it means more. For permanent work these structures range from 75 to more than 100 ft. high to the center of the rope sheaves. The frames are usually provided with bins for coarse ore, fines and waste rock; nearby are located the rock

crushers and sorting screens. In rock crushers are practically the standard equipment from work so that the characteristics may be imparted to the final [illegible]

Three methods of sorting are used: the old method of sorting on a floor, upon revolving steel tables about 30 ft. in diameter; and on Robins conveying belts. The belt method appears to be the most approved. At a mine having 200 stamps there will be fifty or more negroes, chiefly young boys, employed at sorting under the direction of one or two white men.

Revolving steel trommels are used for washing the ore before it goes on the sorting table or belt. They are about 4 ft. in diameter and 10 to 18 ft. long. The percentage of waste sorted from the ore varies from 10 to 30, depending on the mine. A steel head frame 100 ft. high with bins, etc., costs about $26,000, erected. Automatic self-dumping skips and Templer's shaft equipments are installed at some of the important mines.

The ore is conveyed to the mills in various ways. One mine has a railroad and hopper-bottom trucks of 25 tons capacity; the cost of transport in this was about 3c. per ton. At other places railroads pull from 2- to 4-ton self-dumping cars at a cost of 5 to 8c. per ton. The most common method is rope haulage, which costs from 6 to 12c. per ton. Where the distance is not too great, belt conveyers are used with advantage.

Stamp Mill Practice

There are about 7000 stamps running on the Witwatersrand. The largest number of stamps in one building is 400 at the Simmer East and Knights Deep joint mill, and the next largest, at the Simmer and Jack mine, 320 stamps in one mill. The mill at the Robinson gold mine has 220 stamps and three Allis-Chalmers tube mills. The output from this mine averages $400,000 per month. It has been under the management of W. W. Mein for several years.

The crushing capacity of these mills is from 5 to 8 tons per stamp in 24 hours, and it takes 7 to 9 tons of water to the ton of ore. The weight of the stamps varies from 1150 to 1600 lb. Coarse screens are used where there are tube mills. It is customary to install two tube mills for a 100-stamp mill or 3 for a 200-stamp mill. The tube mills are 4 ft. 6 in. in diameter, and about 20 ft. long inside the silex liners. From 50 to 60 per cent. of the gold recovered is caught as amalgam on the copper plates in the mill. The rest is obtained in the cyanide plant from the concentrates, sands and slimes treatment, except a small quantity which is sent to chlorination works.

Some of the mines use Frue vanners and others use Wilfley tables below the battery amalgamating plates. The product is either sent to the chlorination works or subjected to treatment by cyanide. Shaking amalgamators [illegible] with copper plates are used below the tube mills.

Cyanide Treatment

Tailings wheels are used for elevating the sands, because the ground is flat. The sands are delivered to a spitzkasten, where the concentrates are taken out. The material is distributed in the tanks by using Butters' and Mein's distributers or by direct filling. The concentrates go to one set of tanks and the sands to another. Concentrates take about 21 days' treatment and sands about 7 days' treatment. There are settling tanks and treatment tanks of steel.

Classifiers are used for the sands, and the slimes-settling tanks are provided with an annular launder or trough for leading off the water to the return-water reservoir. A solution of KCy is run through the material and thence to the precipitation boxes, where the gold is precipitated on zinc shavings.

The gold and zinc precipitates are dried, calcined and melted. The gold solutions are tested on entering and on leaving the precipitation boxes. Filter presses are becoming more common for slime treatment. Automatic samplers are employed for sampling the sands.

Hoisting

The most expeditious winding done in South Africa is at the Kimberley shaft, De Beers mines, where skips holding 5 tons of blue ground are hoisted 1840 ft. in 45 sec., including loading and dumping time.

The greater number of winding engines in use in the Transvaal are of the double-cylinder, high-pressure type, with double drums arranged to run counterbalanced. The steam cylinders range in size from 16x36 in. to 28x72 in. Some cross-compound winding engines are 28 and 50x72 in. Twin tandem compound engines are used on some of the mines. The Whiting system is used by some of the mines.

A small winding engine geared three to one, having two cylinders 13x24 in., was used in sinking the shaft in which the record of 203 ft. of sinking was made in one month. The time per trip was 3½ minutes, with a one-ton bucket.

The mean effective pressure on the piston of a high-pressure winding engine can be estimated to reach about 75 per cent. of the boiler pressure. One pound of coal will hoist 30 to 50 foot tons of rock with a high-pressure winding engine.

Winding Ropes

Round winding ropes are almost universally used in the Transvaal. They are usually made with 6 strands and 7 wires to the strand, but sometimes 19 wires to the strand are used where the sheaves are small and great flexibility is desired. Occasionally there are 13, 14, and 16 wires per strand. The steel wire usually has from 110 to 140 tons breaking strain. The [illegible] required by the Government mining regulations is 6 for all ropes. The comparative breaking strain between crucible-steel ropes and plough-steel ropes is as 37 is to 48.

Boilers

The boilers are generally in units of 100 to 250 h.p. A mine having a 100-stamp mill plant requires about 1000 to 1600 h.p. boiler capacity. The greater number are of the water-tube type, such as the Stirling, Babcock & Wilcox, and Heine, but there are some Lancashire and horizontal tubular boilers. One chimney furnishes draft for 800 to 1600 h.p. of boilers by way of a flue passing around or through economizers. Weir or Hall compound feed pumps are generally used. Steam traps are employed extensively. One ton of coal is burned for 8 tons of ore mined.

Pumping Machinery

Some of the mines use the Cornish pumping system. Few of these pumps exceed 12 in. in diameter and 8 ft. stroke. Other mines are equipped with electrically driven pumps which are more readily adapted to the varying quantities of water. Some of these pumps are of the single-acting triple-plunger type driven from motors having reduction gear. Some of the pumps are of the high-pressure centrifugal and turbine type directly connected with the motors.

Where strongly acid water is encountered lead-lined steel pump columns are used. Lifts of from 500 to 1000 ft. are employed with electric pumps. With the Cornish system it is rarely safe to exceed 300 ft. lift. From 200,000 to 250,000 gal. per day from a shaft may be near the average on the Rand, but there are one or two shafts that have as much as 2,500,000 gal. per day to contend with. Some of the underground pump stations have dimensions of 12x15x25 ft.

Armored cables with well insulated and protected wires are used to take the current down the shafts.

Compressed Air Equipment

The air compressors are mostly of the compound type, ranging in capacity from 20 to 75 drills. The rating is based on 100 cu.ft. of free air per 3¼-in. Ingersoll rock drill. The piston speed of the large compressors is from 500 to 550 ft. per min., and the pressure maintained is from 70 to 80 lb. The free-air capacity is based upon the volumetric intake of the low-pressure cylinder at the rated piston speed.

The rate of drilling is about 4 to 5 ft. per hour. A 3¼-in. drill takes 12¾ h.p. It takes about 300 lb. of coal per foot for a 5x7-ft. excavation, exclusive of winding and pumping, estimating the evaporating power at 6 lb. of water to 1 lb. of coal.

Pneumatic hammer drills are being introduced by Mr. Hellman for stoping.

machine drills in use at the Johannesburg mines.

Power Plants

Most of the mines generate their own electric power, using two or more generators. Motors are used for the following purposes:

Rockbreakers, sorting tables, etc.	70 to 150 kw.
Pumping and other work in the cyanide and precipitation house	100 to 180 kw.
Returning water from slimes dam	20 to 40 kw.
Carpenters', smiths' and machine shops	20 to 40 kw.
Mine pumping	80 to 150 kw.
Lighting, underground	10 to 30 kw.
	290 to 570 kw.

At night, when lights are required on the surface, there will be fewer motors running than in the day time; so that, for a mine running 200 stamps, a fair estimate of the electric power required will be from 500 to 600 kw., unless more than 250,000 gal. of mine water must be pumped per day.

The Consolidated Gold Fields Company has a central electric plant of about 3000 kw. that supplies several mines.

The Government regulations now allow only 3000 volts to be carried across roads on 24-ft. steel poles weighing 325 to 350 lb. This voltage will have to be greatly increased when electric power is brought from the Victoria falls to Johannesburg, a distance of more than 600 miles. The Victoria Falls Power Company estimates that it can sell power at a profit for less than it costs at a coal mine near Johannesburg, where coal that will evaporate 6 lb. of water per pound of coal can be put in the bunkers for about $2 per ton.

As a precaution against accident, and in order to get to business quickly, the Victoria Falls Company proposes to install a large steam plant near Johannesburg and to use cheap coal. There are no industries of any magnitude nearer Victoria falls than Johannesburg, where 50,000 h.p. could be used easily by some of the large mining companies.

Offices and Shops

The mines are usually equipped with a machine shop containing lathes, planers, drilling machines, milling machines, bolt cutters, pipe-cutting machines; a carpenter shop having saw bench, planer, band saw and lathes; a blacksmith shop having steam hammer, drill-sharpening machines, furnaces for heating drills, blowers for forges, etc.; also boiler shop having punches, shears, rolls and drill.

The furnace room has a drying furnace for zinc slimes, reverberatory furnace for cyanide gold, pot furnaces and retorts.

The surveyors' offices are provided with large tables and drawers for plans. Rollers are arranged at the end of the table to hold the mine plans and assay plans that are kept up to date each day.

The storehouse is generally of considerable size and is supposed to contain all articles likely to be needed in an emergency, so as to avoid delay.

The compound for the natives is composed of a series of rooms about 14x20 ft. arranged in the form of a quadrangle, with an open space in the center. Compounds are built of galvanized iron on wood framing or brick walls, with galvanized-iron roof. The Government regulations require that each native shall have not less than 250 cu.ft. of air. The bunks are made two-high, the framework being of angle iron. The bottom boards are loose, so that they can be taken out for cleaning and disinfecting. The floors are either concrete or asphalt, and natives are detailed to keep these rooms clean. Some compounds are steam-heated and stoves are provided in each room, with a coal allowance. A separate building is provided for a native hospital.

The cook house contains a row of cast-iron cooking pots, about 30 in. in diameter. These are heated with steam. Steam and water pipes are attached to each pot. There is a corn-grinding mill where the mealie-meal, Indian corn, is ground before cooking into a thick porridge or mush. This is stirred by the cooks and dished out to the natives as they file past the windows of the cook house. Vegetables are also boiled and each Kafir is allowed about 2 lb. of meat per week and some bread. The Chinese are fed chiefly on rice and stewed meat with vegetables and bread and are allowed all the tea they want to drink. They are quartered in a separate compound.

The dwellings built by the company consist of a manager's house; houses for the staff, comprising mine foreman, chief engineer, millwright, battery manager, cyanide manager, surveyors, samplers, assayers, resident physician and secretary. Five-room houses are built for married miners and mechanics, and 12x14-ft. rooms for single men. A recreation hall with reading room and sometimes a billiard room and a white men's boarding house are also provided.

Water-retaining reservoirs are needed; sometimes also cooling ponds for condenser water which is usually elevated and spilled over brushwood towers for expeditious cooling.

The mining regulations of the Transvaal Government have provisions for the following subjects: Protection of the surface, protection underground, hoisting and shafts, ventilation and lighting, explosives, mine plans, returns of operating statistics, certificates for managers who have passed examinations and native pass laws.

Diamond-drill Bore Holes

Hundreds of diamond-drill bore holes have been sunk on the Witwatersrand, and in the coal districts. Some of the holes exceed 5000 ft. in depth. The formation is not badly broken, being sandstone, shales, quartzite and porphyry, and it is possible to obtain more than 90 per cent. of the core for examination.

Some of the very deep holes in Africa have been deflected to a considerable extent, especially those sunk on inclines of 45 or 60 deg. The deviations were usually surveyed by H. F. Marriott's instrument, the Galway photographic method or the Zboril hydrofluoric acid method. Both these methods have been tried in the same hole and the results checked closely.

The machines mostly used are the Sullivan and the Bullock, the former for the deepest holes. An unusually difficult diamond-drill hole was started at the bottom of a shaft full of water, the shaft being 2520 ft. deep at the time. The hole was successfully drilled more than 500 ft. below the bottom of the shaft, and a ledge yielding $10 over a good stoping width was found. The Vogelstruis West shaft was afterward pumped out and extended.

Railroads to Johannesburg

Johannesburg has rail connection with Cape Town, 1000 miles; Port Elizabeth, 700 miles; East London, 660 miles; Durban, 480 miles; and Delagoa Bay, 400 miles. The best natural harbor is at Delagoa Bay, but this is in Portuguese territory, which country supplies half the negroes working in the mines. The gage of the Central South African railroads is 3 ft. 6 in., and 80-lb. rails are largely used. The road bed is fairly well constructed and the most important bridges are of steel. The running time is slow as compared with that of English railroads.

The rolling stock is generally good. The sleeping cars have a corridor down the side and the dining cars are on the American plan, but all are somewhat smaller on account of the narrow gage. Some of the hopper-bottom steel coal cars carry 35 tons. The rates of transport for merchandise and coal per ton mile are about five times as high as in the United States. Coal which costs $1.50 per ton at the pit's mouth costs from $2.25 to $5 delivered at the gold mines, the distance varying from 10 to 70 miles.

Most of the heavy machinery imported comes by way of Durban and Delagoa Bay. Oregon pine sticks 18x18 in. by 100 ft. have been hauled by rail from the latter place. All Oregon pine comes from Puget sound and pitch pine from Georgia. Most of the foodstuffs are imported to Johannesburg from other countries, and this together with the machinery and building materials makes a large business for the railroads.

The railroads are controlled by the Government. The value of machinery transported to the mines amounts to more than $55,000,000, including cost and transport.

There are a number of coal mines at a

[illegible] gold mines. Their annual output is about 14,000,000 tons.

The Diamond Mines

There are a number of diamond mines in South Africa, the chief producer belonging to the De Beers Company, at Kimberley, which [illegible] 2,211,000 carats, realizing $8,000,000. They are employing [illegible] people in the employ of this company.

The other large diamond mine is the Premier [illegible] in the Transvaal near Pretoria. The Cullinan diamond, the largest in the world, weighing 3000 carats, and valued at more than $2,000,000, was found here. The output for 1905 was 768,000 carats. After 60 per cent. of the net output had been set aside for the Government, dividends were paid amounting to $1,500,000 per annum.

The Natives

The natives are the happiest and most independent people in the world. Being discharged does not worry them a particle. They can earn enough in a month or two to keep them a year, and they easily acquire extravagant and some other bad habits by contact with white people.

There is enough low-grade ore in the Transvaal to produce $10,000,000 per month, but which will not pay high enough wages for white labor. Must it stay in the ground? There are millions of colored people in the world who have been raising rice, tea, coffee, sugar, tobacco, and doing other kinds of menial work for thousands of years. The more highly civilized races have received and still continue to receive the benefit of this work. The natives of Africa and others who desire employment that will not pay white people should have the opportunity to take out this enormous wealth, nine-tenths of which would be paid out for machinery supplies and labor, and the supervision would give employment to a number of white people.

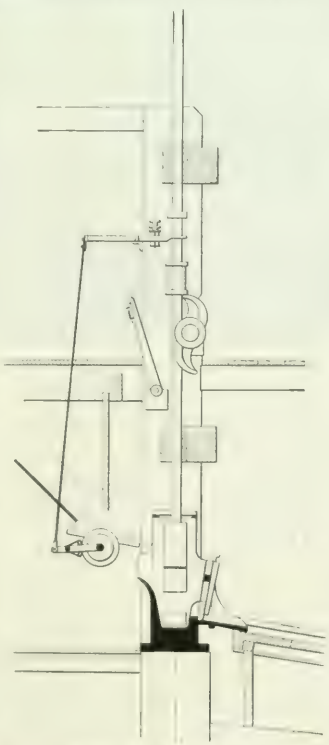
Some Accessory Stamp-mill Appliances*

BY C. O. SMART

The author briefly describes the arrangement for driving the "challenge" feeders as installed at the Simmer and Jack Proprietary mines.

The diagram shows the general arrangement of the various parts. The rocking bar or feeder arm is removed from the top of the mortar box and ore chute, and is placed on the king post under the top guide block; the power to drive the feeder gear is transmitted through a Manila rope, ½ in. or ⅝ in. diameter. The center box, fulcrum bracket, connecting rod, springs, etc., are no longer required, and a [illegible] shaft that can be adjusted to act as a slight brake. This helps to steady the shaft, and by keeping the teeth of bevel wheels up to them [illegible] prevents any back-lash. Where compensating weights are used the center weight can be used to operate feeder gear if necessary.

Some of the advantages gained from this arrangement are: (a) the feed is adjusted from the cam platform by the amalgamator who is testing the stamps, without his having to go downstairs to the feeder platform to make the adjustment; (b) when setting center tappet the box is fed by the man who is at work on cam platform giving an occasional pull on the ½-in. rope, instead of having a boy filling up the box from the feeder platform. The feeder is still worked from the center stamp. Again, the transmission of power through a small rope gives a very easy and steady movement to the gear, instead of the usual hard knock and jar; this reduces the wear on the few parts that are left on the feeder to a minimum. The removal of the feeder arm from the top of [illegible]

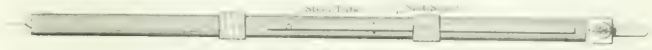


FEEDER ARM ATTACHMENT

*Abstract of a paper read before the Chemical, Metallurgical and Mining Society of South Africa.

[illegible] without having to raise the bottom guide [illegible] crease the weight of the stamps.

The hydraulic press for removing the broken stem ends from heads is convenient. This machine is set up inside the mill, and one man can remove the broken stem end from a stamp head in a few minutes.



[illegible] MEASURE FOR STAMPS

Another device for straightening stems after welding is as follows: The stem is placed on four wheels, two near each end, and can then be revolved by hand to find out the position of the bend; the actual straightening is done by a large "Jim-crow," that slides on a beam running parallel to the stem, so that it can be used at any part of the stem where required.

A diagram of an ingenious instrument for measuring the actual drop of stamps when running is also given, and is useful when the actual running drop of the stamps has to be determined, or for deciding any disputed question of how much drop any stamp has, as it registers accurately the longest drop the stamp has made while it is in position. The instrument is placed between the bottom of top guide block and top of tappet; the set screw is then released for about 20 seconds, then tightened up again, and on removing the instrument the longest drop made while it was in position can be measured off.

I find that a solution of hydrochloric acid of 1.6 per cent. or about 1 in 20 when using commercial spirits of salt, makes a very good substitute for the cyanide solution generally used for dressing battery table plates. I made tests with sulphuric acid, nitric acid and sal ammoniac, but found that the hydrochloric acid gave the best results, and at the strength used had no bad effect on the brushes or the men's hands. When using small quantities of 0.9 per cent. cyanide solution and applying only to the parts of the plate where some discoloration or film was present and using it at the end of dressing just before water was again turned over the plate, so that the contact was as short as possible. I always found a value of from 6 to 8 dwt. of gold in solution in the first flow of water coming over the table after dressing, and a steady 0.02 dwt. was returned as the value in the clear-water overflow from the slime collectors. Since stopping the use of cyanide in the mill altogether and using hydrochloric acid, only when required, I have never had more than traces of gold returned as the value in clear water from slime collectors.

Mining and Smelting in Southern Siberia

With Improved Transportation Facilities the Rich Mineral Deposits Would Attract Abundant Capital. New English Companies in Field

BY H. E. WEST*

After examining a number of properties in the desolate Kirghese steppes we went to examine a gold property, situated, this time, in a most charming country. There were forests of trees, pine principally, as is usually the case in granite country in the steppes. Innumerable sapphire lakes with waters of clearest crystal gleamed over a wide stretch of fertile land. Farms with rank grass and cattle feeding knee-deep assured us this was the land of Canaan after our wanderings in the wilderness.

Here, too, we found evidence of Calmuck workings, who had mined extensively as far as the water-level, leaving mounds now grass, and even tree, strewn. There were several veins in the granite, mostly narrow, but with gold contents that ran several ounces per ton in parts; a very prepossessing property for the small owner, but scarcely one for a corporation, whose requirements would be mining on a considerable scale.

From here we essayed to drive to Akmolinsk, but nightfall found us hopelessly "bushed" and without water, with very little idea as to our whereabouts and heading directly contrary to the direction we wished to go. Before us there was apparently an impassable forest, unpierced by any friendly road, not the most comforting of situations. Almost the entire night I tended camp fire and took care that the horses should not stray and make matters worse. With the earliest streaks of dawn we were once more under way. Happily, after an hour or so of futile wanderings, we ran across some charcoal burners, whose advice eventually brought us to our desired haven.

Copper-smelting Works

Thence to Spassky Zavod, another 300 versts, with but one change of horses. Here we found a town established around the smelters, some six in number, of a somewhat primitive brick-stack variety, but a decided improvement on the small Russian furnaces that were formerly used. Here the ores of the Yuspennsky mine are reduced, the copper deposits at Spassky not being worked. The present smelters have a capacity of 100 tons of metallic copper per month. A new plant is well in course of erection to extract 300 tons of copper per month, equivalent to 100 tons of ore daily.

From Spassky to the Yuspennsky mine I traveled without the good service of my "fidus Achates," who had successfully piloted me thus far on my journeyings, and who happily is a past-master in Russian ways and the Russian language.

Yuspennsky Copper Mine

This mine is 70 miles south of the smelter, while the coal-mines of Karagandy, also belonging to the company, are 30 miles north. Truly a land of immense distances! In many parts to attempt to work mines almost 100 miles apart and connected only by a wagon-road would be deemed almost an absurdity, yet this is but a moderate distance in Siberia.

Arriving here the journey of 1500 miles, occupying all but a whole month of continuous traveling by karabok, was at an end. Doubtless, a modest record for these parts but quite long enough for a "new-chum." The weather, however, had been superb, and sleeping out on most nights was very agreeable. There are no marauding beasts, neither anyone to steal one's belongings, nor even a howling coyote or wolf to disturb one's rest, an ideal country for such a trip as far as the summer climate is concerned.

But to return to the Yuspennsky mine. This mine had also been worked from old times, probably from the period of the Calmucks, and since for some generations of Russian owners. An open-cast of considerable dimensions exists in the center of the mining area; that once was mined, it is said, about 150 ft. in depth, but is now, for the most part, filled in. From

SPASSKY ZAVOD, TOWN AND SMELTING WORKS

[illegible] considerable [illegible] ppr must have been extracted.

It would appear as if there were very little outcrop at any time, and one of the rich shoots worked today does not even come to the surface. The first workings were in the neighborhood of some prominent but barren outcrops, and after many years of work the wider and richer hidden shoots were uncovered.

Nature of the Deposit

The deposit is a phenomenally rich one, of considerable width, 50 ft. not being uncommon, and in places 70 ft. The shoots, as at present disclosed, are not extensive, the longest being 300 ft. The copper contents may be judged from the smelting records of last year, which averaged 22 per cent. Cu, the ore mostly coming from the sill stope on the 350-ft. level. Bornite is the ore of most importance, and when enriched with chalcocite, as it usually is, runs very high, wide sections averaging 15 to 20 per cent., and at times more. On the hanging, and against the shale wall there is a streak, termed the "hanging-wall streak," from 2 to 4 ft. wide, consisting of almost solid bornite enriched with chalcocite along the cleavage planes of the metamorphosed shale, for which it is easily mistaken, its weight alone being the determining factor. This ore runs mostly in the first grade, which is 50 per cent. Cu. Against this is usually a harder streak of high-grade bornite, then some 30 ft. of bornite with quartz and barite, averaging, in sections, fully 20 per cent. Cu; next toward the footwall a considerable width of lean ores that may average 5 per cent., at present unworkable, but suitable for concentration at some later period.

The deposit is between shale on the hanging and on the foot wall, what has been termed a sandstone conglomerate, or rather felspathic conglomerate, or greywacke, and by others an altered igneous rock. Whatever it may be it is largely composed of feldspar with more or less rounded inclusions after pebbles of apparently the same material, impressing one that the rock is derived from the rapid breaking-down of certain igneous rocks in the immediate vicinity. It has been consequently termed an "igneous conglomerate" in reference to its probable origin. The pebbles are of all sizes up to a foot or two feet in diameter, and are usually rounded, one end being often angular, or fragmentary. Immediately to the northeast are sandstone conglomerates, the ordinary steppe conglomerate, while, to the immediate north, are the hills composed of some acid eruptive, with a fine porphyritic texture.

NEW PLANT AT ANNENSKY SHAFT

The ore is a partial replacement of the shale, possibly the copper minerals being thrown down by the graphitic shale, as it is very black, although this is nothing more than a surmise. Secondary deposition is also strongly exemplified.

The mine is developed to the 350-ft. level, and has fully three years' reserves between that level and the next above, based on an extraction of 100 tons daily. Each subsequent lift, if of equal dimensions and grade, will approximate three years' supply; while in the old levels above there is evidence of very considerable bodies of ore being ultimately won, as the former workers contented themselves mostly with the higher grade ores, usually found contiguous to the hanging. The old miners, working on the eastern portion, opened a level at every sajine, or 7 ft., and worked presumably on the gallery system, so common to almost all countries. The next or rather the most recent workers, the Russians, adopted a very much better method, driving their levels at convenient distances, usually 5 sajines, and always keeping these drifts outside the orebody, usually on the hanging wall, and crosscutting the deposit at suitable intervals.

Minerals Present

Chalcopyrite is so far a rare occurrence, and is mostly confined to the footwall shale. Pyrite also is uncommon, all the copper values being contained in the ores of secondary enrichment, notably bornite, chalcocite and tetrahedrite. Above the 15-sajine level, approximately 105 ft., oxidized ores are encountered, as this level is in the zone of mixed sulphides.

Cuprite, usually massive, with native copper, malachite and azurite, are the most common ores of oxidation. Immediately beneath occur the chalcocite and other sulphide bodies. The sulphur content of the ore is low, scarcely satisfying the matte-forming requirements.

Means of Transport

An output of 35 tons per day is all that the mine can produce today—the output being limited by the native horse whim; a suitable steam hoist, compressor and pumps are now in course of erection. The ore is hauled to the smelter by native carts and oxen in summer, and by camels and sleighs in winter, the cost being 12 kopecks per pood, or 6c. per 43 lb.

It is a strange sight to see camels amidst snow—to those accustomed to them in dry climates—but they are the only animals that successfully face the severe snowstorms that, at times, sweep over these steppes. The winter load is about half a ton, while the summer is about ¾ ton.

Coal is hauled from the coal mine to the smelter in the same manner; but one-half of a 2-ft. railroad is already laid and, in the summer of 1907, it will be in operation.

ANNENSKY SHAFT IN WINTER

The coal with which the company possesses a very large area, is of the semi-bituminous kind, of excellent quality for fuel, and is used directly in the smelters, as its coking qualities are not good, although they would be improved by a suitable washery.

On the completion of the proposed government railroad from Orenburg east, via Akmolinsk, which will come near the coal properties, these latter will be an item of no mean value, as there would appear to be a considerable market for such a commodity.

From the smelter the copper bars are hauled to the railroad by teams, a distance of 750 versts, and delivered against payment on cars. The government bonus is £20 per ton of metallic copper produced, which brings the present price to this company of £120 per ton, a highly satisfactory price to all those enabled to produce copper within the Tsar's domains.

Other Operations

Such then is a brief glance of present attainment and future possibilities of copper mining within the Kirghese steppes. Engineers, who know the steppes well, report numerous deposits that will well pay to work when facilities are more favorable than at present, when profitable operations are mostly confined to the higher grade ores. It is not improbable, therefore, that some day the steppes may be no mean contributor to the world's copper production.

There are already several large mining companies operating in Russia and Siberia, mostly English companies, of whom ten are now quoted in the financial papers. Among the foremost is the Siberian Syndicate. This company brought out the Spassky Copper Mining Company, and at the present has large holdings known as the "Popoff" and "Atbasar" properties. The Siberian Proprietary is another large parent company, with holdings principally in Russia and the Urals, in the neighborhood of Orenburg, where gold mining is the staple industry.

Near Tomsk and farther east, near Lake Baikal, there are other large areas of gold mining, while scattered over the Urals and the rivers to the north are extensive placers. In the mining of platinum, this country almost holds the monopoly. Almost without exception the foreign companies are said to be doing well; at all events, their shares have very materially increased in value on the London market.

An increasing number of mining engineers find their way to Siberia in the interests of foreign capital. Fresh companies continue to be brought out in London, and the aggregate of foreign capital in this country at the present time must total no mean figure.

And with the present rate of progress continued it would not appear unduly optimistic to anticipate that Siberia will occupy a prominent place in the eyes of the mining operator and investor, within the next decade or two, becoming a considerable producer of mineral wealth.

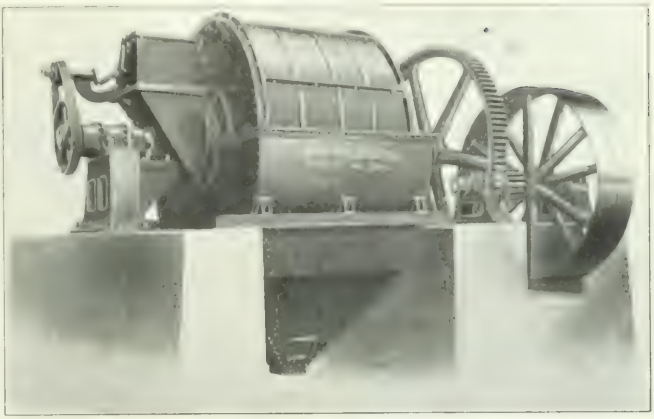
For a quick-setting, rust-joint cement, for making rust joints between concrete foundations and engine beds, *Engineering News* recommends one part powdered sal ammoniac, two parts flour of sulphur, 80 parts iron borings, all by weight, and mixed to a paste with water. For a slow-setting, rust-joint cement, two parts powdered sal ammoniac, one part flour of sulphur, and 200 parts iron borings, all by weight. The latter cement is considered preferable to the former if the joint is not to be used immediately.

CAMELS HAULING ORE TO THE SPASSKY SMELTING WORKS

The Gates Ball Mill

Nine Gates, No. 8, ball mills, supplied by the Allis-Chalmers Company, will be installed in the cement plant of the Universal Portland Cement Company, the new subsidiary company of the United States Steel Corporation, at Universal, Penn. In the Allis-Chalmers mill, here shown in cross section, and also as it appears when mounted, the driving hub or spider at the feed end is a steel casting, with three blade-shaped arms set diagonally so as to assist in throwing into the mill materials fed through the spider. This spider has three feed openings, and is securely keyed to the main driving shaft, and bolted to the side plate by counter-sunk head bolts passing through ring plate and spider.

The driving hub opposite to the feed end is made of cast iron, properly bored to fit the shaft and securely keyed. The wear incidental to the grinding is borne by special steel plates made for the purpose of withstanding this particular use. The holes for the perforated section are cored so that the drilling of small holes is avoided, permitting the use of a harder plate. The wearing plates are 3 in. thick at the point of greatest wear. They are planed and drilled to template so as to make all repairs for these mills interchangeable. Each breast-plate is made in two portions, one constituting a perforated and the other a solid section, thus enabling the operator to replace one section when worn out instead of replacing the entire plate when only one section is worn out.



BALL MILL WITH FEEDER ATTACHED.

Each Allis-Chalmers tube mill is provided with a Gates automatic feeder, adjustable, so that the quantity of material fed may be varied through a range of from zero to 50 per cent. above the rated capacity of the mill. The adjustment of the feeder [illegible] changed, without stopping the mill.

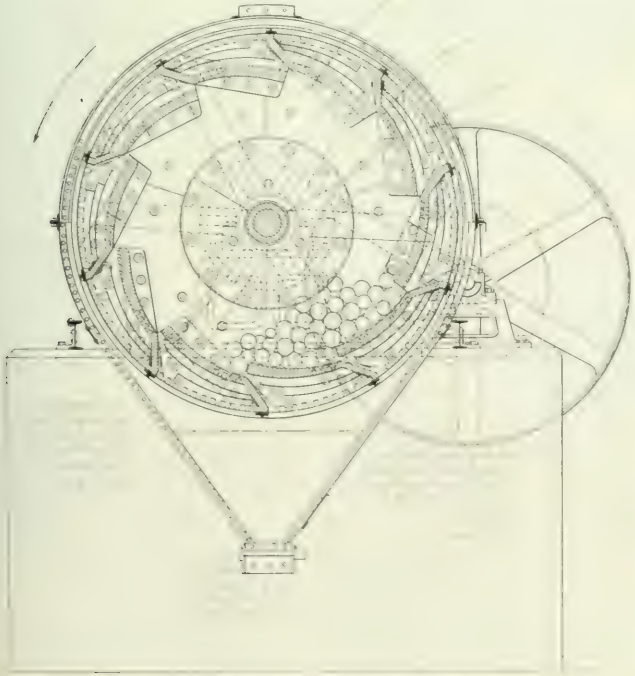
An engineer of the Allis-Chalmers Company, who was for some years employed in Australia, gives interesting facts regarding the use of ball mills with forged-steel balls at one of the leading reduction works in the Kalgoorlie district. The process there began, as a rule, with the breaking of the ore in a Gates gyratory crusher, but it was found that the ball mills gave excellent results when fed directly with ore 3 per cent. of which, by weight, would not pass a 6-in. ring, and 75 per cent. of which would not pass a 2-in. ring. The mills with feed of this character were capable of furnishing 33 tons of product, each, per 24 hours, such as would pass a 20-mesh screen.

A mesh determination on the finished product of the ball mills gave the following results: Retained on 40-mesh, 24.1 per cent.; passing through 40-mesh and retained on 60, 9.4 per cent.; through 60 mesh and retained on 80, 6.2 per cent.; 80-mesh and retained on 100, 6.6 per cent.; 100-mesh and retained on 150, 3.2 per cent.; 150-mesh and retained on 200, 4.2 per cent.; passing through 200-mesh, 46.3 per cent.

Nearly half of the material was reduced to a state of division finer than 200 mesh. One steel ball weighing 18 lb., added daily to each mill, preserved the balance of steel in the mills, while the grinding plates and side liners were replaced in complete sets every 7 or 8 months at a cost of less than $900. Each mill revolved at 25 r.p.m. and required 24 i.h.p.

The aggregate weight of the steel balls in each mill varied from one ton to 22 cwt. Better results are obtained when the ball mills are working on the product of the Gates crusher, and that is the most economical method; but the test shows what mills equipped with forged-steel balls are capable of doing alone.

The ore crushed at the plant mentioned



[illegible] ALLIS-CHALMERS BALL MILL.

A number of analyses averaged as follows:

	Per Cent.
Silica	40 to 60
Alumina	13 to 16
Ferric sulphide	6 to 10
Ferric Oxide	7 to 10
Carbonate of Lime	15 to 20
Magnesia	4 to 7

The ore carried no free gold, the precious metal being in the form of tellurides.

Wooden-stave Pipe *

By Andrew Swickard

During an early period of the growth of some of our Eastern cities, extensive water systems were installed, using as distributing mains small logs of trees with auger holes bored lengthwise. The limitations of such a plant were many, and as soon as necessity required and circumstances permitted, pipes made of iron were used. The next stage in the use of wood in constructing water pipe is found in the New England States. Pipe of large diameter and made of wooden staves banded together by flat iron bands were used in a number of instances for carrying water from dams to water wheels. These were made up in sections 12 or 16 ft. in length, and the sections were so tapered that the small end of one entered into the large end of the adjoining section, forming a telescope joint. Pipe so constructed served the purpose well. A few of these old pipes were still in use until a few years ago. In one case, at least, the pipe was in service nearly fifty years before being rebuilt.

Beginning of Modern Construction

The first wooden pipe built according to [illegible] method was installed by the [illegible] Water Company, at Denver, [illegible] twenty-five years ago. [illegible] and the pipe [illegible] The staves are milled [illegible] corresponding [illegible] and [illegible] When the [illegible] together [illegible] by flat [illegible] in Denver and in the [illegible] flat) are used to bind the staves together.

[illegible] undertake to design a wooden pipe unless [illegible] is familiar with all the factors that enter into the problem.

Decay

The great enemy of wood pipe is decay. If it could be controlled absolutely, the life of wooden pipe would depend entirely upon the life of the bands. In every locality there are local conditions that either hasten or retard the decay of wooden pipe. These local conditions cannot, as a general thing, be controlled in any way. When understood, they can sometimes be met when the pipe line is being located.

Decay is a vegetable growth and is communicable. A small amount of moisture, among other things, is necessary for decay to take place. Thoroughly dried wood, or wood constantly submerged in water will not decay. The moisture conditions in the staves of a pipe carrying water never correspond with either of these two extremes, unless the pipe is laid below the surface of the ground water.

The degree of saturation of the staves of a pipe depends upon the pressure; as the pressure increases, the condition becomes less favorable for decay. The pressure can be varied at will by the designing engineer of a water system, and as a consequence, the moisture condition of the staves is the only element effecting decay that can be at all controlled. In all existing pipe lines, where decay has taken place, it began at the points where the pressure was the lowest. Even the lowest practical pressure will produce a moisture condition in the staves that is not the most favorable to the growth of decay.

The High Points

When decay takes place quickly and rapidly at the points where the pipe is near the hydraulic grade line, it is safe to conclude that the pipe is not running full at these points. When a pipe is installed for the purpose of supplying a town or city with water, a larger pipe than is necessary for the present needs of the community is usually built. If the quantity of water carried is regulated at the upper end, and is less than the maximum capacity of the pipe, the high points of the pipe, if the profile is irregular, will run only partly full of water. (By high points is meant the points in the profile that are near the hydraulic grade line.) Decay will take place quickly and rapidly at these points.

The pipe line of the city of Astoria, Ore., is an illustration of a case of this kind. The profile of the line is very irregular, approaching close to the hydraulic grade at a number of points. After about ten years of service it was necessary to rebuild short sections at these high points. It is a fact, without doubt, that the pipe did not run full at all times. The staves were thus allowed to dry sufficiently to produce a moisture condition [illegible] favorable for decay. The same effect will be produced by the accumulation of air at the high points if means are not provided for allowing it to escape.

When a pipe is built in a locality where there is much decaying wood scattered on the surface of the ground, or where there is much vegetable matter in the soil, it is well to make the moisture condition of the staves more unfavorable to decay by keeping the pressure at all points considerably above that due to a head of a few feet only. (Make the minimum, say 40 or 50 feet.)

Areas overgrown with willows or other trees or shrubbery that require much water should be avoided if possible in locating a wooden-pipe line. Roots from such trees or shrubbery will entwine about the pipe in great masses and actually seem to kill the wood. Where conditions of this kind prevail, pipe will last but a comparatively short time.

Selection of the Wood

The selection of a wood of which a pipe is to be built is an important matter. It is necessary to have staves long and straight grained. On this coast there are but two kinds of trees that furnish lumber suitable for pipe construction. These are the redwood of California and the Douglas spruce or fir of the northwest. The choice between these two should be the one that resists decay the best, even though the lumber with the best resisting qualities costs the most. It has been claimed that if the staves of a pipe are always saturated they will never decay. They are never thoroughly saturated. The degree of saturation depends upon the pressure, and the growth of decay is in inverse ratio to the degree of saturation. As a consequence, the staves are always more or less subject to decay, and it seems to be an act of wisdom to select the wood that resists decay best.

Wood pipe is, as a general thing, much cheaper and more economical than riveted steel pipe. Where the pipe is to be subjected to a comparatively high pressure (say 250 ft. head or over) it might be cheaper to build of steel. There are so many variable elements due to locality that enter into the cost of pipe that it is difficult to make comparisons. As a general thing, wood pipe is from 30 to 50 per cent. cheaper than riveted steel.

The interior of a wooden pipe will not deteriorate as does that of an iron pipe. From the standpoint of steady capacity, the wood is far superior to iron. Not many careful experiments have been made on the flow in wooden pipe. The results are not materially better than those obtained by experiments on the flow in new, smooth iron pipe.

Wider Use in Prospect

The comparatively early deterioration of two or three existing pipe lines has been used as a premise for arriving at the conclusion that wooden pipe is a failure. Where there is one pipe line that

has been a partial failure. There are no absolute failures) there are dozens that are giving the utmost satisfaction. Each partial failure has been due to local causes which might have been avoided if they had been understood. It is well known that iron pipe gives under some conditions the greatest satisfaction, while under others it is very unsatisfactory.

The use of wood pipe has been greatly extended in recent years. A number of long lines have been built in the East during the past two years. It is even attracting attention in Europe. The use of wooden pipe, on a large scale, was decidedly a Western innovation. After a time demonstration of its worth it has found favor with the engineers of the East. At least in one case, wood pipe has been favorably considered by conservative English engineers. This is in connection with a large water project in India. Recently a number of inquiries have come from Japan for detailed information relative to design and cost, and even Siberia is getting into line. Up to the present time, installations have been made in America, from Alaska to Peru, inclusive. Time has proven its worth, and under certain necessary limitations, a more extensive general use is assured.

Simple Language in Mine Reports

By Thos. Bakewell

The object of this paper is twofold. Whatever else it may do I hope it will show to all those interested in mines the necessity of carefully choosing a competent man to report on their properties.

that makes the successful report, but a plain statement and analysis of the possibilities of a property from a standpoint, learned by days of constant association with those who do the work, and with their help looking at all chances. Opinions of workmen must not be taken as a basis for a report unless verified by one's own study of the workings.

When you have satisfied yourself as to the conditions and if necessary have surveyed and mapped the property both for workings and for geological structure, not forgetting to work out the most important part in a cross-section geological map, you are ready to write out your report, which should be as short and yet explicit as possible and should be illustrated with the map when necessary.

Never act in a hurry. If those wishing your report grudge you your salary and ask you to hurry and get through, for your own sake decline the work. Let your motto be thorough work and a well written simple report, and what is of interest to all workers, good honest pay. The company who grudges you your hundreds will probably sink its thousands.

The following is a sample of what I call a simple report. It saved the company for whom it was made from spending thousands of dollars for very little ore.

Copy of Proposed Form of Report

On examination of a cross section into Maverick hill in a line with the workings known as Powder hill and continuing across the valley through the works of No. 197 I find the following:

Maverick hill is a huge mass of diorite so hard and massive that even the tremendous upheaval which threw it 40 deg. a black shale, then for 90 ft. farther it runs into diorite. Through the black shales is an upraise of about 25 ft. into shales carrying cinnabar; here there is a large stope made principally by caving ground. Through one wall runs the seam carrying cinnabar and iron pryites. These shales are much shattered and flattened from the general dip of the rock as if drawn down by friction with other rock.

A shaft, just below the upraise through the shale, was sunk for more than 40 ft. and is entirely in diorite. In such a pocket no great amount of cinnabar can be found, as the amount of rock capable of carrying the mineral is so limited.

From this point to Powder hill the valley is largely filled with slide.

Powder hill is capped with metamorphosed rhyolite and lies almost horizontally. Underlying the rhyolite is a bed of sandstone and under this a bed of coal shales. This hill, which is a small one, being not over 150 ft. high, seems to have been thrust up from below without tilting, opening, however, in a crack about the middle of the hill, which is filled with black shale. Just beyond this hill the sandstones to the northeast show a dip of 30 deg north 70 deg. west.

I have been unable to find cinnabar in this hill but think the most probable place to find it is by sinking and drifting on either side of the hill. As it stands there is probably a wide chasm on each side of the hill at present filled in with eroded rocks and at depth probably with shales.

If Maverick mountain could be depressed until the seams were horizontal and the same could be done for the opposite hill and sandstones, the edges of the valley would come together and the point where the shales in the side of Maverick hill have cinnabar there would be found a good deposit of ore. As it is, in my opinion good ore will be found on the contact at some depth. Moreover, all money spent on exploiting Maverick hill is so much money wasted.

The dip of the rock in both hills would indicate that the line of the main disturbance or upheaval lies at a point north 30 deg. east.

Cross Section of Tunnel 197 and Powder Hill, Brewster Co., Texas

Many, who know little of mining except as it puts money into or takes it out of their pockets, have doubtless tried to understand the expert's published report of a property, and have either put it down in despair or refused to act on it because it was not understood. If some of our young technical graduates would get out and work as miners in the mines they would learn to tell owners what they may reasonably expect from their property.

It is not the high boots, khaki suit and brand-new prospecting pick, nor yet the

out of the horizontal has scarcely broken the rock. The lateral seams are far apart and pitch 40 deg. to the south 40 deg. east. In most instances they have hardly more than formed a visible crack; in other places there is a layer of ground rock and near the surface to the north some shale has deposited.

Where tunnel No. 197 runs into the hill there is a deposit of shale in the shape of a V, the apex of the angle being at one of the seams in the harder rock. This tunnel is 135 ft. into the hill where it strikes

The Crimora Manganese Mine

By F. N. Jones

The Crimora mine, lying at the west base of the Blue Ridge in the Shenandoah valley of Virginia, has long been the largest and most regular producer of manganese ore in the United States. Just now operations are suspended for a few months, pending changes in management and equipment. The mines are owned by the Crimora Manganese Company, of New York, and are in charge of Frank W. Wood, at the mine.

Location and Geology

Crimora is on the Shenandoah division of the Norfolk & Western Railway, six miles north of Basic, Va. The mine is two miles east of the station, but is connected with it by a standard-gage spur.

The Potsdam quartzite, forming the base of the district, has been eroded by some peculiar agency so as to form a bowl, perfectly inclosed on all sides, except, where, at the north, a stream has eroded a narrow gorge. This drains only a small part of the bowl, and the remainder has no natural drainage whatever. The bottom of this bowl has been filled to a depth of 212 ft., at the center, with a stiff red clay, covered by a layer of gravel drift with an average depth of 15 ft. In this clay, manganese oxides are found in rounded concretions, and irregular pockets, seams and stringers, whose position follows absolutely no apparent rule. They are found at all depths, and in all shapes and sizes, from that of a pea to masses of several tons weight. All the ore nodules, however, combine in offering indubitable evidence to their origin as hydrolytic precipitates; the rounded nodules almost invariably present a concentric structure, layers of psilomelane alternating with layers of pyrolusite, while the stalactitic forms of the more irregular masses are too familiar to admit of uncertainty. An occasional geode is found in which crystalized pyrolusite forms a black velvet lining to a shell of psilomelane. Wad manganese prevails in certain portions of the deposit. Some of the adjacent country rocks, on the mountain side, have been demonstrated to carry minute proportions of manganese, and these have no doubt provided the source of the ore now concentrated in the basin.

The manganese-bearing portion of the bowl has been determined, by drill borings, to cover an area of a little over 100 acres, of which the Crimora Manganese Company owns 73 and its neighbor, the Old Dominion Manganese Company, the remainder. The latter company has not yet reached the productive stage.

Mining Methods

In the early days, when the ores first attracted the attention of the Carnegie steel interests, the clay was thoroughly honeycombed with shafts and drifts which required timbering of the most substantial nature. The lowest workings of that epoch reached a depth of about 100 ft. below the original surface, when the copious influx of water naturally gravitating to this spot and finding no outlet, forced abandonment of the project. Although the old operators removed the choicest orebodies, the inefficiency of their methods is shown by the great quantity of valuable ore that is now recovered, by open working, from the close neighborhood of the old openings, and even in among the very timbers of the disused drifts.

The present system of mining may have been suggested by that so successfully practised among the largest gold gravel operators of the Sierras, but it is probably unique among manganese miners. The first step was to drive a drainage tunnel 5800 ft. long through the quartzite rim, tapping the bottom of the basin at its lowest point, and discharging into one of the small streams that flow into the south fork of the Shenandoah. A shaft 202 ft. deep then connected its inner end with the surface. In the neighboring mountains, an extensive system of reservoirs and flumes was then constructed, ending in a smaller masonry tank above the mine, from which a steel pipe, crossing on a trestle the deep gulch above referred to, leads the water to a nozzle in the working place. The tank is now 224 ft. higher than the nozzle, and the discharge is 640 gal. per minute.

The wash from the clay banks thus attacked is allowed to settle in the bed of the working place, so that only the clay is carried off in the overflow down the drainage shaft. The sand and gravel, together with the big fragments of ore, are then collected in cars traveling on movable tracks, and carried to the washing plant, close to the edge of the pit. The area now under work covers 5½ acres, and a depth of 56 feet below its present level will have to be gained before the untouched ore will become available. The entire output now comes from ground that was overlooked by the earlier workers. An ordinary section of clay bank, in which no especially heavy lumps are encountered, will carry around 10 per cent., by weight, of manganese oxides. Wad, which is rather abundant in some spots, can not be saved in this way, and is lost. In any case it would require calcining to bring it up to shipping grade.

A steam shovel is used for removing the gravel overburden. Trains of dumping cars are brought around to it, on track laid close to the edge of the pit, loaded, and drawn off to a waste dump at some distance from the mine, at a total cost of about 6c. per cu.yd. Waste from the washery is disposed of in the same way.

Washery Operations

The washery has a double-tracked incline extending from its top floor to the bottom of the pit, and carrying a pair of self-dumping skips. The loaded cars from the pit, whose contents still retain a lot of adherent clay, dump into a sump which is kept half full of water, so as to cause the material to flow easily. The mixture is then drawn off through gates into the skips and hoisted to the top of the washery. Here it passes into an inclined double logwasher fed abundantly with water, where most of the clay is washed off and discharged. The lumps then go through a crusher and into another, but horizontal logwasher, where the last clay is removed.

The discharge from this washer goes into a trommel with ⅝-in. holes; the oversize passes to picking belts where waste is discarded and the ore becomes ready for market. The undersize goes to another trommel, which makes four sizes, and each size falls into a separate jig. The McClannahan jig has proved admirably suited for this work and makes a clean separation into heads and tails, with no middling product. The tails, carrying 3 or 4 per cent. of manganese, are sold to foundries and basic steel makers. The waste from the picking belts sometimes carries as much as 20 per cent. manganese. A great deal of this waste is in the form of a quartzite conglomerate, manganese oxide being the cementing agent, and, if crushed again, might yield some good ore; the management, however, is storing this material until it can find a market, it being worth more than jig tailings.

No attempt is made to reduce the size of the ore, the management preferring to sell its product in lump form to the steel industry; the Carnegie Steel Company's plants at Pittsburg have been taking the entire output. It is probable that the small additional outlay for grinding equipment would prove a good investment, since the other consuming industries, the glass, the paint, and the storage battery manufacturers, are accustomed to pay about double the price allowed by the steel makers.

The lump ore shipped from the mine averages around 48 per cent. metallic manganese, and occasional lumps reach nearly to 60 per cent. Phosphorus rarely exceeds 0.10 per cent., but silica is rather high, ranging from 2 or 3 up to 15 per cent. The jig concentrates range in silica 2 or 3 per cent. higher than the lump ore produced at the same time.

The company has in mind the erection of a new washing plant whose capacity will more closely correspond to the feasible output of the mine.

Electrically Driven Colliery Pumps

The Pumps at the Concorde Colliery, Belgium, are Operated by Three-phase Motors, Constructed to Resist the Action of Moisture

BY ALFRED GRADENWITZ*

The electric pumping installation at the Concorde collieries at Jemeppe-on-Meuse is one of the most extensive electric mining plants in Belgium. The pumping machinery of these collieries has always been of a very interesting kind and is unusual in the variety of systems which have been employed. In addition to a beam engine which had been in use at the Maquets pit ever since 1878 an underground steam pump was installed at a depth of 680 ft., and two electrical pumps at a depth of 1330 ft.

Development of the System

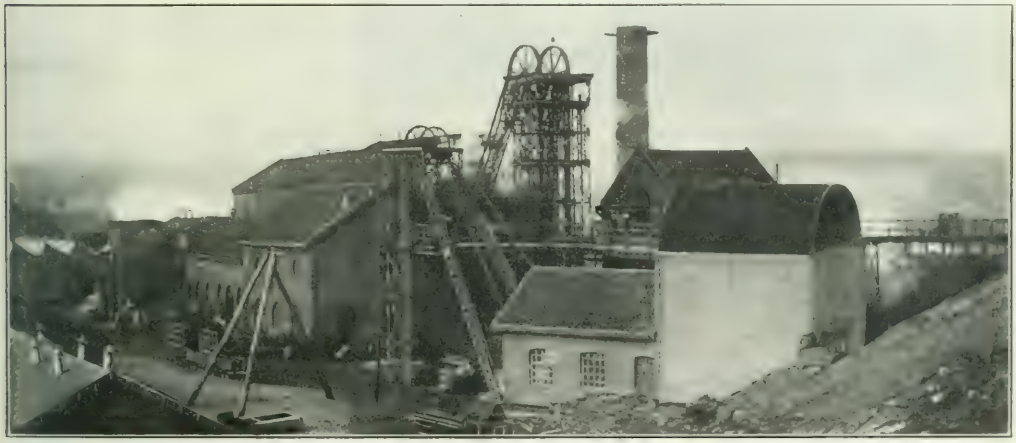
The numerous alterations and improvements of this plant have practically followed the progress made in the electrical industry. When in 1893 the company decided to install an electric pumping plant in one of the mines, orders for the pump and motor were placed with an English firm of mining engineers, while the International Electrical Engineering Company, of Liège, was intrusted with supplying the generating plant. The latter consisted of a Willans & Robinson 200-h.p. condensing engine coupled directly to a continuous-current dynamo running at a speed of 375 revolutions per minute, the tension being 500 volts. The underground part of the installation comprised an inclosed motor, driving by means of two sets of gearing a three-throw pump capable of delivering 1250 gal. per hour at a hight of 1330 ft., the speed of the pump being 31 revolutions per minute. As this pump failed to give perfect satisfaction, a second pump was installed 18 months later. The motor for driving this new pump was, as before, entirely inclosed and of the same capacity; but, being of larger dimensions, it had a lower temperature rise, and with a view to further reducing the tendency to heat, it was fitted with water circulation. The motor worked under these conditions for several years.

It was decided a few years ago to replace the first by a three-throw pump, and in order to minimize the risk of a break-down, the capacity of the generating plant was doubled by adding a 500-volt International dynamo coupled directly to a Carels steam engine. The company was on the point of installing this new plant when an accident occurred to the old beam engine, with the result that the pump-room was flooded at a depth of 1330 ft. The motors remained under water for about 15 days and were rendered useless. When these motors were originally installed, the three-phase system was in its earliest stages, but at the time of the accident it had almost entirely superseded the older system. After the accident the installation was converted into a three-phase one throughout.

Advantages of Three-phase System

The three-phase system possesses several advantages over the direct-current system for mining work. In the first place, direct-current motors, working as they do with commutators, are more or less subject to sparking, for which reason it is absolutely necessary that they should be entirely inclosed when employed in mines. In order to work at the same low temperature as an open motor of the same output, the direct-current machine must be at least 1½ times as large, with a corresponding increase in cost. Direct-current motors do not work well in moist places, the insulation used in the rotating windings being very easily damaged. On the other hand, the three-phase motors used in the present case were especially constructed with a view to resist the effect of dampness.

A highly interesting test was made some time ago by the International Company before Profs. Eric Gérard and De Bast, of the Liège University. A small three-phase motor, completely immersed in water, was run for a quarter of an hour, after which it was stopped and remained submerged for 24 hours, being placed under seal. At the end of this time, the expert commission again met and the motor was run for a few minutes. It was then removed from the water, again put under seal and left to dry for another 24 hours. After this the insulation of the machine was tested and found to be in perfect working order.



POWER STATION AT THE CONCORDE COLLIERY, BELGIUM

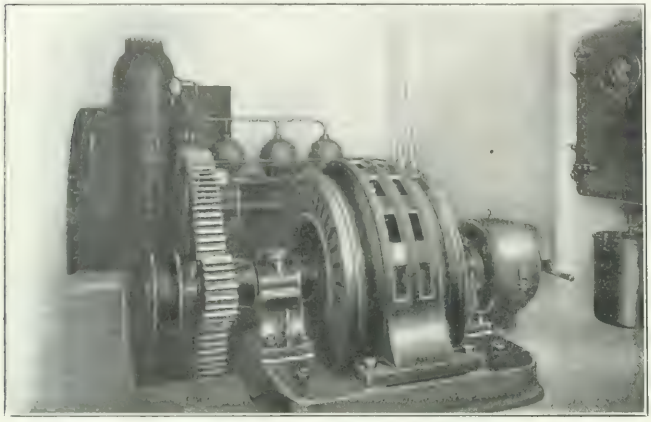
The Present Plant

At the surface, two high-speed direct-coupled steam sets were erected. One of these is the original 200-h.p. condens-

*Körnerstrasse, 25, Berlin W. 35.

and the other a Carels engine of 200 h.p. and capacity. Both sets run at a speed of [illegible] and [illegible] with 11 induction poles, giving a frequency of 43.8 periods per second. The steam pressure is 10 atmospheres. Each engine employs double expansion and condensation is effected by injection, the water from the pieces of silver wire stretched down the center of porcelain tubes and attached to removable contacts. By means of these contacts the fuses can be replaced without danger while the generator is running. The switches are operated by means of long metal rods carrying the contact blades and insulated pieces. They are of the "quick-break" type. The rapidity with which they open, together with the distance between the contacts, enables the current to be cut off when the machine is running with full load without fear of permanent arcs being produced.

The three feeder bars are connected to a three-core armored cable 480 m. in length which carries the current to the bottom of the pits and thence to the motors. The three conductors, which have each a sectional area of 75 sq.mm. are covered with vulcanized rubber, afterward stranded, the whole then covered with two sheetings of lead, and finally armored over all with tinned steel wire.



MOTOR AND PUMP, CONCORDE COLLIERY

Delivery of Power to the Pumps

At the depth of 1330 ft. the cable leaves the shaft and is conducted along a gallery to the pump room where a junction box is placed in a convenient position and from which run the two cables feeding the pump motors. In each of these circuits there is a high-tension single-phase circuit breaker of the same type as those at the surface but inclosed in a cast-iron box. This box also contains a switch which can be controlled from the exterior and an ammeter which can be examined through a glass window arranged for that purpose. Each pump is driven by a revolving-field motor, of the International Company's M. T. 90 type, 80 h.p. at a speed of 31 r.p.m., and is driven by means of two sets of gearing, while that shown in Fig. 5 has only one set of gearing and a speed of 80 revolutions.

The starting is effected by means of a rheostat with metallic resistances, working in oil, having inclosed contacts which are connected with the rotor by means of slip rings in a hermetically inclosed box. They are fitted with an arrangement for putting in short circuit and lifting the brushes. The motors are specially designed for resisting the hot atmosphere and dampness of the mine and the conductors are protected by waterproof insulation.

For the lighting of the pumping rooms incandescent lamps have been provided, fed at a tension of 100 volts by a 1000-100 volt single-phase transformer.

An immense zone carrying manganiferous ore is said to have been discovered in Tunis, near Djebel Batoum.

[illegible] pumped into a reservoir placed 20 ft. above the condensers being used for this purpose. The working data of the Willans & Robinson engine are: diameter of the small piston, 300 mm.; diameter of the large piston, 432 mm.; piston stroke, 203 mm.; revolutions per minute, 375.

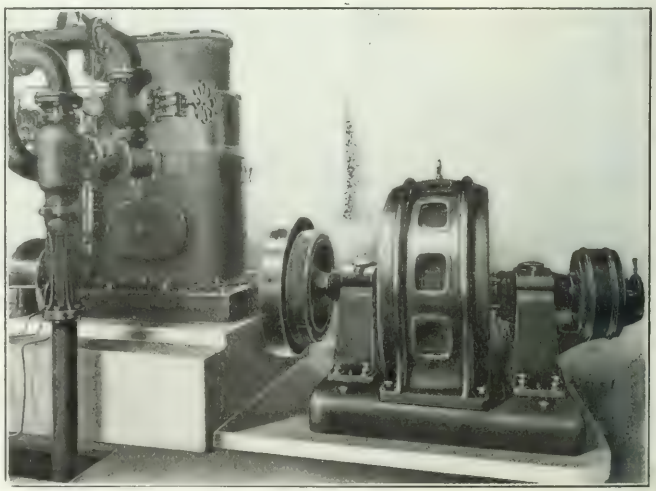
The Carels engine has a diameter of the small piston, 300 mm.; diameter of the large piston, 430 mm.; piston stroke 200 mm.; revolutions per minute, 375.

Each of these engines drives by means of a Zodel coupling, an International alternator with fixed armature and revolving multipolar inductor. The high-tension winding is fixed and can therefore be insulated perfectly. Each alternator has an exciter fixed to its shaft which is extended to receive it.

Switchboard and Connections

The alternators and their exciters are connected to the switchboard by cables running in conduits. The switchboard consists of three white marble panels, the two end panels being reserved for the generators, and that in the center for the exciters and the synchronizing circuit. The current passes through circuit breakers, and then through the switches before reaching the feeder cables. All the metallic parts carrying current at high tension are placed at the back of the board, which is constructed without the use of any combustible material. The frame is of iron and the insulators of porcelain.

The safety fuses are composed of long



GENERATOR SET, CONCORDE COLLIERY

Stopping and Restarting Mine Cars Automatically*

By W. Galloway.

The points at which an appliance for stopping and restarting mine cars can be most usefully employed are at the weighing machine between the top of the shaft and the screens, and in front of the cage at the top and bottom of the shaft. The functions of such an apparatus are to arrest the motion of a full or empty car without shock, to hold it stationary as long as may be necessary, and then to push it forward, with any desired velocity, in the direction in which it was originally moving.

These operations are accomplished without the intervention of an attendant, except that, at the instant of restarting, a lever is moved either by hand or foot which requires only the smallest imaginable exertion of force on the part of the weigher, banksman, or hitcher, as the case may be. By this appliance, all the weighing on the surface and the loading and unloading of the cages at the top and bottom of the shaft have been effected automatically, and without a hitch, for more than a year, at several collieries in South Wales.

Figs. 1, 2 and 3 represent a sectional elevation, a plan and an end elevation respectively, of its application to a weighing machine. A rectangular sheet-iron frame *A*, sliding on 8 supports *b*, two on each side of the cylinder *C*, and two fixed to each end of the frame which surrounds the weighing platform, carries a set of Fisher catches *c* and *c'*, which always occupy the positions shown in Fig. 1, when left to themselves. The frame *A* is attached to a piston-rod *B*, which passes through a stuffing box (in which metallic packing is used by preference), and is fixed to a piston *d* in the interior of the cylinder *c*. A pipe *e*, with a valve *o*, which is always open unless some unexpected emergency arises, connects the inside of the cylinder on the left-hand [illegible] air-compressing engine, which is common to all the other compressed-air machines used at the colliery. Another pipe *g*, with a valve *p*, which is regulated to suit requirements, connects the ends of the cylinder with each other. A third pipe *f*, with a valve *q*, which is opened when the foot-plate *m* is pressed down, and is closed automatically by the weight *t*, passes from the right-hand end of the cylinder under the floor of the weighing-machine house to a point where the foot-plate is convenient to the weigher, and thence out again from under the floor at the other side of the house. The compressed air has thus a free passage into the cylinder on both sides of the piston, and thence into the pipe *f* as far as the valve *q*.

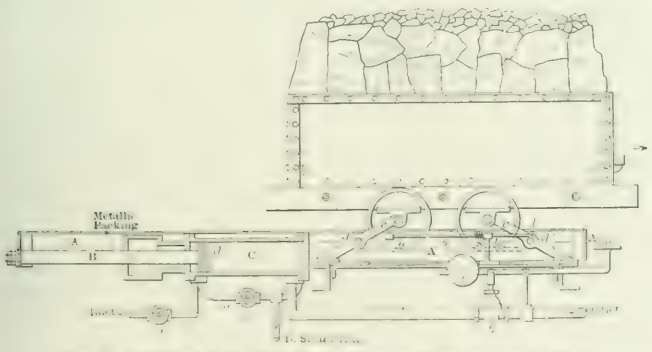


FIG. 1. SECTIONAL ELEVATION OF CAR STOPPING AND STARTING DEVICE.

When the valve *q* is shut, the air within the cylinder is at the same pressure on both sides of the piston; but the area of the left-hand side of the piston being less than that of its right-hand side by the amount of the area of the piston-rod, the piston, the piston-rod, the frame attached to it, and any car that happens for the [illegible] are drawn toward the left-hand side as far as the piston can move. The force with which a movement toward either the left- or right-hand side is effected depends on the relative areas of the piston and piston-rod on the one hand and the pressure of the air on the other, all of which must be taken into account when the required forces are calculated. In approaching the left-hand end of the cylinder, the piston covers the opening into the pipe *g*, and in approaching the other end of the cylinder it covers the opening into the pipe *f*. It is thus cushioned at each end, and prevented from striking the corresponding ends of the cylinder.

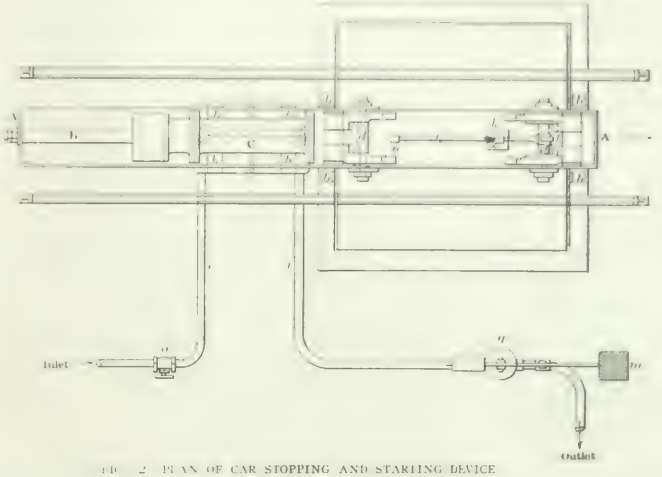


FIG. 2. PLAN OF CAR STOPPING AND STARTING DEVICE.

The operation of weighing is effected as follows: The axles of the full car, running at any velocity less than that required to overturn it, successively depress and pass over the catches *c*, which immediately rise up behind them. No sooner is the hinder axle clear of the catches *c*, than the front axle, coming in contact with and pressing against the catches *c'*, with the full force due to the momentum of the car, pushes the frame *A* and its connections, including the piston within the cylinder, to a greater or less distance in the same direction from a few inches to a foot, according to the greater or less velocity at which the car has been moving. But the pressure of the air within the cylinder, now acting like a spring, arrests the forward motion of the car and then draws it back until it stands directly over the center of the weighing platform. The operation of weighing having been completed, the weigher places his foot on the foot-plate and thereby opens the valve *q*. The air pressure, being thus withdrawn from the right-hand side of the piston, the latter, together with the frame, is pushed toward the right-hand side and the catches *c*, pressing against the hinder axle of any car that happens to be in [illegible]

*A paper read before the North of England Institute of Mining and Mechanical Engineers.

greater or less velocity, according to the greater or less diameter of the cylinder and the higher or lower pressure of the air acting on the piston. When the frame has nearly reached the end of its intended stroke, a knob *n*, on the end of a rod *k*, attached to a crank *l*, on the shaft *d''*, to which the catches *c'* are keyed, comes into contact with a spring *s*, in front of a standard *k* (fixed to the weighing platform), through a hole in which the rod *h* can pass freely. The spring arrests the forward movement of the rod; the catches *c'* are thereby depressed; and the car, continuing to run forward after the frame has come to a standstill, passes over them, and proceeds toward its destination. As soon as the hinder axle of the car is clear of the catches *c'*, the weigher removes his foot from the foot-plate, the valve *q* closes automatically, the pressure of the air on the right-hand side of the piston is restored through the pipe *g* and the valve *p*, and the frame *A* is drawn back to its original position, ready to receive another car. The rapidity with which the frame is drawn back depends on the area of the opening of the valve *p*. The frame *A* is covered with a sheet of iron to prevent coal or rubbish from falling into its interior, and the only openings in it are those through which the catches *c* and *c'* project.

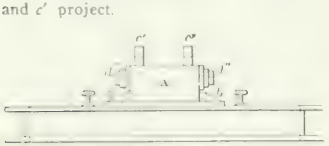


FIG. 3. END ELEVATION.

The valve *p* can be closed and opened by the same lever as that which opens and closes the valve *q*; in fact this is applied in the apparatus employed at the weighing machine at Garth colliery. In the same apparatus, a chain with a spring is used, instead of the rod *h*, Figs. 1 and 2. A slide-valve can be used, in place of the valves *p* and *q*; vertical catches held up by springs or counterweights acting on levers can be used, instead of the Fisher catches; steam or water, under pressure, can be used, instead of compressed air; and the details can thus be varied in many ways.

The points to be specially noted are: that the moving cars are arrested gently, held in the desired position, and again discharged with the required velocity without muscular effort on the part of an attendant.

The average rate at which cars, each carrying one ton, can be stopped, steadied, weighed and disposed of by this apparatus, in the manner described, as applied at one colliery, is six per min., or, more accurately, one car per 9.58 sec. The time occupied in pushing a full or empty car of the same capacity into the cage, and thereby discharging the empty or full car, in front of it, is about 3 seconds.

El Oro Mining Company

This report is for the year ending June 30, 1906. The company's operations in that period resulted in a profit of £204,757, to which was added a balance of £32,058, brought forward from the last account, making a total of £236,816. From this sum the directors distributed £135,000 to the shareholders in dividends, wrote off from the property account £38,379, which was equivalent to the cost of general improvements, the new electric power plant and 100-stamp mill, and carried forward a balance of £58,130.

During the year, mining operations extended along the whole length of the mine, and a total of 234,807 tons of ore was mined. In the footwall orebody, stoping was carried on in the 86-ft. and 186-ft. levels where the veins are from 20 to 40 ft. wide. All levels in the middle section down to the 386-ft. level were worked. The stopes in this part of the mine were from 15 to 50 ft. wide. The southern orebody was chiefly worked in the Blacksmith and 286-ft. levels. The pay-ore in this section runs between 10 ft. and 30 ft. wide.

The chief developments were the finding of a continuation of the Branch vein northward, and above the 186-ft. level, and a good stock of ore on the footwall side of the main vein, a little north of the incline shaft, on the 386-ft. level. A good width of high-grade ore was also discovered in the San Antonio level, just below the capping. Drifting was resumed on the 1000-ft. level on a small vein encountered in the station a little west of the main vein. The south drift on this vein rapidly improved and showed a width of 5 ft. of ore assaying $20 per ton. Nothing was done on the Descubridora vein during the year, but it is proposed to resume work shortly.

Development work was restricted by the attention given to the Somera shaft: This shaft was sunk to a depth of 1460 ft. in bad ground and constant trouble has been given by the timbering. A large part of the year was occupied in re-timbering the shaft and replacing the old sets with close crib work. The general manager estimates the ore reserves at 606,119 tons worth $8.35 per ton, of which 8750 tons valued at $9.60 are in the hanging-wall orebody; 122,645 tons valued at $8.49 in the footwall orebody; 244,032 tons valued at $8.07 in the middle section; 31,534 tons valued at $12.25 in the branch vein; 198,205 tons valued at $7.94 in the southern orebody; and 914 tons valued at $8.35 per ton in the dump.

The mill and cyanide department dealt with 234,079 tons of ore for a return of $2,243,167. Tube mills have been found to be a useful adjunct and there are now five of them in operation. It is now possible to convert 75 per cent. of the ore to slime and grind the sands to 150 and 175 mesh.

The erection of the new mill and introduction of electrical power in place of steam has resulted in a substantial decrease in working expenses, and an increase in the percentage of precious metals recovered. The total average cost per ton, including all expenses in Mexico for the year 1906, was $5.73 per ton, compared with $6.87 in the previous year and the average gross value extracted from the ore in the period reviewed was 84.93 per cent., as compared with 73.80 per cent. previously. The chief items in the mill and cyanide-works statement are as follows: The mill crushed 3.50 tons per stamp per day (24 hours), having an average assay value of $9.30 gold and $1.08 silver. The mill recovered $1.33 gold and $0.04 silver, and the cyanide plant saved $6.76 gold and $1.11 silver per ton. The mill extracted 14.26 per cent. of the gold in the ore and 2.12 per cent. of the silver, while the extraction in the cyanide works was 72.70 per cent. gold and 56.21 per cent. silver, making a total extraction of 86.96 per cent. gold and 58.31 per cent. silver.

During the year the company leased the Suchitepec forests for a period of 25 years. The property comprises an area of 40,000 acres in the vicinity of the El Oro mine, and is estimated to contain 300,000,000 ft. of timber, of which fully 80 per cent. is pine. The control of this forest will benefit the company's railroad, not only by giving it access to a large and important district, but by providing freight to be hauled to other mines and to lumber merchants' mills. It is proposed to operate this property by a company to be formed in Mexico, in which the El Oro company will hold the controlling interest.

Owing to the formalities required by the Mexican mining laws for the transfer of the property to a new company not having been completed before June 30, the company's interest in the Somera No. 1 mine was included in the balance account as part of the company's property in Mexico. It is expected, however, that the formal registration of the mine in the name of a new company with a capital of £500,000, of which the El Oro company will retain 234,000 shares of £1 each fully paid, will be effected at an early date. The company retains an interest in the Mexico mines of El Oro company.

The company's railroad business was prosperous throughout the year. General merchandise freights were largely increased and are now nearly three times as high as three years ago. Shipments of ore and outward shipments of lumber have largely increased this business. The express business which was established in 1905 proves a good source of profit. The track is in good condition and recent improvements in the grades have reduced operating expenses. The total railroad receipts for the year were $675,714.

COLLIERY NOTES

Details in the Operation and Development of Anthracite and Bituminous Mines

In driving a tunnel, practice has shown that any grade less than 0.2 per cent will not furnish proper drainage.

Before placing a shot, the coal face should be carefully inspected to avoid locating the hole near any crack in the coal or near another bore hole. If these precautions are not observed, a windy shot may result and serious damage occur.

It has been found that fresh water corrodes wrought-iron pipe more rapidly than cast-iron pipe, but the reverse condition is true when the water is salty. The corrosion of iron pipe by salt water increases with the increase of the carbon in the iron.

For the purpose of preliminary estimates, the average cost of a number of tunnels may be of interest. When driven in hard rock, the excavation costs $5.95 per cu.yd.; in loose rock the cost was $3; in soft ground the cost averaged about $4 per cubic yard.

When the cleavage planes in a coal seam are definitely marked and also extend into the roof, this condition is generally accompanied by a bad top, and the coal should generally be worked at an angle to the main cleats, instead of driving to the face and to the butt.

In planning the ventilating system for a colliery, each main split should begin as near the downcast shaft as possible; it is also best to have the lengths of the different splits as nearly equal as possible and to provide each main split with a separate return as far as practicable.

Wire-rope guides are being introduced at a number of collieries instead of the ordinary wooden guides formerly used. Since there is no satisfactory safety catch that will arrest a falling cage when wire-rope guides are used, it is doubtful if the innovation will be either safe or satisfactory.

The presence of the alkaline earths in boiler water prevents the maintenance of a constant efficiency on the part of the boiler plant. In order to prevent the incrustation of the boilers and to eliminate the lime content in boiler water, one method is to add one ounce of sal ammoniac to 90 gal. of water.

In a general way, it may be stated that the limit to the advantageous splitting of an air current is reached when the extra power required to overcome the increased shaft resistance is greater than the power saved by the decreased resistance of the underground roads. It is also inadvisable to split the current again when the velocity of the air at the face is reduced to 300 ft. per minute.

When a charge is fired by an electric apparatus, the shot-firer should observe the following precautions: First, do not use a cable which is less than 20 yards in length; second, always couple the cable to the charge before connecting it with the firing apparatus; third, see that all persons in the vicinity have taken proper shelter; fourth, should the charge miss fire, immediately disconnect the cable from the firing apparatus.

The number of fatal explosions in Great Britain has decreased more than 100 per cent. during the past decade. This great diminution is chiefly due to the nearly universal use of permitted explosives. In this particular, America is far behind European countries, since we have concerned ourselves only with the quantity of explosive taken into a mine, and almost wholly neglected to attach importance to the composition of the powder.

Several miners have recently been killed while attempting to charge a shot. In the majority of the cases the cartridge has stuck fast before reaching the back of the drill hole, and the miner has attempted to drill it out with the steel bit on his tamping bar. It is most probable that the powder was fired by a spark produced by the steel. Such accidents, although unfortunate, are inexcusable, as all miners know the danger attached to such work.

In building a stopping to hold back a body of water in a mine, a wooden dam is better than masonry since the latter is more liable to be fractured by any movement of the strata. In all cases where dams are put in, the roof and sides of the entry are likely to cave in when the pressure comes on; in order to prevent such an accident, brick arches and inverts are built in for a distance of 4 or 5 ft. both before and behind the dam and backed up with concrete.

It has been demonstrated by recent experiments, that an atmosphere containing 1 per cent. of CH_4 and 1 lb. of fine dry coal dust per 160 cu.ft. of air becomes highly explosive when subjected to a tongue of flame driven into it under the pressure due to a blown-out shot. Since careful tests with ordinary safety lamps used at present fail to give any indication of fire-damp when the latter forms less than 2 per cent. of the mixture, it is evident of how little value such tests are in dry and dusty mines.

After the disastrous explosion which occurred at the Wingate colliery, Durham, England, it may be interesting to know that the explorers came upon one victim with his lamp burning steadily beside him. This miner, although not dead [illegible] proving the presence of a large percentage of carbon monoxide. In this case, as in many others, artificial respiration was tried in vain; the death being due to the poisonous effect of CO, upon which artificial respiration would have little or no effect.

In any gaseous colliery where compressed air is used, it is advisable to have all pipes sunk at least 1 ft. below the floor level, and carefully covered so that they will not be damaged by an explosion. It is also well to have a column in each shaft so that there will be a chance of saving one. In this way by keeping all pipes well forward and having them terminate in a tap, the workmen could collect together, in case the ventilating current is cut off, and by turning on the compressed air stand a better chance of withstanding the mine gases until rescue is afforded.

The method commonly used in mining an anthracite coal seam pitching from 10 to 18 deg. is to drive a gravity plane at right angles to the strike, and when the face has reached a desired point, turn the lifts off the plane at about 175 ft. centers, leaving about 100 ft. solid pillar between the two lifts. These pillars may be worked as wide cross cuts or slant chambers from the lower lifts. In the former case, there are no roads to be laid in the workings, and no rock cuts to be made if the seam is thin, while the latter method is more desirable if the vein is thicker and the roads are to be laid without cutting the rock. This latter system also tends to prevent the coal from crushing.

One careful student of mine explosions now comes forward with the suggestion that main stoppings between the intake and return airways should be built thoroughly air-tight, but not with the intention of resisting the force of an explosion. His idea is that the brattices should act as a series of safety valves, giving way to excessive pressure and adding space to the rapidly expanding gases, thus breaking the continuity of the current which would prevent the deadly product from being carried to the face where a large majority of the men are at work. Since most of the brattices in this country are built with the purpose of withstanding the force of a terrific explosion, the suggestion is worthy of careful thought. It may be said in this connection, however, that where any mine has but two outlets, one the intake and the other the return, the destruction of the main stoppings would certainly prove fatal to the men confined.

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Colliery Explosions and Barometric Pressure

In the issue of March 2, there appeared an extensive article treating of the relationship between barometric pressure and colliery explosions. We have recently devoted considerable attention to this subject, and evidence in confirmation of the theory is being brought to our attention in a speedy and forcible manner. The many recent explosions in this country have been uniformly in line with the ideas advanced. The latest evidence that a fall in the barometer is accompanied by an increased outflow of gas into a mine, are the disastrous explosions that occurred in the Holden and Woodward mines of the Delaware, Lackawanna & Western Company, near Scranton, Penn., on the afternoon of March 2.

If any of the explosions that have come to our attention were due directly to a decrease in barometric pressure, and the consequent outflow of gas, these latest accidents are certainly the most confirmatory of them all. The barometric readings for the days including the time of these accidents were as follows:

Date.	Time.	Barometer.
Feb. 28,	8 A. M.	30.50 in.
Feb. 28,	8 P. M.	30.40 in.
March 1,	8 A. M.	30.44 in.
March 1,	8 P. M.	30.20 in.
March 2,	8 A. M.	29.62 in.
	Explosion.	29.50 in.
March 2,	8 P. M.	29.64 in.
March 3,	8 A. M.	29.66 in.
March 3,	8 P. M.	29.90 in.

It will be noticed that the barometer began to fall on the morning of Feb. 28, and continued its downward course almost without interruption until the afternoon of March 2, at which time the disasters occurred. The following day, which was Sunday, the barometer again began to rise, having reached its lowest point within a few hours of the time of the explosion. The fact that two explosions occurred, in the same district, at about the same time, which was when the barometer was lowest, increases the improbability that they were merely coincidences and emphasizes the probability that the development of gas was the direct result of the atmospheric conditions existing at that time.

If the Government, through the Weather Bureau, would take the trouble to circulate warnings of the approach of areas of depression, and if mine managers should be educated to exercise special precautions at such times, a great and unnecessary loss of life might be avoided. In the explosions of last Saturday, six men were killed and 20 injured. It is up to the mine managers, superintendents and engineers to give careful consideration to the relation between gas outflows and low barometer, and if they are convinced of the correctness of the theory demand of the Weather Bureau the assistance that is needed.

Lake Superior Iron Ores

We have now the complete figures for the rail shipments of iron ore from the Lake Superior district in 1906, and the distribution of production by ranges. The total for the year was 38,522,139 long tons, an increase of 4,168,683 tons over the previous year. This total includes 128,742 tons from the Baraboo range in Wisconsin, which is outside of the Lake Superior district proper, though some geological authorities trace a connection between its deposits and those of the Gogebic. It does not include 121,555 tons from the Michipicoten range in Canada, which was chiefly used in the blast furnaces at the Sault Ste. Marie.

Nearly all this great mass of iron ore is carried a thousand miles, or more, to the furnaces where it is converted into iron. It has always been American practice to carry the ores to the fuel, rather than the fuel to the ores; and in this case the greater part of the distance is covered by the water route through the Lakes, on which it has been possible to organize a service which gives the cheapest transportation on a great scale known anywhere in the world. The rate for last season from Duluth to Lake Erie ports, for instance, was 0.083c. per ton-mile, on an average; in other words, 1c. paid for the carriage of a ton of ore 12 miles.

During the half century which has passed since the first shipments of Lake ore were made, records have been carefullly kept; and we are able to give the total shipments from each range from the beginning to the close of last season. These will be found in the following table, with the figures for 1906, in long tons:

Range.	1906. Tons.	Total. Tons.	Total. Per Ct.
Marquette	1,057,187	80,857,801	23.9
Menominee	5,109,088	58,676,485	17.3
Gogebic	3,641,985	50,476,665	14.9
Vermilion	1,792,355	25,490,259	7.5
Mesabi	24,792,582	122,742,848	36.3
Baraboo	128,742	327,846	0.1
Total	38,522,139	338,571,894	100.0

The Mesabi is the latest of the great

has been the greatest. It is the growing part of the district, and that upon which future expansion chiefly depends.

To show the importance of Lake ores to the iron trade still further, we give the following table, in which the pig-iron production for two years is arranged by districts, with special reference to the general character of the ore supply:

	1905.	1906.	Changes.
N. England, N. Y. and N. J.	1,525,094	1,952,288	I. 427,194
Maryland	432,030	386,709	I. 44,615
Southern States	2,887,555	3,080,565	I. 192,940
Pennsylvania	10,559,127	11,347,869	I. 668,742
Ohio	4,568,110	5,327,184	I. 741,024
Illinois	2,034,483	2,156,866	I. 122,383
Northwest	640,119	742,779	I. 102,660
West of Mississippi	407,774	419,940	I. 5,266
Total	22,992,180	25,407,191	I. 2,414,211

In arranging these groups, or districts, the lines cannot of course be drawn with absolute strictness; but it may be said that the eastern Pennsylvania furnaces which use local ores are fully offset by those in the Northeastern group, which work on Lake ores. In fact, the increase in that group last year came almost wholly from New York, and was furnished by the stacks of the Lackawanna Steel Company, at Buffalo, which run on Lake Superior ores. Maryland has been placed by itself, because its output comes from a single group of furnaces, which uses Cuban and other imported ores.

Pennsylvania, Ohio, Illinois and the Northwest use Lake ores chiefly or wholly; and the furnaces of those districts made 77 per cent. of all our pig iron in 1906. The use of local ores has made certain advances in the three years of large output, and mines are being actively worked, especially in the Lake Champlain and Hudson river regions in New York; in New Jersey and in the Lehigh valley and Cornwall districts in Pennsylvania. The fact remains that the Lake Superior region is the main supply of our iron industry, and especially of that part of it which is converted into steel in all of its forms; and the tendency is to an increase rather than a diminution of its importance.

Iron Mining in the Eastern States

When the iron industry deserted the eastern part of the United States in favor of more advantageous districts beyond the mountains of Pennsylvania, it was a common belief that the departure would be only a temporary one. High prices would again open the abandoned properties to [illegible] and the [illegible] would resume their places in the ranks. A few of the old workings have been reopened, and a few of the patriarchal stacks have been relined, but the famous pig-iron district of New Jersey and New York has received only a meager share of the prosperity which has stimulated activity in all the furnace yards along the Great Lakes, and in the iron district in the South.

Evidently demand is not the controlling factor in this case, for the supply of lake ore is now unequal to the needs of consumers and the present cost to the purchaser would have seemed prohibitive a few years ago. The reasons for the lack of activity near the market are to be found elsewhere. The iron industry has undergone a change during the last decade. Operations are now carried forward on a vast scale, and it is not only necessary to supply ores of the requisite qualities, but also to deliver them in enormous and constant quantities. New Jersey was at one time popularly supposed to be one large bed of iron ore, but where in its borders are deposits to be found which would feed the great furnaces of a steel city like Gary, or the pig-iron plants of the South?

No doubt iron mining will again become profitable in the hills of New York and New Jersey, as it has always remained profitable in a few favored localities, but the prestige of these districts is not likely to return. The East is now a consumer of pig iron. Its production is relatively insignificant, and will probably remain inconsiderable until the giant steam shovels on the shores of Lake Superior have burrowed far westward through Minnesota and northward into Canada.

Progress and Precedent

The article in this number of the JOURNAL on mining in Cornwall shows how conservatism may, and does frequently, block the wheels of progress. The little county at the extremity of Great Britain has given us the Cornish miner and many excellent methods and devices. But all lessons in mining are not taught in that small school, a fact which the people of Cornwall have been too slow to admit.

The capitalists who are bringing about a revival of tin mining in the ancient workings find a curious collection of antiquated methods and appliances, all ad[illegible] out of date. The old mills and buddles are still in operation at many of the mines, and methods of finance and of marketing the product are quite as antiquated and clumsy. But every innovation meets the usual resistance: thus and so they have always done in Cornwall, and, therefore, thus and no other is the best way possible.

A member of the bar, that structure built of precedent, recently made the remark that the greatest of all enemies of progress is precedent. The achievements of the past are no doubt valuable guides for present workers, but experience is continually bringing up new facts which must be considered. Scientific data and figures presented by practice have no respect for the past, and those who aim at profitable results will do well to base their calculations upon recent figures and not upon precedent.

U. of C. Men in South Africa

Graduates of the mining department of the University of California have played an important part in the development of mining in South Africa. W. J. Pitchford, in the course of an address, the greater portion of which appears elsewhere in the present issue, named a score or more of men conspicuous in that field and all trained under the direction of Prof. Christy.

The list contains such well known names as: Gardner F. Williams, for many years manager of the De Beers Company's diamond mines; Charles Butters, manager of the Rand Central Ore Reduction Works and consulting metallurgist of the Simmer & Jack and Robinson gold mines; W. Bradford, manager of the Langlaagte Deep mine; G. J. Hellman, consulting engineer of the mines of Geerz & Co.; W. W. Mein, acting general manager of the Eckstein group of mines; H. H. Webb, consulting engineer of the Consolidated Gold Fields; and P. Selby, acting manager of the Robinson gold mines.

These are only a few of the graduates who have made records for themselves in South Africa. There are many younger men in the field all eager to make equally brilliant records and who may be expected to give a good account of themselves later on. The University of California will need no other recommendation in that part of the world.

CORRESPONDENCE

Discussions by Our Readers of Various Topics of Interest

Condensation of Sulphurous Fumes

Can you inform us of any successful method for the condensation of sulphurous fumes from smelters, or preventing their injurious effect upon surrounding vegetation? We are about to install a reverberatory smelting works, and being surrounded by dense fir, hemlock and cedar forests, we are wondering if there are any economical means whereby danger from the sulphur smoke can be eliminated. B. B. F. & Co.

Shasta County, Cal., Feb. 27, 1907.

The disposal of smelter smoke is one of the live questions of the day, and inasmuch as we receive many inquiries of the above character, there is a good reason for replying at some length, even at the cost of repeating a good deal that we have previously said in the JOURNAL.

So far as past or present practice is concerned, there are only three ways of taking care of sulphur smoke. These are:

1. Dispersal of the smoke so high in the atmosphere that when it comes down to the ground it will be so dilute that no trouble will result. This means of getting rid of the nuisance is so closely involved with the amount of sulphur dioxide to be produced that no general rule can be formulated. In the case of a works turning out the equivalent of 35 tons of sulphur per day through a chimney 125 ft. in hight, the vegetation of all kinds will be killed, or at least rendered very feeble, inside of a radius of a quarter of a mile from the chimney. Outside of that circle, the effects are still felt, but with diminishing intensity, and depend a great deal upon the prevailing direction of the wind, and other atmospheric conditions. A chimney of 300 ft. or upward in hight will discharge a very large amount of sulphur in such a way that there is no noticeable damage, but, of course, the cost of such tall chimneys is large. The chimney, 365 ft. in hight, of the Orford Copper Company, at Constable Hook, N. J., which was erected solely for the purpose of dispersing sulphur smoke, cost about $50,000.

sulphur dioxide is to convert it into sulphuric acid, which is a marketable product, in many sections. However, in many sections, it is an unmarketable product, and most of the mining and smelting districts of the Rocky mountains fall into that classification. Sulphuric acid of 60 deg. B. (76.6 per cent. pure acid) may be counted on to fetch, in the long run, an average of about $6 f.o.b. works in the Eastern and Central States, and the cost of manufacture as a by-product ought not to exceed $2 per ton (in many cases it will not be more than $1.25 to $1.50 per ton), but obviously there is no margin for the high freight charges of a long haul.

3. Another method of getting rid of sulphur dioxide is to absorb it in water and then neutralize the solution with some cheap chemical, such as lime. This method is practised in Germany, but it is troublesome and costly, and probably is entirely out of the question under the conditions which exist in the mining districts of the Rocky mountains and westward. If the solution of sulphur dioxide could be employed in the manufacture of some product more valuable than artificial gypsum, or in some other useful way, such, for example, as the extraction of copper from low-grade ore, waste slag, etc., there might be something in this process, but so far, all experiments in that direction have been unsuccessful.

Consequently, it is to be said, that at present, the only feasible thing to do is to disperse the sulphur dioxide as high in the air as possible. We read frequently in the daily papers that such and such a smelting company is going to overcome the fume and smoke problem by installing a bag-house. A bag-house is simply a smoke-filtering arrangement on a large scale. The dust, dirt, and carbonaceous matter of the smoke are filtered out, but the sulphur dioxide continues to escape into the atmosphere unaltered and as noxious as it was in the first place. However, a good many of the complaints against smelter smoke are based on the soot and dirty character of the smoke, rather than on its sulphur dioxide content, and in such cases, bag-house filtration will naturally obviate the difficulty, but bag-house filtration is impracticable when the gas contains any considerable proportion of sulphur trioxide.

Hard Platinum

In the JOURNAL of March 2, in the metal market reports, I noticed quotations for unmanufactured platinum, "ordinary" and "hard." I would be glad to learn what constitutes the difference, and would appreciate a reply in the columns of the JOURNAL. R. P. HOLLISTER

Brooklyn, March 4, 1907.

"Hard" platinum is the trade name for iridio-platinum. It contains from 5 to 30 per cent. iridium, the usual amount being from 10 to 15 per cent. Iridium has the property of hardening platinum and increasing the wearing qualities. The principal use for hard platinum is for making electrical contact points and also in the manufacture of crucibles. "Ordinary" platinum is commercially pure although not chemically pure. There is always a trace or more of iridium in commercial platinum, but the small quantity usually present does not affect the hardness to any appreciable extent. Absolutely chemically pure platinum is not used except for delicate scientific research in which the presence of foreign elements would interfere with accuracy.

Molybdenum Ore—Wulfenite

I have an ore containing 25 to 40 per cent. of molybdenum and from 40 to 60 per cent. lead, together with 5 to 500 grams of silver per metric ton. Will you kindly inform me as to the market value of such ore, and the names of concerns which buy it. C. M.

Torreon, Mexico, Feb. 16, 1907.

The ore which is referred to is evidently wulfenite, a molybdate of lead. Such ore is apt to contain undesirable elements, which are hard to remove. Consequently it is impossible to give a regular market quotation, and the value of the ore can be determined only by submitting a sample for analysis. Good wulfenite ore is worth about $6 per unit of molybdenum, i.e., an ore containing 25 per cent. of molybdenum would be worth $150 per 2000 lb., delivered. The names and addresses of several purchasers may be found in the advertising pages of the JOURNAL.

Starting Stresses in Head-frames

What are the stresses produced in a head-frame by the starting of the load with slack rope and their relation to the required size of timbers and safety factors to be used?

A discussion of this kind would, I think, be of value to many, and should be interesting to a great number of readers.

Palo Alto, Cal. RODERIC CRANDALL.

The stresses other than those due to the dead load are so interesting and varied that there should be many readers who have something to say about this subject.

Timber Used in Mining in the United States

Five Thousand Mines Used 90 Per Cent. of All the Timber, While Nine Thousand Used None. Bituminous Mines Use Most Timber

BY R. S. KELLOGG*

These statistics on the timber used in the mines of the United States in 1905 are based upon data gathered by the forest service in coöperation with the United States Geological Survey. The Geological Survey gives the number of mines as over 50,000. This includes, however, all excavations for the purpose of securing mineral products of any kind. In quarrying operations, placer mines, coal "strippings," and clay pits; though they fall in this class, no timber is used; nor is any used by oil and gas wells, or salt works where salt is made from brine. There are also many small mines of other sorts, particularly in the West, in which timber is unnecessary. Nearly 14,000 mines were selected in which the use of timber seemed certain or possible, and from more than 5000 of these reports were received showing that timber had been used. Nearly 9000 mines reported no use of timber, and a small number of operators failed to report. It is probable that the resulting figures cover fully 90 per cent. of the total amount of timber used during the year.

The operators were requested to report only the timber used underground, but it is probable that in some cases they failed to distinguish between timber for surface and underground use.

Kinds of Timber Employed

The reports were of such a character that in many cases the kind of wood used could not be determined. This accounts for the large items in the table under the heading "mixed" or "not specified." On the other hand, it was possible in all cases to separate the material into round and sawed timber. The cost given for the timber represents the cost delivered at the mine. This is an extremely variable figure, since many operators cut their timber very near their mines and include in estimating its cost only the labor required to cut it.

Table 1 gives the kinds and the total quantity of timber used. The total amount reported was 165,535,900 cu.ft. of round timber, and 435,944,000 board ft. of sawed timber. Reducing the sawed timber to cu.ft. and combining with the round timber gives a total of over 200,000,000 cu.ft. Very little of the round timber was of such dimensions as to make possible its manufacture into sawed lumber; however, its total volume is equivalent to 1,986,430,800 board ft., which, added to the amount of sawed timber, makes a grand total of 2,422,374,800 board ft. Of the various kinds of timber used, it will be noted that pine constitutes half of the softwood round timber, and about one-third of the softwood sawed timber. Fir and hemlock are next in importance, in nearly equal quantities. Of the hardwoods, oak, including over 28,000,000 cu.ft. of round timber, and over 58,000,000 board ft. of sawed timber, has by far the greatest use in both forms. A great deal of oak is doubtless included also in the "mixed hardwoods" and "not specified" items.

TABLE 1. KIND AND QUANTITY OF TIMBER USED IN 5163 MINES IN 1905.

Kind	Round timber.	Sawed timber.
	Cu. ft.	Board ft.
Pine	19,100,000	96,692,000
Fir	4,360,000	78,772,000
Hemlock	1,155,800	60,892,000
Spruce	1,104,200	5,403,000
Mixed softwoods	9,085,000	32,146,000
Total softwoods	38,405,000	274,745,000
Oak	28,174,400	58,693,000
Chestnut	1,543,800	908,000
Beech	722,900	1,597,000
Aspen	142,100	.....
Maple	146,000	5,973,000
Elm	117,200	932,000
Hickory	94,400	.....
Poplar	.....	175,000
Mixed hardwoods	54,915,100	60,331,000
Total hardwoods	85,646,500	128,911,000
Not specified	41,483,800	33,288,000
Grand total	165,535,900	435,944,000

The much higher cost of the timbering required for the anthracite mines is due to several causes. In the first place, many of the anthracite workings lie at great depths, and some of the larger properties have many miles of gangways which have to be carefully maintained. They are below water level, and, as a result of the combined action of air and mine water, the timbers decay rapidly. Some of the beds are of enormous thickness, and require vast quantities of timber in the construction of square sets to support the roof and preserve the workings in overlying coal. Moreover, since the hills in the immediate vicinity of the anthracite mines have been largely denuded of timber suitable for mine supports, operators are obliged to obtain their supplies from considerable distances. The majority of the bituminous coal mines, on the other hand (particularly in the Eastern States), lie at comparatively moderate depths and above water level. The methods of mining frequently permit the withdrawal of the timber used for support in the rooms; the roof is allowed to fall in and the timber is used over a number of times. When longwall methods are employed timber is used only for the support of the gangways, and in some cases, where the roof is firm and the coal strong, may be entirely dispensed with.

TABLE 2. QUANTITY AND COST OF TIMBER USED IN MINES IN 1905.

Mineral product	Number of mines.	Round timber. Cu. ft.	Round timber. Cost.	Sawed timber. Board ft.	Sawed timber. Cost.	Total cost.	Average cost per mine.
Bituminous coal	2,940	91,309,700	$4,165,926	140,790,000	$2,214,105	$ 6,379,931	$ 2,170
Anthracite coal	216	43,676,000	2,898,063	101,210,000	1,535,062	4,433,125	20,524
Precious metals	1,718	15,282,500	1,340,808	164,350,000	3,064,882	4,405,690	2,564
Iron	143	13,484,000	728,350	13,920,000	186,099	914,449	6,395
Miscellaneous	146	1,783,700	118,917	15,060,000	203,775	322,692	2,210
Total	5,163	165,535,900	$9,252,064	435,944,000	$7,203,823	$16,455,887	

Table 2 gives the total quantity and cost of the timber, by classes of mines. The cost of the round timber was over $9,000,000, and that of the sawed timber was over $7,000,000, giving a total of nearly $16,500,000. It will be noted that 2940 bituminous coal mines used nearly $6,400,000 worth of timber, while 216 anthracite coal mines used over $4,400,000 worth, the average cost of timber per mine being $2170 for the bituminous, and $20,524 for the anthracite mines.

It will also be noted that the timber used in the 216 anthracite mines was of slightly greater value than that used in 1718 mines for precious metals, the average cost per mine in the latter case being $2564. Many of the precious metal mines are rather small, and are also in such solid rock that often little or no supporting timber is necessary. Timbering for iron mines is rather expensive, the average cost per mine for 143 mines being $6395. In the miscellaneous class, which includes copper and other minerals, the average cost per mine for timber for 146 mines was $2210, and 484 mines reported that no timber was used.

Timber in Bituminous Coal Mines

Table 3 gives the kind and quantity of round and sawed timber used in 2940 bituminous coal mines. In 907 bituminous mines no timber was used. The totals are 91,309,700 cu.ft. of round timber and

Note—From Circular 49, issued by the Forest Service of the U. S. Department of Agriculture.

*Forest assistant, Forest Service, U. S. Department of Agriculture.

Kind.	Round Timber.	Sawed Timber.
[illegible]	21,477,500	75,482,000
[illegible]	1,474,200	10,101,000
[illegible]	5,205,300	7,500,000
[illegible]	1,919,100	6,074,000
[illegible]	1,107,900	760,000
[illegible]	883,200	1,475,000
[illegible]	137,300	
[illegible]	133,200	1,342,000
Spruce	123,700	248,000
[illegible]	117,200	803,000
[illegible]	93,800	
Poplar		475,000
Mixed hardwoods	45,464,400	36,183,000
Mixed softwoods	1,205,000	422,000
Not specified	11,390,300	19,228,000
Total	91,309,500	140,790,000

140,790,000 board ft. of sawed timber. By far the larger part of the timber consisted of hardwoods, among which oak predominated. Next to oak in importance are pine and hemlock, followed by fir, chestnut and several other hardwoods in smaller quantities.

In Table 4 are given the quantity and cost of the timber used in bituminous coal mines, by States. Pennsylvania, with 524 mines, used 37,826,000 cu.ft. of round timber and 55,716,000 board ft. of sawed timber, costing altogether $2,290,053. The average cost of the round timber was 3.5c. per cu.ft. and that of the sawed timber $17.39 per thousand board ft. In Illinois 400 mines used 10,342,300 cu.ft. of round timber, costing 6c. per cu.ft., and 7,025,000 board ft. of sawed timber, costing $22.04 per thousand board ft., the total cost being $778,186. The 325 mines in West Virginia used 6,716,000 cu.ft. of round timber and 19,645,000 board ft. of sawed timber. The total cost was $561,061; that of the round timber being 4.6c. per cu.ft. and that of the sawed timber $12.76 per thousand board ft. Next in order of total outlay for timber come Ohio, with $471,730; Iowa, with $232,148; Indiana, with $220,209; and Alabama, with $216,221. None of the other States used over $200,000 worth of timber.

Timber is seen to be more expensive in Colorado than in any other State. The average cost of the round timber in that State was 11.6c. per cu.ft., and that of the sawed timber $33.76 per thousand board ft. The large amount of mining has made a heavy demand for timber, and although most of the round timber is obtained locally, much of the sawed timber must be shipped in from considerable distances at high freight rates. Round timber in Wyoming and New Mexico cost 10.4 and 10.5c. per cu.ft., respectively, or nearly as much as in Colorado; but the fact that sawed timber was obtained locally kept its price down to $16.93 per thousand in [illegible]

The lowest average price reported for round timber was 3.3c. per cu.ft. in Indiana, and for sawed timber $5.58 per thousand in Washington. It must be borne in mind, however, that in many cases the timber used was cut from land belonging to the mine operators, and the cost includes only cutting and hauling.

In the Appalachian region the bituminous coal beds lie above water level, while in the interior region, covering Indiana, Illinois, Iowa, Missouri, Arkansas, Kansas and Indian Territory, the beds are generally below water level, and relatively more timber is required to offset decay.

Timber in Anthracite Coal Mines

In Table 5 is given the kind and quantity of timber reported by 216 anthracite mines. The total comprises 43,676,000 cu.ft. of round timber and 101,210,000 board ft. of sawed timber. Of the species used for round timber, yellow pine ranks first, with 8,348,000 cu.ft.; of the sawed timber, hemlock furnishes 53,040,000 board ft., or over one-half of the total quantity. Oak ranks next, with 5,192,200 ft. of round timber and 2,380,000 ft. of sawed timber. A large amount of oak is also undoubtedly included under the item "mixed hardwoods." Much of the pine is shipped in from the South, but most of the other timber used is cut in Pennsylvania.

Table 6 gives the cost of the timber used in 216 anthracite mines of Pennsylvania, to which State the production of anthracite coal is confined. The average cost of the round timber was 6.6c. per cu.ft., and that of the sawed timber $15.17 per thousand board ft.; the total cost was $4,433,125. Comparing these figures with those for bituminous mines in Pennsylvania, in Table 4, it will be seen that, though the values of the sawed timber are not far apart in the two cases, the cost of the round timber per cu.ft. is nearly twice as great for the anthracite mines as for the bituminous. This is because most of the round timber for the bituminous coal mines is cut locally, whereas much of that for the anthracite mines consists of loblolly pine in large sizes which is shipped in at considerable expense.

The 216 mines for which reports were received produced approximately 83 per cent. of the total amount of anthracite coal mined in 1905. Assuming that the other mines used timber in the same proportions as those which reported—a fair assumption because of the uniform conditions throughout the anthracite region—it may safely be said that the total amount of timber used in all anthracite mines comprises not less than 52,620,000 cu.ft. of round timber and nearly 121,620,000 board ft. of sawed timber, costing over $5,340,000.

TABLE 4. QUANTITY AND COST BY STATES.

State	Number of Mines.	Round Timber. Cubic Feet.	Round Timber. Cost per Cu. Ft.	Sawed Timber. Board Ft.	Sawed Timber. Cost per M Board Ft.	Total Cost.
Alabama	82	4,538,500	$0 038	4,372,000	$10.44	$216,221
Arkansas	34	876,200	.040	1,091,600	15.08	51,352
Colorado	69	1,315,500	.116	457,000	33.76	168,580
Illinois	400	10,342,300	.060	7,025,000	22.04	778,186
Indiana	162	3,126,400	.033	7,079,000	16.43	220,209
Indian Territory	38	1,765,400	.035	1,686,000	15.29	87,842
Iowa	161	2,306,000	.073	2,438,000	26.43	232,148
Kansas	89	922,800	.077	1,490,000	18.16	104,992
Kentucky	170	2,096,200	.041	5,332,000	12.03	106,610
Maryland	28	2,633,300	.057	2,555,000	15.42	188,471
Michigan	20	1,187,900	.051	938,000	18.11	77,664
Missouri	143	2,155,600	.040	1,185,000	18.04	107,817
Montana	26	617,600	.086	511,000	21.76	64,015
New Mexico	18	460,000	.105	1,023,000	12.18	60,745
North Dakota	37	119,600	.108	102,000	20.54	15,032
Ohio	399	1,427,700	.056	14,781,000	15.08	471,730
Pennsylvania	524	37,826,000	.035	55,716,000	17.39	2,290,053
Tennessee	88	2,405,900	.028	3,104,000	12.10	105,746
Texas	18	343,700	.042	1,304,000	16.68	36,355
Utah	13	338,100	.070	174,000	12.51	25,799
Virginia	30	894,900	.050	1,707,000	13.08	66,969
Washington	2	1,345,500	.050	1,649,000	5.58	98,747
West Virginia	325	6,715,000	.046	19,645,000	12.76	561,061
Wyoming	16	1,376,500	.104	444,000	16.93	151,138
All others (Georgia, Oregon, California, Idaho)	17	1,262,000	.....	652,000	.....	42,651
Total	2,940	91,309,500	.....	140,790,000	.....	$6,379,931

TABLE 5. KIND AND QUANTITY USED IN 216 ANTHRACITE MINES IN 1905.

Kind.	Round Timber. Cu. Ft.	Sawed Timber. Board Ft.
Pine	8,348,800	12,054,000
Oak	5,192,200	2,380,000
Hemlock	985,000	53,040,000
Chestnut	370,800	.....
Beech	139,700	22,000
Spruce	90,000	300,000
Maple	2,200	1,449,000
Mixed hardwoods	8,533,000	23,847,000
Mixed softwoods	398,900	1,144,000
Not specified	19,669,400	6,974,000
Total	43,676,000	101,210,000

TABLE 6. QUANTITY OF TIMBER USED IN 216 ANTHRACITE COAL MINES OF PENNSYLVANIA IN 1905.

Round timber	43,676,000 cubic feet.
Sawed timber	101,210,000 board feet.

TABLE 7. TIMBER USED IN 1718 PRECIOUS-METAL MINES IN 1905.

Kind.	Round Timber. Cu. Ft.	Sawed Timber. Board Ft.
Pine	4,581,500	67,343,000
Fir	2,436,400	72,441,000
Spruce	829,600	4,642,000
Mixed softwoods	6,471,500	19,624,000
Mixed hardwoods	28,900	.....
Not specified	664,600	906,000
Total	15,282,500	164,956,000

As the total tonnage of anthracite mined in 1905 was 69,330,152 long tons the cost of timber was 7.7c. per long ton of coal mined.

Timber in Mines for Precious Metals

The kind and quantity of timber used in 1718 mines for precious metals is given in Table 7. In 1681 mines no timber was used. The total amount of round timber was 15,282,500 cu.ft., and of sawed timber 164,956,000 board ft. Since these mines are located entirely in the Rocky mountain and Pacific coast regions, where the native timber consists largely of softwoods, very little hardwood is used in them, and most of this is probably aspen, although the reports were not specific on this point. Pine ranks first, with 4,851,500 cu.ft. of round timber, and 67,343,000 board ft. of sawed timber, followed by fir, with 2,436,400 cu.ft. of round, and 72,441,000 board ft. of sawed timber. Spruce comes third, with 829,600 cu.ft. of round and 4,642,000 board ft. of sawed timber. The "mixed softwoods," which consisted principally of pine, fir and spruce, show 6,471,500 cu.ft. of round and 19,624,000 board ft. of sawed timber.

In Table 8 is given the quantity and cost of timber used in the precious-metal mines. Montana comes first, with 127 mines, which required 3,390,800 cu.ft. of round and 62,341,000 board ft. of sawed timber, representing a total cost of $1,265,838, and an average cost of 9.4c. per cu.ft. for round timber, and $15.20 per thousand for sawed timber. Next in order comes Arizona, in which 139 mines used 1,045,500 cu.ft. of round and 40,498,000 board ft. of sawed timber, with a total cost of $1,034,614. In Arizona the average cost of round timber was 10.2c. per cu.ft., and of sawed timber $22.91 per thousand board ft. Then, in order of total cost of timber used, come California, with 280 mines and a cost of $499,329 for timber; Colorado, with 399 mines and a cost of $462,893; Utah, with 118 mines, and $455,599; Idaho, with 157 mines and $357,475, and Nevada, where 133 mines used timber costing $144,519. A relatively small amount of timber was used in mines for precious metals in other States.

The highest average cost reported for round timber was 10.3c. per cu.ft. in Idaho and 10.2c. in Arizona. The highest average cost for sawed timber was $30.10 per thousand in Nevada, while Montana reported the lowest cost for round timber—4c. per cu.ft. The explanation of this apparent anomaly is that the small amount of round timber used is chiefly cut at little cost in the vicinity of the mines, while almost all of the sawed timber is shipped in at high freight rates.

Timber in Iron Mines

In Table 9 are given the kind and quantity of timber used in 146 iron mines, 422 mines reporting that no timber was used. This consisted of 13,484,000 cu.ft. of round and 13,929,000 board ft. of sawed timber. Pine ranks first, with 1,177,500 cu.ft. of round and 5,209,000 board ft. of sawed timber, followed by hemlock, with 901,400 and 1,783,000 for round and sawed, respectively. Oak comes third, with 117,700 cu.ft. of round and 280,000 board ft. of sawed timber. Small amounts of spruce, fir and maple were reported. The figures under the items of "mixed" and "not specified" are so large for the iron mines that the amounts for the species given are not at all accurate. Were accurate figures availabe, the figures for pine, hemlock and oak would be largely increased.

Table 10 gives the quantity and cost of timber used in iron mines. In Michigan 40 mines took 11,414,700 cu.ft. of round timber and 10,549,000 board ft. of sawed timber, having a total cost of $669,323. The average cost of the round timber was 4.7c. per cu.ft., and of the sawed timber $12.24 per thousand. The predominance of Michigan in the production of iron ore is strikingly shown by these figures, as this State used 85 per cent. of the round timber and 76 per cent. of the sawed timber required by all the iron mines from which reports were received. The relative order in which the other States used timber for iron mines is: Minnesota, Colorado, New Jersey, Alabama, Pennsylvania and Virginia.

States in Which Most Mining Timber Was Used

In eight States the cost of timber used in mines in 1905 exceeded half a million dollars each. These States are given in order of relative importance in Table 11. Pennsylvania is unique in possessing all the anthracite mines, and, in addition, the most and the largest bituminous coal mines, as well as a number of iron mines. The timber used by 754 mines in this State amounted to 47,606,500 cu.ft. of round and 157,324,000 board ft. of sawed timber, having a total cost of $6,739,755, or five times the cost of the timber used in the mines of any other State. In Montana 153 mines for precious metals and bituminous coal used 4,008,400 cu.ft. of round timber and 62,852,000 board ft. of sawed

TABLE 8. TIMBERS USED IN PRECIOUS-METAL MINES BY STATES.

State	Number of Mines.	Round Timber. Cu. Ft.	Round Timber. Cost per Cu. Ft.	Sawed Timber. Board Ft.	Sawed Timber. Cost per M Board Ft.	Total Cost.
Arizona	139	1,045,500	$0.102	40,498,000	$22.91	$1,034,614
California	280	3,947,400	.076	10,847,000	18.41	499,329
Colorado	399	2,666,300	.087	11,966,000	19.23	462,893
Idaho	157	2,083,500	.103	9,876,000	14.41	357,475
Montana	127	3,390,800	.094	62,341,000	15.20	1,265,838
Nevada	133	81,700	.040	3,683,000	31.10	144,519
New Mexico	59	274,800	.042	762,000	19.07	26,192
Oregon	114	427,000	.061	2,569,000	13.04	59,956
South Dakota	62	486,800	.080	2,020,000	18.31	75,885
Utah	118	730,900	.089	19,150,000	21.17	455,599
Washington	50	61,400	.072	1,133,000	9.95	15,747
Wyoming	64	86,400	.053	191,000	18.69	8,159
Total	1,718	152,825,000	...	164,956,000	...	$4,405,600

TABLE 10. TIMBER USED IN IRON MINES IN 1905 BY STATES.

State.	Number of Mines.	Round Timber. Cu. Ft.	Round Timber. Cost per Cu. Ft.	Sawed Timber. Board Ft.	Sawed Timber. Cost per M Board Ft.	Total Cost.
Alabama	18	184,500	$0.058	414,000	$14.49	$ 19,111
Colorado	19	754,100	143	1,000,000	14.81	25,000
Michigan	40	11,414,700	.047	10,549,000	12.24	669,323
Minnesota	25	750,000	.097	1,228,000	12.56	88,450
New Jersey	11	162,400	.076	258,000	9.15	30,305
Pennsylvania	14	147,700	.075	258,000	9.30	30,905
Virginia	16	169,200	.041	222,000	14.18	7,895
Total	143	13,484,000	...	13,929,000	...	$914,119

TABLE 11. STATES IN WHICH THE COST EXCEEDED $500,000.

State.	Number of Mines	Round Timber Cubic Feet.	Sawed Timber. Board Ft.	Total Cost
Pennsylvania	754	47,606,500	157,324,000	$6,739,755
Montana	153	4,008,400	62,852,000	1,329,838
Arizona	139	1,045,500	40,498,000	1,034,614
Illinois	400	10,342,300	7,025,000	778,188
Michigan	60	12,602,600	11,487,000	746,987
West Virginia	425	6,716,900	19,645,000	561,964
Colorado	487	4,340,900	13,518,000	605,239
California	291	3,971,200	10,942,000	503,124

In Arizona 139 precious-metal mines required 1,045,500 cu.ft. of round timber and 40,498,000 board ft. of sawed timber, having a total cost of $1,034,614. It is the high cost of timber rather than the large amount that gives Arizona such a prominent place, for the quantity used was actually less than that given for any other State in Table 11. In Illinois 400 soft-coal mines required 10,342,300 cu.ft. of round and 7,025,000 board ft. of sawed timber, costing $778,186. Then follow Michigan with a total cost for timber of $740,987, West Virginia with $561,061, Colorado with $605,239 and California with $503,124.

New Publications

With the beginning of the current year the American Chemical Society began the publication of a monthly journal called *Chemical Abstracts*. This is conducted on the same lines as the abstracts which have previously been published in the monthly journal of the society, but the scope has been considerably extended. All who have been acquainted with the previous works of the society will readily appreciate the usefulness of the new and larger publication.

"A Manual of Hydraulics." By R. Busquet. Translated by A. H. Peake. Pp. 312; illustrated. 5x7 in.; cloth, $2.10. New York, 1906: Longmans, Green & Co.

Contents. Fundamental Laws. Flow of liquids in delivery pipes. Flow of liquids in open canals. Hydraulic engines. The construction of a water-fall.

Quarterly of the Colorado School of Mines. Vol. 1, No. 2; catalog edition. Pp. 149; illustrated. 6x9 in.; paper. Published at Golden, Colo.; 1906-1908.

Contents: College Calendar. Board of Trustees. Faculty. Special Lectures. History, organization, etc. Requirements for Admission. Departments of Instruction. Buildings. Laboratories and equipment. Expenses. General Information. Enrolment of Students. Alumni. Index.

"Tools for Machinists and Woodworkers, Including Modern Instruments of Measurement." By Joseph G. Horner. Pp 340; illustrated. 5½x8 in.; cloth, $3.50. New York, 1906: Norman W. Henley Publishing Company.

Contents. Introduction. The chisel group. Scraping tools. Tools related to both chisels and scrapes. Percussive and molding tools. Hardening, tempering, grinding and sharpening. Tools for measurement and test.

"Alternating Currents. A Text Book for Students of Engineering." By C. G. Lamb. Pp. 325; illustrated. 5½x8½ in.; cloth, $3. New York, 1906: Longmans, Green & Co.

Contents. Simple harmonic pressures and currents. Currents due to simple harmonic pressure. Measurement of power. The choking coil and transformers. Transformer-equations. Special forms of transformer. Losses in transformers. The series motor. The e.m.f. of an alternator. Harmonics. Efficiency of alternators. Polyphase currents. Measurement of polyphase currents. Polyphase transformations. The rotating-field motor. The Heyland circles. Equations for induction motor. Multipolar motors; starting; testing. The monophase motor. Motors operating by a rotating field. Armature reaction by synchronous inpedance. Armature reaction in detail. Alternators in parallel. The synchronous motor. The rotary converter.

Patents Relating to Mining and Metallurgy

UNITED STATES

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to name the issue of the JOURNAL in which the notice of the patent appeared.

Published Week Ended Feb. 12, 1907.

HEATING AND ANNEALING FURNACE—George Bodsworth, Sheffield, England. No. 843,574. Filed Sept. 22, 1906.

CONVERTER PLANT—Harry H. Campbell, Steelton, Pa. No. 843,582. Filed Nov. 22, 1904.

PROCESS OF MANUFACTURING STEEL—Byron E. Eldred, New York, N. Y., assignor to Combustion Utilities Company, New York, N. Y. No. 843,592. Filed May 20, 1905.

DEVICE FOR PROSPECTING AND MINING FOR GOLD—Robert Hornbeck, George B. Campbell, and Basil F. Hite, Sacramento, Cal.; said Campbell assignor to said Hornbeck. No. 843,606. Filed Jan. 19, 1905.

DETINNING APPARATUS—Meredith Leitch, Elizabeth, N. J., assignor to American Can Company, Jersey City, N. J. No. 843,616. Filed July 5, 1906.

APPARATUS FOR PRODUCING GAS—Carleton Ellis, New York, N. Y., assignor to Combustion Utilities Company, New York, N. Y. No. 843,669. Filed May 11, 1905.

CONVEYER—Charles O. Gustavsen, Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. No. 843,676. Filed April 27, 1906.

DEVICE FOR GENERATING GAS FROM CRUDE OIL—Michael G. Norton, Gibsonburg, Ohio. No. 843,692. Filed July 2, 1906.

REEL FOR MINE-LOCOMOTIVES—Charles O. Palmer, Cleveland, Ohio. No. 843,694. Filed Dec. 17, 1906.

GAS-GENERATING APPARATUS—Godfrey M. S. Tait, Montclair, N. J., assignor to Combustion Utilities Company, New York, N. Y. No. 843,715. Filed Aug. 16, 1905.

ROCK-DRILL-FEEDING MECHANISM—Thomas Turner, Ottumwa, Iowa. No 843,718. Filed May 9, 1906.

DUMPING-CAGE FOR CRUSHERS AND PULVERIZERS—Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Company, St. Louis, Mo. No. 843,729. Filed July 24, 1905.

ELECTRIC FURNACE—Edward R. Taylor, Penn Yan, N. Y. No. 843,776. Filed May 15, 1902.

METALLURGICAL PROCESS—Edward R. Taylor, Penn Yan, N. Y. No. 843,777. Filed May 27, 1902.

GAS-PRODUCER—Cyril J. Atkinson, Milwaukee, Wis., assignor to International Harvester Company. No. 843,787. Filed Nov. 2, 1906.

ROASTING-FURNACE—Frank Klepetko, New York, N. Y. No. 843,825. Filed Sept. 6, 1904.

FURNACE FOR OBTAINING ZINC FROM ZINC ORES—Adolphe Desgraz and Paul Schmidt, Hanover, Germany. No. 843,872. Filed Sept. 13, 1906.

PROCESS OF CALCINING LIME AND CEMENT FORMING MATERIAL—Carleton Ellis, White Plains, N. Y. No. 843,878. Filed Dec. 6, 1905.

COAL-BIN—August H. Koch, New York, N. Y. No. 843,895. Filed Oct. 31, 1906.

BLAST-FURNACE—Samuel A. Kennedy, Chicago, Ill. No. 843,950. Filed Feb. 23, 1906.

MEANS FOR IMPARTING GYRATORY MOTION TO SIEVE-BOXES AND OTHER BODIES—Emil R. Draver, Richmond, Ind. No. 844,005. Filed Sept. 17, 1906.

PROCESS OF UTILIZING MARL, MAKING CARBIDE—Herman L. Hartenstein, Constantine, Mich. No. 844,018. Filed Apr. 17, 1905.

CONTINUOUS ANNEALING AND BLUING FURNACE—Thomas J. Costello, Youngstown, Ohio. No. 844,101. Filed May 16, 1906.

CAR-HAUL—Charles W. Miller, Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. No. 844,164. Filed Jan. 9, 1906.

CYLINDER FOR TREATING HEATED METAL—James W. Moshier, Bristol, Conn., assignor to The Chase Rolling Mill Company, Waterbury, Conn. No. 844,285. Filed Dec. 14, 1903.

CAR-HAUL—Archibald W. F. Steckel, Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. No. 844,291. Filed July 15, 1905.

MILL—Joseph Dain, Jr., Ottumwa, Iowa. No. 844,303. Filed Feb. 26, 1902.

GREAT BRITAIN

The following is a list of patents published by the British Patent Office on subjects connected with mining and metallurgy.

Published Week Ended Feb. 9, 1907.

DETINNING PROCESS—K. Goldschmidt and J. Weber, Essen, Germany. A method of cleaning tinned articles in order to remove organic matter and solder before detinning by exposing them to the action of hot gases. No. 415 of 1906.

ALUMINO-THERMIC PROCESS—H. Goldschmidt, Essen, Germany. The use of calcium silicide as a substitute for aluminum in the thermit process. No. 788 of 1906.

JIG—D. Jaffray, Lanark. An improved jig containing series of compartments. No. 830 of 1906.

WHITE LEAD—H. A. E. Smith, London. Improved machinery for drying white lead. No. 2045 of 1906.

NITRATE OF SODA PROCESS—R. T. Love, Toco, Chili. Improved lixiviation process for extracting nitrate of soda from caliche. No. 7007 of 1906.

ELECTROLYTIC PROCESS—S. O. Cowper Coles, London. The inventor passes the electrolyte from which metals, such as copper, are to be extracted, through atomizers so as to maintain it in an oxidized state, and subsequently removes the air by passing through vessels from which the air is exhausted; he also uses sunlight or arc light for maintaining the electrolyte in an oxidized state. No. 8924 of 1906.

CASE-HARDENING FURNACE—A. W. Machlett, New York, U. S. A. A furnace for case hardening iron articles, using atmospheres of carbonaceous gases under pressure, instead of solid material. No. 11,069 of 1906.

CHROMIC ACID—Chemische Fabrik Griesheim Elektron, Frankfurt, Germany. Improvements in the production of chromic acid, especially for the purpose of separating the chromic acid from bisulphates. No. 12,618 of 1906.

CRUCIBLE FURNACES—J. Borbeck, Altenau, Germany. Improvements in tipping crucible furnaces having annular blast channels. No. 13,021 of 1906.

TANTALUM—Siemens and Halske, Berlin, Germany. A process for the production of pure ductile tantalum consisting in heating tantalum, containing hydrogen, in a vacuum, above its melting point. No. 14,062 of 1906.

ROCK-DRILL VALVE—G. H. Rayner and C. Walton, Sheffield. Improvements in the inventors' patent (No. 1340 of 1904) for the valves of rock drills of the percussive type. No. 19,384 of 1906.

MOLDS FOR ANODE-PLATES—R. Truswell, Trail, B. C., Canada. Improved molds for casting anode plates of metals to be refined electrolytically. No. 22,314 of 1906.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

E. Jacobs, editor of the *British Columbia Mining Record*, is visiting eastern Canada.

W. Kenyon Burch, chief engineer of the Moctezuma Copper Company, of Nacozari, Mexico, is visiting New York, on business for the company.

Frank G. Willis, Cripple Creek, Colo., has been appointed consulting engineer for the Henry Adney mine at Cripple Creek, under the new management.

A. P. Low, director of the Canadian Geological Survey, Ottawa, is seriously ill with cerebral meningitis. It will be some weeks before he can resume his duties.

Dr. W. F. King, Dominion astronomer, has resigned his position as a member of the Waterways Commission, because of the pressure of his departmental duties.

Frederick Hobart, associate editor of THE ENGINEERING AND MINING JOURNAL, is attending the meeting of the Canadian Mining Institute, in Toronto, this week.

Alexander McLeod, consulting geologist, of Sydney, Cape Breton, has returned from making a mineral examination for southern capitalists in Newfoundland.

F. Lynwood Garrison, mining engineer, of Philadelphia, sailed for Santo Domingo, Feb. 26. He will be engaged there on professional business for a little more than a month.

John Williams, superintendent of the Wood River Zinc Company, of Hailey, Idaho, was in Denver, Colo., recently on business connected with the testing of ores from these mines.

Leo Kluck has resigned his position as chief engineer of the Spring Valley Coal Company, to accept the position of chief mining engineer for the Chicago, Milwaukee & St. Paul Railroad.

Sydney H. Wilcox, of New York, is now on his way to Costa Rica, to take charge of the operations of the Barranca Mines Company, which is developing gold-bearing ledges in that country.

Victor G. Hills and Frank G. Willis, forming the firm of Hills & Willis, mining engineers, announce the opening of an office at 318 McPhee building, Denver, Colo. The office at Cripple Creek continues as before.

Obituary

Frank J. Hearne, president of the Colorado Fuel and Iron Company, died in Denver, Colo., Feb. 25, aged 60 years. He was born at Cambridge, Md., Sept. 21, 1846. After receiving an academic education he entered the Troy Polytechnic Institute, and immediately after his graduation, in 1867, he secured a position as assistant engineer of the Hannibal & St. Joe Railroad, which he held until 1872. He resigned to accept the office of assistant general manager of the Riverside Iron Works Company at Wheeling, W. Va. With the transfer of that company to the National Tube Company, Col. Hearne accepted the office of first vice-president in charge of the manufacturing department of the latter company, with headquarters at Pittsburg. After several years he retired from that position, and in 1903 he was chosen by George J. Gould to the presidency of the Colorado Fuel and Iron Company.

Industrial

The Ashland Iron and Steel Company, Ashland, Wis., manufacturer of Lake Superior pig iron, together with by-products of wood alcohol and acetate of lime, has recently acquired a large additional tract of timber land, aggregating 50,000 acres. Twenty new charcoal kilns will be built and when completed will use about 100,000 cords of wood a year. The furnace at Ashland is one of the largest charcoal furnaces in that region.

The fire, which destroyed one of the factory buildings of the Wire and Telephone Company of America, at Rome, N. Y., Feb. 23, will in no way interfere with taking care of the requirements of the trade as heretofore. Provision has been made to make deliveries and to accept new business. The fire, which destroyed only the wire-drawing plant, was no sooner under control than arrangements were made for the drawing of wire by other mills.

The Jacobson Machine Manufacturing Company, of Warren, Penn., has completed all arrangements with a new corporation organized in Rock Island, Ill., incorporated as the Rock Island Tool Company, providing for the complete transfer of the Jacobson vise business to the Rock Island concern. The Jacobson people are taxing their capacity with gas- and gasolene-engine work, and consider it advisable to divide the business in this way. The Jacobson Company will retain a considerable interest in the new concern.

The blast-furnace plant of the Atikokan Iron Company, at Port Arthur, Ont., which will shortly be in operation, was constructed by the Canada Foundry Company, of Toronto. The roaster for the ore is near the furnace. There are three hot-blast stoves. The self-supporting steel smoke-stack is nearly 15 ft. in diameter and 175 ft. high. The motive power is furnished by over 1000 h.p. of Canada water-tube boilers. There are several specially designed outside-packed plunger pumps. The plant has a capacity of 150 tons of pig iron per 24 hours. F. C. Roberts & Co., Philadelphia, are the designing and consulting engineers. The officers of the Atikokan Iron Company are D. D. Mann, president; J. C. Hunter, vice-president and manager; Hugh Sutherland, treasurer; R. M. Hunter, secretary.

Societies and Technical Schools

Richard Moldenke, secretary, announces that by invitation of the Philadelphia Foundrymen's Association, the next convention will be held in Philadelphia, May 21 to 24. A number of valuable papers have been promised. The elaborate system of working exhibits now being arranged for will surpass everything in that line heretofore attempted. This exhibition will be open May 20 to 26.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

"Steam Shovel News," published in Toledo, Ohio, Jan., 1907. Pp. 10, illustrated; paper, 7½x10½ in.

The Hayward Company, 97 Cedar St., New York. Digging Machinery. Pp. 23, illustrated, paper, 3½x6 inches.

Buffalo Forge Company, Buffalo, N. Y. The Buffalo Air Washer and Humidifier. Pp. 4, illustrated, paper, 6½x7 in.

Universal Portland Cement Company, Chicago, Ill.. Universal Portland Cement. Pp. 72, illustrated; paper; 6x9 in.

T. H. Proske, Denver, Colo. The Improved A86 and D24 Ajax Drill Sharpeners. Pp. 8; illustrated; paper. 4x6½ in. 1907.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1493. The Hancock Jig. Pp. 12, illustrated, paper, 8x10½ in. November, 1906.

Mussens Limited, Montreal, Canada. Multiple Gear Hoist, Hoisting Machinery and Barrel Forges. Pamphlet. Pp. 8, illustrated, paper, 3½x6 in.

National Ore Concentration Company, Milwaukee, Wis. Bulletin No. 4. Woodbury System of Concentration. Pp. 11, illustrated, paper, 6x9 inches.

The Virginia Oregon Development Company, Portland, Oregon. Gold and Platinum in Southern Oregon. Pp. 4, illustrated, paper, 3½x6 inches.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1420. Gold Milling in the Black Hills. Pp. 39; illustrated; paper; 8x10½ in.; January, 1907.

Power and Mining Machinery Company, Milwaukee, Wis. Catalog No. 7. Cement-Making Machinery. Pp. 86; illustrated; index; paper; 6x9 in. 1907.

American Locomotive Company, 111 Broadway, New York. Ten-wheel Type Locomotives weighing more than 150,000 lb. Pp. 72, illustrated, paper, 6x9 in.

Company, Boston, Mass. High Grade Engineering, Surveying, Astronomical and Mining Instruments. Pp. 117, illustrated; paper; 6x9 in.; 1907.

W. H. C. Mussen & Co., Montreal, Canada. Catalog No. 8. Wheelbarrows and Trucks. Pp. 27; Catalog No. 9. High-Speed Steel, Tool Steel, Mining Steel, High-Speed Twist Drills. Pp. 15; Catalog No. 10. Mine Supplies. Pp. 11. All illustrated, paper, 6x8½ inches.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1044. H. Ward Leonard System of Multiple Voltage Control for Variable Speed Motors. Pp. 24, illustrated, paper, 8x10½ in.; October, 1906. Publication No. 115. Directions for Erecting Gates Elevators. Pp. 8, illustrated, paper, 6x9 inches.

Construction News

Placerville, California—A new hoist of 50 h.p. is to be installed at the Sherman mine at Placerville.

Angels, California—It is proposed to build a mill at the Etna-King mine. The address of the company is at Stockton, California.

Cripple Creek, Colorado—The W. P. H. Leasing Company is preparing to put up a 100-ton cyanide mill. A. B. Whitmore, Cripple Creek, is manager.

Washington, California—The Co-operative Exploration and Development Company proposes to put up a 20-stamp mill at the Giant King mine. C. M. Carter is superintendent.

Randolph Flat, California—The Dolly Madison Mining Company is preparing to open a mine, and will need machinery. E. N. B. Whitehead, Grass Valley, Cal., is president and manager.

Yerington, Nevada—The Nevada Douglas Copper Company will soon be ready to take up the matter of smelter and mill construction. Walter C. Orem, of Salt Lake City, Utah, is manager.

Alta, Utah—The Albion Mining Company will erect a concentrating mill this year. The matter is now being considered by the board of directors. The president of the Albion company is William Hatfield, of Provo, Utah.

Nicholasville, Kentucky—The Jessamine Barytes Company will put up a barytes mill at an early date. W. J. Weinman is engineer in charge. The company's address is Diamond Bank building, Pittsburg, Pennsylvania.

[illegible] Simon M. Bamberger, general manager of the mines in Tintic and Bingham, Utah, under the control of Simon Bamberger and associates, has announced that a smelter will be built during the present year. The initial unit will treat 250 tons of ore per day.

Special Correspondence

San Francisco Feb. 27

The Anti-Debris Association Committee on dredge mining has reported that after a conference with the Oroville dredge owners and superintendents, the latter have agreed to erect the necessary barriers to prevent any material reaching the streams. The association is therefore advised to withhold the proposed suit pending developments. This is as it should be and avoids litigation. In fact the dredge men have always been anxious to do the proper thing and most of them had already land-locked their machines, so that no material reached the stream.

There is quite a little excitement on the Forest Hill Divide region in Placer county, the principal seat of the drift-mining industry in California. Since the discovery of gold in this State that section has been thoroughly mined. The placers in the rivers and streams paid handsomely while they lasted; and then the buried channels of the ancient rivers under the lava cap of the Divide were attacked and drifted out, this work still continuing on a large scale. Some quartz mining has been carried on as well, but not as extensively as at other points in the county. It seems to have remained for George Wingfield, the rich mine owner of Goldfield, Nevada, to announce that the richest quartz mine on the Pacific coast has been found in that vicinity. It seems that a prospector named Savage, with his partner, W. H. Warden, recently came across a 30-ft. quartz ledge with a 4-ft. streak of specimen ore. This claim Wingfield has bought, and when he took some of the ore back to Nevada it astonished the men who thought Mohawk ore was the richest. The result of this publicity has been that numbers of men have gone into Forest Hill district in hopes of finding similar mines. Local people are making numbers of locations also.

In the same county—Placer—there is now some little excitement about copper. The Valley View mine near Lincoln has been a copper property of some note, but the locality which is now being exploited for copper is in the Clipper Gap district. This locality was known in former years as Hotaling and was worked for iron, a large plant having been erected, and a busy little village sprung up about the mine. But the sulphur and copper in the ore made it impracticable after a time to continue the mine as an iron producer. The mine was abandoned, and has remained idle for many years. Recently a large tract of the land which comprised the former iron mine was purchased by E. L. Trent, who has a force of men at work, and the adjoining property has been bonded by mining men who are confident in the development of copper. The proposed Midland Electric Railroad will pass through the properties in question.

When the Western Pacific Railroad, now in course of construction, passes through Plumas county, there will doubtless be a distinct revival of the mining industry which has been languishing since hydraulic mining stopped. In the Greenville section, from Taylorville through Crescent Hills northward to the head of Wolf creek, there are known quartz ledges for 15 miles, yet comparatively little has been done with any of them. In this belt there are extensive copper deposits only a few of which have been prospected and from none of which has any ore been shipped, owing to lack of suitable transportation facilities. The region is a mountainous one, with no railroads, but the coming of the new line will give opportunity for shipping ores and bringing in machinery at low cost.

The Tonopah & Greenwater Railroad Company has been incorporated to build a railroad from the Amargosa desert borax fields in Inyo county into the new copper camp of Greenwater in the same county. Outside of F. Marion Smith, the "Borax King," of California, New York State men are the incorporators.

Better weather of late has much benefited the mountain roads, so that teaming to and from the mines has commenced in earnest. In the outlying camps more or less construction work has commenced, as material can now be obtained.

The equipment for the new iron smelter at Heroult on the Pit river 15 miles from Redding, Shasta county, is beginning to arrive. The smelter is to be an experimental one to work the iron ores in that section by some new method, in which electricity is the principal factor.

The San Francisco & Tonopah Mining Exchange commenced business again in this city this week, the first time since April 17 last. The Board deals mainly in Nevada mining securities.

The Mountain Copper Company of Keswick, Shasta county, is advertising for men and asks applications from old employees, it being the intention to resume operations at an early date.

Los Angeles is again agitating the smelter question and the Chamber of Mines has decided that it shall be located at San Pedro on the ocean beach, where there will be little danger of litigation about smelter fumes. Los Angeles and Nevada men have the matter in hand.

The Sullivan Trust Company and its creditors had a conference in this city this week and a basis of settlement has been agreed upon. A managing committee, comprising president Rickey of the State Bank and Trust Company of Carson, Alexander Russell, of Goldfield, Broker Pollock, of Salt Lake, and Broker Hudson, of San Francisco, will assume charge of all the affairs of the company. The creditors are to pool their stocks and sell none. The remaining stocks in the hands

pooled, and only sold in such parcels as the managing committee may direct at such times as market prices warrant such sales. Meanwhile the Sullivan Company, as represented by this committee, will proceed to develop the various properties to the fullest extent, thereby endeavoring to restore public confidence in the mines and securities. As the committee sells stock the proceeds will be divided pro rata, 40 per cent. to the State Bank and Trust Company at Carson, 40 per cent. to the brokers, and 20 per cent. to the Sullivan Trust Company, as compensation for directing development. No time limit is set, but it is stated the affairs of the company are in good shape and that all claims will be paid in full as expeditiously as conditions will permit.

In the oil fields of this State the expense of producing oil has not increased, but the big companies have to pay more for oil when they buy it. A fear is abroad among smaller oil companies that the accumulation of oil lands by the great corporations is preliminary to producing largely enough to again make the minor companies dependent upon the larger ones in the matter of price, and that the great game of controlling the California market is simply taking on another phase with the necessary expenditure of millions of dollars by the Standard and Associated as a preliminary. Standard Oil Company interests have just acquired control of the Independence Oil Company in Coalinga district, so they now own virtually all of the famous Section 28.

The Union Hill Mining Company is about completing a large hydraulic mining plant near Weaverville, Trinity county, with 14 miles of pipe and ditch line and a steel bridge across Trinity river. The company owns a large area of auriferous gravel. Construction work on the plant will be completed by April

Salt Lake City March 1

The New York & Utah Copper and Gold Mining and Milling Company is the name of a new corporation which will undertake the development of the Blue Bird group of claims in Beaver county. The officers are all Salt Lake mining men. J. Galigher is president; A. F. Schneider, vice-president; G. D. B. Turner, secretary and treasurer. New equipment has been installed, and the opening of the property begun. The ores carry values principally in copper

The annual meeting of the Daly West Mining Company resulted in the retention of the old board of directors. The report of General Manager Ernest Bamberger shows that the company had a cash balance on hand Jan. 1 last of $451,711, a gain for the year of $39,824. There was received from the sale of ore and concentrate $1,013,449, and from other sources, $0,928. The disbursements, including $783,052. The dividends paid since the organization of the company aggregate

ment work has been done during the year in various portions of the mine, with the result that new orebodies have been opened and new fissures disclosed. Notwithstanding the management has been unable to do any work on the lower levels of the mine, or explore the property at greater depth on account of the stoppage of the Ontario drain tunnel, it claims that conditions are much better than they have been in many months.

Interest is being taken in that mining region located in the extreme southeastern corner of Nevada, near the camp of Gold Butte. The Gold Butte Mines Company recently made important developments and reports received from there since indicate that Gold Butte is on the eve of a rush such as has been experienced in other portions of Nevada. The region is splendidly mineralized and geological conditions there are said to be favorable for the opening of some good mines. The surface ores of the district carry values principally in gold, and it will undoubtedly prove to be a large low-grade milling camp in which gold will predominate. There is some copper and lead found in the country.

It is announced officially that a smelter will be erected during the present year by Simon Bamberger and associates, who control the Carisa mine, in the Tintic district, and the Fortuna, Bingham Mary and Argentine mines, in Bingham. It is likely that the mining interests under the management of Ernest Bamberger will join in the enterprise, or, at least, to the extent of sending the ores of the Daly West, Daly, and Ontario mines, at Park City, and the Ely Witch, at Ely, Nev., there for treatment, as it is understood the plant will be in the field for custom ores. The initial unit will handle 250 tons of ore per day. Sidney M. Bamberger, of Salt Lake, is general manager.

Stockholders of the Utah Copper Company have authorized the capital stock of the company increased from 600,000 to 660,000 shares. The new stock has been offered to shareholders at $25 per share. The proceeds are to be applied toward the completion of the mill and power plant now under construction at Garfield. The first unit of the mill, which is to handle 3000 tons of ore per day, will be ready in March, but the power plant will not be finished for at least a month later.

Since the management of the American Smelting and Refining Company has succeeded in patching up a truce with the farmers of the Salt Lake valley, who appeared as plaintiffs in the smoke cases tried in the Federal court, which will permit of a continuance of lead-ore smelting at Murray, the other smelting companies operating in the valley are endeavoring to make a similar arrangement. Negotiations

end. But everything is contingent on whether Judge Marshall will consent to a modification of his late decree, which prohibits absolutely the smelting of any ore or combination of ores containing more than 6 per cent. sulphur in the charge.

Helena, Montana March 1

The Spring Hill properties, 3½ miles south of Helena, have proved sensational. But little development work has been done on these claims since it was found that they contained a vein of free-milling gold ore instead of being only an iron property useful for flux. The option obtained by Frank Sizer has been taken up by Helena people and a company formed with a capital of $200,000 in $1 shares. All the shares of the new company were taken by local people. Further development since the last report of this mine shows it to be larger and richer than was thought, and work will be commenced immediately. The company has secured an option on the Hale water rights, 200 miners' inches of water, which will be available for milling, and has purchased the Hale placer and quartz claims in the vicinity of the Spring Hill, containing about 500 acres.

The Valley Forge property, near Rimini, 20 miles from Helena, was purchased last fall for about $30,000 from miners who had an option by Helena and Madison county men. Development shows ore in three tunnels, the returns showing good average values. The company has purchased a wire tramway and modern machinery for the mine, which is worked entirely by tunnels.

It is stated that Breen and Heinze, who have recently acquired several hundred acres of the Porphyry dike, near Rimini, and who have exploited the entire ground with churn and diamond drills, will begin at once the erection of a 60-stamp mill, to be followed by a larger one. Water power has been acquired for mines, mill and railroad. The dike is a large deposit of low grade, running from $1.50 to $3 per ton, and the ore can be mined with steam shovels or quarried.

Helena parties and F. A. Heinze have started preliminary work for the building of an electric road from Helena to Butte, with a view to opening up the mining districts along the route, and also to give transportation to ores from Butte and intermediate sections to a reduction plant to be located on Missouri river near Helena. The haul would be only 53 miles. The dams of the Missouri River Power Company of Helena would furnish plenty of power.

Scranton March 4

PENNSYLVANIA MINE EXPLOSIONS

The past week has been remarkable for the number of explosions which have occurred in the mines in the anthracite region.

the Delaware, Lackawanna & Western Railroad, viz: the Holden, the Woodward and the Auchincloss, all due to the use of naked lights. The Holden mine has always been supposed to be non-gaseous, and great surprise was occasioned by the report that an explosion had taken place there. Fifteen men were injured and four killed. Two men were at work in some of the new workings, using naked lights, when they struck a pocket of gas of great extent, causing a terrific explosion, which destroyed a considerable portion of the workings. A hasty check of the list of men employed in the colliery showed that there were 45 entombed, and elaborate measures for their rescue were immediately planned.

It was not for some hours, after great exertion and some heroic work, that it was found that a mistake had been made and that a number of men in the rescue party were the very ones for whom they were searching. It appears that these men in escaping after the explosion met some of the rescuers, who informed them that 45 men were entombed in the workings, from which these men had just escaped. Without waiting to ask further questions, they turned back and assisted in removing the débris, several hundred tons, before it was found, after a careful calculation, that all the men had been accounted for.

The same day a similar explosion occurred in the Woodward mine, the largest owned by the Lackawanna company. Here two men were killed and five men injured. Naked lights caused the explosion. Three days earlier an explosion was caused in the Auchincloss mine, when one man was killed and seven injured. Some foreign laborers were working in a gangway where they failed to detect the presence of gas. A timberman, who was more than 200 ft. away, was killed by the violence of the explosion, being hurled with great force against a mine car.

At about the same time, an explosion caused by a naked light took place in the Tunnel Ridge colliery, near Mahanoy City, where one miner was killed and another injured.

After working for 55 years in coal mines without sustaining even a scratch, William Watson, of Ebervale, was caught under a fall of roof this week, and died from the injuries. His record of immunity from accidents was probably the best in the anthracite region.

The strikers at the Morea colliery, of the Dodson Coal Company, who were ordered by the conciliation board to return to work, have complied with the order, and their grievances will now be taken up by the board.

A measure has been introduced in the Pennsylvania legislature for the purpose of levying a tax of 3c. a ton on anthracite coal. On 60,000,000 tons of anthracite mined each year, this would bring an annual revenue of $1,800,000 to the State. It the bill is passed it will mean that the additional tax will be placed on the selling price of the coal and the consumer will pay in the end. President Baer, of the Reading Company, in discussing the matter said, "You can make the tax 5c. a ton, or you can make it $1.05; it makes no difference to the railroads. The consumers of the product will have to make the deficit, and they alone will be the sufferers."

The commissioners of both Lackawanna and Luzerne counties have appointed experts to make the assessments of the coal lands. In Lackawanna, Senator Blewitt and mining engineer T. Elsworth Davies, formerly in the employ of the Lackawanna railroad, have been appointed, and engineer John Sturdevant has been appointed in Luzerne.

In Hazleton, Luzerne county, the coal-land valuations were advanced, by the board of appeals, from $500 to $2000 an acre. This will mean an advance of $633,000 in the valuation of the Lehigh Valley Coal Company's deposits which underlie the city.

Toronto, Ont. March 4

An official statement, issued by the Ontario Department of Mines, of the mineral production of the province for 1906, shows the total value of the output at $22,221,808, as against $17,854,296, in 1905. The net metallic production was $13,179,162, and the non-metallic $9,042,646. The principal increases as compared with 1905 are silver, $2,170,212; nickel, $481,485; copper, $309,555; pig iron, $644,720; portland cement, $597,563, and natural gas, $216,970. The principal decrease is crude petroleum, $136,999. The figures of the metallic products are as follows:

Product.	Quantity.	Value.
Gold, oz.	3,519	$ 59,274
Silver, oz.	5,357,830	3,543,089
Cobalt, tons	312	30,819
Nickel, tons	10,932	3,836,419
Copper, tons	5,940	998,548
Lead, tons		93,500
Iron ore, tons	128,099	301,032
Pig iron, tons	275,598	4,554,247
Zinc ore, tons	400	6,000
Total value		$13,422,928
Less value iron ore smelted into pig iron (101,569 tons)		243,766
Net metallic production		$13,179,162

The output of the Cobalt mines was: Silver, 5,357,830 oz., value $3,543,089; cobalt, 312 tons, $30,819; nickel, 156 tons, and arsenic, 1558 tons, values not given. Up to the end of 1906 the Cobalt camp produced 8,016,061 oz. of silver, worth $5,015,479, and 446 tons of cobalt, $150,779; 245 tons of nickel, $13,467; and 1919 tons arsenic, $3596. The last three constituents bring little or no return to the mine-owners. It is noted that if the basis of valuation employed by British Columbia statisticians and the Geological Survey of Canada were adopted, the selling price of the refined metals in the New York market, instead of their value in the form in which they leave the country, the gross value of the output would be about $30,000,000 instead of $22,221,808.

The Ontario Government has appropriated $60,000 for mining operations on the Gillies timber limit, including the purchase of machinery and also $25,000 for a sampling plant. It has also decided on the appointment of an assistant provincial geologist at a salary of $3500 yearly.

Recently there has been quite a rush of prospectors to the vicinity of Elk lake, which is an enlargement of the Montreal river, some 50 miles northwest of Cobalt, where about 100 claims have already been staked. The neighborhood of Silver lake, lying a little farther to the west, is also being prospected. Good native silver has been found in the locality. The rock around Silver lake is like that of Cobalt, being a mixture of diabase and conglomerate. It is expected that next season there will be a great influx all along the Montreal river.

The Timiskaming & Northern Ontario Railway Commission has arranged to send out a surveying party in charge of Chief Engineer McCarthy, to secure information as to the character of the country between the railroad and Larder lake, preliminary to locating a branch line.

Cobalt, Ont. March 2

The mining interests are becoming active in their opposition to the government measure for the taxation of mines and the administration is being deluged with protests. At a largely attended meeting, held at Cobalt, Feb. 25, a series of strong resolutions protesting against the tax, deprecating hasty action, and urging the appointment of a commission to investigate the whole question was adopted. The Standard Stock and Mining Exchange of Toronto has also memorialized the government against the tax. It is hardly probable that in the face of this opposition the government will persist in forcing through the bill, more especially as the general public appear to be apathetic in the matter.

The official report of the Timiskaming & Northern Ontario Railway, showing the shipments of Cobalt ore for the week ending Feb. 23, is as follows: Nipissing, 101,765 lb.; Coniagas, 63,780; Silver Queen, 40,215; Foster, 66,750; Cobalt Central, 34,650; Buffalo, 60,000; O'Brien, 64,500; total, 431,660 pounds.

London Feb. 23

The report of the British South Africa Company for the year ended March 31 last has just been published. It shows that, as usual, the estimated surplus of income over expenditure was not borne out by experience. The cost of administering Southern Rhodesia was less than the revenue, being £499,767, as compared with the revenue of £523,668. On the other hand, the northern and more undeveloped portions cost much more to administer than they brought in, the expenditure be-

ing £1,30,908 and the revenue £5[illegible]8. The total deficiency of the three sections of the country was therefore £59,138. The fact that there was a balance in favor of the chief and more developed section of the country is sufficient encouragement to believers in Rhodesia, who are confident that all will come right in the end. The company has other expenditure and income in addition to those connected with the administration, other expenditure amounting to £99,136, and other revenue, chiefly from interest and dividends in other companies, amounting to £115,235. Another item to be charged to expenditure is £62,500 interest on debentures. The total deficit on the year therefore amounted to £105,700.

Apart from the above summary of the figures relating to the financial results, the most interesting item in the company's report is the information about small producers of gold. We usually associate Rhodesian outputs of gold with the few companies financed from London. No doubt these companies produce the bulk, but at least one-third of the output is due to the aggregate of many small producers. In the report, one month's returns are given in details. Of a total output of 48,503 oz., 14,288 oz. came from 89 small producers. In many cases these small producers have borrowed the necessary capital for batteries from the British South Africa Company.

The Kent Coal Concessions

The work in connection with the development of the coal deposits in Kent, near Dover, proceeds very slowly, and the two groups of people who have independent schemes on hand appear to spend more of their energies on company reconstruction than on actual engineering operations. One of the groups, whose company is called the Kent Coal Concessions, Ltd., is now asking for further capital to continue exploration and development and is offering 35,000 new 10 per cent. cumulative preference shares of £1 each at par for public subscription. The terms offered show to some extent the difficulties met with in obtaining money. To tell the truth, the Kent coal propositions have never taken hold of the popular fancy, or appealed to financiers of solid standing. The coal measures undoubtedly exist; in fact they are the continuation of similar deposits on the other side of the channel in France, where the Courrieres, Lens and Bruay Collieries have made great successes. The coal is, however, of later geological period than that found in South Wales, the north of England and Scotland, and is of much inferior quality. It is obvious that while the present stores of high-grade coal exist in Great Britain it is hardly likely that money can readily be found for developing the Kent beds, even though Prof. Boyd Dawkins should lead the band of geologists and engineers which backs up the proposition.

With the renewed interest in Cornish affairs the financial results of the companies operating in Cornwall are of special importance. I referred to the results at Dolcoath during the latter half of 1906, a week or two ago. This week the report of Carn Brea & Tincroft for the same period has been issued. This company has made a net profit during the half year amounting to £7480, as compared with £10,160 during the previous half year and £6600 during the second half of 1905. During years previous to this the balance was usually on the wrong side. Last half year profits were smaller because of the fall in the extraction and the increase in the costs. The total income during the second half of 1906 was £38,771, as compared with £38,186 during the first half. The extraction during the second half was 397½ tons of concentrates from 30,000 tons of ore, being at the rate of 28.45 lb. of concentrates per ton, as compared with 402 tons of concentrates from 30,055 tons of ore at the rate of 30 lb. per ton, during the first half. The prices obtained from the concentrates averaged £102 during the second half and £94,180 during the first half. The total receipts from tin concentrates during the period were £35,984 as compared with £35,195, and the difference between these figures and those for the total income came from the slimes, copper ore, arsenic and wolfram. During the same periods the total costs increased from £34,280 to £36,915, besides which £1021 had to be paid during the second half as lord's royalties, the first time this item has appeared since these mines were incorporated under the limited liability laws in 1900.

Johannesburg Jan. 28

The principal topic of conversation on the Rand is the declaration of policy of Sir Richard Solomon, the attorney general of the Transvaal. Sir Richard is one of the ablest men in South Africa, a man whose influence is great. For a long time neither party knew which course he would take, but it was confidently believed that he would side with the progressives. In a great speech in Pretoria last week he declared his intentions of going with the Nationalist party, which is merely a branch of Het Volk, the Dutch party. His action is rather a blow to the pro-Chinese party.

Election day has been definitely fixed for Feb. 20. There is some discussion as to whether this day will be declared a holiday or not.

Much interest is being taken in the proceedings of the commission to inquire into mining by single outlet. As the law stands at present, a mine cannot commence crushing on a large scale unless it has two outlets. There are a number of mines with only one shaft, on which mining is suspended on account of the law. To put down another shaft, or make a connection with a neighboring mine would cost too much. The Government has appointed this commission to inquire into the law. From the evidence so far obtained, it is stated that permission should be given in exceptional cases to carry on permanent mining operations with a single shaft, provided proper precautions are taken against fire, and mechanical ventilation is put in.

Good work is also being done by the Rope and Safety Catch Commission. A number of safety appliances have been brought out, and exhaustive tests under actual working conditions are being carried out.

Perth, Western Australia Feb. 2

The December gold yield of 146,196 oz. brought the 1906 total up to 1,794,545 oz., a decrease of 160,771 oz. as compared with 1905. In spite of this decrease the various companies paid increased dividends, and prospects for the new year are good. New districts are going steadily ahead and will, no doubt, shortly make up for any falling off in older parts. Of the new districts Black Range appears the most attractive, and fresh capital is continually being invested there, especially by Melbourne people.

The greatest disappointment during the year has been the falling off in the Great Fingall Consolidated mine, the lowest level having proved much poorer; but bearing in mind the past history of this mine, it may reasonably be hoped that lower levels may yet prove better.

At Kalgoorlie developments in most of the great mines have been very satisfactory. The Great Boulder Proprietary is opening out at the 2050-ft. level, and has already shown good bodies of payable ore at that depth. The management intends to carry on the work of sinking the main shaft to 4000 ft. The Golden Horseshoe Corporation main shaft is down to 1534 ft.; the mine continues to look well at all points.

Altogether, the position here is very much improved, and though all the companies have found it necessary to reduce the grade of ore treated, the continual addition to ore-treatment plants and consequent reduction of working costs now enable all bodies of ore to be used at a profit, and has undoubtedly greatly lengthened the life of the mines. There is also no reason to doubt that future developments will prove the lodes at much greater depths.

The continued high price of copper promises to make that metal a leading production of this State. At Phillips river work is being pushed, and as soon as the trams and lines to the smelters and the harbor are completed, will greatly increase its output. The old Anaconda mine, at Murrin, has been reopened and is doing well. The new finds near Kalgoorlie and at Mount Monger look promising, while many old mines at Northampton, as well as new finds in the northwest, are opening up well.

General Mining News

Southwestern Coastal Oilfield—Coastal tract figures in all fields range from 78c. to 80c., while pipe-line companies have made another 3c. advance in credit-balance quotations. High prices have restricted consumption to some extent and the January output was 40,000 bbl. larger than the December run, so that the January shortage was about 865,000 bbl., as compared with 1,280,000 bbl. in December. The January gross output of the coastal field was 1,308,000 bbl., of which 406,000 bbl. came from Louisiana. Jennings and other Louisiana fields show a decrease, while all the Texas fields had a slightly increased output. The oil in store has decreased to 7,650,000 bbl., and crude will probably advance again shortly, for the market is strong, and there is no pressure to sell, even at present high prices. Field operations in January were about normal, but the number of failures was in excess of the usual average, there having been 34 dry holes to 61 producers. Both the Texas company and the Gulf Pipe Line Company are stringing 8-in. pipe for their lines to the Tulsa Mid-continent field. The work will be rushed, for refinery stocks are rapidly being depleted and the higher grades of crude are in demand.

The January output and present highest credit-balance prices of the coastal fields are as follows: Batson, 210,000 bbl.; 76c. Saratoga, 190,000 bbl.; 76c. Humble, 195,000 bbl.; 71c. Sour Lake, 170,000 bbl.; 76c. Spindletop, 125,000 bbl.; 78c. Dayton, 12,800 bbl.; 73c. Jennings, 400,000 bbl.; 70c. per barrel.

ARIZONA

Golden Idol—The Arizona Mine Supply Company has just shipped to this company a 90-horse-power gas engine to be installed in its mill at Cherry. A large amount of ore has been taken out and is awaiting the completion of the mill. The ore is gold and free milling.

[illegible]—These two mines at McCabe are employing 180 men and are sending three cars of ore to the smelter at Humboldt each day besides supplying the mill with 60 tons. New development work is being vigorously pushed.

New England-Arizona Gold and Copper Company—This company has resumed work after being idle for over two months, on account of delay in receiving machinery. With the new hoisting plant sinking has been resumed and will be continued until the 600-ft. level is reached.

New Year Mine—This mine is being unwatered by Montana parties preparatory to examination. The values are copper and gold; some high-grade ore has been taken from the property.

CALIFORNIA

Amador County

Keystone—Owing to the breakage of the air compressor at this mine, Amador City, the oldest productive quartz mine in the State, it has been compelled to shut down. A number of the miners have left, being attracted by higher wages for labor elsewhere.

Oneida—In this mine at Jackson they are cross-cutting to strike the orebody at the 2600 levels. Twenty stamps are dropping on low-grade ore.

Bunker Hill Mining Company—This company has increased the monthly dividends from 2 to 3c. per share.

Wildman—This mine at Sutter Creek has been sold at sheriff's sale to J. S. Brownell, of San Francisco. The sale includes other neighboring properties, the Lincoln, Mahoney, and South Mahoney. The company will doubtless redeem the property before the expiration of the legal period.

Butte County

Kentucky Ranch Gold Dredging Company—This company has obtained from L. Gardella a lease for the Kentucky ranch between Honcut and Wyandotte. There are 960 acres, of which 100 are to be dredged.

Calaveras County

Union Gravel—This old mine at Central Hill is being opened by John Nuner, who has cleared out the tunnel and will start development at once.

Kern County

Copper—The 85 claims owned by W. H. Schmidt and R. H. Pigott, at Copper Basin, have been leased to William F. Lay, of New York.

Nevada County

California—This mine at Grass Valley has been unwatered to 250 ft. vertical and development work has commenced under Superintendent A. Hall. New machinery has been provided. The mine has not been worked for some years.

Norambagua—P. Knapp, of Pittsburg, Penn., has taken a bond on this Grass Valley mine, and will organize a company to work it. The mine was profitably worked in early days.

Coldspring—The tunnel of this drift mine on the Harmony ridge, near Nevada City, is now in 150 ft. Superintendent N. B. Gray expects to tap the Harmony channel in 400 ft. more. The new mill is nearly completed.

Conlin—The new 10-stamp mill of this Grass Valley mine will shortly be completed. Operations have been suspended in the mine owing to lack of fuel.

Plumas County

Indian Valley—E. J. Franz has been appointed superintendent of this mine, and is arranging to begin active work upon it.

Seneca Mining and Milling Company—This company has been organized by S. P. Dunn, E. K. Foster and A. C. Wagg, of Los Angeles, and E. and R. R. Dunn, of Seneca, to work the White Lily mine on the North Fork of Feather river. New machinery will be installed the coming summer.

Shasta County

Balaklala Consolidated Copper—The stockholders will meet on March 11 to authorize (1) a change in the par value of the shares from $25 to $10; and (2) to decrease the stock from $10,000,000 to $4,000,000; and on March 12 to authorize an increase in the stock from $4,000,000 to $6,000,000, divided into 600,000 shares of $10 each. If the above changes are authorized, stockholders will be offered for subscription 100,000 shares of the new stock at $10 per share.

Pacific Gold Dredging Company—This company, which owns the dredging rights on 13,500 ft. of the Sacramento river, between Keswick and Coram, has been organized with a capital of $500,000. August Hurst is the general manager of the company, and it will at once construct a suction dredge to mine the river bottom.

Chrome—Three carloads of chrome ore have recently been shipped from the chrome mine, near Castle Crags, owned by L. H. Brown and Charles Dougherty, of Dunsmuir. It brought $15 per ton.

Siskiyou County

Wood Ranch—John C. Wood, of Nolton, has leased the water and pipes of the Minetti mine, and has started mining on his ranch at the mouth of Thompson creek.

Tuolumne County

Sale—L. O. Beamer, of Los Angeles, has deeded to Augusta Johnson, of the same city, all interest in the Jupiter, Lucky Find, Los Angeles quartz mines, situated on the south fork of the Stanislaus river, near Confidence, subject to an option to purchase a half interest given to W. W. Hoyt, which deed is now in escrow.

Yuba County

Strawberry Valley—John Thomas, who has been prospecting in this section for some time, and who has taken out several rich pockets, crosscut a ledge in a tunnel which he had been running and specimens of the rock are full of free gold. The ledge is believed to be the continuation of the old Costar & Daley ledge.

COLORADO

Lake County—Leadville

Evaluator—Two years ago the Evaluator this claim, South Evans gulch, was sunk 400 ft., when work had to be abandoned on account of the heavy inflow of water; three weeks after the shaft was closed down the water had reached the collar. Charles H. Collins secured a favorable lease on the Boulder, White Cloud, Bessie, Bull of the Woods, and Red Cloud, situated partly on the north slope of Breece hill and Big Evans flat; he assigned the lease to K. P. Crawford, of Boston, who guarantees to work the property extensively. To this end a company with plenty of financial backing has been formed, and Timothy Kyle, an experienced miner of Leadville, has been appointed manager. Mr. Kyle has ordered a new plant of machinery, including heavy pumps, to handle the water. The water in the shaft has receded 215 ft., caused no doubt by the sinking of the Mammoth shaft farther down the gulch, so a heavy flow of water is not looked for.

Buckeye—This mine, Fryer hill, is one of the oldest locations on the hill, end lines to the north with the Little Chief, and extends to Big Evans gulch. The property has been worked off and on from the time it was located, but no large body of ore has ever been encountered. At a point 625 ft. from the Little Chief a body of ore was opened, but it only proved to be a pocket. Three months ago lessees took hold of the claim, and started a drift from the 200-ft. mark driving north; after driving about 250 ft. the parting quartzite was encountered and driving on this for 50 ft. a body of sand carbonate, 2 ft. wide, was opened at the latter part of the week; the values of the body run from 57 to 69 per cent. lead, 11 oz. silver, and 0.13 oz. gold per ton. The work done on the orebody since it was cut shows that it promises to be continuous. The ore was caught on the south edge of the gulch, and across the gulch is 243 ft., so it is more than probable the ore shoot will carry itself across the gulch and into Progressive hill. The parting quartzite before the ore was found was on the pitch, but with the ore coming in it flattened out, and future work will prove the ore to be on the blue lime; blue lime and porphyry being the formation that all of the Fryer hill shoots have been found in. Capt. Jenks and Nicholas Finn, two of the oldest miners in the district, have the property.

Little Chief—A surprise was in store for some lessees working at No. 3 shaft last week. They were prospecting in virgin ground at one of the lower levels and ran into a brownish sort of matter that carried considerable moisture; as it was different from anything ever found in the mine but little attention was paid to it. After working on it for several days it was taken from different parts that gave returns of 7 per cent. copper per ton; with more work done the brownish stuff became heavily stained with green. The ore is now being shipped, and the extent of the body is not yet known. The ore was found in the lime, and it is the first time that a body of copper has been opened in the property. At No. 4 shaft at the 1300-ft. level, in the fissure-vein country, copper is found with the gold values, and some chunks of native copper have been taken out.

Little County—Cripple Creek

This is essentially an age of local milling in this district. Quite a number of mills have been recently erected for the treatment of the low-grade oxidized ores by the cyanide process. Among those are the small Homestake mill, which is to be operated under lease by the Ironclad Milling Company, and is doing very good work on ore from its own leased property and some custom ore. The large Homestake mill will also soon be in operation. This will be run partly on ore from the Homestake and partly on custom ore. It will be operated by the Phœnix Leasing and Milling Company. The Isabella Company, on Bull hill, has recently erected a mill on its property, and it is now running steadily on its own ore. The Vindicator has also just completed a mill on its property. The Craig mill, near the town of Anaconda, is running on custom ore. The Wishbone mill, on Spring creek, is handling some custom ore. It is understood that the Little Giant mill, in Pony gulch, will also make a bid for custom ore. Two small mills, at the Home Run and Santa Rita, respectively, are running. A mill on Trail mountain is also understood to be running on its own ore. This proposition has just started, and is still in the trial stage. Other mills are in process of construction, and more are talked about. Apparently the future will show a quantity of ore treated in local mills, put up and owned by the mining companies.

Drainage Tunnel—It now looks as though the drainage tunnel will certainly be constructed. Some work has already been begun, getting affairs in shape for actual driving. The intermediate or Gatch Park project will be the one. This will cut El Paso workings at the depth of between 1300 and 1400 ft. The commencement of work on the tunnel is heralded with delight in this district, as it has been the opinion the past few months that the tunnel would not be built. That the tunnel is fast becoming a necessity for a number of the mines there is no doubt, and it is also beyond question that with the question of pumping eliminated a great amount of ore below water level that cannot now be made to pay can be extracted at a profit. S. S. Bernard, of Colorado Springs, president of El Paso company, is chairman of the drainage committee of the Mine-owners' Association.

W. P. H. Leasing Company—The directors of this company at a recent meeting authorized its manager, A. B. Whitmore, of Cripple Creek, to proceed with the erection of a 100-ton cyanide mill. The property operated by this company consists of a part of the W. P. H. claim and other property on Ironclad hill. Work will be commenced at once.

KENTUCKY

Pike County

Breeding Coal and Coke Company—This company intends to increase its capital stock from $110,000 to $300,000 to make improvements for the additional development of its property in Pike county. Among the betterments which is contemplated to make is a railroad to connect with the main line of the Norfolk & Western Railway. The company owns about 3000 acres of coal lands, which are said to contain two seams of high grade. Officers of the company are Frank A. Harman, president; William Hurt, vice-president; J. R. Gilliam, treasurer; R. O. Horton, secretary, and W. A. Young, assistant secretary. The office is at Edgarton, West Virginia.

LOUISIANA

Caddo Parish

Shreveport—Only one well, Producers Oil Company No. 1, was completed during January. This well is 1400 ft. in depth and is producing 75 bbl. daily. Texla Oil Company No. 1, the other producer in this field, is over 2100 ft. deep. Development is now extending over several square miles, and operators appear confident of obtaining gushers. Many locations have been made and wells are now being drilled by the Guffey Petroleum Company, the Texla Oil Company, Savage-Richardson and the Producers Oil Company.

Calcasieu Parish

Jennings—Nine wells were completed in January, of which five were dry holes and only one was a large producer. Development is at low ebb, only four wells being drilled. The Jennings-Heywood Oil Company wells are now producing over one-third of the product of the field.

MICHIGAN

Houghton County—Copper

Copper Range Consolidated—Diamond drill work on the lands lying west of the Baltic, Champion, and Trimountain mines will be started early in the spring. The diamond-drill crew employed at the Globe property, which is under option to the same company, will be transferred to

work at the Globe is finished, and the ground is in shape for diamond-drill work.

South Range Townsite Company—Diamond-drill explorations have been started. A drill has been rigged up within the village limits of South Range. R. C. Pryor, of Houghton, is in charge of the work.

Globe—Sinking in the shaft on this property, under option to the Copper Range Consolidated, has reached a depth of 210 ft. The work is slow and tedious, but is being carried forward carefully. The shaft is still in clay.

Centennial—Rock shipments to the mill at Grosse Pointe are again normal. Several days' production was lost because of the winter storms which crippled the railroads. As soon as No. 2 shaft goes into commission there will be a considerable increase in production.

Isle Royale—No. 5 shaft has encountered some good copper ground in the last few days. The shaft was bottomed in the Isle Royale lode a couple of weeks ago.

Transportation—Installation of the electrical system to replace steam is nearing completion. A 15-hp motor is being installed in the machine shop, to furnish power for the lathes.

Baltic—The electrical system is being changed from the direct to the alternating current, and several months will be consumed in the work. The direct system will be used in the operation of the locomotives underground.

Quincy—In a decision handed down by the United States circuit court of appeals at Cincinnati the mortar discharge patent issued to Henry C. Krause and Charles H. Krause, and now operated by the Parnall-Krause Machinery Company, was sustained. The suit was brought to restrain use of infringing discharges in the Quincy stamp-mlils on Torch lake.

Keweenaw County—Copper

Adventure—Cutting of the plat at the eighth level of No. 1 shaft is nearing completion. Sinking will be resumed as soon as drill is installed.

Mohawk—Preparations are under way for the installation of an electric generating plant. Electricity will be used for various purposes on surface and in the mine. The work will be partly in the nature of experiment, and drill will determine results as to whether further expansion will come in the use of electricity. There has been considerable improvement in underground conditions lately. As depth is gained, the lode becomes more regular and values improve. The showing at No. 5 shaft is particularly encouraging.

Ontonagon County—Copper

Mass Consolidated—The company will probably start diamond drill explorations in the spring to locate the lode recently opened at the Lake property, and pronounced by experts to be the Baltic. A large portion of the Mass property should carry the outcrop.

Lake Copper Company—This company has opened a lode, believed to be the Baltic, in Section 31, 51-38. A number of cores were extracted from the formation and all show excellent copper values. The lode is wide. Sinking in the shaft on the Knowlton lode has reached a depth of 600 ft. Drifting at that depth is under way east and west and the showing is quite promising.

Adventure—Stephen Prince, chief clerk of this mine, has resigned and on April 1 will assume an important position with one of the United States Steel Corporation's iron mines at Eveleth, Minn. Mr. Prince's successor at the Adventure has not been named.

St. Mary's Mineral Land Company—This concern owns a tract of 480 acres just east of where the Lake company located the Baltic lode, and much of this territory should carry the outcrop of the same formation.

Nonesuch—Mining operations have been discontinued at this property, under option to the Calumet & Hecla, and the temporary stamp will close down. A crew of engineers is still employed, doing some surveying, and diamond-drill work is progressing on contiguous territory controlled by the corporation.

NEVADA

Esmeralda County—Goldfield

Goldfield Consolidated Mines—This company has made public the following statement of results from the Mohawk leases from Aug. 1, 1906, to Jan. 7, 1907, five months:

	Hayes-Monette.	Frances.	Other Leases.
Dry tons ore.....	20,909	6,422	7,466
Gross values....	$2,597,645	$993,508	$483,766
Net values..	2,038,398	784,490	313,538
Royalties.....	458,640	176,510	70,320
Balance.....	$1,579,758	$607,980	$243,218

The total result was 34,797 tons ore; gross values, $4,075,919; net values, $3,135,426; royalties, $705,400; balance, $2,330,957. Some ore remains on the dumps, still to be worked.

Esmeralda County—Tule Canyon

Dredging—The Esmeralda Consolidated Mining Company has been formed in Philadelphia to operate gold mines in the Tule cañon, at a point about 7 miles southeast of Lida. The company's operations will embrace both vein and dredge mining. A large dredge has been built and will be shipped into the country as soon as the roads will permit. This placer ground ranges from 10 to 35 ft. down to bed rock, giving the company a large area of territory to work.

Nye County—Bullfrog

Denver—The rich oreshoot has been cut 50 ft. below the fourth level, proving that it extends from the surface to a vertical depth of 300 ft. It has been prospected at every level and is remarkably uniform in appearance and value. The company has decided to make no efforts at present to sack any of the ore, but to confine attention to continued development operations on the fifth level.

Bullfrog Mining—The main crosscut has been advanced to 825 ft. The country rock continues unchanged. The drift in the Indian Girl claim is improving in appearance.

Shoshone—A further shipment of 50 tons of high-grade ore has gone forward to the Utah smelters. This makes a total shipment of 300 since the opening of the Las Vegas & Tonopah Railroad.

Tramp—It is rumored that John W. Brock and T. Z. Oddie are taking steps to consolidate the Tramps Consolidated, Victor, Spearhead and Little Bennie mines into a large corporation. A good deal of activity has been noticed on the group recently and developments are such as to warrant the belief that there is some truth in the above statement.

Gold Bar—A shipment of 32 tons of ore was sent to Salt Lake during the past week. Developments in the mine are good and should the returns from the shipment be satisfactory further parcels of ore will be sacked and forwarded to the smelters. The pipes for the company's water plant are arriving, and men are being put to work in digging the trenches. Enough water has been developed by sinking to supply the reduction plant the directors contemplate erecting as soon as prospecting work has progressed further.

Venture—The tunnel has been run in a distance of 170 ft. There has been no change in the character of the formation lately. It is proposed to equip the mine with a pneumatic drilling plant.

Nye County—Tonopah

Extension—Regular ore shipments, averaging 350 tons weekly, are going forward to the Salt Lake smelters. The ore is of high grade and the general manager reports there is plenty of it.

West End Consolidated—Owing to the dearth of railroad cars no ore shipments are being made. The management is chiefly directing attention to the sinking of two new shafts which have recently been started. One is designed as a deep working shaft and the other is to prospect the western portion of the company's leases.

Ore Shipments—Ore shipments over the Tonopah Railroad for the week ending Feb. 21 were: Tonopah Company, 1200 tons; Montana Tonopah, 350; Tonopah Midway, 51; Tonopah Belmont, 300; West End, 25; Tonopah Extension, 195;

total from Tonopah, 2121 tons. In addition there were 1309 tons shipped from Goldfield, making 3430 tons [illegible].

NEW MEXICO

Grant County

[illegible] production of the Hearst, Pacific, Kept Woman, and other mines of the company, [illegible] sufficient to keep the 250-ton [illegible] blast furnace, at Silver City, supplied with copper-gold ore. The limestone flux is obtained from the old Chloride mines, and runs 5 to 15 oz. of silver, while iron flux comes from the company's Iron Mountain mine of rich hematite ore. The 200-ton concentrator, adjoining the smelting works, is completed, but is not working steadily, as numerous adjustments were found necessary to obtain the best results on the Pinos Altos ores. There will be three classes of concentrates: an auriferous copper-iron pyrite for the blast furnace, a zinc blende for the spelter makers, and a little galena for the lead smelter.

Rio Arriba County

Rio Chama—A dredging company has been organized to work these placers. The company's ground includes all the river gravels between the Piedra Lumbre and the Canyon de Chama land grants, a distance of 3¼ miles. It has been known for many years that the Rio Chama gravels were auriferous, but the lack of dumping ground, and the fineness of the gold prevented operations. The headquarters of the company are at Albuquerque, with Maynard Gunsul as president, and R. W. Hadden, the Scotch mining engineer, as secretary.

San Miguel County

About 12 miles west of Chapelle station, a 2-ft. vein of solid mica has been discovered by a railroad man and samples show it to be of light brown shade and obtainable in fair-sized sheets. In the same district is a considerable area of sedimentary copper rock, but all efforts to make it profitable have failed. The copper occurs as malachite and chalcocite in quartzitic sandstone, but the values are apt to be spotty and the general average is low. The Blake Mining and Milling Company is the only active one on this belt, and is now engaged in developing enough ore to insure the steady working of its 50-ton mill. The process used is sulphuric acid leaching with steel plates to precipitate the copper.

Socorro County

Mogollon District—Manager Ernest Craig, of the Ernestine Mining Company, has improved the new mill so as to increase its saving and capacity, but enough ore is blocked out in the Last Chance mine to insure an ample ore supply. The old Confidence mine, owned by Colorado people, has been idle for years, but it is now proposed to build a cyanide mill and to reopen the plant. The property has four miles of development work, done in the days when it produced largely by the pan-amalgamation process. The Little Fannie mine is being developed by new drifts, as the old workings are badly caved.

The Mogollon Gold and Copper Company has just struck, in its Charlie group, what appears to be the extension of the rich shoot of the Little Fannie, which averaged $48 a ton across its 12-ft. width. In the next cañon this company owns the Leap Year, with a good record, and the adjoining mine, the Cooney. The latter mine has been developing only during the past two years, and the 100-ton concentrator can now be started as soon as sufficient fuel can be stored. The Enterprise has a small amalgamation mill, but for a satisfactory saving of value, the addition of a cyanide plant is imperative.

Magdalena District—The Kelly mine shipped 27,000 tons of lead-zinc ore in 1906. Since the Tri-bullion Company got back the mine from the lessees on Jan. 1, the shipments have ceased, but development is very active, in the Paschal and Traylor shafts, sinking and drifting, with three eight-hour shifts. The Graphic company is developing four drifts, but shipping very little. It is planning to build a 100-ton concentrator this spring. The new orebody struck in the south drift, from the Waldo adit, has been cut off by a fault, and is probably much smaller than was first supposed.

The driving of the Tip-Top and Treasure adits is the only other important work now in progress. The South Juanita mine, recently leased to Socorro parties, is being equipped with a gasolene hoist at the old shaft.

Elephant Camp—Near the south county line and 12 miles north of Fairview, the Elephant Gold Mines Company, of New York, has slackened its operations, pending the granting of patents on its mine claims and millsite. The main vein extends for over a mile, and has four branches; it is vertical, and where opened it shows a width of 6 to 12 ft. with gold values, in the quartz filling, of $7 a ton.

Estey District—On the east side of the Oscura mountains the Dividend Copper Company, G. M. Boyson, manager, has spent $380,000 on mines, and mill, with no returns. The mill was started last winter, but only obtained 10 tons daily of payable ore, though its capacity was nominally 100 tons. The ore of the region is malachite disseminated in sedimentary rock, and in all but a few bunches is too low grade to be leached in this mill. An adjoining operator, with the same obstacles to overcome, is the Sunflower Company, of which David Sanders is manager.

OREGON

Lane County

Star Consolidated—Active development work is in progress at this property on Martin creek in the Bohemia district. [illegible] property and good ore blocked out. Other improvements consist of a five-stamp mill, wagon road, and flume. It is the intention of the present management to increase the size of the mill as well as put in new concentrating tables. Work at this time consists of crosscutting to the vein known as the Star ledge, and 200 ft. more will strike this ledge at a depth of over 400 ft. The tunnel will strike the ledge at a point directly underneath the rich ore-shoot which was partially mined out by Jennings Brothers before the present management took over the property.

Combination—This property, also on Martin creek, is the scene of active development, under the management of Sherman Clarke. A good vein of ore is exposed at a depth of some 400 ft. and runs high in silver. A concentrator will be brought in as soon as a road is built. Everything thus far has been transported on mule back.

PENNSYLVANIA

Anthracite

Reading Coal Company—This company has completed the buildings of the large breaker at Coal Castle, at the West Pine Knot colliery. Work was commenced this week. It is one of the largest breakers in the anthracite region, and when the developments are completed at the big shaft, the colliery will be one of the largest shippers of anthracite coal.

Delaware, Lackawanna & Western Railroad—This company will reopen the Red Ash slope of the Espy tunnel, near Nanticoke, which has been filled with water for many years. The water is now being removed by means of a bailing tank, operated by electrical power. The mine will yield 200 cars of coal a day.

This company is planning to reopen some old mine workings which have been abandoned, some as long as 40 years ago. At the time, it was thought that no more coal could possibly be worked therefrom. With modern methods, however, it has been demonstrated that there are millions of tons awaiting developments. Mine Foreman John R. James, who has had special experience in working abandoned places for this company, has been assigned the work of making a detailed inspection of all the old workings and reporting the amount of coal which would be obtainable under modern methods of mining.

Lehigh & Wilkes-Barre Coal Company—This company has resumed operations at No. 19 colliery, Wanamie, which had been idle since Feb. 8, owing to the disastrous fire. There were six victims whose bodies were found, but the remains of the seventh are still missing.

[illegible] has completed plans for a new breaker on

the site of the old Girard colliery, near Girardville.

Company—This company is re-timbering the slopes at the Richardson colliery, at Glen Carbon, preparatory to replacing the pumps to pump out the water which has flooded the mine when abandoned in 1902.

Coke

From the annual review published by the Connellsville *Courier* we take the following table, giving the number of ovens and production of coke in the Connellsville and Lower Connellsville districts at five-year intervals from 1880 to 1900, and yearly from that date; the production figures are in short tons:

	No. Ovens	Tons Shipped.
1880	7,211	2,258,500
1885	15,471	3,950,012
1890	19,830	5,164,146
1895	17,047	8,344,148
1900	20,612	10,109,234
1901	21,525	12,400,499
1902	20,500	11,178,540
1903	20,119	11,457,500
1904	20,119	12,457,168
1905	20,812	17,886,426
1906	24,011	19,191,736

According to the *Courier* much speculation has been indulged in as to the unmined acreage of both regions. By some authorities it is placed at 30,000 to 40,000 acres in the Connellsville region and 40,000 to 50,000 acres in the Lower Connellsville region. Others estimate that each region has about 40,000 acres left. It is evident that both districts have some years of active life before them.

SOUTH DAKOTA

Lawrence County

Homestake—The Ellison shaft is being sunk to the 1700-ft. level, and may be continued to the 1750. When the superintendent's report was made, last June, the deepest workings were 1550 ft. and 150 ft. of that had been sunk during the year. The Golden Star and Old Abe shafts will also be sunk to corresponding levels, and the drifts and cross-cuts run to connect these shafts will block out immense amounts of ore.

Hidden Fortune—It is stated that the floating of the authorized bonds of this company is now assured, and that $30,000 is now on hand with which to start development work, and put the mill in operation.

Minnesota Mines—The building for the 200-ton mill is about closed in, and the machinery will be shipped as soon as the building is ready. The plant will have tank capacity sufficient to increase the mill to 300 tons, with but little additional labor. Electric power will be used, and the wet-crushing process. The main shaft is 150 ft. deep, and will be continued to the 200-ft. level. At the 100-ft. level, a cross-cut was run, intersecting two large verticals, 38 and 54 ft. in width. The ore resembles Homestake ore, and carries values from $2.80 to $7 a ton.

Gilt-Edge Maid—This company is installing a tailings stacker, which will convey the tailings in buckets a distance from the mill, and will deposit them where the sluicing water with which they are mixed will carry them off down the gulch. This was necessary, as formerly the tailings accumulated at an inconvenient point.

Rochford-Wyoming Oil Company—At a meeting of the directors, it was decided to resume work at once on this property, 25 miles west of Deadwood. The well, which is nearly 200 ft. deep, will be continued. The directors for the coming year are: Smith Willey, G. P. Billups, E. B. Deffebach, Hiram Davidson, and J. W. Lapp.

Gold Eagle—This company is about to commence operations on its property in False Bottom. It is now advertising for bids for sinking the shaft 100 ft. farther and for running a tunnel for crosscutting the vertical. The present shaft is 60 ft. deep and is all in ore.

Homestake South Extension—This company is about to install some machinery for the purpose of continuing the shaft. The work of drifting on the 300-ft. level will be suspended, and the shaft will be sunk to a further depth. Some stringers of ore have been encountered but the main body has not yet been reached.

Dauntless—Some excellent orebodies have been encountered recently on this group of claims in the Garden City district.

Iron—The sum of $30,000 is to be expended in development work and the installation of machinery. The orebodies on the surface have been fairly opened up, but as yet no deep mining has been done. A working shaft will be sunk to quartzite, and all of the machinery, including compressor and drills, will be operated by electricity.

Dakota—The report of the manager of this company from July 2, 1906, to Jan. 31, 1907, has just been made public. The property is closed down, first, on account of the burning of its hoist, and second, because of the strike of the miners on the company's refusal to grant the eight-hour day. The report shows the receipts during that time, including cash on hand, to be $67,811, and the disbursements, with the exception of $1332 on hand, equaled this amount. Enough ore to run the mill for a year is exposed and carries an average value of from $3.80 to $4. Work will not be resumed unless money is raised by the stockholders to rebuild the hoist, sink the shaft to quartzite, and overhaul the mill.

Homestake—This company recently opened on the 1300-ft. level a cross vein 27 ft. wide and carrying rich values.

TENNESSEE

Franklin County

Cross Creek Coal Company—This company is arranging to make five openings for a daily capacity of from 3000 to 5000 tons of coal. The Nashville, Chattanooga & St. Louis Railway is now preparing to build a spur track two miles long to the mines. The company was organized with a capital stock of $1,000,000 for the purpose of developing 8000 acres of coal land near Sherwood. Its stockholders include Mark Packard, Buffalo, N. Y.; John H. Prendergast, Edgar S. Taylor and S. E. Parsons, New York; F. B. Stewart and L. F. Thompson, Fredonia, Penn.,; W. F. Goodwill and J. A. Hernchey, of Welch, W. Va.

UTAH

Juab County

May Day—The management of this mine has succeeded in obtaining a more favorable contract from the smelters. It is claimed that under present metal market conditions the company will receive around $4 per ton more for its ores in the future than it has in the past.

Yankee Consolidated—Work is progressing in the sinking of the new shaft to 600 ft. depth.

Eureka Hill—Lessees at work in this property are shipping ore to the Salt Lake smelters at the rate of a car per day.

McKinley—There is a movement on foot to consolidate with the General Logan Company. By merging their properties the new corporation would be in possession of an attractive piece of ground adjoining the Bullion Beck.

Victor Consolidated—This company is displaying considerable energy in sinking its main shaft, which is now about 640 ft. down.

Centennial Eureka—This mine, which is operated under the control of the United States Mining Company, is to be equipped with a new shaft-house of steel construction. The material has been ordered. The new compressor is in commission.

Salt Lake County

Markham Gulch Milling—The construction of a concentrating mill by this company is progressing. It will probably be ready for commission in May or June.

Last Chance—This mine, which is owned by the Nevada Utah Mines and Smelters Corporation, will soon have mill facilities again. The old plant has been remodeled and will be ready in March.

Albion—Shipments of crude ore will be inaugurated again about May 1. The mine is at Alta.

Continental Alta—The tramway belonging to this Alta company is out of commission, having been partially destroyed by snowslides.

South Columbus Consolidated—Two ledges carrying high-grade values in copper have been recently opened in this property at Alta. Tony Jacobson, of Salt Lake, is president of the company.

ore of shipping grade has been encountered in the west drift from the main tunnel of this Alta property. In the early history of Alta the old Emma mine was an important producer.

Consolidated Flagstaff—The main tunnel of this Alta property is being driven toward the contact, where ore was extracted extensively nearer the surface in the early 70s.

SUMMIT COUNTY

[illegible] progressing vigorously on the upper levels with occasional shipments noted. Until the Ontario drain tunnel is opened again the management will be greatly handicapped.

Ontario—The management reports that it has been necessary to work around an obstruction in the drain adit by means of a parallel drift. After running ahead for 100 ft., drill holes into the main avenue will determine if it has been passed. The last obstruction is within 600 ft. of Ontario No. 2 shaft. It is believed that there is very little more bad ground between where the men are now working and the shaft referred to, and hopes are entertained that the avenue, which has been closed for practically two years, will soon be opened again.

Daly West—Recent developments made in what is termed the Little Bell fissure have been of a satisfactory character, and the management has been drawing on this portion of the mine quite heavily for shipping ore.

TOOELE COUNTY

Western Utah Copper—Satisfactory developments are reported from this property, which is controlled by parties identified with the management of the Bingham Consolidated. Ore has been recently developed in an east crosscut at 225 ft. depth. The main shaft is down 170 ft. below the tunnel level, and will be continued to 300 ft. before crosscutting will begin. A railroad to connect with the main line of the Western Pacific will be built during the present year. Engineers have already gone over the road and the distance will be about 30 miles.

WASHINGTON

CHELAN COUNTY

Washington Meteor—A body of ore 12 ft. wide and rich in gold is reported. The company will add 20 more stamps to its mill.

FERRY COUNTY

New York people have had an agent in Republic camp, looking over the mines, with reference to bonding the principal ones, claiming that they have no doubt of being able to mine and treat ores with a profit that have a value in gold and silver as low as $5 per ton.

Mountain Boy—In the new tunnel, at 110 ft. in from the portal, a new strike has been unexpectedly made of a blind quartz vein, which assays well in silver and lead.

FERRY COUNTY

[illegible] pany, operating the Winnipeg group of claims, about 12 miles northeast of Republic, is preparing for more extensive operations. The company is installing a dynamo for electric lighting the camp and also the mine. The foundations, of concrete, are in for the installation of a 100-h.p. boiler, a six-drill Leyner air compressor and a 65-h.p. Russell engine. A stringer of quartz, heavy with chalcopyrite and 3 ft. wide, was intersected a few days ago in the Winnipeg tunnel, which is now in 840 ft. It is expected that in a few days a connection will be made with the main shaft upon the tunnel level, when the management expects to be in a position to ship from 100 to 150 tons of ore per day. Manitoba people are chiefly interested in this property.

Oversight Mining and Milling Company—A body of arsenical iron has been uncovered in the Pin Money shaft sufficiently large to justify the laying of 1000 ft. of 2-in. pipe from the compressor house to the shaft, and the substitution of power for hand drills, now in use. The oxidized ore pinched at a depth of about 60 ft., and the arsenical iron came in a few feet deeper. The working force has been increased, and a gasolene hoist has been ordered which is expected to be delivered and installed by March 1. The Pin Money vein is distinct from each of four others on the Oversight group of claims, both in character and value. The arsenical iron has its chief value in gold. The ores of the other veins assay in gold and copper and an excess of iron and about 30 per cent. sulphur. The Pin Money ore will be hauled in wagons to the railway, while the shipment of ore from the other veins will await the construction of a tram between the Oversight property and the railway. The company has been conducting experiments on its oxidized ores, of which there is an immense tonnage in this and neighboring mines, expecting to treat them by cyanidation. Mr. Delbridge, the manager, is arranging to ship several tons to Denver, and if the tests there prove satisfactory, a cyanide plant will be constructed on the ground.

Bortle Copper Gold Company—Owing to the Belcher Mountain train being snowed in, a sleigh road is being constructed from the shaft to a point intersecting the main wagon road, for the haulage of ore to the Lambert railway siding. The company expects to ship to the Granby smelter, at Grand Forks, B. C., several hundred tons of ore, which is said to assay 2 or 3 per cent. copper, and a few dollars per ton in gold. The ore is an iron sulphide and contains an excess of iron.

The forming of a corporation, to be known as the Ore Purchasing and Transportation Company, to construct a tramway for the carrying of low-grade ores from the mines of Belcher mountain and neighborhood to the main railway lines, or possibly to the upper terminal of the Belcher railway, is reported. The necessary rights of way have not yet been acquired.

[illegible] stock 2,000,000 shares, at a par value of $1 each. President, F. Levigne; secretary, A. M. Campbell. Office, 312 Hyde block, Spokane, Wash. This company owns eight claims, with veins assaying in gold, silver and lead from about $100 to $150 per ton. The property is situated in the southern part of Ferry county, about 3½ miles west of the Columbia river, and is opened by two tunnels, aggregating 1400 ft. in length, and a winze down from the upper one 30 ft., giving about 135 ft. of depth on the vein.

KITTITAS COUNTY

Hans Wyncgar Group—Sylvanite has been found in a body of gold-silver ore. This property is in the Swank district, near Meaghersville.

WHITMAN COUNTY

Gold Bug—A shaft is down 300 ft., and drifting has been done on a vein of gold-copper ore on each of three levels. Shipments to the Tacoma smelter await the construction of a spur of the Washington, Idaho & Montana Railway.

Bald Mountain—A drift is being run on a vein of ore which assays well in copper. E. W. Conrad, of Spokane, Wash., is secretary and general manager.

Foreign Mining News

CANADA

ONTARIO—COBALT DISTRICT

Abitibi—Dr. Deadman, manager of the Abitibi Mining Company, Harris township, reports the discovery of a silver vein on the property, which adjoins the Bucknell claim. Considerable development has been done.

Canadian Central—Samples of rich ore taken from an 18-in. smaltite vein on the Nado property owned by this company, near the Edison location on the Montreal river, are stated to assay 902 oz. silver to the ton.

Cobalt Lake Mining Company—On this property, Cobalt, a vein of native silver 8 to 12 in. in width has been discovered on the east side of the right of way included in the company's property. It is believed to be a continuation of the McKinley-Darragh vein. Since the beginning of operations by the company seven veins have been discovered, the ores consisting of niccolite, smaltite and cobalt

operation at two points. Drilling operations on the lake bed will shortly be begun through the ice. A large cabin, containing a boiler, hoist and diamond-drill outfit is placed on a big sled. This is taken out on the ice to the point where the drilling is done. The first part to be prospected is the southern end of the lake, where the Nipissing veins will be sought for.

Nova Scotia—A strike made at the 125-ft. level in this mine, Cobalt, on a vein that has been traced across Peterson lake is stated to disclose higher silver values than hitherto taken from the property.

Silver Queen—Robert A. Bryce, who has had mining experience in the United States and Mexico, succeeds George Leyson as superintendent.

Cobalt Merger—A strike has been made on No. 3 shaft on the Morrison claim, at 35 ft. The vein found is diorite and silver about 6 in. wide. An extension of the Jacobs vein has been discovered on the McCormick location, at a depth of 45 ft. Diamond drilling will be done in the McCormick shaft.

Cobalt Lake—The shaft has reached a depth of 45 ft. Two more veins, one of calcite and the other calcite and smaltite, have been opened up. A new vein was found, Feb. 20, on the shore line on the east side adjoining the Nipissing. It is a 14-in. vein of cobalt-niccolite. Fifty men are at work.

Cobalt Central Mines—The shaft of the Big Pete is down 72 ft., and drifting is being done at this level into 12-in. diabase carrying high silver contents. Two carloads of ore have been taken out. Four shafts on other properties of the company are being put down.

Cobalt-Lake Mining Company—The management has effected an arrangement with the Nipissing Mining Company by which it can sink a shaft on the Nipissing property, which runs along the eastern shore of Cobalt lake. This will be a great advantage, as they can locate the shaft sufficiently far back from the shore to avoid the danger which might result from heavy blasting near the water. The Nipissing company had located its power-house, ore docks, etc., on Cobalt lake property, and the latter consented to allow them to remain in consideration of being permitted to sink shafts on the Nipissing location.

Dufferin Silver Cobalt Company—This company, Cobalt, has done over 1200 ft. of stripping and has uncovered seven veins running on the surface, from 4 to 12 in. in width. A plant has been ordered from the Rand-Jenckes Company, of Sher-

Gillies Timber Limit—Prof. W. G. Miller states that drifting has been carried on for 200 ft. and the vein was found in good condition. Shipments will not be made until a branch of the railway is extended to that point.

Hunter-Cobalt—On this property, located in Cobalt, directly north of the Green-Meehan mine in Bucke township, a shaft has been sunk on a vein of cobalt and calcite to a depth of 40 ft. Another shaft has been put down for 35 ft. at 200 ft. distance from vein No. 1. About 12 men are employed.

Jackpot Cobalt Silver Mining Company—This company, of which John F. Anderson, of Philadelphia, is president, has secured several properties at Cobalt, including one near the Buffalo and Trethewey mines, in which there is an 8-in. vein, which has been traced for 135 ft. Active development work is being undertaken.

Nova Scotia—In this mine, at Cobalt, a slab of almost pure silver has been taken from the drift between No. 1 and No. 3 shafts at the 125-ft. level, and forwarded to Toronto. The drift struck a rich vein that had been worked at the surface.

Ontario Quebec Mining Company—This company, Cobalt, owns two prospects in Bucke township, two miles from Haileyburg. A recent find on one of these claims is reported as assaying 4576 oz. silver to the ton.

Red Rock—Active development work is being carried on on this mine at Cobalt. Shaft No. 14 is being put down on the Green-Meehan vein and drifting has been started at the 60-ft. level. Plans for extensive cross-cutting to tap other veins have been adopted. On vein No. 1 extension the shaft is down 40 ft. A plant is being installed in a central position, from which all the shafts will be worked. Twenty-eight men are now at work, but as soon as the plant is in running order four drills will be put to work and operations will be carried on by double shifts. Shipments will not be made until considerably more development work has been effected and a large body of high-grade ore blocked out.

Silver Queen—The main shaft is now down 150 ft. and several hundred feet of drifting have been done on the 75- and 125-ft. levels. Forty men are steadily employed.

United States Cobalt Company—This company, Cobalt, of which Stafford Higgins is the principal promoter, has 120 acres and is beginning development work on a location adjoining the Nancy Helen. Contracts are let for camp buildings and sinking a shaft.

Ontario—Kent County

While a well was being sunk on lot 21, concession 4 of Romney township, on Feb. 23, the tools suddenly disappeared when a depth of 230 ft. had been reached, and a gush of oil followed, flooding the fields for some distance. The strike is regarded as being the best so far made in this field.

Ontario—Manitou Lake

Laurentian—A carload of machinery now en route to the mine includes a 50-h.p. duplex steam pump, capable of raising 500 gal. water per minute, which will be installed at Crystal lake to supply water to the mine. The existing pipe line, which was frozen up this winter, will be buried below the frost line.

Victory—Managing Director H. D. Alston has left for the Eastern States, where he will purchase a quantity of machinery for development operations.

Quebec

Bell's Asbestos Company—The ownership of this company, formerly English, has now passed into the hands of a manufacturing company at Ambler, Pennsylvania.

Glasgow & Montreal Asbestos Company—The asbestos properties belonging to this company, and to the Manhattan Asbestos Company, at Black Lake, have recently been sold to H. M. Whitney, of Boston. These properties, which adjoin each other, are considered to contain excellent asbestos ground, but owing to the narrowness of the lots they could never be worked to advantage. Both properties will be operated from one machinery plant, while the number of pits will be limited to one or two. Owing to the limited dumping ground the Manhattan property is equipped with a tramway 3000 ft. long, over which all the waste rock will be hauled as far as Cariboo lake and dumped on waste land. The properties were equipped with both mining and asbestos separation plants, but the present company intends to put up an entirely new equipment. H. M. Whitney owns also the King Brothers' mine, in Thetford, the largest asbestos producer in the country and the American Asbestos Company, at Black lake.

Standard Asbestos Company—This company, operating at Black Lake has disposed of about 300 acres of its asbestos land to an American syndicate and a 100-ton separation plant will be erected shortly on the premises.

Tingwick—Mr Martin, of New York, has taken up the option which he had on an asbestos property in Tingwick, and which he tested by a number of pits, together with a small asbestos refining plant, which he put up on the premises.

EUROPE

Spain

Exports of minerals from Spain for the full year are reported by the *Revista Minera* as follows, in metric tons:

	1905.	1906.	Changes.
Iron ore	8,590,488	9,311,325	I. 720,842
Copper ore	1,017,798	1,139,963	I. 122,165
Zinc ore	132,507	138,969	I. 6,462
Lead ore	5,428	4,582	D. 846
Manganese ore	48,859	89,150	I. 40,291
Pyrites	759,385	1,075,643	I. 316,258
Sulphur	996	658	D. 338
Salt	358,873	439,504	I. 80,631

The exports of metals for the year are reported as below, also in metric tons:

	1905.	1906.	Changes.
Pig and manuf. iron....	69,331	60,040	D. 9,291
Copper.....	10,524	11,288	I. 764
Copper precipitate.....	29,193	21,865	D. 1,328
Zinc.....	1,519	1,546	I. 27
Lead.....	179,321	179,489	I. 168

Imports of chemicals in 1906 included 14,824 tons alkaline carbonates, etc.; 13,774 tons caustic soda and potash, 2443 tons sulphate of soda. Imports of fertilizers included 173,441 tons chemical manures, 100,073 tons phosphate rock and basic slag.

Coal Trade Review

New York, March 6

The situation in the hard and soft-coal markets remains unchanged. The new schedule for anthracite will probably go into effect on April 1, and until then purchasers are holding off, and buying only enough to satisfy their needs. Slow deliveries during the past few weeks have depleted stocks, necessitating prompt deliveries for the present.

Main-line roads have announced an increase in through-freight rates of 5c. per ton, and contracts will shortly be made by the soft-coal operators on this basis.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to Feb. 23 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite.....	784,303	757,620	D. 26,683
Bituminous.....	5,397,915	5,491,444	D. 105,601
Coke.....	1,920,719	2,037,845	I. 117,126
Total.....	8,302,067	8,286,909	D. 15,158

For the first time this year a small decrease in the total is shown. There was, however, one day more in 1906, the reports being made by weeks. The average daily tonnage was 150,947 in 1906 and 153,461 in 1907, a gain of 2514 tons.

New York March 5

ANTHRACITE

The market is strong, and there is quite a little business doing, although no large contracts are being made; this is natural in consideration of the fact that the new schedule will take effect in about a month. Car supply seems to have improved during the past week, and it is reported that shippers are receiving from 70 to 80 per cent. of their requirements. Local dealers are still active, but are now able to fill their orders with more promptness than during a week ago. Prices remain unchanged at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are quoted nominally at $3 for pea, $2.25@2.50 for buckwheat, $1.50 for rice, $1.40 for barley; all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade is inclined to be quiet, and there seems to be a general cleaning up on old contracts. Reports are current that main-line roads have issued a notice to the effect that there would be a general advance in freight rates, with a few minor exceptions, of 5c. per ton to take effect May 1. The naming of prices for the coming year should be both encouraging from the operators in a short time.

Trade in the far East shows a few orders upon old contracts coming forward to deep-water ports, while there are quite a number of orders to shoal-water ports, coming into the market for shipment as soon as ice conditions permit. There seems to be a fairly steady demand for the Sound, it being noticeable that at the first sign of an shortage prompt shipments are urged.

The New York harbor trade is quiet; fair grades of steam coal can be bought for $2.70 per ton, f.o.b. New York harbor shipping ports. All rail trade shows a good demand with prices fairly strong. Transportation from mine to sale is a little slow and irregular. Car supply is slightly shorter than last week.

In the coastwise-vessel market there seems to be a sufficient number of vessels to take care of the demand.

Freight rates from Philadelphia, on large vessels, are quoted at $1@1.05 and discharge, to Boston, Salem and Portland, loading and discharging clause included.

Birmingham March 4

There is a larger production of coal in Alabama at present than has been noted for four months. There is no falling off in the demand, for every ton mined is in demand. Good prices have prevailed. The Southern Railway has placed a car-distributing agent in Birmingham, and considerable difference is already felt in this district. The completion of the North Alabama railroad extension (Louisville & Nashville) from Banner to a point near the Walker county line, in the western part of Jefferson county, will mean an increased production of coal; the Pratt Consolidated Coal Company alone expects to improve its output from 10,000 to 20,000 tons a day.

A revision of the figures of the coal output in Alabama during the year 1906, compiled by State Mine Inspector Gray, shows 12,771,775 tons of coal mined with two mines in Walker and Tuskaloosa counties to be heard from and Jackson county not reporting at all. In 1905 the production was 11,900,153 tons. The figures in hand, by counties, are given out as follows: Bibb county, 122,534 tons; Blount, 159,963; Cullman, 115,607; DeKalb, 32,834; Etowah, 130,000; Jefferson, 6,629,293; Marion, 60,895; Shelby, 176,660; St. Clair, 219,478; Tuskaloosa, 1,041,192; Walker, 2,972,197; Winston, 10,363; total, 12,771,775 tons.

Operators and miners have been arguing before committees of the legislature now in session in this State, in regard to an improved mining law. Provisions are made in the bill for liabilities on the part of the corporations, two openings, better ventilation, timber for propping purposes, cleaning out of dust in dust mines, etc.

Chicago March 4

Weakness of prices and small demand for coal in the open market are the chief features of the local wholesale coal business. The demand for eastern coals is somewhat better than for months, but is due to short supplies rather than large demand. Until the spring trade has been well established the market generally will be in an unsettled condition. Contract shipments for manufacturing and commercial use are large, of course, but the open market continues to be affected with the difficulty of disposing of coal on track promptly enough to relieve demurrage.

Illinois and Indiana run-of-mine is most in demand of western coals, prepared sizes and screenings being weak. Prices are 10@20c. lower than last week. Lump and egg sell for $1.75@2.50, run of mine for $1.65@2.15 and screenings for $1.20@1.50.

Smokeless run-of-mine continues the strongest of eastern coals, bringing $3.10 with a short supply due apparently to transportation troubles. Hocking is not in large demand and has sold for $3@3.25 in the last week. Youghiogheny brings $3@3.20, with the market generally weak. Pittsburg is $2.80@3.00 for three-quarter inch No. 8, and is in good supply. The demand for anthracite is chiefly in small orders with chestnut greatly in demand as compared with the supply.

Pittsburg March 5

Prices have stiffened considerably during the week and a number of important sales were made on a basis of $1.25 for mine-run coal at the mine. The absolute minimum is $1.15. The mines are running fairly well, but cars are not as plentiful as a week ago. The rivers are navigable this week and yesterday and today large tows were sent out. It is estimated that the total shipment of coal to Southern ports will reach 4,000,000 bushels. A number of tows of empty coal boats and barges came in and there is a good supply at the mines.

Connellsville Coke—For spot shipment coke prices are a trifle easier, but it is almost impossible to make contracts for deliveries extending through the year at less than $3.10 for furnace coke. Furnace coke for spot is quoted at $3.40@3.50 and foundry is quoted at $3.75@3.85. The Courier gives the production for the week in the Connellsville region at 282,412 tons and in the Lower Connellsville region at 128,112 tons, a total of 411,543 tons. The shipments aggregated 14,594 cars, distributed as follows: To Pittsburg, 4880; to points west of Connellsville, 8656 cars; to points east of Connellsville, 1058 cars.

Foreign Coal Trade

March 6

Imports of fuel into Spain for the year 1906 were 2,101,206 metric tons of coal, a decrease of 15,192 tons; 231,090 tons of coke, a decrease of 85,802 tons.

Shipments of Nova Scotia coal in January were as follows:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The Dominion and Acadia companies showed considerable losses; all the others [illegible] the month.

Iron Trade Review

New York, March 6

The pig-iron market remains firm but sales are reported light throughout the West. Consumers are not anxious to buy too far ahead, fearing a break in prices. Advices from Chicago indicate a weakening in Southern iron, although agents deny these reports.

Finished steel material shows considerable strength at good prices. The United States Steel Corporation has been an active buyer and there has been much activity among all producers.

Baltimore

March 5

Imports of spiegeleisen at this port for the week were 1725 tons; of silicon-spiegel, 150 tons; of ferro-manganese, 1947 tons; of ferro-silicon, 150 tons. Imports of iron ore were 8780 tons from Cuba and of pig iron, 2300 tons from England.

The exports included 89 tons of wire; 708 tons of copper in bars, cakes and in got bars; 78,170 lb. of nails; 120 tons of pipe and galvanized iron.

Birmingham

March 4

Much strength is to be seen on all sides. Not only is there a good inquiry for iron, but some large sales are being recorded. The railroads have again postponed the advance in freight rates from the Southern territory to the Ohio river for 30 days. Car distributers have been named by some of the larger railroads in this section and it is expected that the present month will see a larger amount of iron and kindred products moved out than during any one month in more than half a year. An estimate of the amount of accumulated iron and cast-iron pipe on the yards in this [illegible] on March 1 [illegible]

There has been no improvement in the make in this State recently. The Sloss-Sheffield Steel and Iron company will blow in one of their furnaces in the Florence district.

Quotations for iron in Alabama are firm. No. 2 foundry delivery at any time after the second quarter of the year is not selling under $18.50 per ton. A rumor that some of the smaller companies in this district were offering the product at $18 per ton on cars cannot be verified. Nineteen dollars per ton for No. 2 foundry, delivery during the second half of the year, [illegible] to be the most popular quotation.

Chicago

March 4

The pig-iron market continues without important change, though indications are that the Southern situation is weakening. Reports are current that $18 Birmingham is the price at which considerable Southern is being sold for the second half, though agents assert that $18.50 Birmingham ($22.60 Chicago) is the general contract price. Users of iron appear still to be in the waiting mood, and quick-delivery lots are the main business of the market. Northern iron is fairly steady at $23.50 @24 for No. 2 deliveries in the second half. The second postponement of the 25c. advance in the freight rate on Southern iron, from March 1 to April 1, strengthens the belief of melters that the Southern situation is not so strong as it has been, and that stocks in the Southern yards are so large as to encourage bear tendencies.

Coke is in active demand for quick deliveries, with a sluggish market as regards contracts for the future, and Connellsville 72-hour selling for $6.65.

Philadelphia

Mar. 6

Pig Iron—The recent rather hostile developments look exceedingly threatening, but it is impossible to predict or infer what might be likely to happen. The demand for pig iron may not have turned the corner, but there are some indications to warn those who are trying to get more than legitimate profits. A careful study has developed the belief that a wild rush for iron beyond absolute necessities for three or six months has been checked.

Quotations are less reliable than formerly because some people are frightened. This point should be kept in mind in reading the following quotations: No. 2 X foundry may be quoted at $26.50; standard gray forge, $23.25; basic, $25; low phosphorus, $27; malleable, $26; Middlesbrough No. 3 on dock, $23; Scotch, $25.25; No. 1 X foundry, $25.50. These quotations are for deliveries during the first half, but there are some signs that there will be fewer contracts for delivery for the last half of the year.

Steel—A heavy business is being done quietly in steel. Some concessions are said to have been made, and an intention of advances in steel from Western markets is also announced.

Bar Iron—There is nothing specially [illegible] in bars and a fair retail and [illegible] demand is reported at most centers.

Sheet Iron—A good many large consumers who have been waiting with as little sheet as they felt safe have recently changed their views and have bought heavily.

Plates—Plates are in good demand, but in a smaller way than usual. The smaller buyers are very anxious to get enough iron to cover their contracts as their customers are extremely solicitous. There is no change in prices.

Structural Material—The business appears to have been scattered among the smaller contractors and engineers. There are rumors in railroad circles that big orders are likely to come out in the spring.

Scrap—The only activity is in No. 1 steel; there would be activity in other kinds if it could be had for early delivery, but it seems to be hard to get.

Pittsburg

Mar. 5

The steel market is gaining in strength and pig-iron prices are firmer, although the sales for the week outside of a purchase of 5000 tons by the Carnegie Steel Company were limited to small lots for prompt delivery and did not aggregate more than 600 tons. A number of finishing mills are crippled for want of steel. The United States Steel Corporation has just purchased the entire tonnage of crude steel offered by the New York State Steel Company, which has started its new open-hearth plant at Buffalo. It is known that the steel corporation has made several deals for steel with independent concerns lately, but the transactions are not made public.

As a result of the scarcity the Carnegie Steel Company has not been able to operate its light-rail mill at Braddock to capacity and it has orders on hand that will keep that mill busy until August. Contracts for standard steel rails for steam railroads taken by this company up to March 1 are 4000 tons in excess of the orders booked for all of last year, but the tonnage from trolley roads was 83,000 tons less. The trolley roads, however, are usually slow in placing contracts, but the business is coming; there are now inquiries in the market aggregating over 200,000 tons. The capacity of the Carnegie company for standard steel rails this year will be over 1,000,000 tons.

One of the events in the steel market during the week was the placing of a contract for 2000 tons of sheet bars for delivery in the third quarter at $30 a ton, the minimum price for several months. This is taken as an indication that there is no likelihood of lower prices for finished steel products this year and it seems probable that some lines will be higher unless pig-iron prices can be kept down.

Specifications for plates are in excess of production and premiums offered for prompt shipment range from $4 to $6 a

... With the establishment ... sales of small lots have been made at 2c. The demand for tubular goods, which has been unprecedented, is increasing and it does not seem possible that the mills will be able to take care of the new business. The steel-bar situation is as bad as any of the finished lines and most of the large mills are specified up to July 1. The sheet and tin-plate mills also are filled up to July 1 and large orders are being booked for the third quarter.

Pig Iron—The market for prompt iron was a trifle stronger except for 5000 tons of bessemer bought by the Carnegie Steel Company for March delivery at $22, Valley; other sales totaled about 600 tons. $22.50 to $23 being the price paid for bessemer. Nothing is being done for the second half as consumers appear to have assurance that the price of $21.50, Valley furnaces, established for bessemer iron will be considerably reduced. Late last week a representative of a large independent interest requested an official of the leading steel interest to make an offer for a large tonnage of bessemer iron for the second half, but he declined to enter into negotiations despite the fact that it was intimated that a very low rate would be accepted. It is believed the last-half price asked is about $2 a ton higher than it should be, compared with the prices of finished material. The Carnegie Steel Company for which the Steel Corporation has bought most of the outside iron in the past is operating all of its 53 blast furnaces and two new furnaces at the Carrie group at Rankin will be blown in during the next five or six weeks. The report last week that the corporation was ready to buy 200,000 tons of bessemer iron for last half had no foundation. The monthly average price of bessemer iron for February was $21.93, Valley furnaces, or $22.78, Pittsburg, compared with an average for January of $22.07, or $22.92, Pittsburg. The average for March likely will be less as it will include many sales for future delivery made at considerably lower than prompt-delivery prices. Bessemer iron for spot shipment is quoted at $23, Valley, or 50c. higher than a week ago; but for second quarter $22 and probably less can be done. No. 2 foundry iron for prompt delivery has advanced to $25.85, Pittsburg, and several 100-ton lots were sold at that figure. Gray forge is weak at $21, Valley. The announcement that the Carnegie Steel Company had bought 5000 tons of bessemer iron for prompt shipment from the Bessemer Furnace Association was made late this afternoon. The price is regarded as extremely low for spot iron. The Carnegie Company also bought 10,000 tons of heavy melting scrap at $18.

Steel—Bessenier steel billets are quoted nominally at $29.50 and open hearth at $32. There is a decided scarcity. Plates continue firm at 1.70c. and merchant steel bars at 1.60c., but premiums are readily paid for prompt delivery.

Sheet—There is no material change in the sheet market. The mills are filled up to July 1 and premiums are paid for early shipment. Black sheets are still quoted at the established price of 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-manganese—The market has advanced and sales have been made during the past few days at $76, Pittsburg, for prompt delivery.

Metal Market

NEW YORK, March 6.

Gold and Silver Exports and Imports.

At all United States Ports in January and year.

Metal.	Exports.	Imports.	Excess.
Gold:			
Jan. 1907...	$2,443,441	$ 3,204,457	Imp. $ 761,016
" 1906 .	5,741,065	2,605,709	Exp. 3,135,356
Year 1907..	2,443,441	3,204,457	Imp. 761,016
" 1906..	5,741,065	2,605,709	Exp. 3,135,356
Silver:			
Jan. 1907...	4,766,874	3,620,888	Exp. 1,145,986
" 1906 ..	7,516,668	4,686,711	" 2,829,957
1907 ..	4,766,874	3,620,888	" 1,145,986
1906 ..	7,516,668	4,686,711	" 2,829,957

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Mar. 2 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 2,956	$ 41,903	$1,456,000	$ 26,665
1907.....	1,413,311	1,574,146	5,815,618	411,168
1906	3,023,379	427,504	14,658,679	345,271
1906.....	29,456,196	758,742	4,758,558	344,579

Imports for the week, both gold and silver, were from the West Indies and Mexico. Exports of gold for the week were to the West Indies; of silver, chiefly to London.

The joint statement of all the banks in the New York Clearing House for the week ending Feb. 23 shows loans, $1,079,185,600, a decrease of $4,274,000; deposits, $1,038,431,800, a decrease of $6,589,600, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie.....	$182,067,500	$184,065,300
Legal tenders.....	74,522,000	74,401,400
Total.....	$256,589,500	$258,466,700
Surplus..	$ 3,118,570	$ 2,667,725

The surplus over legal requirements shows a decrease of $450,925, as compared with the previous week.

Specie holdings of the leading banks of the world in March 2 are reported as below, in dollars:

	Gold.	Silver.	Total.
Asked New York	.....	.....	$184,065,300
England..	$180,648,115	.....	180,648,115
France	527,363,515	$196,966,695	724,330,210
Germany.....	173,280,000	52,760,000	226,040,000
Spain.....	77,060,000	123,065,000	200,125,000
Netherlands ..	27,722,500	29,141,500	56,864,000
Belgium.....	16,530,000	5,235,000	21,765,000
Italy.....	162,340,000	24,712,000	187,052,000
Russia.....	595,420,000	47,045,000	642,465,000
Aust.-Hungary.	232,005,000	61,145,000	293,190,000
Sweden ..	20,540,000	.....	20,540,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Feb. 21:

	1906.	1907.
India	£2,500,000	£1,400,000
China	.....	.....
Straits..	76,300	76,300
Total.....	£2,576,300	D. £1,323,700
	£2,116,910	D. £1,479,090

Receipts for the week were £1800 from Australia, £2200 from New Zealand, £203,000 in bars and £81,000 in Mexican dollars from New York; a total of £288,000. Exports were £1300 to Port Said, £253,500 in bars and £49,000 in Mexican dollars to India; £303,800 in all.

Indian exchange has been steady, the Council bills offered in London being taken at 16.09d. per rupee. There has been considerable buying of silver for the Indian government.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.501	$0.55
Peruvian soles and Chilean.....	0.484	0.49
Victoria sovereigns	4.854	4.87
Twenty francs.....	3.80	3.89
Spanish 25 pesetas...	4.78	4.80

SILVER AND STERLING EXCHANGE.

Feb. Mar.	Sterling Exchange.	Silver, New York, cents.	Silver, London, pence.	March.	Sterling Exchange.	Silver, New York, cents.	Silver, London, Pence.
28	4 84	69	32	4	4 84	69	32
1	4 84 1/2	69 7/8	32 1/8	5	4 84	69	32
2	4 84 1/2	69	32	6	4 84 1/2	69	31 7/8

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

Feb. Mar.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts per lb.	Lead. Cts per lb.	Spelter. New York, Cts per lb.	Spelter. St. Louis, Cts per lb.
28	25	24 3/4				6.85	6.70
1	25 1/4	@25 1/2	105 1/2	42	6.00	@6.90	@6.75
2	25	24				6.85	6.70
3	25 1/4	@25 1/2	103 1/2	42	6.00	@6.90	@6.75
4	25 1/4	24 7/8				6.85	6.70
5	25 1/2	@25 3/4	110	42 1/2	6.00	@6.90	@6.75
6	25 1/4	24				6.85	6.70
	25 1/4	@25 1/2	109 1/2	42	6.00	@6.90	@6.75
	25 1/4	24 7/8				6.85	6.70
	25 1/4	@25 1/2	109 1/2	42	6.00	@6.90	@6.75

London quotations are per long ton (2240 lb.) standard copper which is the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers. Price New York [illegible] of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

which are considerably higher than those ruling heretofore. This has had the effect of raising the level of the general market, but so far business among outside producers does not appear to have been stimulated by the event. There is a little more activity in Europe, and an increased demand from that quarter, but on this est in the market for other grades than Lake. Prices at the close are firm and higher at 25¼@26c. for Lake, and 24⅞@25¼c. for electrolytic in ingots, cakes and wirebars. Casting copper is quoted at .

The bull movement in the London standard market has made further progress and under active dealing the market at one time crossed £110 for spot, £111 for three months'. Since then the tendency has been somewhat reactionary, but the close is steady at £109 5s. for spot, £110 5s. for three months'.

Refined and manufactured sorts we quote: English tough, £114@115; best selected, £116@117; strong sheets, £125@126.

Statistics for the second half of February show a decrease in the visible supplies of 600 tons.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The market has again drifted into a rather listless state. The movement in London is indifferent, and the market has fluctuated within narrow limits, closing without a defined tendency at £190 17s. 6d. for spot, £189 17s. 6d. for three months'.

Business in this market is doing at around 42c. for near-by deliveries.

Statistics for the month of February show a decrease in the visible supplies

Exports of tin from the Straits in February are cabled as follows: United States, 1450; Great Britain, 2640; other Europe, 525; total, 4615 long tons.

Visible stocks of tin on March 1 are reported as follows, in long tons:

	Store.	Afloat.	Total.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The total supply shows a decrease of 273 tons, compared with that reported on Feb. 1.

Lead—The quotation for desilverized 5.02½c., St. Louis. The price of corrodsilverized.

Owing to scarcity of supplies and a heavier inquiry from consumers, the London market advanced, and closes firm at £19 17s. 6d. for Spanish lead, £20 for English lead.

Spelter—A steady business is reported, although the activity has subsided somewhat. The market closes unchanged at 6.85@6.90c. New York; 6.70@6.75c. St. Louis.

The London market has been featureless, and closes nominal at £26 for good ordinaries, and £26 5s. for specials.

Zinc Sheets—The base price is now $8.50 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The market is substantially unchanged. Ordinaries, 23@23½c.; Hallett's, 23½@24¼c.; Cookson's, 24½@25½c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at $38 per oz. for ordinary and $41 per oz. for hard. For good scrap $31.50@32 is paid.

Quicksilver — Current prices in New York are $41 per flask of 75 lb. for large quantities, and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up, over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Imports and Exports of Metals

Copper—Exports of copper from the United States for January are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each:

	1906.	1907.	Changes.
Great Britain	1,409	2,518	I. 1,109
Belgium	277	136	D. 141
France	2,980	3,259	I. 279
Italy	655	947	I. 292
Germany and Holland	6,924	7,013	I. 89
Russia	662	170	D. 492
Other Europe	988	729	D. 259
Canada	152	110	D. 42
China	200		D. 200
Other countries	22	16	D. 6
Total metal	14,279	14,898	I. 619
In ores and matte	770	316	D. 454
Total	15,049	15,214	I. 165

The total increase was 1.1 per cent. The actual quantity of ore and matte imported was 5082 tons, of which 4275 tons came from Canada, 750 tons from Mexico and 57 tons from Germany.

Imports into the United States of copper and copper material for January, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico	3,369	1,022	4,391
Canada	1,076	778	1,854
Great Britain	1,326	.....	1,326
Japan	170	.....	170
South America	191	491	
Other countries	1,788	4	1,792
Total imports	7,669	2,295	9,964
Re-exports	60	.....	60
Net imports	7,609	2,295	9,904
Net imports, 1906	6,299	2,217	8,516

The total increase in the net imports this year was 1388 tons, or 16.3 per cent. The actual tonnage of ores and matte imported from Mexico this year was 4638 tons; from Canada and Newfoundland, 21,946; from South America, 4571 tons.

The exports and the net imports compare as follows:

	1906.	1907.	Changes.
Exports	15,049	15,214	I. 165
Net imports	8,516	9,904	I. 1,388
Excess, exports	6,533	5,310	D. 1,223

This shows for the month a decrease of 18.7 per cent. in the excess of exports.

Lead—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for January, in short tons, of 2000 lb. each:

	1906.	1907.	Changes.
Lead, metallic	1,149	453	D. 696
Lead in ores and base bullion	8,032	4,321	D. 3,711
Total imports	9,181	4,774	D. 4,407
Re-exports	4,159	2,073	D. 2,086
Net imports	5,022	2,701	D. 2,321

Of the imports this year 3943 tons were from Mexico, and 347 tons from Canada. Exports of domestic lead were 21 tons in 1906, and 48 tons in 1907; an increase of 27 tons.

Spelter—Exports of spelter in January were 1188 short tons in 1906, and 98 tons in 1907; a decrease of 1080 tons. Exports of zinc dross were 1497 tons in 1906, and 1412 tons in 1907; a decrease of 85 tons. There were no exports of zinc ore.

Imports of spelter in January were 15 tons in 1906, and 27 tons in 1907; an increase of 12 tons.

Nickel—Imports of nickel ore and matte into the United States in January were 1097 tons in 1906 and 1344 tons, containing 1,614,042 lb. of metal, in 1907. Metal contents were not reported last year.

Exports of nickel, nickel oxide and nickel matte in January were 925,019 lb. in 1906, and 645,834 lb. in 1907; a decrease of 279,185 lb. this year.

[illegible] the United States in January were 1400 lb. in 1906, and 510 lb. in 1907; a decrease [illegible]

[illegible] from the United States in January were [illegible] increase of 2852 lb. this year.

Aluminum—Exports of aluminum from the United States in January were valued at $8205 in 1906, and $44,056 in 1907; an increase of $35,791 this year.

Wisconsin Ore Market

PLATTEVILLE, March 2

For nearly three months past the price of 60 per cent. zinc ore has steadily risen, and the fact that the demand has increased simultaneously with the output indicates a healthy condition, to say the least. Several lots of choice ore sold for $51.50 to $55. Bad roads and not enough cars prevented the loading of all the ore produced. The Empire at Platteville has been waiting all week for cars.

The camps of the district loaded ore for the week ending March 2, as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	130,800	.....	.....
Bonnombe-Hazel Green	441,500	.....	.....
Cuba City	412,640	.....	.....
Linden	299,607	.....	.....
Benton	166,280	.....	.....
Galena	161,000	.....	.....
Rewey	149,000	.....	.....
Harker	66,810	.....	.....
Highland	66,005	.....	.....
Mineral Point	57,500	.....	.....
Total for week	1,817,242	.....	.....
Year to Mar. 2	13,877,719	648,470	96,480

Several mines had ore all ready to load but were unable to get any cars.

Missouri Ore Market

JOPLIN, March 2

The highest price reported paid for zinc concentrate was $53.50 per ton, on an assay basis of $47 to $53 per ton of 60 per cent. zinc. The average price, all grades, was $47.62 per ton.

The highest price reported paid for lead was $86 per ton, a decline in two weeks of $2 per ton. The average price was $83.34.

The highest assay basis price paid for zinc was for concentrate carrying 7 per cent. iron, and this was $2 per ton higher than the highest assay-basis price paid for the choicest ore, with a minimum of iron. This would seem to prove the justice of the claim that the smelters of the United States need no longer deduct $1 per unit for concentrate carrying over 1 per cent. of iron. It would indicate that the line of deductions should be gaged more to correspond to the European scale. One principal cause for the decline in lead prices may be attributed to the inability to move the ore, the St. Louis Smelting and Refining Company having 15 to 20 carloads purchased that cannot be moved for lack of cars. The car shortage, on the other hand, aids in the upward tendency of zinc, because the situation is worse in the West and Southwest, holding back shipments from Colorado and importations from Mexico, and necessitating smelters to get ore in this market that have not bought here for months.

Following are the shipments of the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	1,[illegible]	[illegible]	$145 [illegible]
Joplin	2,187,930	281,[illegible]	61,[illegible]
Galena-Empire	1,214,750	20[illegible]	1[illegible]
Duenweg	729,020	54,[illegible]	[illegible]
Alba-Neck City	616,560	[illegible]	[illegible]
Granby	700,100	[illegible]	12,[illegible]
Baxter Springs	421,870	[illegible]	[illegible]
Aurora	243,080	14,[illegible]	7,874
Prosperity	187,650	35,630	6,083
Oronogo	129,900	62,740	5,915
Spurgeon	70,260	54,500	[illegible]
Carthage	129,240	[illegible]	3,295
Cave Springs	126,320	.....	3,091
Sherwood	33,120	18,470	1,[illegible]
Wentworth	39,870	.....	956
Ash Grove	[illegible]	57,500	1,377
Totals	10,975,970	1,931,910	$341,957
Nine weeks	104,[illegible]	14,[illegible]	$[illegible]
Zinc value, the week, $26,1[illegible]		9 weeks,	$2,[illegible]
Lead value, the week, $[illegible]		9 weeks,	[illegible]

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.58
February	47.37	47.11	February	72.83	84.53
March	42.68	.....	March	73.73	.....
April	44.63	.....	April	75.13	.....
May	40.61	.....	May	78.40	.....
June	43.83	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	43.56	.....	August	75.36	.....
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.10	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Chemicals

NEW YORK, Mar. 6

Copper Sulphate—The demand has increased considerably during the past few weeks and orders for agricultural purposes and for the export trade have been large. This has caused an advance of 10c. to $7.35 per 100 lb. in car-load lots and $7.60 in smaller quantities.

Nitrate of Soda—Supplies of nitrate of soda for spot delivery are extremely scarce in the local market. The situation is one of great strength and prices have advanced during the past few days. European advices state that a very large consumption of nitrate is expected on the Continent, especially in France and Belgium. We quote 95 per cent. for 1907 at $2.45@2.47½ for all positions and 96 per cent. at $2.50@2.52½. For 1908 delivery [illegible] prices are $2.42½@2.47

Mining Stocks

NEW YORK, March 5

The general markets both on the exchange and on the curb were heavy and prices have suffered materially during the past week. Amalgamated has been sold [illegible] Anaconda followed suit, with a substantial loss. Practically all mining and industrial stocks on the New York exchange suffered large losses. The curb was erratic with very low-priced stocks selling fairly strong, but with the higher-priced issues losing a few points during the week. The feature of the week was Nevada-Utah M. & S., which under extensive pressure and advertising advanced from 5⅛ to 8¼, closing at 7½. The majority of stocks on the list show a loss rather than a gain.

Boston

There has been little news in this market the past week, and liquidation has been the feature. Stocks are anywhere from $2 to $10 below the prices prevailing a week ago, and through no other agency than forced and bear selling. Wolverine again increased its semi-annual dividend, this time to $10. Even this had been discounted, as the stock touched $200 some weeks ago. The price is now off $6 for the week to $192. LaSalle went down $4.50, touching $21, with recovery to $23. It is thought the price was forced to accommodate accumulation of stock. North Butte, after advancing to $116, broke to $106.87½, and closed weak. Copper Range broke $5, touching $89 today.

Amalgamated has had a steady week of decline, and made its low price at $105.12½ today, a loss of $6.25. Trinity has been less active and has followed the course of other stocks. It is $4.62½ lower than a week ago at $27. Lawson's advertising of Nevada-Utah has drawn attention away from Trinity. Utah has also suffered a loss, touching $66 today, a decline of $4.50. United Copper spurted $6.50 to $76.25, losing less than $1 of its gain. Isle Royale is off $3.50 to $29, Greene $3.12½ to $27.75, and Old Dominion $4.50 to $52.

Shannon is off $2 to $20. U. S. Smelting $2.75 to $59.75, Allouez $3 to $68, Centennial $5.25 to $39, Arcadian $1.75 to $9.75, Mohawk $3.50 to $88.50, Osceola $11 to $160, Tamarack $6.50 to $150, Quincy $8 to $136, Calumet & Hecla $10 to $950, and Calumet & Arizona $15 to $179. Atlantic and Franklin had sharp rallies late last week, the former advancing $5 to $22, and the latter $2.25 to $29.50. Atlantic is back to $17.25 and Franklin to $26. The curb has attracted more attention than the exchange. Nevada-Utah has occupied the center of the stage on tremendous dealings. From $5.50 it rose to $9.50, and went back to $7 today. February was the biggest month the local curb ever had, transactions footing up almost 2,000,000 shares. Raven has also been revived and the price touched $3 Monday. Announcement is made that [illegible]

treasury shares at par, $25. The market

report of the St. Mary's Mineral Land

Colorado Springs

Trading on the local stock exchange has been dull and featureless the entire week. Less than 200,000 shares changed hands in the mines list. The stocks showing any activity were Acacia, El Paso, Gold Dollar, Isabella, Work and Jennie Sample. Prices have remained steady at about the same prices as last week. Work on the drainage tunnel has been started and brokers predict a stronger market in the near future as a result.

STOCK QUOTATIONS

NEW YORK	Mar. 5
Name of Comp.	Clg.
Arosa Mines	1
Ariz. Commercial	1
Atlanta	1
Bonanza Dev.	1
Butte Coalition*	18
Cobalt Contact	1
Colonial Silver	1
Cons. Ariz. Smelting	1
Davis-Daly	13
Dominion Cop.	67
El Paso	1
Foster Cobalt	2
Furnace Creek	1
Giroux Mines	1
Gold Hill	1
Greene Con. Cop.	1
Greene Con. G. & S.	1
Greene Gold-Silver	1
Guanajuato Dev.	1
Hancock	2
McKinley Dar.	1
Mexican	1
Mines Co. of Am.	2
Mitchell Mining	5
Mont. Shos. Con.	12
New Mex. & Ariz.	1
Nipissing Mines	32
Nixon Nev.	1
Old Dominion	1
Silver Queen	2
Stewart	1
Tennessee Copper	49
Tonopah Ext.	1
Tonopah Mining	1
West Columbus	1

INDUSTRIAL	
Am. Agri. Chem. pf.	22
Am. Smelt. & Ref.	1
Am. Smelt. & Ref. pf.	1
Batopilas Mining	
Colo. Fuel & Iron	2
Federal Min. & Sm.	2
Int. Salt	
National Lead	1
National Lead pf.	1
Pittsburg Coal	1
Republic I. & S.	1
Republic I. & S. pf.	1
Sloss-Sheffield	1
Tenn. C. & I.	1
U. S. Coal & Oil	1
U. S. Steel	1
U. S. Steel pf.	1
Va. Car. Chem.	29
Va. Car. Chem. pf.	1

ST. LOUIS	Mar.
Name of Comp.	High.
Adams	
Am. Nettie	
Badger	
Black Rock	
Cent. Oil	60.00
Doe Run	160.00

BOSTON	Mar. 4
Name of Comp.	Clg.
Adventure	5
Allouez	65
Am. Zinc	41
Arcadian	10
Atlantic	17½
Bingham	27
Boston Con.	27
Calumet & Ariz.*	179
Calumet & Hecla	900
Centennial	40
Con. Mercur	.45
Copper Range	89
Daly West	18
Franklin	25
Granby, New	67
Greene-Cananea	27½
Isle Royal	28¾
La Salle	22½
Mass.	8
Michigan	18¼
Mohawk	89
Mont. C. & C.(new)	2
Nevada	16
North Butte	106⅞
Old Colony	
Old Dominion	52
Osceola	160
Parrot	25½
Phoenix	2
Quincy	148
Rh. de Island	½
Santa Fe	4½
Shannon	20
Tamarack	
Trinity	27
United Cop., com.	76
U. S.	14
U. S. Smg. & Ref.	½
U. S. Sm. & Ref. pf.	45
Utah Copper	56
Victoria	9¼
Washington	½
Winona	11
Wolverine	192
Wyandotte	1¾

Ex Div. *Ex Rights.

BOSTON CURB	
Alaska	
Ariz. Com.	27
Butte, Mt.	7
Cananea Cent.	52
East Butte	15¾
Hancock Con.	
Keweenaw	31
Mayflower	1¼
Raven	¼
Shawmut	1
Superior & Pitts.	

LONDON	Mar.
Name of Comp.	High.
Stratton's Ind.	
Camp Bird	1
Esperanza	
Tomboy	
El Oro	
Mexico	
Nacozari	
Oro Bl. & Mex.	
Ariz. Cop., pfd.	1
Ariz. Cop., def.	1

Quoted over 60th Hay Stone & Co., N. Y.

SAN FRANCISCO	Feb. 28
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.40
Best & Belcher	1.50
Caledonia	.55
Challenge	.15
Con. Cal. & Va.	.94
Crown Point	.30
Exchequer	.03
Gould & Curry	.30
Hale & Norcross	.76
Mexican	.85
Ophir	2.70
Overman	.18
Potosi	.16
Savage	.85
Sierra Nevada	.75
Union	.78
Utah	.05
Yellow Jacket	1.05
TONOPAH STOCKS	
Golden Anchor	.31
McNamara	.60
Montana-Pitts. ex	.26
North Star	.36
Rescue	.19
GOLDFIELD STOCKS	
Black Ants	.11
Blue Bull	.52
Columbia Mt.	1.05
Comb. Frac.	5.12
Conqueror	.23
Daisy	.72
Florence	3.25
Frances-Mohawk	1.00
Goldfield Con.	10.12
Grandma	.20
Great Bend	1.10
Red Hills	.28
St. Ives	1.67
BULLFROG STOCKS	
Amethyst	.50
Bonnie Claire	.44
Mayflower Con.	.43
Montgomery Mt.	.30
Original	.21
MANHATTAN STOCKS	
Gold Wedge	
Manhattan Mg.	.14
Pine Nut	.20
Ruby Wonder	
Stray Dog	.39
Yellow Horse	.08

NEVADA	Mar. 6
(Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	16.50
Tonopah Exten.	4.25
Montana Tonop'h	3.75
Belmont	5.12½
Tonopah Midway	2.40
West End Con.	1.60
Jim Butler	1.00
GOLDFIELD STOCKS	
Sandstorm	.65
Kendall	.45
Red Top	1.25
Jumbo	4.25
Goldfield Mining	1.60
Dia'dfield B. B. C.	.45
Atlanta	.54
Mohawk	18.50
Silver Pick.	1.40
Laguna	1.75
BULLFROG STOCKS	
Mont. Shoshone C.	12 37½
Tramps Con.	1.28
Gold Bar	1.24
Bullfrog Mining	.31
Bullfrog Nat. B.	.44
Homestake Con.	1.30
MANHATTAN STOCKS	
Manhattan Con.	.83
Manhat'n Dexter	.30
Jumping Jack	.25
Stray Dog	.37
Indian Camp	.60

COLO. SPRINGS	Mar. 2
Name of Comp.	Clg.
Acacia	12
Black Bell	
C. C. Con.	5½
Dante	5½
Doctor Jack Pot.	1
Elkton	61½
El Paso	56½
Findley	68
Gold Dollar	7½
Gold Sovereign	6⅝
Isabella	20½
Lindell	9½
Jennie Sample	7
Jerry Johnson	
Mary McKinney	67
Pharmacist	
Portland	1 24
Un. Gold Mines	9½
Vindicator	92
Work	19½

New Dividends

Company.	Payable.	Rate.	Amt.
American Coal, Md	Mar. 1	$7.50	$375,000
Butte Coalition	Mar. 15	0.50	500,000
Calumet & Hecla, Mich.	Mar. 22	20.00	2,000,000
Cambria Iron Mg.	pd.	1.00	169,360
Federal Mg. & Smelting	Mar. 15	5.00	300,000
Federal Mg. & Smelt., pfd.	Mar. 15	1.75	210,000
General Chemical	Mar. 1	2.00	148,206
Greene Con. Copper	Mar. 25	0.40	345,600
Greene Gold-Silver, pf.	Mar. 26	0.40	120,000
McKinley-Darragh, Ont.	Mar. 1	0.02	40,000
National Lead, pfd.	Mar. 15	1.75	260,820
North Butte, Mon.	Mar. 24	2.00	400,000
Parrot, Mon.	Mar. 12	0.25	57,462
Quincy Copper	Mar. 11	4.50	486,446
Republic Iron & Steel, pfd.	Apr. 1	3.75	765,634
St. Mary's Mineral Land	Apr. 1	1.00	150,000
Shannon Copper	Mar. 30	0.50	150,000
Sloss-Sheffield, S. & I.	Mar. 1	1.25	93,750
Standard Oil	Mar. 15	15.00	14,700,000
U. S. Red. & Refining	Apr. 1	1.50	59,187
U. S. Steel Corporation	Mar. 30	0.50	2,500,000
U. S. Smelt. Ref. & Mg.	Apr. 1	0.87½	1,312,500
Wolverine Copper	Apr. 1	10.00	600,000

Assessments

Company.	Delinq.	Sale.	Amt.
Butler-Liberal, Utah	Mar. 14	Apr. 1	$0.01
Clark Virginia, Utah	Mar. 5	Mar. 12	0.00½
Etna-King, Cal.	Mar. 10	Apr. 3	0.01½
Exchequer, Nev.	Mar. 4	Mar. 25	0.05
Gt. Copper King, U	Feb. 15	Mar. 10	0.001
Jagged, Utah	Mar. 15	Apr. 1	0.02
Jennie Lind, Cal.	Mar. 21	Mar. 27	0.03
Johnnie, Utah	Feb. 24	Mar. 12	0.02
Lucky Nev.		Apr. 14	0.03
Oro Blanco, Cal.	Feb. 25	Apr. 22	0.03
Quincy, Jr., Idaho			0.10
Sevopo, Nev.	Mar. 14	Apr. 3	0.10
Sierra Nevada	Feb. 25	Mar. 18	0.10
St. George, Utah	Mar. 4	Mar. 25	0.01
St. Joe, Utah	Mar. 28	Apr. 16	0.02
Tetro, Utah	Feb. 6	Mar. 11	0.03
Wabash, Utah	Mar. 12	Apr. 3	0.05
West Century, Utah	Mar. 6	Mar. 23	0.00½

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65 288	68.673	30 113	31.769
February	66.108	68.835	30 464	31.852
March	64.597		29.854	
April	64.765		29.984	
May	66.976		30 968	
June	65.394		30 185	
July	65.105		30.113	
August	65.949		30 529	
September	67.927		31.483	
October	69.523		32.148	
November	70.813		32 671	
December	69.050		32.003	
Year	66.791		30 868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.864	18.116	25.236	78.147	107.356
March	18.361		18.641		81.111	
April	18.375		18.688		84.793	
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.751		83.864	
Septemb'r.	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November.	21.833		22.398		100.270	
December.	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.686	
March	36.662		September	40.516	
April	38.900		October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year.	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16 850	19.828
February	5.464	6.000	16.031	19.531
March	5.350		15.922	
April	5.404		15.959	
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.526	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.811	5.924	6.664	25.844	25.938
March	6.209		6.054		24.563	
April	6.078		5.931		25.781	
May	5.997		5.846		27.000	
June	6.086		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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The Low-grade Copper Deposits at Ely, Nevada

Steam Shovels Will Be Used in Working These Extensive Orebodies. Concentrating and Smelting Works Will Treat 5000 Tons Per Day

BY WILLIAM STARR BULLOCK

Ely, Nevada, which is now attracting such attention throughout the mining field because of the rapid development of its enormous low-grade sulphide deposits, is in White Pine county, not many miles from the Utah line. The town itself lies in the beautiful Steptoe valley at the mouth of Robinson cañon. Throughout the latter, in a belt at present estimated to be approximately 12 miles east and west, an immense porphyry intrusion cuts through the country shale and limestone of the district.

The surface outcrops are badly weathered, and the leached zone seems to extend in depth from 100 to 250 or 275 ft., so far as present workings indicate. Chalcopyrite and chalcocite are the most frequent ores encountered, although bornite, in comparatively small pockets, is more common than in most copper-bearing orebodies.

It is the belief of engineers thoroughly familiar with the district that values will not persist for more than 400 or 500 ft. below the zone of oxidation; but so extensive are the orebodies laterally that they may not be exhausted for generations.

In few cases are the walls of the orebodies clearly defined; and on the borders of the ore zone values are reduced gradually below the limit of pay ore. The formation of the deposits is generally loose, and although timbering is required in nearly all of the workings, the ore is very easily drilled and shot. The cost of operating, after having actually located the ore shoot, should be comparatively low.

The Veteran Workings

To date the best developed properties in the Robinson district are those of the Cumberland Ely Copper Company and the Nevada Consolidated Copper Company. Each of these holdings is considerably over 1000 acres in extent. Four shafts are now down on various portions of the Cumberland Ely ground, and development work is going forward rapidly. The company's Veteran workings are a mine in themselves. Here are found some of the best values in the district, assays from the Manhattan drift, running off from the main tunnel at the 166-ft. level, showing from 5 to 9 per cent. copper and about $2 gold.

At the 360-ft. level of the main shaft drifts have been run for over 500 ft., north and south, and for 175 ft. east and west. Each of these drifts is in ore all the way, and although millions of tons have been blocked out, the extent of the orebody here can only be surmised. It is little more than a year ago since active development work was undertaken on the Veteran, but for the time elapsed this has been one of the most successful propositions in the entire district.

Assay values at the Veteran in its lower workings run from 2½ to 3 per cent. In the Ada and Jupiter shafts of the Cumberland Ely Company values are slightly lower. An average in either of these two mines is hardly above 2¼ per cent. In the Jupiter drifts more or less limestone is encountered, and dikes of leached porphyry are occasionally in evidence. It would seem, therefore, that these workings are still somewhat above the pay ore which in this locality is probably some 500 ft. below the surface.

The "Wedge" shaft, which is now being put down at a point about half a mile from the Jupiter, and midway between it and the Ada shaft, has cut into a good showing of copper sulphides at the 95-ft. level. The collar of the Wedge shaft is several hundred feet lower down in the gulch than the shaft-houses of either the Ada or the Jupiter. It seems probable that the ore-body dips under the hill from the Wedge, in the direction of the other shafts.

SITE FOR SMELTING WORKS, McGILL, NEVADA

Nevada Consolidated

The workings of the Nevada Consolidated are three—the Ruth, the Star Pointer and the Eureka. In June, 1904, J. Parke Channing made a report of the company's holdings, and again in July, 1905, visited the property and examined its development work. At this time he reported an abundance of ore, urged the construction of a railroad to connect Ely with the Southern Pacific system, 140 miles to the north, and suggested the installation of a concentrating and smelting plant capable of treating 1000 tons of ore per day.

Today the railroad from Ely to Cobre, on the Southern Pacific, is an established fact. The Nevada Consolidated properties have, according to estimates more

[illegible] and smelting plant with a daily capacity of 10,000 tons [illegible]

[illegible] Railroad

The railroad runs all its way through Steptoe valley, which is almost as level as a billiard table, and varies from seven to ten miles in width between imposing mountain ranges. Throughout its entire length, there is neither cut, fill nor trestle of any magnitude, and little ballasting was necessary. The line is being rapidly pushed forward west of Ely through the Robinson cañon to connect with the mines. Here some tunneling and considerable filling is necessary. Taken as a whole, however, the Nevada Northern is built on one of the best natural roadbeds of the entire West.

Already the road is bringing in large quantities of supplies, machinery and equipment for the mines, and for the new city which is rapidly coming into existence. Within two months the Western Pacific will tap the Nevada Northern, and establish a through Pullman service from Salt Lake City. The Clark lines are pushing east from Goldfield and Tonopah, with Ely as an objective point, and still another line is being surveyed from the South.

[illegible]

Probably never before in the entire history of mining in the United States have such large sums of money been put in the work of development and preparation in so limited a period, as is the case in Ely. Some of the largest financial interests in the East are putting millions of dollars into the work of development of the Nevada Consolidated and the Cumberland Ely mines, the Nevada Northern Railroad and the mammoth concentrating and smelting plant, all of which properties are jointly owned by the two companies instanced. Millions more are waiting investment here as soon as the opportunity offers. The proposition is really commercial, rather than mining, in many of its aspects, for there is no question of ore. It is simply a question of the difference between the cost of mining and smelting and the market value.

Steam Shovel Mining

When the railroad is completed up the gulch to Copper Flat, daylight mining by means of steam shovels will be undertaken at the Eureka mine of the Nevada Consolidated on a very extensive scale. Over 3000 ft. of drifts and tunnels have developed "ore in sight" on the Eureka property. By the use of a battery of ten-ton steam shovels the mountain side can be torn away at a rate which will make the 80,000-ton ore dump of the Eureka look insignificant by comparison. Very probably better results from steam-shovel work can be obtained in the Ely district than at the Utah Copper Company's Bingham mine, in Bingham Cañon. The formation here, although in many ways similar, is easier to work.

RUTH ORE DUMP AND SHAFT HOUSE

The Ruth Mine

The Ruth mine is well developed; and its orebody is uniform for hundreds of feet along the main tunnel and in the drifts. The dump here is the largest in the district, and contains over 100,000 tons of ore. The shaft is driven in the hillside at about a 35 per cent. incline, and at the 600-ft. level the main tunnel extends through the orebody for over 2000 ft. Shaft, tunnel and drifts are well timbered. The Ruth tunnel is now being extended toward the Star Pointer mine on the other side of the hill, and will connect with a drift coming in the opposite direction from the 280-ft. station of the Star Pointer shaft. This shaft is the largest mine shaft in the State. It has four compartments and is 25½ by 5½ feet within timbers.

Only about 1200 ft. more of tunneling remains to be done to connect the two shafts. When this is completed, an electric tram system will be installed and the ore on the Ruth dump and from the mine workings will be trammed to the crushing plant, shortly to be installed at the Star Pointer shaft. Drifts from the upper levels of the Ruth have encountered leached ore within 100 or 200 ft. of the station; but the commercial orebody is considerably over 200 ft. in depth, and it will last for many years. Average assay values here are slightly in excess of 2.7 per cent. copper, with traces of gold and silver.

From the hill top between the Ruth and Star Pointer can be seen the shaft-houses of the Eureka, Bunker Hill, Bee Hive,

EUREKA ORE DUMP AND CAMP, COPPER FLAT

Groux and Alpha mines to the west and just over Pilot Knob the Veteran workings. Looking easterly from the same eminence, one notes the Ruth, Jupiter and the Wedge properties. All of these workings are within a belt less than one half a mile wide, north and south, and over six miles from east to west. There seems to be little question that the underlying orebody is practically continuous throughout this belt, and that the great bulk of it contains commercial ore. While this is by no means the extent of the ore zone, it seems to be the most productive section of it which has thus far been developed.

The Smelting Works

The completion of the smelter, the first unit of which will probably be in operation before the end of the year, makes it possible to handle profitably many thousand tons of ore which otherwise would be valueless from a commercial standpoint. The smelter site is 14 miles north of Ely on the eastern slope of Steptoe valley. The natural water supply at hand is amply sufficient to treat over 25,000 tons of ore per day.

In order to avoid complications similar to those which have arisen at Butte and Bingham about the question of smoke nuisance and water pollution, the company purchased over 8000 acres of land. The site is ideal for a reduction plant, and every economy which engineering skill can devise has been considered in the layout of the works.

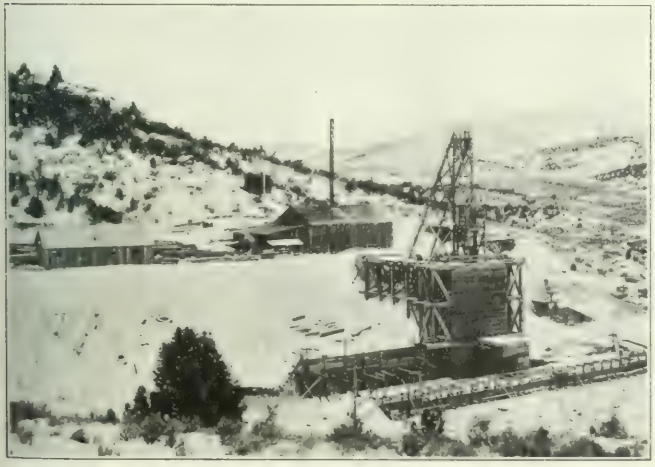
An idea of the ground area covered may be gathered from the fact that the concentrating mill is more than a mile from the smelter, and that $20,000 worth of copper cable for power transmission will be used between the two structures. Over 12 miles of standard railroad tracks will be put down in the smelter yards.

The smokestack is to be 550 ft. in hight, the tallest in the country, and will be 23 ft. inside diameter at the top. The dust chambers between the smelter and the stack are 50x150 ft., and the dust flues 16x19 ft. inside and 1600 ft. in length. The first unit of the power plant will include two 1500-kw. General Electric generators, two 750-kw. Bullock generators, one 60,000-cu.ft. and one 12,000-cu.ft. blower, and one 1000-cu.ft. high-pressure air compressor. In addition there will be eight 400-h.p. Babcock & Wilcox boilers equipped with Sturtevant forced-draft fan blowers. The condensers and air pumps will be on a proportionately extensive scale.

The Concentrating Plant

The first unit of the concentrating plant will include 120 Wilfley tables, 96 Frue vanners, 8 Huntington mills, 6 sets of rolls and 24 trommels. The concentrator, smelter, power plant and all other units of the plant will be so constructed that the capacity can be doubled in the most economical manner. The first unit of the plant will be capable of handling approximately 5000 tons of ore per day, and by the time it is in operation the mines will be in readiness to furnish fully that amount regularly.

VETERAN MINE CAMP, CONSOLIDATED MINES



STAR POINTER SHAFT, NEVADA CONSOLIDATED MINES

The smelter plant will furnish electric power to the mines, 22 miles distant, over a transmission line carrying 40,000 volts.

History of the Camp

Ely has been known as a mining camp for over 40 years. Following the silver excitement at Hamilton, some 50 miles distant, in the early 60's, dozens of prospectors drifted in to Robinson cañon in search of gold and silver. Their methods were crude, they had a constant struggle for existence, and fortunes did not result.

The history of the camp for the next 35 years is rather a disappointment. A few who stuck to the district located fairly good claims and at times the camp seemed prosperous, but values did not hold and so much copper was encountered as to make cyaniding a failure. The existence of the copper deposits here has been known for years, but their extent was never realized until early in the present century. Further than this the ores were mostly of low grade, the question of transportation was an unsolved problem, and it required both time and money to determine the extent and richness of the mineral zone.

Today the orebodies have been explored, transportation established, concentrating and smelting provided for and every economy installed that modern engineering skill could devise. The district is now entering upon an era of prosperity which seems destined to continue for many years to come.

Electrolytic Precipitation of Cyanide Solutions

The Process Perfected at the San Sebastian Mine, San Salvador, Yields Fine Gold and Separates the Copper in a Marketable Form

BY CHARLES P. RICHMOND*

At the San Sebastian mine, located near Santa Rosa, in the republic of Salvador, and belonging to the Butters Salvador Mines, Ltd., of London, an improvement on the Siemens & Halske method of electrical precipitation is successfully used. It is particularly adapted to the very refractory nature of the ore, which is a complex mixture of sulphides, in which at least four distinct minerals have been identified: pyrite; marcasite; a mineral similar to enargite, but containing antimony—determined qualitatively only; copper, 38 per cent.; sulphur, 26 per cent.; arsenic, 9 per cent.; telluride of copper, rickardite; copper, 40 per cent.; tellurium, 56.5 per cent., with silica, sulphur, and antimony present in small quantities.

Silver is present in the ore in very small quantities. Free gold, in the unoxidized zone, is of common occurrence, but the greater part is combined with the telluride and sulphide. Telluride of gold undoubtedly exists, but is so finely disseminated and obscured that absolute identification is lacking. The quantity of copper varies and apparently bears no close relation to the gold content. The amount extracted by cyanide averages from 1.5 to 2.5 lb. av. per ton of ore treated.

Course of Ore Through the Mill

The cycle of the ore from the time it reaches the mill may be briefly given, as follows: Breaking in Blake-Marsden crushers; drying in rotary dryer; crushing in No. 5 Krupp ball mills to 40 mesh; roasting in Jackling furnaces—which reduces the sulphur from 3.5 to 0.25 per cent.; elevation of roasted ore with weak cyanide solution to sand collecting tanks; separation of sand and slime; agitation and filter-box treatment for slime; gravity percolation for sand, and recovery of gold and copper by means of combined electrical and zinc precipitation.

The gold extraction has averaged 95 per cent. during the period of operation, about four years. The only drawback to the process was the poor character of the product obtained for shipment. The gold and incidentally the copper, were precipitated on lead foil cathodes. Cupellation refining was impossible because of the large excess of copper, hence these cathodes were milled, sampled and shipped to the smelters. The average composition of the product was: Gold, 3.73 per cent.; copper, 65 per cent., and the remainder lead from the cathode.

* Mining engineer and metallurgist, Butters Salvador Mines, Ltd., Santa Rosa, Salvador.

The smelters paid nothing for the copper and lead, and only 32s. 6d. per fine oz. for the gold.

Tinned iron cathodes, similar to those in use at the Charles Butters & Co., Ltd., Minas Prietas and Virginia City plants, where the slimy low-grade precipitate is recovered from the bottom of the boxes, had already been tried at this plant, and were discarded in favor of lead foil for two reasons; first, because of the excessive quantity of gold necessary to coat the plates before any values would slime to the bottom; and second, because of the difficulty and loss in scraping off the dense hard deposit of gold and copper.

The Improved Product

It was left to the writer to overcome these objectionable features by obtaining a product on which full value could be realized. This product has been successfully produced and at present the gold, copper and lead are sufficiently separated to bring their respective values.

The gold precipitate, separated from the copper and lead, is melted into bars 750 to 850 fine at a cost of 1 penny per fine ounce of gold. These bars are shipped to the refiners and realize 84s. 11½d. per fine ounce, less a charge of 2 pence per bullion ounce for refining.

The copper is shipped to the smelters as copper cement and brings prevailing prices, also a return for the small amount of gold which it contains.

The lead cathodes, not being destroyed, are returned to the precipitation boxes for further use.

The purpose of this article is to detail how these results are obtained, that they may be intelligently utilized if required. To do this it is necessary to describe first the electric process as improved by Charles Butters and installed at this plant.

Electrical Precipitation

The cyanide solutions first entering the electrical precipitation box contain an average of 16.0 dwt. gold per ton, and flow through at the rate of 150 tons per 24 hours. The box is 30 ft. long 10 ft. wide and 4 ft. 8 in. deep, as shown in Fig. 1, with a bottom slope of 1 in. to the foot. It is divided by weir partitions into twelve compartments, ten of which are used to precipitate, while the last two settle the solution preparatory to entering the zinc boxes. Each compartment contains 25 anodes and 24 cathodes. The anodes are rolled lead plates ⅛ in. thick 22 in. wide and 4 ft. long.

To protect the lead plates from the combined action of the current and the cyanide solution, they are first peroxidized in a solution of permanganate of potassium, with or without the addition of sulphuric acid. Experiments are now being tried with plates peroxidized in the following bath: permanganate of potash, 1 per cent.; sulphuric acid, 2 per cent.; current strength, 2½ amp. per sq.ft.; time under current, 6 hours.

The average life of an anode is from 8 to 12 months. The chemical action which finally destroys them does not appear to result in a dissolving or wasting away of the lead, but apparently is an oxidizing effect by which the lead is slowly converted into peroxide. The final result is complete disintegration. The disintegrated anodes are smelted in a small cupola furnace, and a pair of rolls will soon be installed for making new plates.

For the old lead-foil cathodes previously used have been substituted lead plates of the same size but 1/16 in. in thickness. These cathodes receive no preliminary treatment.

Electrical connection to the plates is made by means of cast-lead lugs to which is soldered the copper wire. They are then inserted in a wooden head and secured with wooden pegs. They hang in the box, 3 in. apart, the extension of the wooden head resting upon two horizontal strips nailed to the sides of the compartments. The 10 compartments are connected in series, the current strength being one amp. per sq.ft. of anode surface, with resistance from 4.0 to 4.5 volts for each compartment.

The gold and copper precipitate on the cathodes, forming a dense hard coating. There is no tendency to slime and the cathodes can be lifted out and handled with little danger of loss. There is a gradual accumulation of low-grade precipitate on the anodes and in the bottom of the box with a gold content of from 5 to 50 oz. per ton. With this one exception all the gold is obtained with the copper on the cathodes.

To complete the electrical connection and allow of the easy removal of the cathodes for refining some device other than soldering was necessary. This requirement was met by placing copper bars 1¼ in. wide and ¼ in. thick along the tops of the box partitions. Brass carriage bolts are cut off at the head and the end screwed into the bar, the threaded end standing upright about 2 in. high. A vertical slot is then cut down to the bottom

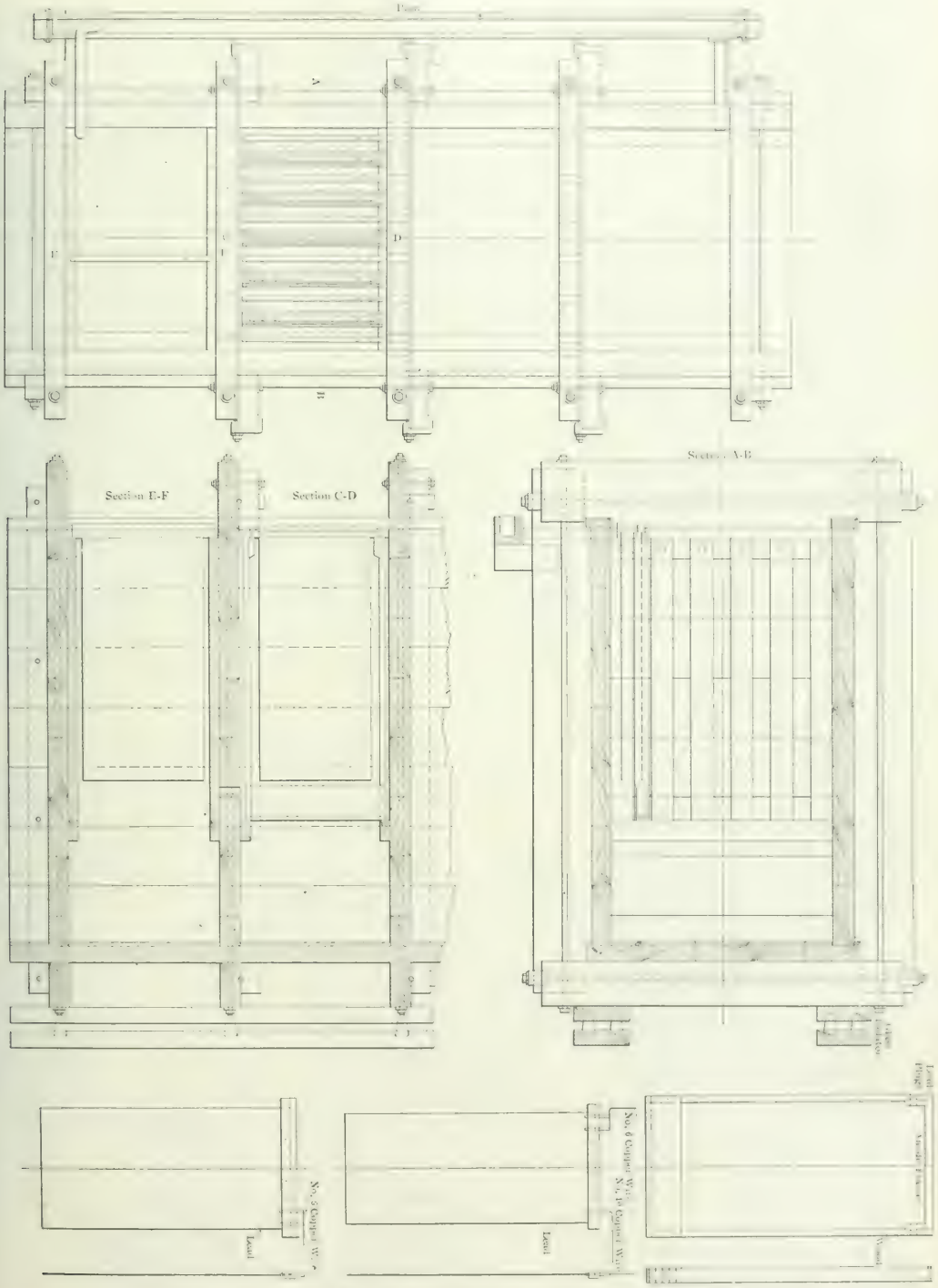


FIG. 1. PLAN AND SECTIONS OF ACID REFINING TANK, WITH DETAILS OF ANODE AND CATHODE

of the threads. The wires from five ments are laid in this slot and a tight connection secured by screwing them down with a butterfly nut. These bolts are spaced 19 in. apart, and six of them connect the cathodes of one compartment to the anodes of the next. It is by this means possible to remove any of the cathodes without interrupting the flow of current or solution.

After passing the electrical section the solution flows direct to the zinc boxes. There are two of these, 22 ft. long, each containing 14 compartments 2 ft.x 1 ft. x 2 ft. deep. Each box receives one-half of the flow. The electrical section extracts from 80 to 90 per cent. of the gold, nearly all the copper that is precipitated and regenerates a high percentage of cyanide. The tail solution from the zinc carries from 0.06 to 0.10 dwt. per ton, giving a total extraction of about 99.5 per cent.

One curious feature is that the tail solutions still carry a high percentage of copper. Table 2 gives in detail for each month the result of a year's precipitation. The variation in the amount of KCN regenerated per lb. of gold and copper precipitated remains unexplained. The amount of copper shown in the table to have been precipitated agrees reasonably closely with the amount recovered and sold.

Electrical Refining

The lead cathodes are allowed to remain in the cyanide electrical box for a period of from 20 to 30 days. In that time they will have increased in weight from 8 to 12 lb., which represents the accumulated deposit. They are then removed and after draining, are placed in an acid box containing dilute sulphuric acid of from 2 to 3 per cent. strength, where their function is reversed to that of an anode. They hang in a wooden frame with closed bottom and open sides, over which is stretched a cotton-cloth sack. The cathodes in this box are lead plates 1/16 in. in thickness.

The box contains four compartments, each holding 5 anodes and 6 cathodes. The distance between plates is 4 in. The compartments are connected in series and receive a current of 450 amp. The average resistance of the box is 8 volts, and the current strength about 5 amp. per sq.ft. of anode surface. As an anode, the copper on the plate dissolves, passes through the cloth side of the frame and precipitates on the cathodes, where it slimes and falls to the bottom of the box. The gold, released from the copper, falls to the bottom of the anode frame.

When the plates are cleaned down to the lead they are lifted out, washed and replaced in the cyanide electrical box to receive a new deposit of gold and copper. The time required to clean a plate varies from 48 to 72 hours, depending upon the weight of deposit it carries.

Two electrical connections are necessary for each anode, one of No. 10 copper wire, which is used when the plate is a cathode in the electrical precipitation box. The other is a No. 6 wire, and is used in the refining box for the heavier current. Both wires are permanently soldered to the lead lugs cast on the plate.

Both the cyanide electrical box and the acid refining box are on the same electric circuit, which does the work of precipitation and refining. Cathodes are first removed from the head of the cyanide box and, as refined, are replaced, thus gradually working down to the end. This requires from 25 to 30 days, and by this time the full. By that time the cloth sacks, weakened by acid, should also be replaced.

At clean-up time the acid solution is siphoned into a storage tank. The anode frames are raised and allowed to drain over the box. They are then placed in an upright position on a washing board over a tank, provided with a filter bottom, and the cloth sack is cut down the sides and removed. The gold slime in the bottom of the frame is washed into the tank, and the frame well scrubbed. The old sacks are washed over the same tank, placed in a dryer and burned. When thoroughly drained the gold slime is removed from the tank, dried and smelted in graphite pots.

The copper slime is flushed through 1½

TABLE 1. RESULT OF A YEAR'S PRECIPITATION.

Month and Year.	Solution Entering Electrical Box. Per Cent Cu.	Solution Entering Electrical Box. Per Cent KCN	Solution Leaving Zinc Boxes. Per Cent Cu.	Solution Leaving Zinc Boxes. Per Cent. KCN.	Lb. Av. of Copper Precipitated.	Lb. Av. of KCN Regenerated.	Fine Oz. of Gold Precipitated.	Ratio of Gold to Copper, Gold = 1.	Lb. of KCN Regenerated per lb. of Copper & Gold Precipitated.	Percentage of Regeneration KCN.
May, 1905	0.093	0.096	0.046	0.102	1,136	401	2,282.5	1 : 7.25	0.31	6.2
June, "	0.065	0.101	0.052	0.105	968	278	2,817.8	1 : 4.07	0.25	3.9
July, "	0.094	0.099	0.070	0.118	1,618	1,464	3,306.3	1 : 7.13	0.71	19.2
August, 1905	0.119	0.087	0.094	0.127	2,196	3,531	3,200.2	1 : 10.00	1.46	46.0
September, 1905	0.102	0.117	0.070	0.152	2,106	2,303	3,228.8	1 : 9.51	0.99	30.0
October, 1905	0.090	0.102	0.053	0.157	2,536	3,770	3,097.7	1 : 11.94	1.37	53.9
November, 1905	0.116	0.103	0.074	0.170	3,051	4,506	3,994.2	1 : 11.21	1.35	65.0
December, 1905	0.105	0.136	0.055	0.164	2,097	1,957	2,102.1	1 : 14.55	0.87	20.6
January, 1906	0.086	0.143	0.063	0.192	1,980	4,191	2,691.0	1 : 10.73	1.93	34.2
February, 1906	0.079	0.163	0.061	0.198	1,965	3,843	3,042.1	1 : 7.27	1.72	21.4
March, 1906	0.088	0.132	0.057	0.166	2,916	3,226	3,923.3	1 : 10.83	1.01	25.7
April, 1906	0.075	0.135	0.047	0.156	1,888	1,483	3,356.4	1 : 8.20	0.70	15.8
Total					24,391	30,953	37,942.4	1 : 9.37	1.14	28.46

TABLE 2. RESULTS OF REFINING.

Date of Clean up.	No. of Cathodes Refined.	Gold Product. Dry Weight of Slime Before Melting in Oz. Troy.	Gold Product. Weight of Gold Bullion Oz. Troy.	Gold Product. Gold Fineness.	Gold Product. Total Fine Oz.	Copper Product. Dry Weight of Copper Slime in Lb. Av.	Copper Product. Oz. of Gold per Ton of 2000 Lb. Av.	Copper Product. Per Cent. of Copper.	Copper Product. Total Fine Oz. Gold.	Copper Product. Total Lb. Av. of Copper.
July 5 to July 25	173	3,495	2,690	794.6	2,137.48	1,541	3.36	84.7	2.58	1,305
July 25 to August 9	136	3,248	2,021	740.4	1,496.33	1,649	2.22	86.0	1.83	1,418
August 9 to Sept. 5	196	5,141	2,568.3	835.9	2,097.01	2,226	1.82	87.0	2.02	1,936
Sept. 25 to Oct. 17	153	6,284	2,486	782.1	1,631.85	1,861	3.72	84.8	3.46	1,578

cathodes at the head of the box are again ready to refine.

To prevent short circuits in the acid box between the cathodes and the cloth sides of the anode frames, it is necessary to circulate the solution, passing alternately up and down the compartments. A lead air injector lifts the solution over the side of one end compartment and discharges into a wooden launder which delivers by gravity into the opposite end of the box. Holes in the partitions direct the flow, and in this way uniform density of solution is secured.

The time between clean-ups varies from 15 to 25 days, depending upon the quantity of copper accumulated in the bottom.

The copper capacity bears a definite ratio to that of the anode frames, where the gold slime accumulates so that when the former is full the latter is about ¾ in. holes bored in the side of each compartment one inch above the bottom. Outside, the stream is diverted by a copper funnel into a cement launder in the floor. This runs outside the building and discharges into a tank with a filter bottom. When drained the copper slime is dried, sampled and boxed. The time required for a clean-up is 7 hours.

As lead, in the presence of a strong oxidizing agent can be readily peroxidized, it would appear that the lead anodes would, after removal of their copper, speedily peroxidize in the presence of the oxygen liberated by the electrolysis of the solution. This action, if long continued, would peroxidize and desintegrate the lead. But the law that the current will follow the line of least resistance, and that that line will be through those anodes which still contain copper, prevents this action from

becoming harmful. The cleaned anodes receive but a small amount of the total current and the polishing effect is small.

Conditions are encouraged whereby but part of the anodes are cleaned off at one time, the remaining anodes serving to protect them until they are removed.

Fig. 2 is a plan of the box showing the anodes in place. The figures are the number of amperes flowing through that anode at the time the reading was taken. Anodes marked with a star are in the finishing stages. There is some loss of current by short circuits seen by comparing the sum of the total amperes of the different compartments.

Table 2 covers a period of over two months' refining and gives, in detail, the value and quantity of the two products obtained. The cost for acid, power, labor, and cloth, amounts to 3 pence per fine ounce of gold refined. The net returns from the copper more than pay all the expenses of acid box refining and melting of gold slime. As the lead cathodes, under the present system, are not de-

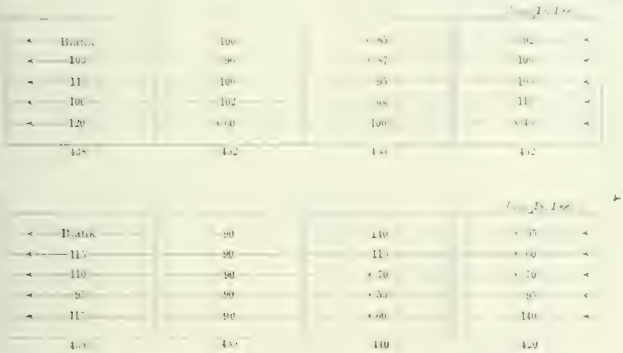


FIG. 2. DIAGRAM OF BOX WITH ANODES IN PLACE.

stroyed, but returned for further use, the saving in lead amounts to about 500 lb. monthly.

With this system of precipitation and refining some of the difficulties encountered in cyaniding cupiferous ores are eliminated. With the constant removal of the copper from the solutions, their extractive power is maintained unimpaired. High cyanide consumption, due to the copper, is partly offset by the regeneration of cyanide in the electrical box, and the receipts for copper recovered in the refining; while the ability to ship a fair grade of bullion eliminates excessive treatment charges.

By kind consent of Charles Butters, and the courtesy of H. P. Garthwaite, resident director of Butters Salvador Mines, Ltd., I am enabled to present this paper.

Although many metallurgists have been interested in this problem, there was very little literature on the subject, and practically all details had to be worked out on the spot.

Hydraulic Mining in California

SPECIAL CORRESPONDENCE.

The Gillett-Englebright bill amending the Camminetti law, or California hydraulic mining law, has passed the House of Representatives. It grants permit to mine without impounding works in localities where no damage can be done, a permit from the California-Debris Commission still being necessary. This bill is intended mainly as a relief to small hydraulickers, and as such will be of great benefit, if finally passed. The area of auriferous gravel exempt from the operations of the present law is located in the northwestern end of the State in the counties of Humboldt, Siskiyou, Trinity and Del Norte. The debris from the mines in those counties dumps into the Klamath river, which has been declared non-navigable and which carries it out into the ocean. The bulk of the gold-bearing gravel area of the State is located in the watersheds of the Sierra Nevada mountains, the rivers of which flow into the Sacramento end of the San Joaquin. It was to protect these rivers and the lands of the Sacramento and the San Joaquin valleys that hydraulic mining was prohibited by decisions of the court, and afterward by the Camminetti law.

The Government and State debris barrier in the Yuba river is to be raised another 8-ft. step, which will make the height 22 feet. This is expected to be the last time that barrier will be raised, and if any additional barriers are needed they will be built a short distance above this one. The spillway built last year is to be made considerably wider, in order to take a larger portion of the flow of the river at all seasons of the year. The contract just let also includes the placing of a large quantity of stone at the foot of the barrier where the water washed the gravel away. The contract price is $151,668, this being over $46,000 less than the next lowest bid received at the offices of [illegible] San Francisco. These barriers are not dams, in the usual sense of the term. They do not hold water, but by checking the force of the current they cause it to drop much of the sand and clay carried along in suspension, and interpose an effective obstacle to gravels rolled along the bottom by the torrential stream. These gravels are the most injurious material that can reach the Sacramento river, as they are too heavy to be carried along by the water, and so tend to lodge and create bars obstructive to navigation.

An interesting feature of these Government barriers across the Yuba is that they rest upon deep deposits of material such as that they were built to impound, and not upon bedrock. This engineering work is purely remedial in character. It was not designed to enable hydraulic mining to be continued or resumed.

Utilization of Oil Shales

A Government publication, issued by the geological survey office, London, treats of the "Oil shales of the Lothians," dealing with (1) the geology of the shale field, (2) methods of working the seams, and (3) the chemistry of the oil-bearing mineral. The workable seams of oil shale in Scotland all occur in the calciferous sandstone series, which has two subdivisions. The upper, known as the oil-shale group, is over 3000 feet in thickness, and contains, in its higher parts, beds of coal usually of inferior quality, and farther down, about six main seams of oil shale, interstratified with beds of sandstone, shale, fire clay, marl, and estuarine limestone. The lower group, in which no oil shales of economic importance have yet been found, consists of white sandstone, and shales, passing downward into gray, green, and red shales, clays, marls, and sandstones, with beds of argillaceous limestone or cement stone.

Good shale can, as a rule, be distinguished by its brown streak, toughness, and resistance to disintegration by the weather. Oil shale resembles hard dry wood or dry leather, and its quality in the field is measured by the degree of facility with which it can be cut and curled up with the edge of a sharp knife. It is free from grittiness, and is often flexible as well as tough.

With reference to the yield of crude oil and sulphate of ammonia the experts have found a remarkable variation in the character of different seams and of the same shale in different places. It seems to be a general law that shales deteriorate with depth. The highest shale in the Scottish series is the richest in crude oil, supplying 130 gal. per ton, but only a few pounds of sulphate of ammonia, while the lowest shale yields only about 80 gal. per ton, but the sulphate of ammonia amounts to 60 lb., or double the amount of ammonia of the highest shales.

The Lead-smelting Works of Port Pirie

The Ores from the Broken Hill Plant Are Smelted and the Bullion Refined and Prepared for the Market

BY GUILLAUME D. DELPRAT*

The lead concentrates from the ore treatment plant at Broken Hill, described in an earlier issue of the JOURNAL, are sent to Port Pirie to the smelters, as also the sintered slimes. Occasionally some carbonate ore is sent down, but the quantity of this is not very large. The concentrates on reaching Port Pirie are discharged into bins and passed through mechanical roasting furnaces of the Ropp type, of which there are five. They are mixed with 14 per cent. of fine shell. 4.5 per cent. of fine iron ore, and 9 per cent. of silicious ore. Each furnace can deal with over 100 tons per day of the mixed material. At the end of each roaster is an iron bin which holds about three tons. The ore is pushed by means of the mechanical rakes into these bins, and from there lowered into 1-ton trucks; these trucks are raised by means of a hydraulic lift to a higher level commanding the Huntington-Heberlein converter pots. The pots are made of cast iron, and can hold about eight tons each; there are 17 of these pots. The ore, when still quite hot, is dumped into the pots in a powdery condition, and a blast turned on at the bottom. An iron hood is lowered on to the pot so as to direct the escaping gas into a large flue. The air blown in oxidizes the remaining sulphur, and the contents of the pot are raised through this to a red heat; the mass fuses together, and after about four hours the pot is tipped, and the partially fused mass falls a hight of 10 ft. on to the floor. On the floor four cast-iron cones are placed; the mass, falling on these cones, breaks up into large sections, and these are further reduced by hand spalling until the pieces are small enough to handle.

On the feed floor we now have: (*a*) the sintered slimes from sintering works, (*b*) the converted material from the "H. H." process, and (*c*) raw concentrates. The ordinary charge fed into the smelting furnaces is made up as follows: Sintered slimes, 1000 lb.; converted concentrates, 2000 lb.; raw concentrates, 200 lb.; old slag, 800 lb.; ironstone, 1050 lb.; limestone, 550 lb.; total ore and flux, 5600 lb.; coke, 840 lb.

It is found that the present style of furnace allows of treating an appreciable quantity of raw lead concentrates, and this is, of course, an advantage, saving on that quantity (about 40 tons per day) the cost of roasting and converting, and the lead and silver loss connected with this.

The charge carries about 17 per cent. of lead; the recovery is about 95 per cent. of lead and 98 per cent. of silver, and practically all the gold.

About 1000 tons of slag are dumped during the 24 hours, of the following composition: SiO_2, 25 per cent.; FeO, 33; MnO, 6; CaO, 12; ZnO, 13; Al_2O_3, 6; S, 3; Pb., 1.5.

The construction of the smelting furnaces differs slightly from the usual type. They are rectangular, measuring 212x62 in. at the tuyeres. The tuyeres, of which there are 11 at each side, instead of having nozzles projecting into the furnace, are flush with the water jackets on the inside. The distance of 62 in. between the sides appeared at first too great for flush tuyeres, but experiments proved that such was not the case, and all the tuyeres are now being gradually replaced with flush tuyeres. Figs. 1 and 2 show a section of a furnace according to the latest construction.

The blast to these furnaces is supplied by eight Green blowers, No. 8, which all discharge into one main pipe 60 in. diameter, from which branches are taken into each furnace. The motive power is supplied by four compound surface-condensing engines, of a total of 1400 h.p. As a rule, only 1150 h.p. of the total available is used, the engine representing the balance being held in reserve in case of accidents or repairs. The total amount of air supplied is approximately 75,000 cu.ft. per min. under a pressure of 30 oz.; this is found sufficient for eight blast furnaces.

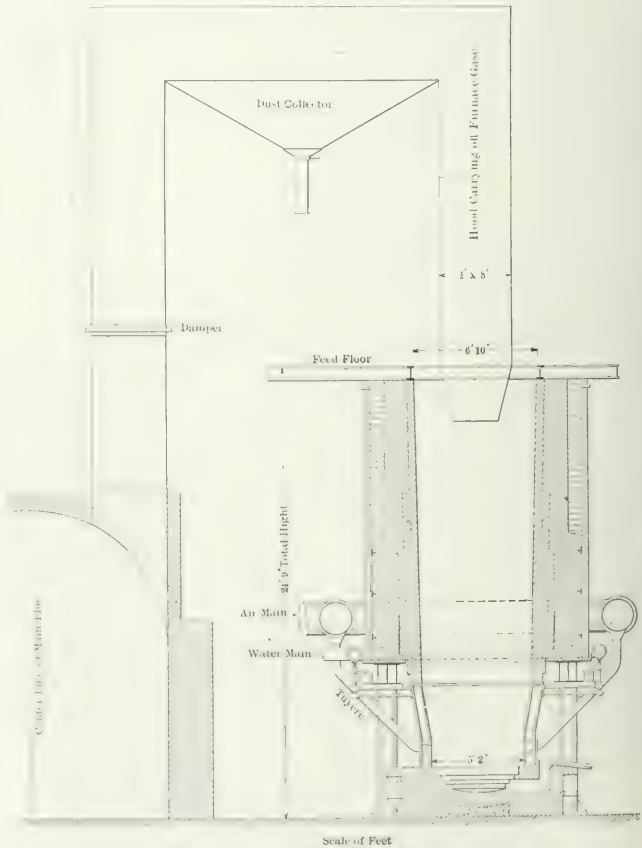


FIG. 1. SECTION OF 120-TON SMELTING FURNACE

*General manager, Broken Hill Proprietary Company, Broken Hill, N. S. W.

A plate-iron hood is placed over the top of the furnaces, and projects about 3 ft. into the furnaces, and, instead of the down-take being arranged below the feed floor, the smoke goes up into the hood and then along a level iron flue with a pocket to trap the flue-dust, and then down again into the main flue, and on to the chimney. The feed is introduced in the space between the hood and the sides of the furnace; it is found that the advantage of these hoods is that wall accretions are very rare, the central draft causing the gas to travel toward the center through the ore instead of going along the walls of the furnace. Barring-down is thus reduced to a minimum. The loss in flue-dust is also greatly reduced, the greater part of the flue-dust falling down again

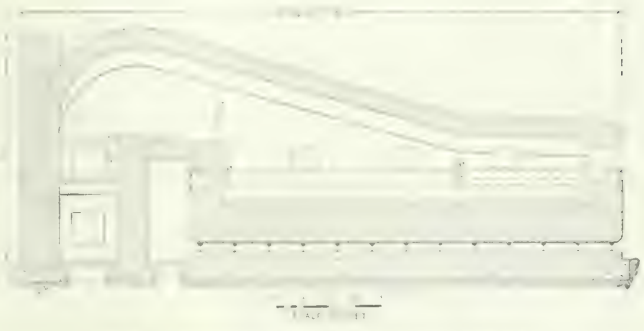


FIG. 3. LONGITUDINAL SECTION OF SOFTENING FURNACE.

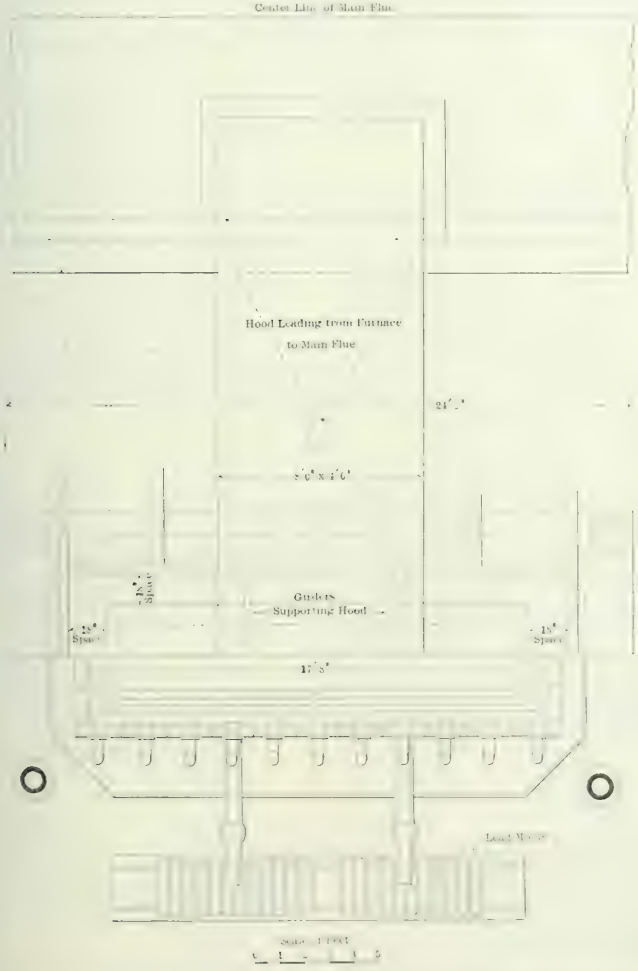


FIG. 2. PLAN OF 120-TON SMELTING FURNACE, SHOWING HALF SECTION THROUGH WATER-JACKETS

into the furnace. Another reason why so little flue-dust is lost is the fact that the quantity of gas going from the furnace into the chimney is practically limited to the amount of air blown into the furnace, while with open tops (the usual construction) a large quantity of air is drawn into the furnace through the open top, increasing the volume of air and gas, which carries away more flue-dust. There are many other advantages connected with the use of the hood—the entire absence of lead fumes on the feed floor certainly not being the least important of all.

At present, out of 13 furnaces, eight are in blast, each producing from 25 to 30 tons of bullion per 24 hours. This bullion is transported to the refinery. In the refinery the first operation is to melt the bullion in a copper-softening furnace of the ordinary construction (see Fig. 3). This furnace holds about 36 tons of bullion. The bullion is melted at a comparatively low temperature, when the dross floats on the surface, containing most of the copper. This scum, or copper dross, is skimmed off. On 36 tons of bullion about 3000 lb. of dross are formed, assaying lead, 77.5 per cent.; copper, 8 per cent.; iron, 1 per cent.; zinc, 1.2 per cent.; sulphur, 4.3 per cent.; arsenic, 0.7 per cent.; antimony, 0.7 per cent.; insoluble, 2.1 per cent.

The operation takes about eight hours. The copper dross is returned to the smelters. The still molten remaining lead is tapped through an iron launder into a second furnace similar to the first, where the temperature is raised, and subsequently cooled, the dross which forms on the surface being skimmed off. This heating and cooling is done twice, and the whole operation takes about 16 hours. This dross assays lead, 74 per cent.; antimony, 10.7 per cent.; arsenic, 1 per cent.

When sufficient quantity of this has accumulated, it is passed into what is called an antimony-dross furnace. This furnace is of similar construction to the two previous furnaces. The dross is mixed with fine coke and fine coal—on every 2800 lb

[illegible] 4,120 lb. [illegible] per 24 hours, or per 12-hour shift. The oxide of lead is reduced to metallic lead, which is tapped off every shift, and returned to the second softening [illegible] The slag assays lead, 55.6 per cent.; antimony, 18.05 per cent.; arsenic, 3.7 per cent.

This slag is now sent to a cupola furnace, where 450 lb. of antimonial slag is mixed with 250 lb. of blast-furnace slag and 100 lb. of coke. This produces an antimonial metal containing lead, 78 per cent.; antimony, 20 per cent.; arsenic, 1.5 per cent. This metal is put on the market. The resulting slag from the operation is generally poor enough to be thrown away.

The copper-softening furnace uses about 2 per cent. of coal per ton of bullion; [illegible] 4 per cent. of coal per ton of bullion; while the antimony-dross furnace takes about 10 [illegible]

The bullion remaining is now free of copper and antimony, and contains all the silver and gold. These two metals are separated from the lead by means of metallic zinc. For this purpose the now purified lead is run into kettles holding about 40 tons. About 200 lb. of zinc are added, in order to combine with the gold. A Howard stirrer (see Fig. 4) is then gently lowered into the molten lead. The molten mass is thoroughly mixed, and allowed to cool down slowly, and the gold-zinc crust which forms on the top is skimmed off and put on one side; this gold alloy is generally too poor to be treated by itself, and is therefore used in the next kettle on a fresh charge of bullion, just as if it were zinc, for extracting the gold, and ultimately a third kettle. This saves zinc and labor. The resulting alloy, called gold skimmings, after being used three times, contains about 200 oz. silver per ton; 6 oz. gold; 10 per cent. zinc; and 80 per cent. lead.

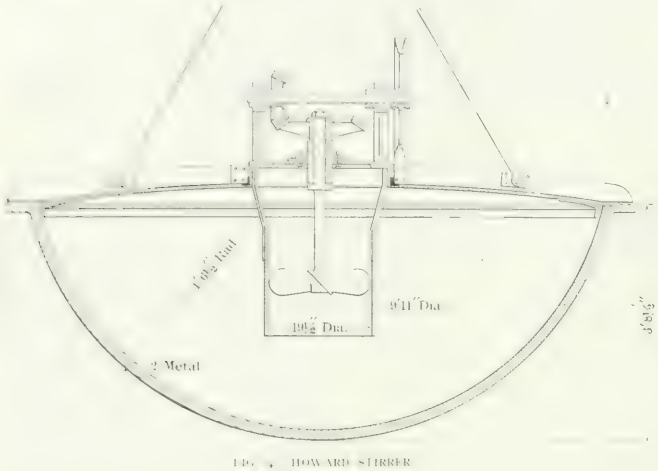


FIG. 4. HOWARD STIRRER

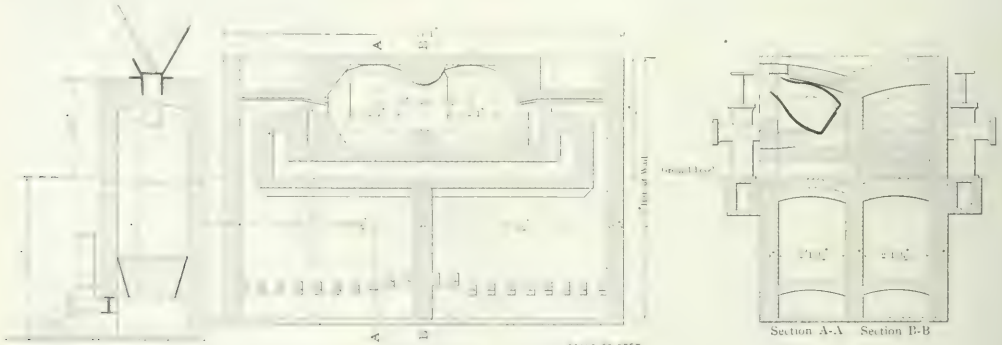
After removal of the first dross, a second quantity of zinc is added (about 750 lb.) and the stirrer again applied. On cooling down a second time, a new scum forms on the surface, containing the zinc and practically all the silver; this scum is raked into the baskets of a Howard press operated by means of compressed air. The molten lead is squeezed out of the zinc-silver alloy through the perforations in the basket. The resulting zinc-silver-lead alloy weighs about one ton, and assays about 3000 oz. silver per ton, about 20 per cent. zinc, about 70 per cent. lead, and goes to the silver department.

The lead in the kettle still contains a little more silver, which is removed by a further admixture of 700 lb. of zinc, which again is stirred and skimmed off as before and treated in the same way as previously, with this difference, that it is not pressed, as this third scum is too poor for the silver department, but is used over again with more zinc for desilverizing the next kettle of bullion. The separation of the gold and silver from the lead requires about 3.4 per cent. of coal for heating.

The lead has now lost all its silver and gold and is drawn off into a refining furnace, where the last traces of zinc are removed by heating and cooling and skimming the dross twice, as previously, consuming 4 per cent. of coal; the pure lead is then run into the market kettle, from where it is drawn off into molds for the market. The assay shows this lead to be about 99.995 per cent. of metallic lead. The dross resulting from this operation goes back to the smelters.

Every 36 tons of bullion put into the refinery produces about 30 tons of market lead direct and some by-products which are ultimately reduced to metal again.

The gold skimmings from the first zinking are now sent to the retort furnace. The retorts are made of plumbago and heated by means of gas. Each retort holds about 10 cwt. of skimmings. It is heated for four hours, during which time the whole mass is melted and some of the zinc distilled off. What remains in the retort is gold bullion and gold dross. The bullion contains about 225 oz. of silver and 7 oz. of gold. The coal consumed is about 15 per cent. The gold bullion is



[illegible] GAS-FIRED RETORT FURNACE

stacked until about 35 tons have accumulated, when it is put in one of the kettles and melted down and drossed. About 15,000 to 20,000 lb. of dross are obtained, containing lead and some copper.

TREATMENT OF DROSS.

This dross is squeezed in the filter press in the same way as the ordinary zinc dross, so as to remove the lead mechanically mixed therein. After this the dross is smelted on a cupel. These cupels are made of four parts of cement and one of sand, and take about half a ton as a charge. The materials resulting from the cupel are a gold concentrate, carrying about 17,000 oz. of silver and 550 oz. of gold, and a slag (mostly litharge) carrying 0.1 oz. of gold and 40 to 50 oz. of silver per ton. The concentrates are passed into another cupel, and are run up to doré bullion, which carries about 30 to 35 oz. of gold per 1000 oz. of silver. This doré bullion goes to the parting plant.

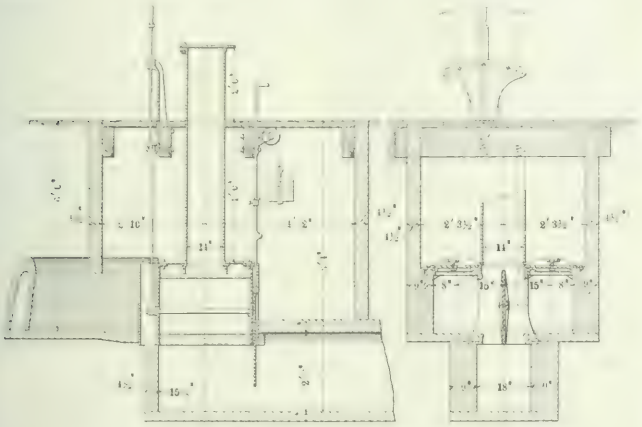


FIG. 6.—AIR VALVES AND FLUES.

It is necessary now to go back to the kettle from which the dross has been removed as described. After the dross has been removed, 700 lb. of zinc is added to complete the gold extraction, and when this is done, desilverization as usual by means of a further addition of zinc is accomplished. This second gold skimming is treated in the same way as the first scum—that is, pressed in the Howard press, retorted, cupeled, and run up to doré bullion. This completes the treatment of the gold skimmings.

SILVER CRUSTS.

Now to follow the silver skimmings (silver crusts). These are heated in plumbago pots in a gas-fired furnace (see Figs. 5 and 6); 12 cwt. constitute one charge, just the same as the gold skimmings. The product from this operation is retort bullion and dross. The retort bullion is about 82 per cent. of the skimmings put in, the dross about 3 per cent., and the balance, which consists of zinc, is distilled over and caught in the form of metallic zinc. The value of this bullion is about 3500 oz. per ton, and this is concentrated on cupels until it contains about 50 per cent. of silver.

After this is done, the rich bullion is brought into the silver yard, an inclosed area where no one is admitted except those working the process. Here the bullion is further concentrated on cupels into crude silver, and this crude silver is remelted with the addition of a little lime, in a perfectly new cupel, which never had any charge before, so as to remove the very last trace of litharge, if there should be any left.

The fineness of the silver now obtained is 998.5. This refined silver is remelted in plumbago pots, 2200 oz. to the charge, and a little copper is added in order to reduce the fineness to 996, which is the fineness of the export bars. The last operation is then to pour the molten contents of the plumbago pots into molds holding about 1020 oz. each. The resulting bars are carefully trimmed, weighed, and marked, and are ready for export. The weekly production is a little over 100,000 oz. of silver. The litharge from all the operations, of course, goes back to the smelters.

PARTING PLANT.

The separation of the gold from the silver is done in the parting plant. Here the doré bullion is dissolved in sulphuric acid in cast-iron kettles placed on a coal fire. Of these kettles there are three in a row. The dissolving takes place in the two outside ones, and the vapors are caught in small lead chambers and condensed back to sulphuric acid. When the silver has been dissolved, the solution of silver sulphate in strong acid is siphoned from the dissolving kettles into cast-iron settling vats, and allowed to remain for a short time to permit any particles of gold which may have been carried over to settle out. The solution is then carefully run off into cast-iron crystallizing tanks placed inside larger tanks so as to allow cold water to be circulated around them. Here the strong liquor is diluted, and the sulphate of silver (although soluble in strong acid, is sparingly soluble in weak) crystallizes out. The crystals are collected on a filter, washed with water, dried, and reduced to metallic silver with coke dust. The mother liquor, weak sulphuric acid, is run into a lead-lined vat, where, by means of a steam coil, it is concentrated, and along with fresh acid is used for dissolving another batch of doré bullion.

The washings from the silver sulphate crystals are run into a vat containing metallic copper, with the result that metallic silver is precipitated, and the copper goes into solution as sulphate. The copper is afterward recovered as metal by the well known reaction with scrap iron. Meanwhile the residue in the two dissolving kettles, consisting of metallic gold with salts of iron and lead, is put into the third kettle and boiled again with fresh sulphuric acid to remove any silver that may have been left undissolved from the previous operation. The residue is then collected and washed with water to remove the silver salt; it is then boiled with hydrochloric acid to take out the iron and lead salts. Finally, it is thoroughly well washed with water, dried, melted, and cast into ingots, which run about 0.992 fine.

Petroleum in Italy

As early as 1893 a French company obtained a concession from the Italian government to explore a certain tract in the Apennines, near Piacenza, and to exploit any deposits of petroleum found there. The success of this company was sufficient to cause the formation of another French syndicate four years ago, and last July these two were absorbed by a Genoese company, with a capital of $3,000,000. The wells already bored are some 95 in number, of which 70 are practically exhausted. The remaining 25 produced about 40,000 bbl. of crude oil in 1905, and with the eight wells now boring it is expected that the total production for 1906 will reach over 65,000 bbl. The concession of the new company comprises about 11,000 acres.

The wells, none of which are gushers, reach a maximum depth of 1300 ft., and the engineers in charge say that those which are exhausted may be made to yield again by deepening. This has not as yet been undertaken, perhaps because by the terms of the grant it is necessary to bore new wells in order to maintain control of the territory. A central motor is used to operate, by cables, the pumps of the various wells.

The British consul at Goa reports that six concerns have commenced mining operations on the manganese deposits of Portuguese India.

The Year 1906 in the Klondike District

The One-man Enterprise is Giving Way to the Large Corporation Plan. In the Mean Time Less Gold is Being Produced

BY J. P. HUTCHINS*

The gold production of Klondike in 1906 was about $5,994,600, or 14.36 per cent. less than that of 1905. This is not surprising, for much ground which would have been worked under normal conditions has been acquired and held during the year for future working when a large corporation and its subsidiary companies shall have completed purchases and installations of machinery for replacing present methods. The year has been one of comparative idleness on the part of many claim owners who expected to be bought out.

Although the snowfall was heavy the thaw was so rapid that the water could not be used so as to produce the best results. There were few winter "lays," or leases, given out, the region being in a buying and selling ferment. A heavy freshet caused considerable damage; one dredge was partly submerged, and a number of cabins and flumes were washed away.

May and parts of August and September had rains, while June and July were very dry. The season was in the main unfavorable for working.

Labor

There was a shortage of labor during the summer when the preparations for future working on a large scale were at their hight. There are no unions in the Klondike, and the only labor difficulty was experienced on work by one who has had many similar troubles elsewhere. Klondike labor is efficient, seemingly as a result of the remarkably stimulating climate. There has been a most pleasant feeling between employer and employee. Wages are still high, 40c. per hour and board in summer; 30c. per hour and board in winter.

The gold production of the Canadian Yukon territory, which includes Klondike and several other districts, is as follows:

Year	Amount
1897	$ [illegible]
1898	[illegible]
1899	[illegible]
1900	[illegible]
1901	[illegible]
1902	[illegible]
1903	12,250,000
1904	[illegible]
1905	7,000,000
1906	[illegible]

This is all placer gold, for there are no gold vein mines in Yukon territory.

*[illegible] 52 Broadway, New York

The White Channel

No discoveries of new deposits or of rich peneplains on the rims of the channels already worked have been made. There is the likelihood of the occurrence of such deposits as secondary benches or terraces on the "back rims" of the "White channel." This "White channel" is what is left of the ancient creek beds; it has a course approximately parallel to, and an elevation of 150 to 300 ft. above the present creeks. Where it has not been eroded it appears as a bench deposit with one rim completely removed. There is one notable exception to this occurrence, at Lovett gulch, off Bonanza creek, near its confluence with the Klondike river.

There are remains of the "White channel" or of contemporaneous gravels, on Adams gulch, off Bonanza creek, and on Last Chance off Hunker creek; these deposits contain rich gravel, and have yielded well where cheap water is available for hydraulic mining. There is a promising future for these areas.

Dredging

Although there have been no discoveries of importance, there were many stampedes, as they are called colloquially, rushes to known areas which were suddenly considered suitable for exploitation by the dredging method. This was due principally to the success of a 7½-cu.ft. bucket dredge, which operated about 60 days in 1905, and in the open season of 1906 with most gratifying results. The conditions encountered were unusually favorable for Klondike, for there was but little frozen ground to excavate and an easy bedrock and free gravel combined to make the enterprise a successful one. It was due to the success of this one installation that the dredging frenzy began; there have been other successes since.

The circumstance that the dredge was installed in an area possessing exceptionally fortunate characteristics, not found generally in Klondike, was not kept in mind. There has been much excitement and many abandoned claims have been restaked for dredging. There is talk of installing about 30 dredges in 1907, but only about three are certainties.

New Devices

The Klondike has always been a district where volatility, if not emotionalism, has prevailed to a considerable degree; I attribute it in part to the effects of the remarkably stimulating climate. A result of this tendency is seen in the large number and variety of machines and methods applied to areas of similar characteristics. These experiments have generally been costly. To be sure some excellent devices like the steam thawer, steam scraper, inclined cableway and self-dumper have been evolved. It can be predicted with certainty that if floating dredges are installed on some of the creeks, failure must occur even though a gold tenor of more than 50c. per cu.yd. shall be found. Frozen muck, a mixture of semi-decomposed vegetable matter, silt, sand, and water in varying proportions, usually more than 75c. per cent., as an overburden, and blocky schist bedrock are the most difficult physical conditions, and a short season, high wages, costly fuel and supplies, are adverse economic conditions.

As an example of the same sort of spirit, the Hatfield rain-making expedition in 1906 may be noted. The Hatfield brothers "were imported at great expense" to make rain during the dry summer months when all the conditions except the annual scarcity of water are most favorable. If success were achieved, $10,000, paid share and share alike by the Yukon territorial government and the Klondike miners, was to be the reward. "A cloth-covered cabinet, which no one was permitted to enter," was an essential part of the apparatus. As usual there was a dearth of water.

No doubt there are other areas like the one proved by drilling during the past year, where a minimum of about 40c. and a maximum of over $2 per cu.yd. is said to have been found, which may be worked with success; but the promiscuous placing of dredges in Klondike will mean numerous failures, even though a gold content very much greater than that encountered at Oroville shall be proved. This prospecting has shown that there are wide pay streaks. No discoveries showing other than great vertical concentration have been made.

Methods of Mining

Mining methods have not changed materially during 1906. The year has, however, been one of transition.

When the reservoirs to conserve local water, and the long ditches, are completed, the water will be used in generating power for operating floating dredges and electric machinery, lifts, pumps, etc., in conjunction with modified hydraulic-mining machinery and methods not only to excavate and hoist material to the sluices but also to dispose of tailings. These operations, covering large areas of

creek bottom claims, make a merger of considerable magnitude and will depart in some cases rather radically from existing methods and the established ideas of the most effective means of working.

There are many reasons why these creeks are unusually amenable to working as "one-man propositions." The total gravel section is usually shallow and solidly frozen and the overburden must be stripped in successive layers as it thaws by exposure. This may best be done by ground sluicing or with steam scrapers, as the material is then removed as it thaws and no attempt is made to handle frozen ground. Ground sluicing is the cheaper when ample water is available, but water will always be comparatively scarce and costly in Klondike.

Now, after most of the creek bottoms have been partially or thoroughly worked, in many cases more than once, and the original superposition of muck has been disturbed, the opportunities for ground sluicing are not so favorable. Steam scraping has been the favorite means of stripping and only in exceptional cases has any other method for removing overburden been used.

Handling Pay Material

The means of excavating and transporting pay material to the sluices, after the overburden has been removed, have been most varied. The following are those employed: Shoveling to platforms, then to sluice; shoveling to wheel-barrows, wheeling to bucket, raising on inclined cableway to sluice; shoveling into cars, hauling on inclined track to sluice; steam-shoveling into cars, hauling on inclined track to sluice; steam-shoveling directly into sluice; shoveling into skips, skidding and hoisting by derrick into sluice; hydraulicking to a sump, hoisting with steel bucket conveyer to sluice; hydraulicking into a sump, hoisting by centrifugal dredging pump into sluice; steam-shoveling into skip, hauling on cableway to sluice; and several other combinations. In a few cases a steam elevator was used to raise the material to the sluice. The means most generally used is shoveling into wheel-barrows, wheeling to bucket, hoisting on inclined cableway to sluice. It is well adapted to the one-man enterprise.

The methods and machines in contemplation will use many of the old features, but will include better means for tailing disposal and will have other advantages. Machinery will replace hand labor and larger capacities will be attained. Areas which have been worked on the one-man plan will be worked on a large scale. In the early days many of the creek claims were grouped and exploited under corporate ownership and management. There were failures in nearly every case, although in several noteworthy instances very rich ground was mined. However, bad management contributed largely to this result. Klondike operations will be watched with more than usual interest after the contemplated changes have been in force for a time.

Cost of Dredging

Two new dredges began operations in 1906, and there are three in course of construction; much of the ground to be mined is frozen, and will need steam thawing, at a cost of 25 to 50c. per cu.yd. One dredge operating in ground but little frozen has excavated material yielding 50c. to $1 per cu.yd. at an operating cost of about 12c. per cu.yd.; a daily average capacity of over 3000 cu.yd. was attained. It is interesting to note that the daily average capacity of a dredge at Oroville, the counterpart of this one, for a year, was about 2900 cu.yd., at a cost of less than 5c. per cu.yd.

Dredging in the Klondike river valley, near the mouth of Bonanza creek, is said to have been very profitable. From operations conducted during 1906 it is thought that, in normal seasons, dredging can be begun about May 1 and continue until about Oct. 20, although operations in the early and late parts of the season must necessarily be at higher cost and with greater difficulty. The design and construction of the dredges must be suited to operations in cold weather. A well designed dredge should be able to operate 30 to 45 days longer in a season than possible in hydraulic mining, and 45 to 60 days longer than open-cut mining may be carried on.

Hydraulic Mining

By hydraulic mining between 2,500,000 and 3,000,000 cu.yd. was washed, about twice as much as in 1905, in spite of a poor water season. This was due to more available sources of supply, and to the construction of storage reservoirs. There were no essential modifications in method and for cost, including amortization, about 20c. per cu.yd. is proper for well managed operation. A dam, 54 ft. high, on Adams creek, and forming a reservoir containing 58,000,000 gal., was completed in 1906. Another, to be 60 ft. high, and to conserve 2,000,000,000 gal., was begun on Bonanza creek.

Two ditches of considerable size with capacities of 10,000 miners' inches and 500 miners' inches, respectively, were partly built. About 5 cu.yd. per miners' inch was hydraulicked per day in mines operating on a scale employing 5 to 7 cu.ft. per sec. Owing to conflicting grants of water rights, there has been considerable difficulty, much of which was aired in the courts. There have been fewer applications for water rights, hydraulicking, as a means of profitable working, having been superseded in popular esteem by dredging. Hydraulicking with pumped water was carried on in but one notable instance. This method is extremely costly and seldom profitable.

Storage

The physiography of Klondike is extremely unfavorable to getting ample supplies of water without long ditches, pipes, flumes and inverted siphons. Topographic isolation is the cause. Climatic conditions are very unfavorable to the construction and maintenance of water ways. In addition to the high cost of labor, materials and transportation, good ditching ground is seldom encountered and maintenance expense is large.

Attempts have been made to use steam shovels as ditching machines in gravel, loose rock, and muck. Where the material was thawed, good progress was made, but as this was the exception rather than the rule, much difficulty was experienced. Wooden-stave pipe is being used instead of open flumes for the first time in Klondike. Horse scraping has been used rather generally of late in ditch construction. A cost of 30 to 50c. per cu.yd. was noted for such work.

Fuel and Transportation

The fuel problem was still a difficult one. Wood hauled on runners cost $10 to $16 per cd.; for that delivered on wheels, $14 to $20 per cd. was paid for 16-ft. lengths. Wood tends to become more costly each year as it is necessary to haul greater distances.

Coal from Coal creek, Tantalus and Five Fingers, has been used in a limited way, but not with encouraging results. It possesses low calorific value, and is only used where its cost per ton is less than that of wood per cord.

The transportation problem is still a difficult one. Although the Canadian Government is still pursuing its excellent policy of building and maintaining roads, cost of transportation is high. New roads have been built in Stewart river district and elsewhere. A narrow-gage steam railway is being built out of Dawson to Stewart river. Freight rates from the "outside" are still high; about $60 per ton is the charge. Passenger rates for railway, river steamer and stage travel are about as formerly: 20c., 11c., and 25c. per mile being the respective average charges.

Considerably more drill prospecting has been done in 1906 than in former years. The frozen condition of the gravel makes no essential differences in the manipulation. Prospecting value and dredging value, as determined by drilling with percussion drills and dredging with buckets, respectively, check well.

A new mining code has been adopted and numerous betterments will result. The regulation, passed in 1904, to permit the sale of water, has had no effect for there has been no surplus water to sell. No new concessions were granted, and there is little likelihood of any being given in the future.

Phosphate Mining in Tennessee

The Industry has Suffered Severely from Violent Market Fluctuations. Consolidation is Creating More Stable Conditions

BY H. D. RUHM*

Phosphates occur almost entirely in Silurian and Devonian strata, but more particularly in the former, and in the transition strata between the two. The Silurian was essentially the age of shell-fish, the deposits of which formed the immense beds of Silurian limestone. The Devonian was the age of fishes, whose bones are composed of calcium phosphate. Far back in the Silurian age, however, certain species of shell-fish had phosphatic shells, and the commingling of the two formed the "phosphatic limestones" of the Silurian. In some places the phosphate

boniferous beds, and subsequent pressure hardened all these into rock. At about the middle of the sub-Carboniferous age all these were elevated above the surrounding country and began at once to undergo erosion.

Natural Alterations

In the central basin, where conditions were favorable, the strata intervening between blue and brown phosphatic beds were partly or wholly removed, allowing the blanket of blue rock to subside on to the brown, resting either directly on it or

and density. Occasionally, however, the layer of blue rock is found resting immediately on the layer of phosphatic limestone, and where this is the case numerous faults and dips occur.

Again, in the central basin, or brown-rock region, the top erosion first disintegrated and then partially took off the upper layers of shale, sometimes entirely, sometimes leaving it from 1 to 40 ft. thick; this accounts for the varying overburden.

In some places where the limestone layers were entirely soluble, the upper

MT. PLEASANT PHOSPHATE FIELD—A TYPICAL PLANT

shells were in considerable proportion, and subsequent erosion, proper underground drainage and leaching dissolved out the carbonate to greater or less extent and left the "brown phosphate" of the middle basin. Meantime the transition stage between the two ages had been reached and its deposit spread over the central basin and the highland rim in the form of a thin blanket of the so called blue rock, which is blue, brown, gray and black, according to the coloring matter present. It is composed of a preponderance of microscopic shells composed of phosphate of lime, but mixed with enough carbonate to make the resulting mass vary from 65 per cent. to as high as 80 per cent. calcium phosphate.

Subsequent depression permitted the deposition of Devonian shales and sub-Car-

separated from it by only a thin band of clay. If the original phosphatic limestone carried, say, 50 per cent. calcium phosphate, 38 per cent. calcium carbonate and 12 per cent. of insoluble matter, and if leaching took out all the soluble carbonate, the remaining rock would have 80 per cent. of phosphate, which is the usual grade of the bottom rock at Mt. Pleasant, or "export." The top rock varies in analysis from 65 to 80, just as the original blue rock did.

In the highland rim this process took place only on the slopes of the narrow valleys and occasionally in projecting points, instead of over large areas of country as in the central basin. In that portion of the highland rim left intact the blue rock remains in place, as a general thing, with its varying quality and thickness, retaining its original compact form

layers of phosphate were dissolved and redeposited in the boulder and stalagmite forms of the "white rock" found in Perry and Decatur counties and near Godwin, in Maury county, and in the "boulder rock," found everywhere to greater or less extent, but in especially heavy deposits on the McGavock place, near Nashville. These redeposits vary in analysis from 50 to as high as 90 per cent. phosphate, but are variable in richness, though individual deposits from one to 20 or 30 acres of very uniform quality are found.

Early Development

In December, 1833, blue phosphate rock was discovered in Hickman county. The discovery was due largely to the persistence of prospectors for coal, who insisted on hunting in a section of country two geological ages below the coal measures The year 1894, while it brought much ex

citement, saw a pitifully small output, and comparatively little development of the various facilities necessary for putting on the market a product so widely scattered and so remote from immediately available transportation.

A few companies struggled through 1894, 1895 and the first half of 1896, digging "rabbit burrows" under the hills and stripping back to "face up" their mines. This had the inevitable result of breaking away the main face of the hill, rendering it worse for permanent work than if it had never been touched. Two companies constructed and began to operate narrow-gage railroads, having grades up to 5 per cent. and curves as high as 50 deg. With these facilities, supplemented by all the wagons they could get to work, the several companies managed to get out a really remarkable output of 19,188 tons in 1894, 38,515 tons in 1895 and 17,000 tons for the first half of 1896.

All that time, these blue-rock hunters were walking over and kicking out of the way the brown rock of Indian and Swan creeks and Totty's bend, and prospectors were daily getting off the train at Mt. Pleasant, and driving out to the blue-rock field on Big Bigby creek; they even mined some of this rock, hauling it to Mt. Pleasant and shipping it, never dreaming they were walking and driving every day over the finest deposit of phosphate ever known to the world.

Market Fluctuations

Probably no other commodity has seemed to be so sensitive in its market fluctuations. Prior to the discovery of the blue rock, Florida phosphate of about the same grade was selling in the interior at about $6 per ton for 65 to 70 per cent. on the basis of Centerville freight rates. The first sale of Tennessee phosphate was at $4.65 per ton by the old Southwestern Phosphate Company. In all hunting up the same buyers at once, the mines succeeded in a short time in reducing the price to $2.25 per ton. The hight of folly was accomplished when Louisville and Birmingham parties purchased the Tennessee Phosphate Company [illegible] on upper Swan creek, expecting to construct a road from the N. & F. division of the Louisville & Nashville Railroad down Swan creek, and thus to cut out the expensive haul of the other mines, which in most instances amounted to 75c. per ton. They also expected, by using machinery, to lessen the cost of production, so they sold 100,000 tons at $1.95 per ton in order to freeze out the small producers. Some of the small producers had in the meantime, however, been holding tight this precious knowledge of the nature of the Mt. Pleasant deposit, and about the time the above action had already put the blue [illegible] interests did, however, move into the Mt. Pleasant field, bought one of the best prospects at $100 per acre and began operations by reducing its blue rock 65 per cent. prices to $1.50 and $1.40 for 75 per cent. brown rock. For a long time thereafter $1.10 was the ordinary selling price, and $1.25 the maximum.

Slowly the miners began to find out that it cost more to produce than they had figured on, and prices advanced until in 1898 rock was sold at $2 per ton for 75 per cent. In the meantime the export market had been essayed and the guarantee for this was made 78 per cent. bone phosphate of lime, and 3 to 4 per cent. iron and alumina. The first price at which this grade of rock was shipped was about $1.65 per ton, and in not very many months it had come up to $2.25 per ton. During fall of 1898 and spring of 1899 an era of activity was seen. Property changed hands at a lively rate; laborers flocked to the field, everybody mined all he could get out, regardless of sales and shipments, and still the prices climbed, until in the fall of 1899 and spring of 1900, export rock brought as high as $4 per ton and domestic $3. The fury of production was redoubled and simultaneously the extent of the Maury county field was ascertained to be much greater than had been thought possible.

PHOSPHATE MINE, MT. PLEASANT, TENN.

About this time the Boer war broke out and as three-fourths of the carrying trade for phosphate was done in English vessels, the export business came to a standstill, and the export rock not only of this field, but of Florida, was dumped on the domestic market.

The Trusts [illegible]

In the meantime first the Southern trust and then the Northern trust was formed, the two companies comprising most of the fertilizer factories in the United States. These two concerns partially supplied their wants by purchasing

rock property, but failing to supply their entire requirements, attempted to get them at their own prices later by depreciating the prices of their product.

This depreciation, coupled with the enormous increase in the use of fertilizer, caused the starting up of a large number of independent factories, and consequently an increasing number of buyers of Tennessee phosphate rock. Also the packing-house people being unable to supply the demand for their pure blood and bone fertilizers, and finding that the quality was

REMOVING OVERBURDEN, PHOSPHATE MINE

very much improved by the use of high-grade rock, became large customers of the Mt. Pleasant and other Tennessee fields. Numerous cotton-oil mills having been purchased by the Southern trust, many more were started up, and these all being producers of cotton-seed meal, largely used in the manufacture of fertilizer in the South, they in turn became fertilizer manufacturers and users of Tennessee phosphate rock. Also experiment stations in several States had been making actual experiments with raw ground phosphate rock without acidulation, as a direct fertilizer, and instead of reaching the position taken by the Tennessee station that it was worthless and that its sale should be prohibited they arrived at the directly opposite conclusion. Lastly, with the end of the war, the export trade reached out more strongly than before. The weak condition of the producer was thus changed to one of great strength.

MINING METHODS

The first thing that impresses itself on any visitor to the phosphate fields is the almost universal dependence on hand labor. This is partially due to the fact that they "just started that way," and hence the most "experienced laborers" have always done that way; and partially to the fact that the varying conditions met with in the deposit make it very difficult to devise appliances suitable for one portion of a mine that will answer the requirements in the closely adjacent portions. For instance, it is possible in the same open face of a mine to find the overburden varying from 2 ft. to 20 and the rock from a few inches thick, sticking tight to the top of a lime boulder, to 15 ft. in the "dip between two boulders," while the rock itself will vary from the shaly, partially disintegrated top rock through various sizes to heavy blocks 6 to 8 in. thick and often 10 or 12 ft. long.

It will therefore be seen how difficult it is to design a machine that will accommodate itself to the handling of this material. The removal of the overburden has been generally accomplished with wheel scrapers. Two companies have used the New Era or Western machine plow, with elevator belt loading the dirt into dump-bottom wagons alongside. Two steam shovels are now in use, being of the traction type, and occasionally these have been used in digging the rock, though apparently with not entire success. Cableways have never been used to transport the material, and this is done largely by wagon and team, though many tram roads, with cars propelled by either mules or dinky engines, are in use.

The bulk of the rock, however, is dug by the miner with pick and fork, loaded into wagons, hauled out and dumped in windrows on the ground, stirred with a potato plow and harrows, allowed to dry in the sun, taken up again into wagons and hauled either direct to cars for shipping or put under sheds for storage. When an extra good quality of rock is wanted, as for export, a few layers of cordwood are put down and the sun-dried rock put on that. Then, when ready to ship, the wood is fired, and after the rock is cool it is broken and loaded with forks, when most of the dirt sloughs off, leaving the rock almost perfectly clean.

METHOD OF DRYING PHOSPHATE ROCK—THE PILE ON THE RIGHT IS READY TO FIRE

Some rock can be put from the mines immediately on the wood and burned for export, but generally this will only be a safe domestic rock. Some companies who have water accessible pick out the large pieces and send them direct to the dry kilns, and then the small pieces with the dirt, known as "muck," are passed through washers, the rock coming out clean and being deposited on cordwood and burned as above described.

The resulting rock, after being crushed, is passed through screens, which separate it in three sizes: from 1½ in. up going for export, that between 1½ and ¼ in. for domestic, and the dust and ¼-in. pieces being ground up and sold for direct use, or to small factories.

The Century Phosphate Company has installed a system of driers, and does not wash the rock, but dries it thoroughly in mechanical driers, and then screens it as above. Miners are generally turning their attention to labor-saving devices for doing the preliminary operations, and to systems for saving the valuable products that have heretofore gone to waste in large quantities. At least 10 per cent. of the present output is thrown away to prepare the high-grade rock now demanded. I should estimate that this waste rock can be made into acid phosphate at a cost such as to yield an annual net profit of $162,500. This excess fertilizer could profitably be employed in enriching the barren lands whose cordwood has been consumed in drying phosphate rock at Mt. Pleasant.

SITUATION AND PROSPECTS OF THE INDUSTRY

The principal localities in the State where operations are now in progress, are: Mt. Pleasant, Kleburn, Jameson and Century, in Maury county; Lower Swan creek, Twomey and Totty's Bend, in Hickman county; near Gallatin, in Sumner county; Wales station, in Giles county, and near Nashville, in Davidson county.

The principal localities where developments will gradually take place as the demands of the business require are: Southport, Estes bend, Bear creek, Neeley's valley, Little Bigby, West Fork, Baptist Branch and Leiper's creek, in Maury county; Richland creek, in Giles

county; Station Camp creek, in Sumner county; north and west of Franklin, in Williamson county; Brentwood and Bellevue, in Davidson county; Beech river, in Decatur county; Lick creek, Buffalo river, *Hurricane creek and Cane creek, in Perry county; *Forty-eight Mile creek, in Wayne county; *Upper Swan and *Indian creeks, in Lewis county; *Lower Swan, *Indian creek, Ship's bend, Gray's bend, Persimmon, Haleys and *Leatherwood creeks, in Hickman county.

The total tonnage of phosphate rock of 70 per cent. and better grade now available in the Tennessee field is estimated at 44,800,000 tons, and of this the State may be counted on to produce 35,000,000 tons.

Of the present working localities the principal one is Mt. Pleasant, and while the property owners there are beginning to figure a little on how much they have left, still the prevailing impression that Mt. Pleasant is about through mining is an exceedingly mistaken one. With the present rate of output, the visible supply of the Mt. Pleasant field proper will last for seven years longer, without taking into consideration the Southport field, which is practically part of the Mt. Pleasant field. With the Southport field, mining will last here, at the present rate of output, for 11 years. It is very easy to understand that as work progresses at Mt. Pleasant and the end approaches, some miners drop out by selling, some by working out their small deposits and these naturally go to the other fields. In none of the other fields is found the persistently uniform, high-grade, brown rock of Mt. Pleasant except Southport, Century and Kleburn, in the two latter of which operations are now in progress, and in the former the extension of the Mt. Pleasant Southern Railway will soon cause development work there. As these deposits afford practically the same grade of rock as Mt. Pleasant proper, they will be worked out simultaneously with it and will cater to the same market.

The producers of this character of rock are gradually increasing their prices and reducing their output, thus giving opportunity for the marketing of the lower grades in the other fields, notably the Swan creek and Indian creek deposits in Hickman county. This means that the producers at Mt. Pleasant will make more money from their product, and that it will last a considerably longer time, so that it is safe to say that mining in force will be carried on at Mt. Pleasant and kindred localities for at least 20 years.

During the next decade, to supply the diminution of Mt. Pleasant's output, will come the gradual development of the vast blue-rock field of Maury, Hickman and Lewis counties, and the white rock of Perry and Decatur counties, which form the backbone of the phosphate industry in Tennessee, and whose millions of tons will cause these counties to be considered the phosphate reservoir of the world for the next 75 or 100 years.

The change of base will be gradual, and the trade will have ample opportunity to adjust its operations so as to utilize the lower grade blue rock as it becomes advisable and necessary to do so. Its many points of superiority for acidulation and for direct use without acidulation will largely make up for its lower grade.

The blue-rock field proper covers a territory bounded approximately by a trapezoid having as its four corners Centreville, in Hickman county; Kinderhook and Mt. Joy, in Maury county, and Lewis

MAP SHOWING PHOSPHATE DEPOSITS OF TENNESSEE

*Blue rock.

Monument in Lewis county. Traversing this territory are Duck river, Indian, Swan, Blue Buck and Cathey's creeks, and their tributaries, and outcropping along these valleys and underlying the ridges between them are deposits of blue rock running in bone phosphate from 60 to 78 per cent., with less than 3 per cent. iron and alumina, that will aggregate in the neighborhood of 40,000,000 tons.

This field will soon be developed by the extension of the Nashville, Chattanooga & St. Louis branch up Swan creek and the Louisville & Nashville branch down Swan creek, with side lines and spurs leading off each, surveys for which have been made, and work on construction will soon be under way. If, however, the Florence Northern Railroad should ever be built from Florence to Nashville it will run through the heart of this territory as well as the magnificent iron deposits of Wayne and Lewis. With the above road and a road from Huntsville on the southeast to Milan on the northwest, all of the phosphate territory would be fully developed, and this section of Maury, Hickman, Lewis, Perry, Giles, Davidson and Williamson counties would be the site of more fertilizer factories than will be found elsewhere in the world in the same space.

THE PHOSPHATE PLANT AT PLEASANT

Cost of Pipe-line Transportation

The investigations of the Interstate Commerce Commission show that the expense of pumping oil is very much less than the cost of transporting it by rail. It was said that the actual cost of pumping a barrel of oil 100 miles was about 2c., and while this must vary with different conditions the estimate seems to be sufficiently high on the average. The cost to the Standard of transporting a barrel of oil from the Kansas field to the Atlantic seaboard would not be much, if any, above 30 cents.

Standard Screens, Weights and Measures

The Central Standardization committee of the Institution of Mining and Metallurgy recommends the adoption of the following as "The I. M. M. Standard Laboratory Screens":

Mesh, apertures per linear inch	Diameter of Wire	Aperture	Screening Area.
4	0.1 inch.	0.1 inch	25.00 per ct.
8	0.065 "	0.062 "	24.60 "
10	0.05 "	0.05 "	25.00 "
12	0.0417 "	0.0416 "	24.92 "
16	0.0313 "	0.0312 "	24.92 "
20	0.025 "	0.025 "	25.00 "
25	0.02 "	0.02 "	25.00 "
30	0.0165 "	0.0166 "	24.80 "
35	0.0143 "	0.0142 "	24.70 "
40	0.0125 "	0.0125 "	25.00 "
50	0.01 "	0.01 "	25.00 "
60	0.0083 "	0.0083 "	24.80 "
70	0.0071 "	0.0071 "	24.70 "
80	0.0065 "	0.0062 "	24.60 "
100	0.005 "	0.005 "	25.00 "
150	0.0035 "	0.0043 "	24.50 "
200	0.0025 "	0.0025 "	25.00 "

Owing to the limits in wire drawing and in the weaving of wire cloth, absolute accuracy to the fourth place of decimals of an inch is unattainable with uniformity of 25 per cent. of screening area; but the above table is so near to theoretical perfection, and the unavoidable irregularities of screening tests themselves are so wide that any inaccuracies in the table would be immaterial in practice. It is not possible to weave the 200-mesh screen except in what is known as "twilled" or double wire.

The advantages of the series are: That a definite ratio and a corresponding arithmetical progression of both aperture and mesh is secured; that by adopting a screening area of 25 per cent. the wires are absolutely "locked" in position, thereby preventing shifting and consequent irregularity in the size of aperture; and that the ratio between wire and aperture in all meshes being constant, the angle of taper of the hole is also constant.

As regards the more exact definition of the word "slimes," the committee suggests: that material coarser than 150 mesh be described as "sand," coarse or fine; that material passing 150 mesh but settling in — seconds in a — inch column of water be described as "meal," and that material settling more slowly in water be described as "slimes."

Mesh per Linear Inch

The mesh committee had issued a printed circular to members of the institution and others. Replies to the questions were received from over 100 engineers. Assuming the adoption of a standard series of screens, which makers of wire cloth could supply, there was a practical unanimity as to the advantages of retaining the description of the various sizes by *mesh per linear inch*, for the following reasons:

Those who objected to the use of the term "mesh" based their objections on the fact that in the past it had not denoted the size of aperture; but as the whole object of establishing a laboratory standard would be to fix definitely a certain aperture for a certain mesh, it would be simply a matter of convenience of terms as to whether a screen was described as a certain "mesh," or with apertures expressed in decimals. There could be little doubt that in practice engineers would continue to use the term "mesh" by choice, because it is shorter, really descriptive, easily remembered, and precisely as accurate as, because interchangeable with, a certain size of aperture. An agreed standard table giving the size of aperture in decimals of an inch, for each standard mesh, would obviate any confusion. The suggestion of one or two engineers that in future aperture should always be specified alone would be unworkable in many cases, and would not necessarily insure accuracy or uniformity. Micrometer measurements of fine wires when once woven and crimped are not always to be relied on, and uneven weaving would in practice vitiate conclusions as to size of aperture much more than in the case of the use of standard screens specially prepared for laboratory use. The dependence on every individual who reports screening tests to verify the measurement of such screens as he happens to have by means of a micrometer, even if advisable or practicable, would produce results of grading that could not easily be made comparable with results obtained elsewhere. The attempt to use a standard of apertures in arithmetical ratio, accurate to two or three places of decimals, is pronounced impracticable by wire-cloth makers; and in any case would only prove to be the introduction of a new arbitrary scale of grading, differing greatly from past practice, and offering no advantage over an agreed standard set of screens such as are now advocated.

As regards the description of screens

in mills, the mesh committee does not propose for the moment to put forward any suggestions. There are difficulties to be considered from the fact that managers of mines are likely to be guided by personal opinions of expediency in connection with the kind of ore, type of crusher, cost of material and subsequent processes of treatment. It is well known that different ores, different quantities of water, wet or dry crushing, and different crushers, all give varying characters of discharge through exactly the same screen. The committee therefore recommends in the first instance the establishment of one uniform standard method of expressing grading analysis of all mill products in the laboratory, which would enable accurate comparisons to be made.

Only comparative accuracy can be attained in the description of *mill* screens made in commercial quantities, owing to the fact that both in the drawing of the wire and in the weaving considerable irregularity always occurs.

Division of Slimes

There seems to be a general opinion that material passing the finest screen of any standard series should be divided into two classes, and not be described under the one heading of "slimes." Various suggestions have been made as to the method of division and as to the terms to be used for describing the three degrees of fineness of particles. The general opinion seems to be that all material coarser than 150 mesh should be described as "sand"—coarse or fine, if preferred; that the portion passing 150 mesh, but readily settling in water, should be described by some such term as "meal;" and that the term "slimes" should be limited to particles which settle slowly in water. It may be difficult to get any general agreement as to the division between "meal" and "slimes;" and even if this be made arbitrarily, it will remain a fact that two materials having the same settling speeds may not be of the same size of particles, character or permeability. Some such rough division of the two classes would, however, tend to greater accuracy and uniformity of description than is usual at present.

Weights and Measures

The weights and measures standardization committee submits the following recommendations for adoption by the central committee:

That the word "ton" shall represent a weight of 2000 lb. avoirdupois (29,166.6 oz. troy); that the use of the terms "cwt." and "qrs." be abandoned, and that fractions of a ton be expressed either in pounds or in decimals of a ton.

That the "miner's inch" be understood to mean a flow of 1.5 cu.ft. of water per minute.

That the word "gallon" be understood to mean the imperial gallon of 10 lb.

That all temperatures be expressed in degrees Centigrade.

That gold and silver returns be expressed in terms of fine gold and silver, and not as "bullion."

That gold contents of ores, etc., be expressed in money values as well as in weights; and that in this connection the standard value be taken at 85s., or $20.67 United States currency, per troy ounce fine gold.

The members also suggest that the following questions be appended to any memorandum that may be issued to the members of the institution embodying the above definitions:

(*a*) Do you consider the general adoption of the metric system of weights and measures to be feasible in mining and metallurgical work, or would this, in your opinion, lead to undue dislocation?

(*b*) Have you any suggestion to make as to weights and measures other than those already dealt with, which require exact definition?

The question of the adoption of metric standards has engaged the attention of the committee, as the present movement in that direction in other branches of industry rendered it, in their opinion, inadvisable to ignore it entirely. The feeling of the committee, however, is that, while the question should be brought to the attention of the members, it would at present be quite inexpedient to advocate the general adoption of the metric system in mining and metallurgical work. On the other hand, an attempt to decimalize existing weights and measures is considered to be a step in the right direction, and as tending to bring about a desirable simplification.

Phosphorus from Wavellite Deposit at Holly Springs, Penn.

Until recently phosphorus, which is used chiefly in the manufacture of matches, was made solely from bones and organic substances. Only since the perfection of the electric furnace have natural phosphates been used to any extent in making phosphorus. The extraction of phosphorus from mineral deposits has been investigated by the United States Geological Survey, and the forthcoming number of the annual "Economic Bulletin" will contain an article by George W. Stose on phosphorus ore at Holly Springs, Penn.

At the foot of the northern slope of South mountain in the vicinity of Mount Holly Springs, about 10 miles southwest of Harrisburg, a deposit of wavellite occurs in the white clay associated with manganese and iron ores. Small quantities of phosphorus had previously been obtained from phosphorite and from apatite, but wavellite, which is aluminum phosphate, has never before been used commercially in the manufacture of phosphorus, as the mineral generally occurs in very limited quantities.

The American Phosphorus Company was organized by Philadelphia capital to develop the deposit and a mill was built nearby. The mine was opened in 1900, the first years being devoted to prospecting and experimenting with the reduction of the ore. During 1905 the mine was in active operation and 400 tons of ore were reported to have been extracted and reduced in the company's furnaces.

The different methods of manufacturing phosphorus are described. The Readman process, patented in 1889, is the one that has come into commercial use in most countries.

The world's production of phosphorus has been variously estimated to be from 1000 to 3000 tons a year. The greater part is made in the Albright & Wilson factory, Wednesfield (Oldbury), England, where the Readman process originated. Other large factories are located at Lyons, France, and at Griesheim and Frankfort, Germany. There is also a plant in Sweden, and there are numerous smaller ones in Russia.

Tonopah & Goldfield Railroad

The report of the Tonopah & Goldfield Railroad deals with the first fiscal year ended June 30, 1906. The total operating expenses amounted to $516,150 and the net earnings totaled $432,726, which, after the deduction of dividends, enabled a balance of $186,633 to be carried forward. A dividend of 7 per cent. was paid on the preferred stock and another of similar amount was declared on the common stock. During the year the company was consolidated with the Tonopah Railroad Company. At the time of the consolidation the Goldfield road was making excellent earnings. The road is broad gage, laid with 65-lb. rails. The company continues to enjoy the monopoly of the immense traffic of the various gold fields in southern Nevada, but has been greatly hampered by a difficulty in securing new rolling stock to meet the demands of the freight offering. Orders for steel ore cars and Pullman passenger cars, under construction in the Eastern States, were not delivered on time.

The company has under construction a spur to the Silver Peak gold field from Tonopah, a distance under 20 miles, and an extension of the main line from Goldfield to Bullfrog.

There is now a through daily train service in conjunction with the Southern Pacific Railroad Company, between Bullfrog, Goldfield and Tonopah, and San Francisco and Ogden, Utah. There is a large passenger traffic and more freight offering than the company's plant can possibly handle. As a consequence the shareholders look forward to a prosperous future.

Electric Power vs. Mules for Mine Haulage

The Electric Installation Described, Besides Increasing the Output, Effects a Saving of 1 Cent per Ton. Plant Pays for Itself in 4 Years

BY M. F. PELTIER*

There is no feature of electric-mining application more successful than electric haulage, and it is the purpose of this article to show by actual results the superiority of this method over mule haulage. The introduction of the system at one of our mines has not only resulted in reducing the cost of production, but has also made practicable the development of more extended operations and has increased the output from 1400 tons to a daily average of 2000 tons. The motors have pulled as much as 2570 tons in 8 hours.

The Electric Equipment

Prior to installing electric haulage there were 16 gathering mules and 17 mules working in spike teams, pulling from the lyes to the bottom, producing 1400 tons of coal per day. Owing to the size of the cars, grade and average haul of 1800 ft. from lyes to bottom of shaft, the output had reached its limit with mule haulage; so, after careful examination of the existing conditions, it was decided to install electrical haulage. Two 15-ton Goodman traction locomotives with double-end control were installed. The frame of these locomotives consists of an upper and lower casting securely bolted together and suspended from the wheel axles. No part of this frame overhangs the rails, an important factor in narrow entries. The trolley pole is of the reversible type and so designed that it accommodates itself readily to the hight of the roof.

Trolley wire No. .0000 is used and securely fastened to the roof with trolley hangers, 8 in. outside of outer rail. The wheels have steel tires, which give them a tractive effort of 20 per cent. above that of the chilled rim. The locomotives are provided with two motors wound for 250 volts and exert a draw-bar pull of 8200 lb. on the level. They have pulled 17 loaded cars up a 2½ per cent. grade 1200 ft. long. These cars weigh when empty 1650 lb. and hold on an average 6600 lb. coal, so the weight of the loaded trip would be over 72 tons.

The Peabody No. 3 Mine Installation

This plant was installed at No. 3 mine of the Peabody Coal Company, Marion, Ill. (Fig. 1), by its manager, T. J. Armstrong. He has made the mine one of the best producing properties in the State. The vein is what is known geologically as the No. 7 seam and dips to the northwest from 2 to 3 per cent. The seam is 9 ft. thick, 2 ft. of which is left for roof, owing to the soft nature of the sandstone immediately over the coal.

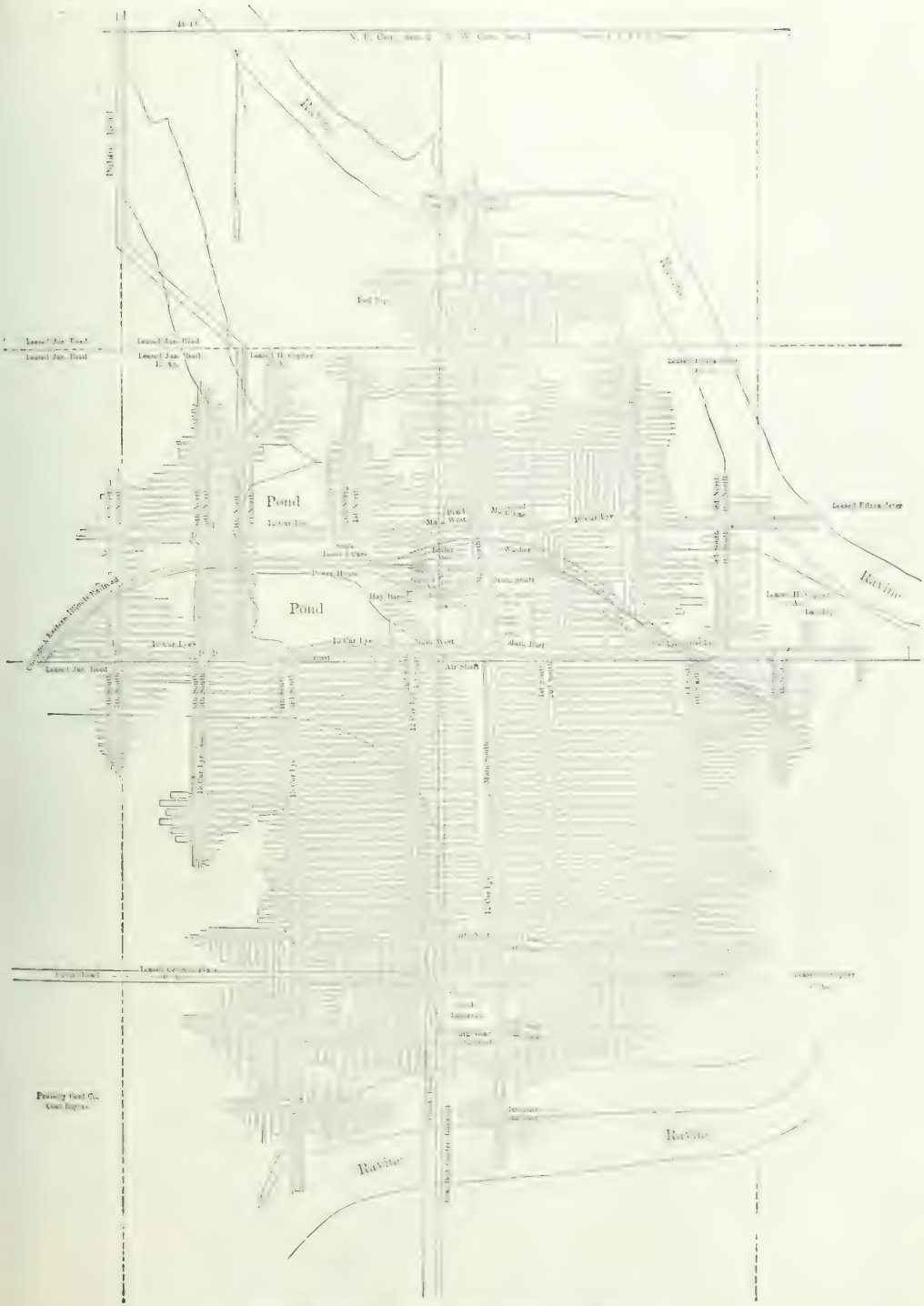
The gage of the track is 42 in. The track, which measures 9000 ft. over all, is laid with 40-lb. rails, which are bonded and cross-bonded for return current, and is laid on white-oak ties. The curves on the locomotive-haulage track are from 40 to 60 ft. radius, which gives 16 ft. to 18 ft. from point of frog to point of switch on all cross-overs and turnouts. The curves are elevated on the outer rail to suit a speed of 8 or 10 miles an hour; therefore, when a trip is started, it will not lose speed or coal until it reaches the bottom.

One of the features of the mine is the method in which the coal is handled on the bottom. The loaded cars are all caged on one side and the empty cars are taken off on the other. The bottom proper is 225 ft. long, 18 ft. wide and 8 ft. high, and has a double track laid to a grade of 1 to 1½ per cent. in favor of the loaded cars, which run by gravity to the cages, where they are elevated and brought to the surface and dumped. On the return of the empty car from the top it is bumped off the cage by the loaded car and runs by gravity down a 4 per cent. grade for a distance of 60 ft., then up a 3 per cent. grade for a short distance, and backswitches itself in one of the run-arounds where the empty cars are collected for the motors.

FIG. 1. PLANT AT NO. 3 MINE, PEABODY COAL COMPANY

The Power Equipment

The electrical power for operating the motors in the mine is supplied by a 175-kw. generator belted to a 200-h.p. McEwen high-speed engine, 18x18 in., located in the power-house department of the building containing the hoisting engines. The generator also furnishes light for the underground haulage ways. This generator is designed and built to meet the special requirements of mine service where constant and extreme variations in the load are the rule. From the switchboard in the power-house the current is transmitted over a 400,000-cm. lead cable



MAP OF MINE NO. 3, PEABODY COAL COMPANY, MASON, ILL.

Steam to run the electric plant is furnished by a battery of four 150-h.p. tubular boilers, which also furnishes steam for the large hoisting engines; but in order to make the proper comparisons between mule and electric haulage, I will add the cost of two complete power units to the electrical equipment. The machinery making up the electrical installation is as

ELECTRIC EQUIPMENT INSTALLATION

[illegible] generators @ $2,500	$1,600.00
[illegible] generation and switchboard	2,400.00
Mill or engine [illegible] 200 h.p.	2,000.00
[illegible] and placing engine and generator	300.00
2—72 in. by 18 ft. tub. boilers, 150 h.p. complete	2,800.00
9000 ft. trolley wire	1,019.90
[illegible]	110.00
665 trolley hangers @ $0.65	432.25
768 bonds @ $0.35	268.80
[illegible] @ $0.35	26.25
[illegible] trolley frogs @ $2.75	49.50
1 extra 250 volt armature	375.00
2 motor jacks @ $12.80	25.60
Extra fittings for motors	86.24
[illegible] to lb. rail @ $28.25, $3,291.13. Cr. for 25-lb. rails, $2,056.75	1,234.38
6055 white-oak ties @ $0.10	605.50
55 kegs [illegible] in spikes @ $6.75	244.50
22 split switches, material and labor @ $17.00	374.00
Fish plates and bolts	280.00
[illegible] for trolley supports	76.11
Sundries	3,810.21
Entire labor cost	3,810.21
Total of complete installation	$21,172.79

COST OF MULE HAULAGE

Mules, average cost.....$225.00
Mules, depreciation.....20 per cent.
Mules, interest .....6 per cent.

MULE DAYS DIVIDED FOR 275 WORK DAYS PER WORK DAY

Depreciation	$0.163
[illegible]	0.049
Feed	0.20
Shoeing and stableman	0.158
Total per day, 275-day basis,	$0.57

[illegible] MULE DAYS worked [illegible] 1400 tons

17 mules @ $0.57	$9.69
9 drivers @ $2.56	24.24 Team drivers, $0.15 extra, or $1.20 extra for 8.
Total	$33.93
Cost per ton outside mule haulage,	$0.024.
[illegible]	275
[illegible]	[illegible]

2 locomotive runners @ $3.20	$6.40 per day
2 trip riders @ $2.56	5.12 per day
1/3 electrician @ $75 per m	1.08 per day
[illegible]	0.07 per day
[illegible] @ $0.75	0.15 per day
Total fixed labor, etc	$17.02 per day
Interest on investment, $21,172.79 @ 6 per cent.	$4.62
Depreciation and repairs @ 8 per cent.	6.16
Oil and waste	0.30
[illegible]	0.50
Total others	$11.58
Total daily operating cost electrically	$28.60
Cost per ton based on 2000 tons	$0.014

It will be seen from the foregoing that the plant, besides increasing the output and saving 1c. per ton, which means $20 per day, practically pays for itself in four years.

Some of the advantages of electric haulage are the simplicity of the entire installation, its flexibility, and the low cost of maintenance, extensions, repairs and changes in the transmission circuits, which are quickly and inexpensively made. Although the plant has been in operation one year, the total expense, excluding operating costs, has been less than $100.

In planning an electric-haulage plant, no set of rules can be rigidly adhered to, as each equipment should be treated as a special problem; but it is my opinion that when grades of over 5 per cent. are encountered, some other means of mechanical haulage must be considered, either the third-rail system or rope haulage.

Coal-mine Hospital Car

Mine Inspector H. D. Johnson, of the fifth anthracite district, has invented a mine-hospital car which was placed in the Seneca colliery at Pittston this week, where it was given a thorough test. This is the first hospital car to be used in any anthracite mine. The trucks are similar to those of the ordinary mine car and upon these are two platforms. The lower platform is of the regulation kind, but between this and the upper deck are four sets of springs to prevent unnecessary shaking of the injured. Two upholstered stretchers are placed side by side on the platform. Between these can be placed an upholstered board, making separate compartments. The sides of the car are also upholstered. The injured are thus kept in firm, yet comfortable, positions. The stretchers are movable, so that the victim need not be moved from the time he is placed on the stretcher at the place of accident until he reaches the hospital or his home.

On either end of the car are two chair-like seats to accommodate four attendants. The car is equipped with rubber and woolen blankets, a medical case containing bandages, ointment and stimulants, oils for burns, various devices for stopping the flow of blood, as well as splints for broken limbs.

The car is kept in an especially arranged barn, near the mine hospital, and can be reached on short notice. In case of accident all haulage on the roads leading to the scene of the accident is stopped and the track made clear for the hospital car, which is hauled to the place required either by electric motors or the mules. It is estimated that an injured person can now be hurried to the foot of the shaft in one-half the time it formerly required, and this is an important feature, as in mine accidents minutes often save lives. Formerly, in case of an accident, workmen would be compelled to travel fully half a mile to get a stretcher, then return to the victim. Once on the stretcher, he was placed on an ordinary coal car and brought to the foot of the shaft.

The officials of the Lehigh Valley Coal Company and the Erie collieries have already inspected the car. The former were so pleased that they gave an order for six cars, and the latter will adopt the car in connection with their first-aid societies.

The Illinois Coal-mining Industry in 1906

The following general summary of the production, developments, prices and other statistics of the coal-mining industry of Illinois during 1906 has been prepared by Secretary Ross, of the Bureau of Labor Statistics of the State of Illinois:

Number of counties producing coal	54
Number of mines and openings of all kinds	1,018
New mines or old mines reopened during the year	151
Mines closed or abandoned since last report	123
Total output of all mines, in tons of 2000 pounds	38,317,581
Number of shipping or commercial mines	419
Total output of shipping mines, tons	37,122,811
Number of mines in local trade only	599
Output of local mines, tons	1,194,770
Total tons of mine-run coal	9,777,905
Total tons of lump coal	16,878,088
Total tons of egg coal	1,850,427
Total tons of nut coal	1,931,988
Total tons of pea coal	6,622,087
Total tons of slack coal	1,257,086
Total tons shipped	33,096,110
Tons supplied to locomotives at the mines	1,035,344
Tons sold to local trade	2,539,678
Tons consumed (or wasted) at the plant	1,646,449
Average days of active operation for shipping mines	189.6
Average days of active operation for all mines	172
Average value per ton all grades at shipping mines	$1.025
Average value per ton of mine-run coal at shipping mines	$0.983
Average value per ton of lump coal at shipping mines	$1.292
Average value per ton of egg coal at shipping mines	$1.224
Average value per ton of nut coal at shipping mines	$0.991
Average value per ton of pea or screenings coal at the mines	$0.504
Average value per ton of slack coal at the mines	$0.319
Aggregate home value of total product	$39,895,802
Number of mines in which mining machines are used	85
Number of mining machines in use	962
Number of tons undercut by machines	9,563,230
Number of tons mined by hand	28,754,351
Average number of miners employed during the year	42,920
Average number of other employees underground	11,605
Average number of boys employed underground	1,499
Average number of employees above ground	6,259
Total employees	62,283
Number of persons at work underground	56,024
Number at work on surface	6,259
Average price paid per gross ton for hand mining, shipping mines	$0.5702
Average price paid per gross ton for machine mining	$0.762
Number of kegs of powder used for blasting coal	1,027,273
Number of kegs of powder used for other purposes	2,749
Number of pounds of dynamite	41,137
Number of men accidentally killed	155
Number killed inside of the mine	147
Number killed outside of the mine	8
Number of wives made widows	105
Number of children left fatherless	333
Number of men injured so as to lose a month or more of time	480
Number of gross tons mines to each life lost	247,210
Number of employees to each life lost	402
Number of deaths per 1000 employed	2.5
Number of gross tons mined to each man injured	79,828
Number of employees to each man injured	130

Delaware, Lackawanna & Western Colleries

The Delaware, Lackawanna & Western Railroad Company, besides its railroad lines, owns a great coal estate in the Wyoming district of the anthracite region. The company operates this coal property directly. The report covers the [illegible] ended Dec. 31, 1906.

The total anthracite coal carried by the railroad was 8,582,380 tons. The average haul on this coal was 172 miles. The average receipts per ton were $1.50; per ton-mile, 0.873c. The earnings of the railroad from this coal were $12,902,851, being 39.1 per cent. of its total receipts. In addition to the anthracite tonnage, the road carried last year 983,909 tons bituminous coal; 174,086 tons coke; 298,705 tons ores; 527,014 tons stone, sand, etc., 869,478 tons of iron and steel; 249,238 tons of cement, lime and brick.

The coal-department income account is as follows, averages being calculated on the tonnage opposite each item:

Coal Sales	Tons.	Amount.	Per Ton.
Miners	113,216	$245,260	$2.17
Company's supply.	1,476,331	1,707,950	1.16
Local agencies	5,301,477	19,922,168	3.76
Foreign agencies..	2,315,801	14,667,358	6.33
Total sales	9,205,728	$36,542,736	$3.97
Earnings, Co. boats	794,603	207,220	0.26
Total	9,205,728	$36,749,956	$3.99
Cost mined & bought	9,152,743	$15,521,053	$1.70
Decrease in stocks.	52,985	641,387	12.12
Transportation, Co. lines	7,487,840	12,705,897	1.73
Transp'tion, other	2,510,675	1,972,431	0.78
Hauling and selling	9,205,728	1,442,714	0.16
Vessel expenses	794,603	202,333	0.25
Improvements	9,152,743	609,022	0.07
Total expenses	9,205,728	$33,094,837	$3.59
Net earnings	9,205,728	$3,655,119	$0.40

General expenses are included in handling and selling. As compared with 1905, there was a decrease of $2,021,090, or 5.2 per cent., in gross earnings; but an increase of $359,694, or 10.9 per cent., in net earnings. The expenses last year were 90.1 per cent. of gross earnings.

A summary of the coal statement is as follows, in long tons:

	1906.	1905.	Change.
On hand, Jan. 1	655,124	655,124	D. 250,470
Mined and bought	9,342,602	9,152,743	D. 189,919
Total	10,248,062	9,807,867	D. 440,389
Coal sold	9,642,148	9,205,728	D. 436,419
On hand, Dec. 31.	605,914	602,139	D. 3,775

The decrease in coal mined and bought was 4.8 per cent.; in coal sold, 4.5 per cent.

The report says: "Notwithstanding the suspension of mining operations during April and the first half of May last, the net results of the operations of the coal department during the year were highly satisfactory. The total tonnage produced at the company's mines and washeries and purchased from individual operators aggregated 9,152,743 tons, or but 189,919 tons less than in the year 1905. That the total tonnage did not show a greater reduction from the previous year by reason of the six weeks' suspension was due to the ability of the company to run some of its mines and all its washeries during that period. It may be further stated that the collieries of the company were in such condition after the suspension that they were run for the balance of the year to their full capacity, with but little interruption from breakdowns or other causes, and produced during this period an abnormally large tonnage. The average breaker time worked at all the company's collieries for the year was 198.3 days of 10 hours each, as compared with 210.8 days in 1905, or but 12.5 days less. The cost per ton of mining and preparing the coal for market was higher than in the previous year, necessarily so by reason of the fact that certain fixed expenses of managing, protecting and caring for the coal properties must be borne whether they are operated or not, and these were increased substantially during the period the mines were idle, and this cost necessarily had to be charged up against the tonnage produced during the active months. The prices of all classes of materials and supplies used about the mines were higher than in any recent year; notably was this the case as to all kinds of timber used in the mines, also as to steam and water pipe and fittings. The development work in the mines has been prosecuted on a large scale with the view of keeping up the production to the increased requirements of recent years. Special efforts and expense have been directed toward redeeming coal from abandoned workings, and same have been successful and promise better results another year. The management believes that no reasonable effort or cost should be spared to secure from the old workings and from the pillars left in the mines to support the surface of the ground as large a tonnage as possible without endangering the lives of the miners or the workings of the mines. The policy indicated in previous reports of making liberal annual expenditures for improvement of the company's collieries and breakers was continued, and during the past year the sum of $609,022 was expended or set aside for these purposes.

"The use of electricity in the mining of anthracite coal has been extending rapidly during recent years. This company stands well to the front in the use of electric appliances for lighting its breakers; for handling coal under ground with electric motors and in hoisting same on planes from one level to another by electric hoists, for pumping water with electrically operated centrifugal pumps, and other purposes. It has about 75 miles of trolley wire in use on its underground electric railways, with about 27 miles of feed wire. It has two large central plants for generating electricity for use in different mines contiguous thereto. A large amount of electrical work has been installed during the past year, and more is contemplated for the future.

"After the suspension of mining before referred to, the company's mine employees all returned to work under an understanding that the wages previously paid as established by the Anthracite Strike Commission shall be paid until April 1, 1909. The relations between the company and its mine employees were not seriously disturbed by the suspension and have continued pleasant and cordial since the resumption of work. The accidents in the mines and resulting casualties have been somewhat more numerous than usual during the past year. Experience has always been that increase in accidents follows a period of idleness in the mines. The company and its employees were fortunate, however, in not suffering any serious accidents involving large loss of life or damage to property.

"The demand for anthracite coal has been active throughout the year and this company has had no difficulty in marketing all the coal it could produce at the prices which have prevailed since the strike of 1902. As indicating the activity of the demand, this company at the close of the year had about 60,000 tons of coal less on hand than at the close of 1905. The indications are that the demand during the coming year will equal the tonnage the several companies will be able to produce; indeed, it is generally considered by those qualified to judge that with the growth of the population and business of the country during the past few years the future normal demand for anthracite coal will be so large that the producing companies will not in all probability be able to increase their output above what the market will require from year to year. This condition insures stability in prices and a continuation of prosperity for the industry.

"In the amendment to the Interstate Commerce Act, passed at the last session of Congress, was contained a provision making it unlawful for a common carrier to transport in interstate commerce any commodity, such as coal, mined or purchased by it or in which it has any interest, excepting such coal or other commodity is for its own use, this provision or the law to become effective after May 1, 1908. The avowed purpose of this law was to compel companies such as this to dispose of their coal properties, thus separating the transportation of coal from the mining and merchandizing thereof. The management is advised, by its legal representatives, that this company cannot be required to dispossess itself of its coal properties by the action of Congress under the guise of regulating commerce between the States, especially as by the terms of its charter, one of the early ones granted by Pennsylvania, it has the undoubted right to mine, purchase, transport and merchandize coal."

The Mineral Production of Canada

With its usual commendable promptness, the Mines Branch of the Geological Survey of Canada has issued the preliminary statement of the mineral production of the Dominion for 1906. The figures are given in the following table:

MINERAL PRODUCTION OF CANADA IN 1906.

Product.	Quantity.	Value.
METALLIC.		
Copper, lb.	57,023,291	$10,264,192
Gold		12,423,932
Iron ore (exports), tons.	74,778	149,177
Pig iron from Canadian ore, tons	104,666	1,724,101
Lead, lb.	54,200,000	3,066,094
Nickel, lb.	1,400,000	840,000
Silver, oz.	5,088,000	3,724,027
Cobalt ore and other metallic products		350,000
Total metallic		$42,979,629
NON-METALLIC.		
Asbestos, short tons	59,283	$1,970,878
Asbestic, short tons	20,127	17,230
Chromite, short tons	8,750	92,100
Coal, short tons	9,916,177	14,945,032
Peat, short tons	250	750
Corundum, short tons	2,274	204,973
Feldspar, short tons	15,873	38,740
Graphite, short tons	447	18,780
Grindstones, short tons	5,545	61,624
Gypsum, short tons	417,755	591,828
Limestone for flux in iron furnaces, short tons	366,015	286,632
Magnesite, ore exported, short tons	93	925
Mica (exports), short tons	913	581,919
Mineral pigments:		
Barytes, short tons	4,000	12,000
Ochres, short tons	6,837	36,955
Mineral water		100,000
Natural gas		528,868
Petroleum, bbl.	569,753	761,760
Pyrites, tons	39,611	157,438
Salt, bbls.	70,887	257,130
Talc, tons	1,284	3,630
Total non-metallic		$25,738,612
STRUCTURAL MATERIALS AND CLAY PRODUCTS.		
Cement, natural rock, bbl.	8,610	$6,052
Cement, portland, bbl.	2,139,164	3,164,807
Sands and gravels (exports) tons	256,550	139,712
Sewer pipe		446,790
Slate		21,146
Building material, including bricks, building stone, lime, etc.		7,200,000
Total structural materials and clay products		$10,981,807
Estimated value of mineral products not returned		300,000
Total		$80,000,048

The tons given are short tons of 2000 lb. The metals are valued at average prices in New York for the year.

The total value of the mineral production of Canada for 20 years past has been as follows:

1905, Total	$69,525,170	1895, Total	$20,505,917
1904, "	60,073,897	1894, "	19,931,158
1903, "	61,740,513	1893, "	20,035,092
1902, "	[illegible]	1892, "	15,925,417
1901, "	65,801,611	1891, "	18,976,616
1900, "	64,420,983	1890, "	16,763,353
1899, "	49,234,005	1889, "	14,013,118
1898, "	38,412,431	1888, "	12,518,894
1897, "	[illegible]	[illegible]	[illegible]
1896, "	22,471,256	1886, "	10,221,285

Of the gold reported in 1906, the Yukon furnished $5,600,000, and other parts of the Dominion $6,423,932 in all.

The general comments submitted by Elfric Drew Ingall, chief of the Mines Branch, follow:

The total output of gold as estimated [illegible] $12,500,000. This is due mainly to the continued shrinkage in the shipments from the Yukon, which district fell short of its last year's output by about $2,750,000. British Columbia showed an increase. For the rest of Canada, which, however, contributed only about 2.5 per cent. to the total, the figures, as far as at present available, show practically a stationary condition of affairs.

All the gold production of the Yukon and about 15 per cent. of that from British Columbia is obtained from placer deposits, the whole from this source amounting to 77 per cent. The remaining 23 per cent. represents the gold contents of the sulphuret and quartz ores worked in British Columbia and in eastern Canada. The placers as a source of the metal have for some years showed a continuous falling off, which, however, is more than neutralized by expansion in the lode-mining branch of the industry. Recent consolidations and the inauguration of extensive enterprises for working the poorer gravels, which, however, exist in large quantities in the Yukon Territory and in British Columbia, are likely in a few years to produce marked results in this line.

Silver

In 1906, Ontario, British Columbia, Yukon Territory and Quebec contributed to make up the total production of silver which reached 8,568,665 oz., valued at $5,723,079. This is an increase, in quantity, of 2,574,373 oz., or 42.95 per cent. over the previous year. The average yearly price of the metal on the New York market was 66.791c. per oz. for 1906, as compared with 60.352c. in 1905. This brings up the increase in value of the Canadian production in 1906, over that for 1905, to 58.20 per cent.

Ontario has assumed first place in Canada as a silver-producing province, owing to the rapid development of the Cobalt camp, which has attracted the attention of the whole mining world. As is well known, the silver occurs mostly in the metallic condition associated with numerous other minerals, the most prominent of which are cobalt and arsenic. The veins are narrow, but the ore is exceedingly rich. Some shipments are reported to have returned $100,000 per car load.

The figures of silver in the ores shipped from Cobalt, Ont., adopted in this report have received corroboration from data kindly furnished by T. W. Gibson, deputy minister of the Ontario Department of Mines, who puts the figure at 5,500,000 oz. of the metal, when complete returns shall be available. This closely agrees with our own estimate of 5,485,000 oz., which, taken at the market price of the metal, would give a value of $3,663,486.

British Columbia, on the other hand, shows a slight decrease in 1906 as compared with 1905, owing to the output of the Slocan district falling off much below expectations; this was offset to a great extent by an increased production from the St. Eugene and the Sullivan mine in the East Kootenay. The falling off of the Slocan, however, is only temporary, and there is every indication of a resumption of activity, more especially if the expected developments take place in the zinc industry. This would permit of mining the large bodies of zinc-lead ores, which are, as a rule, appreciably argentiferous.

Copper

Stimulated by the enhanced price of the metal, the production shows a very large increase in quantity, which expansion, together with the higher values obtained, is shown in the increase of nearly $3,500,000, or nearly 47 per cent.

British Columbia and Ontario are, as formerly, the two main contributors, the former supplying about 79 per cent., the latter about 18.5 per cent.

In British Columbia the mines of the Boundary camp are estimated to have contributed about three-quarters of the output of the province; Rossland being the second in importance, with the mines operated along the Pacific coast making up the balance. The rest of the Dominion output is represented by the copper contents of the nickel-copper mattes shipped from the Sudbury mines, with a small contribution from Quebec, representing the copper contents of the pyrites ores shipped from the mines of the Eastern Townships district.

Cobalt

The production of this metal is represented by the amounts contained in the shipments of ore made from the camp of that name in northern Ontario. It is stated by some operators that in selling the ores value has been received for the cobalt contents; while others have claimed to get no return for this metal. As processes of treatment for these complex ores are perfected, however, it is hoped that this unsatisfactory state of affairs will be remedied.

Nickel

The production of nickel from the ores of the Sudbury district in Ontario has made a very rapid growth during the past two years, the output in 1906 being over twice that of 1904. The ore is smelted at Copper Cliff and Victoria mines to a matte carrying from 78 to 80 per cent. of the combined metals, copper and nickel. The resulting matte is shipped to the United States and Great Britain for refining.

The following were the aggregate results of operations on the nickel-copper deposits of Ontario in 1906, in tons of 2000 pounds:

Ore mined	343,814
Ore smelted	340,059
Matte produced	20,364
Matte shipped	20,310
Copper contents of matte shipped,	5,264.6
Nickel contents of matte shipped,	10,745
Spot value of matte shipped	$4,629,011

According to customs returns, exports of nickel in matte, etc., were for 12 months ending Dec. 31 as follows:

	Pounds.
To Great Britain	2,210,892
To United States	21,262,444
Total	23,909,336

Although nickel is one of the minor constituents of the rich silver ores of the Cobalt district, the buyers of these ores have made no allowance for the nickel contents, and statistics of its output have not been obtained.

Lead

The figures of production of lead show a slight decrease in tonnage this year as compared with 1905; but owing to an increase of 20 per cent. in the average yearly price of this metal on the New York market, the value is very sensibly greater. The total quantity produced in 1906 was 54,200,000 lb., valued at $3,066,094, whereas in 1905 a quantity of 56,580,703 lb. was recorded, valued at $2,676,632.

About 95 per cent. of the above figure of production is to be credited to British Columbia, the great bulk being derived from the East Kootenay district. However, when arrangements are completed which will permit of mining the bodies of zinc-lead ores of the Slocan district, there is no doubt that a much larger production will be recorded.

Zinc

Throughout the year great hopes were entertained that the problem of utilization of the zinc ores of British Columbia was drawing very near to a solution. The Federal Government had appointed a commission to study the question of the sources and of the market for these ores, and a large zinc smelter was being erected at Frank, Alberta, through the enterprise of a group of French capitalists. The conclusion of the commission was that a satisfactory supply of zinc ores could probably be obtained in the Kootenays. The Frank smelter was put in operation and several tons of spelter were turned out from ores derived mainly from the Slocan district, but owing to defective apparatus the plant will require extensive and costly alterations before it can be run on a remunerative basis.

Iron

The total production of pig iron in Canada in 1906 from both Canadian and imported ore amounted to 598,411 short tons, as compared with 525,306 tons in 1905, or an increase of over 13 per cent. in quantity. This production represents the output of nine companies operating fifteen blast furnaces. Of these furnaces, three use charcoal as fuel, and twelve are run on coke.

The ore charged into the blast furnaces totaled 1,204,473 short tons, of which 221,733 tons were Canadian ore, and the balance, or 982,740 tons, was imported. The production of pig iron attributable to Canadian ore amounted to 104,660 tons, which is a marked increase over the previous year, when the production amounted to only 68,170 tons.

Besides the above quantity of Canadian iron ore charged into the furnaces, 74,778 tons were exported, which brings the total of iron ore produced in Canada in 1906 to 296,511 tons.

Asbestos

The production of asbestos from the eastern townships of the province of Quebec, divided into crude and mill stock, was as follows:

	Tons.	Value.
Crude	3,793	$ 624,895
Mill stock	55,490	1,343,983
Total asbestos	59,283	$1,970,878
Asbestic	20,127	17,280
Total products	79,410	$1,988,108

Exports of asbestos, according to customs returns, were 59,864 tons, valued at $1,689,257.

The special features of interest regarding the asbestos-mining industry during the year have been a general increase in output, a marked improvement in plant and machinery in some of the older mines, the opening up of new and promising properties, and a tendency toward the consolidation of a number of mines formerly separately owned, under one management and ownership.

Coal and Coke

The provinces of Nova Scotia, British Columbia, Alberta, Saskatchewan, New Brunswick and the Yukon Territory contributed to the total coal production, their relative outputs being in the order named. Nova Scotia figures in the coal returns for more than 60 per cent. of the whole Canadian production, and British Columbia for slightly over 20 per cent. As far as the figures now available will permit us to compare, the output for 1906 shows an increase of 1,248,229 tons over 1905.

The coal output is growing steadily and for the past 12 years each year has shown an increase over the preceding one. The salient feature of the Canadian coal industry in 1906 is the great development which coal mining has assumed in the western provinces, more particularly in Alberta. In this last province there were in 1901 only two mines which produced over 100,000 tons each per year. In 1906 not less than six collieries had an actual production greater than this figure; and several others, whose output did not quite reach the 100,000 mark are equipped to easily handle this amount.

In Nova Scotia and in British Columbia the increases of the past few years have been due mainly to the development of comparatively old established collieries.

An appreciable proportion of the coal of both eastern and western provinces was converted into coke for metallurgical purposes. At the end of the year there were about 800 coke ovens in operation in Nova Scotia, and somewhat over 1000 in Alberta and British Columbia.

Petroleum and Natural Gas

The production of petroleum is practically all derived from the Ontario peninsula, the only exception being a very small quantity obtained in New Brunswick in the Memramcook field. Besides the old established fields of Lambton and Kent counties some new oil pools were brought in in 1906, the main ones being those of Merlin in Tilbury township and of Moore township.

In the western provinces there has been great activity displayed in search for petroleum and natural gas; large sums have been spent in boring operations both in Alberta and Saskatchewan, but so far we have no production to record from these.

The figures of production of natural gas show a substantial increase over those of 1905, resulting mainly from the development of new gas pools by the Dominion Natural Gas Company in Brant, Haldimand and Norfolk counties. This company and the Provincial Natural Gas and Fuel Company are now the largest Canadian producers. The Medicine Hat field, in Alberta, has also produced very satisfactorily, and shows no perceptible sign of diminution.

Cement

The total quantity of portland cement made in Canada in 1906 was 2,152,562 bbl., as compared with 1,541,568 bbl. in 1905, an increase of 610,994 bbl., or 39.6 per cent. The total sales of portland cement were 2,119,764 bbl., as compared with 1,346,548 bbl. in 1905, an increase of 773,216 bbl., or 57.4 per cent. Additional details will be found tabulated below.

Fifteen companies were operating plants during 1906, with a total daily capacity of about 10,500 bbl., viz.: one in Nova Scotia, two in Quebec, eleven in Ontario, and one in British Columbia. At least four plants were under construction during the year, of which the total initial daily capacity will be about 4700 barrels.

Detailed statistics of production in 1905 and 1906 are as follows:

	1905. Bbl.	1906. Bbl.
Portland cement sold	1,346,548	2,119,764
Portland cement manufactured	1,541,568	2,152,562
Stock on hand Jan. 1	111,446	289,558
Stock on hand Dec. 31	306,466	322,356
Value of cement sold	$1,940,740	$3,164,—

The average price per barrel at the works in 1906 was $1.49, as compared with $1.42 in 1905.

The imports of portland cement into Canada in 1906 were 2,430,760 cwt., valued at $778,706. This is equivalent to 694,503 bbl. of 350 lb. each, at an average price per barrel of $1.12. The duty is 12½c. per 100 lb. The imports in 1905 were equivalent to 917,558 bbl., valued at $1,138,548, or an average price per barrel of $1.24. There is very little cement exported from Canada. The consumption is therefore practically represented by the Canadian sales, together with the imports.

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*Illustrated

Standardization of Measures

The Institution of Mining and Metallurgy is one of the few technical organizations which take positive action in the advancement of the professional interests of its members and of the industry with which they are associated. In the line of this policy it appointed, some time ago, a committee to formulate plans for the standardization of the weights and measures commonly employed in mining and metallurgy. This is an important matter, as we have argued many times, well worthy of the consideration of an organization like the Institution of Mining and Metallurgy. The committee has recently reported its recommendations, a summary of which is published elsewhere in this issue. In general we think that these recommendations will meet with the approval of mining engineers and metallurgists. Certainly they are conservative, which is manifested, moreover, in the decision not to urge the adoption of the metric system.

The abolition of the ton of 2240 lb. and the adoption of that 2000 lb. will eliminate a common and troublesome source of confusion. In accepting the understanding of the miners' inch as a flow of 1.5 cu.ft. of water per minute, the committee conforms to the best engineering practice in America. No exception will be taken to the recommendation that gold and silver returns be expressed in terms of fine gold and silver, and not as "bullion," the former being already the best practice in the world, for which the JOURNAL fought long and earnestly. The recommendation that the gold content of ores be expressed in money value as well as in weight appears to us to be rather unimportant, because so long as it is understood that the returns are being expressed in terms of fine gold, the conversion into money value of any system is easily made, and is without danger of confusion.

The recommendation of the committee that the word "gallon" be understood to mean the imperial gallon of 10 lb., and that all temperatures be expressed in degrees Centigrade, are more open to adverse opinion. As between the gallon of 10 lb., which is the standard in Great Britain, and the gallon of 8.33 lb. (231 cu.in.), which is almost universally employed in the United States, there is no question that, aside from the matter of custom, the former is the simpler for engineering purposes. Considering the matter from the latter standpoint, however, we are of the opinion that the committee would have done better to recommend the discarding of the word "gallon" and the substitution of the common measure of volume, namely the cubic foot, which has already been adopted as the basis for the miners' inch.

We conceive that the true line of progress in simplifying our weights and measures is according to the common methods of thought. It is simple to introduce the custom of measuring liquids by the cubic foot, because everyone is able to picture immediately in his mind how much is represented, which he cannot always do in the case of gallons. Similarly, most English speaking people are accustomed to think of common temperatures, say up to 120 deg. F., by a mental comparison with the Fahrenheit scale, while the same people may think of high temperatures by the Centigrade scale, because they are more generally accustomed to that in connection with furnace work. Consequently, it might be advisable to limit the official adoption of the Centigrade scale to the temperatures higher than the ordinary.

The standard laboratory screens that are recommended by the Institution of Mining and Metallurgy will, we think, meet with general approval, conforming as they do to the ordinary expression of number of meshes per linear inch, and providing a nearly uniform screening area of 25 per cent. The series has certain advantages, which are well pointed out by the committee in its report.

As to the definition of "sand," "meal," and "slime," the committee has evidently had difficulty in coming to a conclusion, and is not yet at all clear in its own mind. It is sufficiently precise to define sand as material coarser than 150 mesh, but to attempt to define meal and slime as material passing 150 mesh but settling in different times in a column of water of certain hight is, we fear, a definition that is so impracticable as to be of comparatively little value.

The Lake Copper Consolidation

In recent issues, we have referred to the aggressive policy adopted by the Calumet & Hecla Company, and the steps which it had taken to secure control of important properties in the Lake Superior

country. In some of the cases—the Allouez and the Centennial—no opposition appeared. At the annual meeting of the Allouez this week a majority of the old board was replaced by Calumet & Hecla men, and it it announced that the same course will be adopted at the coming meeting of Centennial.

For the control of the Osceola, however, it seems that the old Bigelow party was determined to fight. Aware that, by actual purchase and through proxies, shares enough had been secured to control the coming meeting, an unexpected blow was struck. An amendment to the Michigan mining law was sprung on the legislature suddenly and passed with little or no debate. The senator from the copper district was temporarily absent, and apparently most of the members were willing to vote for any measure which seemed to put a limitation on corporate activities. This amendment reads as follows:

"Provided, that if any corporation organized or existing under this act has heretofore purchased or acquired, or shall hereafter purchase or acquire, either directly or indirectly, through its trustees or otherwise, stock in any other such corporation which, at the time of such purchase is operating a producing mine, such stock while owned by such purchasing corporation or held in trust for its benefit, shall not be entitled to any vote at any corporate meeting."

It will be seen that this clause would, in the case of the Osceola, leave the election of the new board practically in the hands of the minority stockholders; that is the representatives of the old Bigelow party. The purpose of the new clause and the fact of its passage became known at once, and prompt measures were taken to prevent, if possible, its approval by the governor of the State.

The course taken to prevent the absorption of the Osceola has met with general condemnation. A snap judgment, secured from legislators, most of whom knew little or nothing about the facts of the case, and were liable to be swayed by the existing feeling against corporations, is not a method which appeals to most men. The purchase of stock, and the securing of proxies for the Calumet & Hecla were openly conducted, and there was no reason to believe that any interests of other stockholders were in danger. Opposition in the open was fair, and might be expected; but the tortuous method adopted did not deserve to succeed.

The latest news is that the Michigan Senate has recalled the bill from the governor; and this probably means its final failure. Whatever opinion may be held of the policy of consolidating Lake interests, there must be general approval of the defeat of an underhand move like this one.

Mining Promotions and the Daily Press

Remarks in three of the leading dailies of New York, which recently came under our attention the same day, were suggestive. In one, a correspondent who is visiting Nevada wrote, "After marveling at a thousand and one fabulous tales of lucky strikes that have suddenly transformed paupers into princes, the light was turned on for me by the chief boomer and one of the cleverest promoters in Goldfield, who, in a moment of inadvertent frankness, remarked, 'At least 97 per cent. of our mining promotion schemes are bubbles.'"

In another paper, a well known advertiser, who does not hide his light under a bushel, remarked in the course of one of his daily outpourings that naturally it would be pleasant just to wave the wand, and thus put up the market price of a stock tenfold, and then "sell out to the man in the moon." If the investors who buy stocks for a rise could appreciate thoroughly that there is safety only when the rise is justified by increase in the intrinsic value of the property represented, and not by the possibility of unloading upon the more unwary public, or the man in the moon, something would be gained.

The third matter of this day was an eight-page supplement of a reputable New York daily, of which about 75 per cent. was devoted to the advertisements of mining enterprises, and a large portion of the remainder to editorial write-ups. It would be conservative to say that upward of 90 per cent. of the advertisements were of enterprises that, to say the least, would be pronounced suspicious by an honest and intelligent mining engineer. It is such prostitution of the press that is largely responsible for the present evil of fraudulent mining promotion.

In this connection it is gratifying to see that the New York *Sun* is turning its satirical guns on some of the dubious promotions. A great deal would be done toward curing this festering sore if all the daily papers would be more circumspect about the advertisements which they accept and publish. There are some honorable journals which put such advertisements under the same ban that they do the advertisements of patent medicines and other discreditable matter, but the majority are utterly conscienceless.

The Butters Treatment for Cyanide Solutions

The spirit that prompted Manager H. P. Garthwaite and his associates of the Butters Salvador Mines, Limited, to give to the readers of the JOURNAL the details of the admirable process devised by the staff metallurgist, Charles P. Richmond, for the separation of gold and copper from cyanide solutions, is the spirit that has made the engineering professions what they are. If everyone capable of adding to the structure of human knowledge were compelled to build his own foundation from the ground up, the edifice would never rise above the first few stories.

This addition to our available stock of information concerning the treatment of cyanide solutions appears elsewhere in the present issue. Here was a problem which has limited the usefulness of the cyanide process in many cases. The slimes produced in the usual way contained so large a bulk of copper that the separation of the gold involved a complicated and costly process which could not conveniently be carried out at the mill. The shipment of the product to the refiners entailed heavy treatment charges and the loss of any returns which the copper in the ore should yield. The method now at the service of every metallurgist not only saves the charges for refining the gold, but also separates the copper in marketable form. Moreover the process is practically continuous.

In many of the industries a process so simple and so profitable would have been closely guarded as a valuable secret. The gates of the plant would have been locked and any visitor showing a suspicious gleam of curiosity would have been turned away by the watchman. Happily the engineers who have to do with mines can still afford to contribute freely to the store of knowledge to which we all owe so much.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Depreciation of Smelting Plants

It is to be regretted that the readers of the JOURNAL have not kept up the discussion, recently inaugurated, on the subject of depreciation of smelting plants, and the allowance that ought to be reckoned for amortization. The importance of the subject has been emphasized in several of the valuable articles that have already been published. However, the discussion has failed to crystallize itself into concrete examples, that might enable generalizations and rules to be deduced, or if that be impossible, to learn the consensus of opinion.

I have recently had before me a case wherein there was a choice between two processes. After studying carefully the items of direct operating expense in each case, the question of first cost of plant naturally arose. By one process, the first cost was about $7 per ton of annual capacity, i.e., the cost of a unit capable of working up 10,000 tons of material per annum was $70,000. In the other case, the first cost was about $10 per ton of annual capacity. Reckoning amortization at 10 per cent. per annum, which has been my usual practice, the fixed charges on that account were $0.70 and $1 per ton, respectively. The process requiring the more costly plant did not show sufficient advantage in direct operating expense to justify the larger expenditure on capital account, but if it were safe to reckon amortization at only 5 per cent., the prospects would have been materially altered, and very likely the decision in this particular case would have been different; on the other hand, if amortization had been reckoned at a higher rate than 10 per cent., the prospects would have been considerably more unfavorable for the more costly plant.

These are very important considerations, especially in the cases of works of high first cost and low operating cost per ton of material treated. If, for example, the first cost is in the neighborhood of $10 per ton of annual capacity, and the operating cost is in the neighborhood of $2.50, an amortization charge of 10 per cent. is 40 per cent. of the direct operating expense, and small variations in the rate are of large influence in determining the commercial result.

It may be that under certain special conditions, 5 per cent. amortization may be safely reckoned, but I am disposed to believe that in the majority of metallurgical constructions the rate which ought to be reckoned for amortization is above 10 per cent., rather than below it. Certainly, 10 per cent. is not an ultra conservative figure.

ROBERT ANSTEE.

New York, Feb. 15, 1907.

Moisture of Coke Shipped in Closed Cars

The question of hydrogen in coke, whether as an occlusion or in the form of carbon compounds, has been gone into quite fully by Parry (*Chemical News*, 25, 98); Dingler's *Pol. J.*, 204, 470; Muck, "Steinkohlen Chemie," p. 153; Summersbach and Anderson "Chemistry of Coke," pp. 79 *et seq.* The weight of evidence appears to be that it occurs in both forms. The question of whether by catalytic action a portion of this hydrogen is oxidized to water may be very readily settled by careful sampling and retention of the sample for a sufficient time in a closed receptacle, unless there is assumed to be some special advantage in a box car and the motion of the train.

Coke is exceedingly hard to sample on the yard. It is hard to break. The product of a single oven represents a complete manufacture from start to finish, and differs somewhat from every other oven and from other drawings of the same oven. The coke from the top, from the bottom, from the front, and from the back may, and often does, differ widely. As ordinarily sampled the moisture determinations are valueless.

Coke does not readily absorb water, but when hot coke is watered down more or less of a vacuum is formed in each cell and they become practically filled with water. If watered properly the bulk of the water is again driven off in the process of drawing a beehive oven, and nearly all of the balance is gradually evaporated from the still warm coke as it lies on the yard. Mr. Page says he has more trouble in summer. At that season the coke is notoriously over-watered, while we do not realize the amount of moisture which continues to be given off. This is indicated in winter by the cloud of vapor above each pile of coke. If such coke is loaded "warm" in a closed car it will undoubtedly continue to give off moisture which will condense against the cold top, sides and bottom of the car, and also on the comparatively cooler outer surface of the pile of coke. In that event, on opening the car, everything seems to be saturated with moisture and samples from the surface would probably be greatly in excess of the average.

CHAS. CATLETT.

Staunton, Va., March 2.

The Laborer is Worthy of His Hire

"Wanted—An A 1 mine accountant and cashier; thorough knowledge of Spanish and Mexican Stamp Law essential. Salary $200.00 Mexican Silver per month. Apply, etc.:—"

What a travesty of justice is displayed in this advertisement! Anyone at all acquainted with the work and responsibility pertaining to a post such as indicated knows that a competent man would be worth at least double the salary offered.

If the advertiser simply desired an office assistant with prospect of promotion, there would be no call for remark—if so stated; but to expect a capable man to offer his services at such a figure denotes, either crass ignorance or despicable meanness on the part of the advertiser.

A trustworthy official who understands and is interested in his business will save the company the amount of his salary over and over again in ways that would remain undetected or neglected by a less conscientious man.

Granting, that a man possessing the required qualifications accepted the post, it would probably imply that he was "hard up" and looked upon the position as a "makeshift" until something better offered itself, or that his habits were such as to unfit him for a better post.

Other advertisements are constantly appearing for mine superintendents, mill and cyanide men, assayers, chemists, etc.; with such niggardly salaries attached as to preclude the possibility of obtaining good men. The "chief sinners" are mostly those who know little or nothing of the duties belonging to such positions.

All strong, sound companies have realized or are quickly realizing that it is the hight of wisdom to pay competent men good salaries. Many people confuse elements of this subject; in reasoning from cause to effect they argue that prosperous companies can afford to pay good salaries, whereas it should be, good salaries command capable men who make the prosperous companies.

DAVID WALLACE.

Monterey, Mex., March 5, 1907.

Meeting of the Canadian Mining Institute

The Proceedings of the Ninth Annual Convention Included Discussions of Mine Taxation and of the Ores of Cobalt

BY FREDERICK HOBART

The ninth annual meeting of the Canadian Mining Institute began on March 6, at the King Edward Hotel, Toronto. This was the second meeting held in Ontario, the institute having met in Toronto in 1904.

The morning session was devoted chiefly to routine business. President George R. Smith delivered a brief annual address, in which he spoke of the great progress of the mineral industry of Canada in recent years. He called especial attention to the late developments in Ontario, especially in the Cobalt district, and the extraordinary increase in the mineral production of that province. He also referred to recent changes in the mining laws of the provinces, and to the proposed measures for taxation of mining property.

The report of the treasurer showed a balance of about $1300, after paying all claims.

The report of the council showed the work accomplished during the year, and continued as follows: "It is gratifying to be able to record an important increase, of approximately 20 per cent. in the membership during the year, which now, including students, for the first time exceeds 500 names. This may be regarded as indicative of appreciation and recognition on the part of those engaged in the development of our mineral resources, of the useful work this institute is attempting to perform in the interests of mining in the Dominion.

"Pursuant to a resolution unanimously passed at the Quebec meeting, requesting the president to appoint a delegation to wait on the Dominion Government and urge the desirability of the early establishment of a Federal Department of Mines, under the direct supervision of a responsible minister, a deputation consisting of Messrs. Smith, Adams, Porter, Drummond, and Brown, proceeded to Ottawa on April 18, and presented the views of the Institute to Sir Wilfred Laurier and his colleagues, by whom they were most favorably received. Within a few weeks of this interview, the office of director of the Geological Survey of Canada, which had remained vacant since the death of the late Dr. George Dawson, was filled by the appointment of A. P. Low, whose interest in that branch of geological science which deals more particularly with the solution of economic problems, is well known. The work of the Survey during the past year under Mr. Low's direction has been of an eminently useful and practical character; and the appointment of that gentleman to the head of the Survey is a matter for congratulation. Following the appointment of Mr. Low, the Survey was disassociated from the Department of the Interior, and placed under the ministerial charge of Hon. Mr. Templeman. Although, as yet, the bill for the establishment of a Department of Mines has not been introduced into Parliament, it is understood that such a measure is now under contemplation, and it is hoped, therefore, that before another year shall have passed, the wishes of the mining industry in this important respect, will have been realized.

"During the year an addition of some fifty volumes was made to the library, and a number of exchanges, including transactions of technical societies, official reports and periodicals, covering a period of three years, were bound and added to the shelves.

"After receiving the report of the judges, Messrs. Charles B. Going and Frederick Hobart, the council awarded the president's gold medal, for the best paper submitted by a student member during the year, to Frank G. Wickware, of McGill University, for his thesis entitled 'The British Columbia Copper Company's Mine and Smelters.' The council also awarded three cash prizes of $25 each as follows: To Frank B. Wickware for the paper mentioned above; to J. J. Robertson, School of Mining, Kingston, for his paper entitled 'Cyanide Tests on Timiskaming Ores'; and to R. P. Cowen, McGill University, for his paper entitled, 'Number Four Pit, Brayton Domain Collieries, Cumberland, England.'"

The ballots for officers were referred to the scrutineers, Messrs. F. Hobart, R. H. Murray and A. R. Wilson being appointed to that position.

At the afternoon session J. M. Clark read a brief paper on "Royalties on Minerals in Ontario." This was followed by a discussion on the mining tax law pending in the Ontario legislature, at the close of which the following resolution was adopted:

"This institute believes that the bill now before the Ontario legislature providing for the taxation of mines is opposed not only to the mining interests, but also to the manufacturing and agricultural interests of the province, and we, as a body, respectfully ask the Ontario Government to take time, and carefully consider what has been the effect of mining legislation in other countries and in this province."

The members of the institute then proceeded to the Parliament House, where the Minister of Mines, Hon. Frank Cochrane, had arranged for a hearing of the bill. President Smith, Messrs. Hardman, Coste, Hay, Leonard and Clark were spokesmen for the delegation.

At the evening session a number of papers were read by title. Three papers were presented in full: "New Tilbury Oilfield in Ontario," by Eugene Coste; "Status of Mining in Canada," by J. C. Gwillim; "Anthracite Coal Mining," by H. H. Stoek. Mr. Coste's paper was accompanied by maps and diagrams. Mr. Gwillim's paper, which referred to the ethics of the mining profession and the relations between engineers and promoters, was discussed at some length.

The Second Day

The morning session was chiefly devoted to Cobalt. W. G. Miller, provincial geologist of Ontario, opened with a brief address on recent changes and developments in the Cobalt district, which was illustrated by maps and geological sections. He was followed by Prof. C. R. Van Hise in a long and interesting paper on the "Ore Deposits of the Cobalt Region," in which he discussed the probable methods in which the ores were deposited. He considered it probable that the cobalt was the result of deposition by underground waters, the silver being a secondary deposit due to descending waters. He gives his reasons for this belief in a very clear way. In conclusion he expressed the belief that other rich deposits might be found in the neighboring areas. It is impossible to abstract this valuable paper in a brief space. It was followed by a discussion, in which a number of members took part.

In discussing the paper, Eugene Coste said that the Port Arthur district would yet surprise Canadians for silver deposits. It had never been properly explored, and if it were it would show ores of exceptional richness, he thought.

Dr. Robert Bell, of Ottawa, read a technical paper on "The Cobalt Mining District," giving an account of his explorations in regard to mineral areas of the north.

At the afternoon session there was some further discussion on the Ontario tax law, and the following resolution was adopted:

"While freely acknowledging and assenting to the right of the Government to impose such taxation as may be shown to be necessary or expedient for purposes

that all such measures of taxation should

and discussion as may insure a minimum of discomfort and of burden to the industry thus taxed. Therefore, be it resolved, That the mining industry has no objection to taxation imposed of necessity and equitably distributed and collected, and provided, further, that such taxation thus imposed shall not attack rights and titles already vested with the sanction of the Crown; that it does object to the principle of a royalty tax, because it is confiscatory in its nature. Properties have been taken up under legislative enactments abolishing royalties in Ontario. It is impossible of collection except by an intolerable system of inquisition, which is imposed on no other business interests in the province. It will undoubtedly act, as did the bill of 1891, to prevent the investment of capital in Ontario.

"In consideration of these facts we hereby request the appointment of a commission to consider the bill along the following lines, namely: The amount of revenue which your Government deems necessary to procure from the mines of the province; a proper and equitable method of collecting such revenue; the effect of such a tax upon the mining industry and upon those interests which depend thereon; the history and effect of similar legislation in the Dominion of Canada; the following methods of raising such revenue, if necessary: A tax on acreage of mining land; a tax upon the capitalization of mining companies; an increased annual license fee from incorporated mining companies; a tax on dividends declared by mining companies."

P. H. McBennie, Niagara Falls, read a paper prepared by himself and F. A. Fitzgerald on "Magnetic Separation by the Gondal Process," showing that this method was used in Scandinavian countries with success. The crushing mechanical treatment and other incidents were explained.

Dr. Robert Bell, Ottawa, read a paper on "Sir William Logan and the Geological Survey of Canada," giving a selection of the incidents and anecdotes, reminiscences of the man from all points of view.

Hiram W. Hixon, Victoria Mines, read a paper on "Magmatic Waters," which called out a lively discussion.

The Annual Dinner

The annual dinner of the institute, always an important function, was largely attended, and passed off very successfully. Some excellent speeches were made in response to the various toasts. After the usual toasts to the King and the President of the United States, the following were

The Dominion and Provincial Governments responded to by Lieutenant-Governor Clark, of Ontario, Hon. Frank Cochrane, minister of mines and Hon. W. J. Hanna, provincial secretary.

The Mining Industry; J. E. Hardman, of Montreal and Prof. J. R. Kemp, of New York.

Sister Societies; Dr. A. R. Ledoux, of New York, for the American Institute of Mining Engineers, R. W. Leonard, for the Canadian Society of Civil Engineers, and H. W. Corbett for the Mining Society of Nova Scotia.

The Guests; Prof. C. R. Van Hise, Prof. Chamberlain, and Bailey Willis, of the United States Geological Survey.

The Press; Frederick Hobart, of New York, R. H. Murray, of Toronto, and H. H. Stock.

The Transportation Companies; R. C. Steele, of the Toronto Board of Trade.

Retiring President George R. Smith delivered a brief and appropriate valedictory, and introduced the new president, Frederick Keffer, who responded, also briefly.

The Third Day

At the morning session a paper was given by Dr. Wm. Campbell, of Columbia University, New York, on "Microscopic Examinations of Nickeliferous Pyrrhotite." His address was illustrated by lantern slides.

"The Marble Bay Copper Deposit, Texada Island, B. C.," by O. E. Leroy, of Ottawa, was read.

E. Jacobs, of Victoria, dealt with "Progress of British Columbia Mineral Production." He stated that the dividends declared last year by British Columbia mining companies amounted to between $3,000,000 and $4,000,000.

It was announced that the mine-taxation bill of Ontario would probably be considerably modified, or that full opportunity would be given to draft a new bill.

At the afternoon session the scrutineers reported the result of the ballots as follows, the gentlemen named being elected for the ensuing year:

President — Frederick Keffer, Greenwood, B. C.

Vice-presidents—Dr. J. Bonsall Porter, Montreal; W. G. Miller, Toronto; W. Fleet Robertson, Victoria, B. C.

Secretary—H. Mortimer Lamb, Montreal.

Treasurer—J. Stevenson Brown, Montreal.

Council—E. W. Gilman, Montreal; Jas. McEvoy, Fernie, B. C.; Frank B. Smith, Edmonton, Alberta; R. W. Brock, Ottawa; J. C. Gwillim, Kingston; Dr. F. D. Adams, Montreal; H. E. T. Haultain, Craigmont, Ont.; D. H. Brown, Copper Cliff, Ontario.

The following papers were read and briefly discussed: "The Geology of the Franklin District Ore Deposits, B. C.," by R. W. Brock, of Ottawa.

"Some New Points in the Geology of Copper Ores," by Prof. James F. Kemp, New York.

"Iron Possibilities of the Province of Quebec," by F. Cirkel, Montreal.

"History of the Bruce Mines," by H. J. Carnegie Williams, Bruce Mines, Ontario.

A number of papers were read by title. The usual resolutions of thanks, etc., were passed and the meeting finally adjourned.

The Cobalt Excursion

A party of about 60 members of the institute left Toronto at 9:30 p.m. on a trip to Cobalt, a special train being furnished by the Grand Trunk and Timiskaming & Northern Ontario lines. This party spent two days in Cobalt, leaving there March 10 for North Bay, whence the members dispersed to their homes. This closed one of the largest and most successful meetings ever held by the institute.

Zinc Production in Russia

According to the *Financier and Bullionist*, zinc ore is produced in Kieletz, and the metal is smelted and rolled and zinc white produced in the Bendinsk district of Petrokoff, Russia. Statistics for the full year are not yet available, but those for the first nine months of 1906 are compared with corresponding figures for 1905. They are supplied by the Polish Mining Council. The production of zinc ore came from the mines known as the Joseph, the Ullis-Franco-Russian Company, and the Boleslav-Sosenowicz Company, while manufactured zinc and spelter were produced at the three factories, Bendinsk, Paulin and Konstantin. The summary is given in the subjoined table:

Material	Jan.-Sept. 1905.	Jan.-Sept. 1906.	Changes.
	Lb.	Lb.	Lb.
Calamine.....	163,056,000	104,556,843	D. 58,499,157
Calamine and Galena.....	9,646,382	13,921,573	I. 4,275,191
Spelter.....	13,214,861	15,680,264	I. 2,465,403
Zinc white....	712,345	1,242,903	530,558

On Oct. 14, 1906, the stocks of calamine at the mines amounted to 38,443,932 lb., and there were 561,144 lb. of manufactured zinc held at the factories, and of zinc white the stocks amounted to 145,856 lb. The decrease in the production of ore, the large stocks, and the increases in the quantity of zinc smelted are accounted for by the fact that the year 1905 was one of the most miserable for the production of zinc at the Russian factories and smelters. This accumulated large stocks at the mines, necessitating curtailment in production the following year. It is believed that the total production of metallic zinc for 1906 will fall behind that for the years 1904 and 1903, when the results showed 23,372,264 lb., and 21,812,370 lb., respectively.

Adequate ventilation is one of the best preservatives of timber. A poor and stagnant atmosphere may rot 12-inch Oregon pine in six or eight weeks. Timber with cold water dripping on it will last longer than that which is set up in a dry drift.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Benjamin Sadtler, of Denver, is at present making a professional trip to Sonora, Mexico.

Stanley Unwin, of London, has started on an extended visit to the United States and Canada.

James MacNaughton, general manager Calumet & Hecla Mining Company, has gone to Boston.

Walter Fitch, general manager Utah Copper Company, has been in Calumet, Mich., for the past few days.

H. W. Hardinge left New York on March 4 for Colorado and Arizona. He expects to return about the end of March.

F. Julius Fohs is now at Lexington, Ky., working on several geological reports, and will probably remain there for several months.

W. E. Thorne has left San Jose, Cal., to examine some ancient channels in Placer county, making his headquarters at East Auburn, Cal.

C. Colcock Jones has returned to Los Angeles, Cal., after several weeks passed in eastern San Bernardino county, Cal., on professional business.

H. H. Robinson, general superintendent Michigan State Telephone Company, has been a visitor in the copper country in the interest of extensions contemplated by the company.

W. C. Fitzsimmons, of Cleveland, O., started on March 10 for Mexico, where he will examine a number of gold mining properties for New York and Philadelphia parties.

A. C. de Jongh, a mining engineer from Holland, passed through Denver a few days ago. He is studying mining and metallurgy in the United States, previous to leaving for the Dutch East Indies.

George A. Laird, superintendent of the Copper Queen Consolidated Mining Company's Sierra de Cobre mines, at Cananea, Sonora, Mexico, and formerly manager of La Victoria y Anexas, San Pedro, Mexico, has resigned his position with the Phelps-Dodge Company and will enter into the general engineering business with Franklin W. Smith, of Franklin W. Smith & Co., of Bisbee, Arizona.

Obituary

Homer J. Lindsay, who died in Pittsburg, March 3, aged 48 years, was one of the original Carnegie partners. For some years he had been assistant to the first vice-president of the Carnegie Steel Company.

Lord Penrhyn, who died in London, March 11, aged 71 years, was the owner of large slate quarries in Wales and was best known on account of the most stubborn and protracted labor contest ever known in the mineral industry. He kept all his quarries closed for three years rather than yield to the men's demands, notwithstanding a heavy loss of trade to home and foreign competitors.

Industrial

The Fleming Auto Loader Company, Detroit, Michigan, is getting out plans and specifications for a new factory building, which will more than double the present capacity. J. C. Fleming is president and manager.

The Salt Lake City office of the Denver Engineering Works Company has been moved from 416 Dooly Block to 205 Atlas Block. The steadily increasing business under the management of L. G. E. Bignell required roomier quarters.

The Midvale Steel Company, of Philadelphia, Penn., has opened a branch office in the City of Mexico. John E. Strachan, formerly in charge of the Denver office, will be manager of the City of Mexico office. The head office for the Pacific coast, for the Midvale Steel Company, is located in San Francisco, Cal. Jas. C. H. Ferguson is the Pacific coast sales agent.

The Fred. M. Prescott Steam Pump Company, Milwaukee, is again making large extensions, which when completed will more than double the present capacity of the plant, built but four years ago. The additions to the office, drawing rooms and pattern shop are finished; the foundations for the new foundry have been laid, so that the steel work for same will probably be raised within the next month. This building will, be 300 ft. in length, and includes several novel features in the way of handling the pig iron, coke and sand. Paralleling the foundry will be two long machine shops, spanned at the east end by a high erecting shop, 205 ft in length. The rectangular court between the two shops will be divided by a railroad track and used for the storage of castings. New machinery will be installed in both the foundry and shops, all electrically driven.

The first application in America of the Rateau process for the utilization of exhaust steam from intermittently running engines has been put in operation at the steel works of the International Harvester Company, South Chicago, Ill. The exhaust steam from a reversible blooming mill is utilized in a low-pressure Rateau turbine of 600 kw. capacity, direct-connected to two 250-volt genrators. To regulate the intermittent exhaust of steam, the exhaust of the blooming mill is worked through one of the water-type Rateau steam regenerators, which has a capacity sufficient to take care of intermissions of several minutes' duration in the running of the main engine. The steam then feeds the low-pressure turbine, and is condensed in a barometric condenser. The pressures are atmospheric pressure absolute at the inlet of turbine and 28-in vacuum at the outlet. The quantity of steam available from the main engine is more than twice the amount needed by the turbine. In case of a shut-down of the main engine for a long period of time an automatic reducing valve allows the steam from the boilers to be directed and utilized in the low-pressure turbine.

Societies and Technical Schools

The [illegible] officers of this society for 1907 are: President, W. L. Abbott; vice-presidents, Andrews Allen, E. N. Layfield, A. N. Talbot; treasurer, A. Reichmann; secretary, J. H. Warder. The office of the society is in the Monadnock block, Chicago.

[illegible] regular meeting of the society for February, the trustees, to whom was referred the bill for a State Geological Survey, presented by Professor Bowman at the last meeting, made a verbal report. On motion the society voted to indorse said bill, now pending before the legislature of Montana.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Pelton Water Wheel Company, San Francisco, Cal. Pelton Water Wheels. Pp. 108, illustrated, paper, 6x9 in.; 1906.

Joseph Dixon Crucible Company, Jersey City, N. J. Crucibles, Their Care and Use. Pp. 39, illustrated, indexed, paper, 6x9 in. 1907.

Construction News

Birmingham, Ala.—The Kilby Frog and Switch Company has increased its capital stock of $150,000.

The Southern Steel Company has completed the installation of another battery of patent wire-drawing machines at the Ensley plant.

Blue Tent, California—This mine is to be worked on a large scale, and machinery will be needed. W. H. Metson and C. L. Canfield, San Francisco, are owners.

Nevada City, California—The Channel Gold Mining Company is preparing to operate on a large scale and will need machinery. Chauncey L. Canfield, Nevada City, Cal., is manager.

Republic, Washington—It is proposed to erect a large mill to treat ores from the Republic and other mines by crushing and cyanidation. Harry L. Rodgers, of Butte, Mont., is managing the project.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco March 6

[illegible] stamps of the Champion mill, and all of the Home mill, at Nevada City, have been started up again after a long period of idleness due to the extended litigation between the two companies. The Champion mill has 70 stamps and the Home 30 stamps. A large quantity of ore had accumulated previous to actual litigation. Some 2500 tons remain uncrushed which was taken by the Home company from the disputed ground, finally adjudged to have been the Champion's. The Champion Company has arranged to connect with the Home water supply to operate the compressors of both plants, which will save considerable expense.

The Tonopah Company (or Brock railroad) has bought out the Bodie Railroad, a wood railroad running 12 miles from Bodie into the great timber belt of Mono county. This deal means much to the Nevada mining country. The problem of an adequate timber supply has long been one to cause anxiety in the Nevada mining section. The Brock syndicate has completed the survey of the right of way upon which it will soon begin the construction of a standard gage from Tonopah junction to connect with the Bodie road by means of which it will tap the great timber belt.

There is a little local excitement in the Honey Lake Valley region, in Lassen county, particularly near Spoonville, the Gibson ranch and Schafer mountain, where considerable prospecting is now being done. Lassen county has for some years had only one producing mine—the old Golden Eagle, owned by the Lassen Mining Company, composed of Louis and Leon Sloss, E. M. Hunt, Curtis Lindley, E. H. Benjamin, and others.

Quite a notable strike has been made in the Mountain Maid mine, Chicago Park district, between Grass Valley and Colfax. The mine is owned by Dr. Charles Puscheco. The ore is rich and much specimen material is being taken out.

In the Fruitvale mine, on the Yuba river side of Chipps ridge, Sierra county, they have come across a pocket of more than $20,000 in specimen ore. They have been driving a tunnel in the mine for several months, under superintendence of Andrew Fitzgerald, of Alleghany. The ledge where found is 6 ft. wide. The discovery is considered important to that part of Alleghany district lying west of the famous Tightner ledge.

The excitement about the Savage mine on the Forest Hill divide, in Placer county, recently bought by George Wingfield, of Goldfield, Nevada, still continues The Forest Hill miners are locating claims in all directions, and as far down as Yankee Jim's. The travel into the mountain section is rapidly increasing and numbers of men from adjoining States have gone into the districts. The Savage mine is in a high mountain locality, 2½ miles from Forest Hill.

The Grizzly Hill drift mine on the South Yuba river, below Blue Tent, Nevada county, is about to be re-opened. Considerable development work has been done and a gravel-mill erected by men who had dissensions among themselves, and then shut down work. W. H. Metson, of San Francisco, and C. L. Canfield, the oil investor, are completing arrangements to open and work the mine on an extensive scale. Only a small part of the gravel channel has heretofore been worked.

Work will soon commence on the 1271 acres of gravel ground owned by El Oro Gold Mining Company, of Nevada City. The claims extend from the Malakoff mine, at North Bloomfield, to the neighborhood of Columbia Hill. Twelve tunnels have been run into the ridge at different times, but all have been too high to bottom the channel, which is believed to be either an extension of the old Bald Mountain channel, which crosses the South Yuba river, from Minnesota, in Sierra county, to Snow Point, in Nevada county, or else the channel which was worked with such rich results by the Blue Banks and other companies in the vicinity of Moore's Flat. As soon as the winter is over the company will start re-opening a 2300-ft. tunnel half a mile above the Pickle ranch, near Columbia Hill, which was driven in from the north side many years ago. An incline will then be put down to reach the bottom of the channel, and the bedrock will be followed for some distance. The company doing this work has for its president Frank T. Smith, and secretary and treasurer, E. L. Bosqui, of Nevada City.

Salt Lake City March 8

A heavy stock interest in the Emma Copper Company, with properties at Alta, has been purchased by Samuel Newhouse, D. C. Jackling and Charles W. Whitley. Recent developments in this mine indicate that it will become a shipper as important as any in the camp.

The Alta Coalition Copper Company has been formed to develop a group of mining claims in the Big Cottonwood district. The officers are: F. R. Snow, president; B. F. Grant, vice-president; N. Y. Stringham, treasurer; all of Salt Lake.

The Daly and Ontario mining companies will probably enter the Salt Lake market with coal, being joint owners of the Weber coal mine at Coalville, Summit county. Heretofore only the camp and mines at Park City have been supplied from this source.

An Ely statistician estimates that during the past year $2,000,000 has been expended in that camp in mine development and improvements. The Nevada Consolidated and Cumberland Ely companies have been the heaviest investors.

Samuel Newhouse, president of the Newhouse Mines and Smelters corporation, has made the statement that a dividend will be declared during the present year. The company owns the Cactus copper mine in Beaver county. It is said the net earnings for this month will be around $225,000.

The mill on the Last Chance property at Bingham, which was recently overhauled thoroughly, is about ready for commission. It is to be operated by electric power.

Shareholders of the Bullock Mining Company, with headquarters at Provo, have elected the following officers: B. H. Bullock, president; J. I. Bullock, vice-president; who, with M. M. Kellog, W. F. Giles and Thomas Boardman are directors.

The owners of the Little Pittsburg and Pioneer mines in the Little Cottonwood and American Fork districts, near Alta, are endeavoring to bring about a consolidation.

It is expected that the smelter of the Utah Smelting Company, located near Ogden, will be in commission not later than March 10. The company has been buying ores for several months and has an accumulation of over 3000 tons on hand.

Denver March 8

Although the past month was a short one, the record of the production of the Cripple Creek district makes a very favorable showing, amounting to 43,100 tons, valued at $1,135,075. In consequence of fine weather conditions, causing the roads to be unusually good for this season of the year, and the starting up of several small metallurgical plants, treat-

me the lower grades of ... good advantage, the winter's record is a fine one and the present month promises to show a large increase over the above figures.

It is expected that the Golden Cycle mill at Colorado City, which is almost completed, having been constructed under Philip Argall's personal supervision, will commence operations in a short time on the ores of the Milliken properties. It is understood that the management of the Portland Company is considering the erection of a plant in the immediate vicinity of their properties to treat low-grade ores.

The stockholders of the Yak Mining, Milling and Tunnel Company, operating at Leadville, have declared the regular quarterly dividend of 2c. per share and besides, an extra dividend of 4c. per share. The tonnage of this mine has been very large lately.

A meeting of the directors of the Calumet Telluride Gold Mining Company was held at Calumet, Mich., a few days ago and a contract for the construction of a 20-stamp mill and electrical plant, was awarded to the Allis-Chalmers Company of Milwaukee, at a cost of $40,000.

There is considerable activity in the Tungsten district of Boulder county and the price for concentrates continues to advance. During the past week $9.20 per unit is understood to have been offered for 60 per cent. concentrates, which is more than double the price of a year ago.

The International Trust Company of Denver has brought suit in the district court against the Campbird Extension Mining Company, this company having borrowed $70,000 on a bond issue about three years ago, the total indebtedness being $86,800, at present. The company owns a property adjoining the famous Campbird mines near Ouray but is in no way connected with them.

Two million ounces of silver will be coined by the Denver mint in 50-centavo pieces for the Mexican Government, as soon as the latter delivers the bullion.

From present appearances the trials of Haywood, Moyer and Pettibone in Idaho will not be held for some time to come. It was expected that they were to commence on March 5, but on that date the defense was granted further time.

Indianapolis March 5

Almost the entire time of the convention of the United Mine Workers of district No. 8 known as the block-coal district, was taken up in considering the trouble at the Progressive Coal Company's mine. It appears that the miners made a contract with the company to mine and load fireclay at 30c. and shale at 25c. a ton. This scale worked satisfactorily as long as there was a good demand for coal, but when the coal business fell off and the company kept the miners busy a part of the time in loading clay and shale, earning from $1.75 to $2 per day, they demanded an increase in price which the company refused to grant. The miners appealed to the district organization. The officers told the miners that it was a private contract made without consulting the district officials and consequently nothing could be done for them. The men were advised that if they did not wish to load the clay by the ton they could load it at regular day wages of $2.56 a day. Thereupon the miners voted to return to work, but trouble is anticipated if they repudiate their contracts and demand the $2.56 per day.

Cobalt, Ont. March 9

The official report of the Timiskaming & Northern Ontario Railway of shipments of Cobalt ore for the week ending Mar. 2 is as follows: Buffalo, 60,000 lb.; Green-Meehan, 68,380; La Rose, 57,480; Nipissing, 148,470; O'Brien, 194,610; Silver Queen, 54,670; total, 583,610 pounds.

Owing to the great demand lately for mining plants, there is much delay in filling orders. The business in Canada is confined to comparatively few companies, the principal trade being done by the Rand-Jenckes, the Allis-Chalmers-Bullock, and Mussens, Ltd., who have agents at Cobalt, and whose machinery is well known. The companies are disposed to be conservative in their orders for plant, and do not care to buy machines of new types with which they are unfamiliar; so that newer rivals in the trade find it difficult to obtain orders. The leading firms have so much business on hand that an order for a large compressor generally takes five or six months to fill.

London March 2

At the Redruth tin ticketings held on Feb. 25, an interesting feature of the function was the sale of a parcel of tin from Swaziland, South Africa. It is not usual for any tin ores or concentrates to be sold by public competition in Cornwall. About 16 tons of Swaziland ore was sold on this occasion, and the price obtained was £135, as compared with £124 obtained by Dolcoath, and Grenville. The ore must therefore have been almost pure tin oxide. It shows that the Swaziland alluvial tin can be dressed very fine.

I have referred in this column a number of times during the past few years to the Avino Mines of Mexico, Ltd., a company operating in Durango, Mexico. For the past year Ralph Nichols has been engaged in directing exploring operations with the object of getting an idea of what ore is really to be found. Hitherto various dressing and reduction processes have been recommended and adopted with insufficient data to go on. The cost of Mr. Nichols' operations is necessarily considerable, and the company now finds itself in the position of running short of funds. The exploring work will take all the money on hand, and perhaps more, and there will be none left for reorganizing the plant. The directors have come to the conclusion that reconstruction with a view to assessment is the only possible way of raising any more money, so a scheme of this sort is to be laid before shareholders shortly whereby £60,000 further capital will be provided.

One of the sources of public revenue in the Transvaal is the income derived from the profits of the Premier diamond mines. For the year ended Oct. 30 last the public income from this source amounted to no less than £370,000. At the same time the shareholders in the company receive £260,000 as dividends. This is a practical example of the highest form of socialistic doctrine that mineral deposits should be worked for the benefit of the State. During the year in question, the mining expenses amounted to £286,000, and the sorting and washing to £183,000. Development work cost £42,000, extra equipment, £55,000, and office expenses, marketing expenses, etc., brought the total expenditure of the year up to £660,000. The total income from the sale of diamonds was £1,277,739. The production of diamonds during the year was 899,746 carats, an increase of 54,000 carats over that of the previous year. The water difficulty has now been got over, and by the recent completion of the pumping station on the Wilge river, a water supply of 2,000,000 gal. every 24 hours is assured. Additional pumping plant is to be erected before long by means of which this supply will be doubled. New equipment is also under consideration in order that the output may be increased. It is not probable that this additional expenditure will be embarked on until the famous Cullinan diamond is disposed of. This diamond figures in the assets of the company at a purely nominal sum. Some day it will be realized for a good round sum, which will provide the additional capital required for extending the plant. The company now disposes of its output itself, the original contract with Neumann's having expired.

The affairs of the Ymir mine of British Columbia, and of the English company owning it, are still in suspense. The scheme by which it was hoped to obtain financial assistance from America fell through, and the directors had considerable difficulty in arranging a scheme for providing new capital. It was impossible to raise money by reconstructing and assessing, as many holders would have dropped out, so a scheme for raising money by debentures is now practically complete, and the directors have felt enabled to go forward with the reorganization necessary. It has been decided to appoint a local board of directors, of which S. S. Fowler will be head. The new manager, H. G. Nichols, left London a fortnight ago for the mine.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

Arizona Copper Company—At the recent annual meeting of this company, the chairman announced that with the additional mills recently erected and in course of erection, with the proper complement of men, the company could produce 18,000 long tons of copper per annum, if the ore averaged 2.14 per cent.; and 21,000 tons, if it averaged 2.4 per cent. The production in 1906 was about 13,500 tons.

Pima County

Imperial Copper Company—This company, with mines on the branch railroad from Red Rock, on the Southern Pacific, is now erecting a 350-ton smelter, with converters complete, for the treatment of its own and custom ores. Provision is made for a second furnace of equal size, when it shall be required. The construction is under the care of Meade Goodloe, of the Congress mine.

California

Argonaut—The new manager of this company is shortly to arrive, and it is expected that this property will before long be operated on a larger scale. A new shaft will be sunk on the Hoffman ground.

Last Chance—A new 10-stamp mill has been placed on this mine at Nashville, Henry Smith superintendent.

Sherman—An electric motor is being installed at this mine, near Placerville, and in a short time the whole plant will be run by electricity.

Inyo County

Southern Belle—This group at Laws is now thoroughly developed, and is equipped for extensive operations. The New Year shaft shows a large body of ore. The mine was a large producer many years ago. W. G. Scott is superintendent of the mine, and A. E. Vandercook, president of the company. Deeper sinking is to be carried on at the property.

New Coso—This company at Darwin is making good progress on the Lucky Jim, and also on the six Thompson claims adjoining. Two new gasolene engines have been installed.

[illegible] County

Dredging—Location notices covering some 15,000 acres have been filed for claims in the southeastern part of Kern county, extending into San Bernardino. The project is to dredge in the Mohave desert on the line of an ancient river-bed which crosses it, and the ground has been located along the line of the old river.

Madera County

Golden State—These mines, near Raymond, R. D. Morris, superintendent, are about to be worked by a party of Los Angeles men.

Modoc County

Hoag District—In this new district the following mines are being worked: Turner, Williams and Mason, Wade and Plummer, Kaffader and Bassett, and Seltz, the latter being a copper claim.

Monterey County

Quicksilver—The Esmeralda quicksilver mine has been sold to Cruikshank, Harboldt & Wetzel, and is now being worked by the new owners. A tunnel is being run to open the orebody.

Nevada County

Channel Gold Mining Company—This is the name of the new company which has taken hold of the old Blue Tent gravel mine, six miles north of Nevada City. The directors and officers are as follows: J. C. Wilson, president; R. S. Moore, vice-president; George Wilbrand, secretary-treasurer; Chauncey L. Canfield, manager. J. O. Jones, generally known as Oscar Jones, who for many years had charge of the Bald Mountain mine, at Forest City, and the Mayflower mine of Placer county, is the superintendent in charge. The new company is now engaged in getting ready to open a large area of virgin ground, and expects to work the mine extensively.

Champion—The litigation being ended, 20 stamps of the mill of this mine at Nevada City, have started running, for the first time in nearly two years. Ore is being hoisted through both the Champion and Home shafts.

Placer County

Bellevue—This mine at Ophir has been sold to W. F. Brice and associates, of Los Angeles. Electric power will be used.

Gold Run Gravels—On this property, Dutch Flat, air compressors and other improvements are being put in.

Savage—This mine at Forest Hill, recently purchased for $100,000 by George Wingfield of Goldfield, Nevada, will be thoroughly opened and developed at once by its new owner. There are a number of proved mines near this one—notably the Barton, or Herman. The mine is in Volcano cañon.

Hibbe Copper Mine—This mine, on Bear river, three miles above the Dairy Farm mine, has been sold through C. L. Wilson, and the new owners have commenced to take out ore for shipment.

Riverside County

During January 256 mining locations were placed on record in the county recorder's office.

San Bernardino County

Desert Mining and Reduction Company—A new mill, pumps, hoist, etc., are about being purchased for this company, whose property is in Bullion district in the New York mountains. Arthur Woods is manager.

Shasta County

Treat Consolidated and Little Rover Group—These mines, between Iron Mountain and Shasta, have been re-located by C. Litsch. The orignal owners spent considerable money on development and machinery and applied for patent. The United States land office was not satisfied, and canceled the entries on Nov. 6. Litsch then took up the claims.

Bonanza—For this mine at Harrison Gulch a patent has been issued and it is thought that this will end the long litigation about the Harrison Gulch town-site.

Sierra County

Tightner—At this mine, Alleghany, work is to be resumed without delay on the 1000-ft. tunnel from Kanaka creek, a contract to run 500 ft. having been let to Wliliam Kidd and Gabriel Nelson. The tunnel was started last year, but operations on it were delayed.

Siskiyou County

Bloomfield—A third interest in this copper mine in the Blue Ledge district, is reported to have been sold to Montana men for $45,000. Six mines of importance have been opened on the same ledge. In the development of the Blue Ledge mine, which gives the name to the district, $200,000 has been expended. Diamond drilling has been done to the extent of 7000 ft. or more.

Champion Group Mines Company—This company has shipped a carload of rich ore and cencentrates from the McKinley

and Old Flag mines, to the Selby smelter. The ledges on these mines are growing wider and richer as they go down, and the indications point toward the development of a valuable property. The company is working two shifts and is in need of ten more miners. A. L. Hays is superintendent.

[illegible] COUNTY

[illegible] Mining Company [illegible] pany has been formed for the purpose of developing and operating the Ida Klein mine, situated near Stent. The property is a comparatively undeveloped one, but bears the marks of a valuable mine, and it is the intention to immediately equip it with all necessary machinery.

Roosevelt—This mine, formerly the Equitable, has been sold by J. H. Adams to W. E. Mitchell, of New York, together with a 5-acre mill site, and the Bourbon group of claims.

Colorado

LAKE COUNTY—LEADVILLE

Buckeye—Work on the recent strike in this mine, Freyer hill, has proved that the sand carbonates found in the north drift, gave place to a large body of iron. Upraising in the iron body is now in progress and no doubt when the top is reached the carbonate will be found there; this is the general history of the hill. The drift will be driven ahead to the end of the iron shoot to the north.

Cleveland—The manager of this property, South Evans gulch, was surprised to find during the week that the shaft had passed through the body of lead ore and entered the porphyry; the orebody passed through was 10 ft. thick. When sinking was resumed at the 500-ft. mark the shaft was in hard gold quartz, running $6 per ton; after going down 40 ft. the body of lead ore was caught, and passing through that, the shaft is now in porphyry and going down at the rate of 5 ft. per day. What will be encountered before the shaft reaches the 625-foot is a matter of conjecture.

Helen Gould—Work has been going on all winter driving a tunnel on this claim, East Tennessee section, now in 180 ft. During the week the tunnel ran into a body of ore 4 ft. wide carrying gold, silver and copper.

Breece Hill—The Vinnie is shipping an average of 50 tons daily of a good grade of silicious ore. The large body of zinc opened in the M. N. fraction and running to the end-lines of the Vinnie, will be opened in the latter property. From the lateral run from the Yak tunnel through the Vinnie ground an upraise has been started to make connections with the shaft. When that is completed all the ore mined in the property will go out through the Yak tunnel, which will materially lessen the cost of mining. The Highland Chief employs five four-horse teams steadily, hauling ore from the mine to the switch down the gulch the average shipments being 60 tons daily. From the body of ore recently opened at one of the lower levels of the Elk, 50 tons daily are being hoisted. Hanifen & Reynolds secured a lease on the Black Prince, north of the Little Jonny, sunk the shaft deeper, drifted and have opened up a good body of ore from which they are shipping steadily. The Fanny Rawlins, Big Four, Big Six, Penn, etc., are shipping steadily.

Mammoth—The water in this shaft, Big Evans gulch, has been lowered to 400-ft.; at this point a large station is being cut and when the pumps are installed unwatering the shaft will be resumed.

Monthly Tonnage—The total for the month of February was 75,000 tons of all classes of ore, and considering it was a short month the output is up to the average.

Zinc Mill—The plant belonging to the Boston-Arizona Company has been installed and experimental tests are at present being made; in a few days the mill will be treating 50 tons daily. The process used is magnetic separation.

Swisher Tunnel—This tunnel, driven into Sugar Loaf mountain from the north side, has caught the vein, which is about 3 ft. wide and runs $8 to $10 gold and $16 silver per ton. The new find differs from the typical fissures of the hill, being in blanket form.

Bull's Eye—This mine, Iron hill, under lease to the Bray Brothers, is shipping a good grade of iron from the upper workings. Recently a good vein of carbonates was opened in one of the lower levels, and ore is now being shipped from that part of the mine.

Mammoth—The new machinery and pumps have been installed, and the shaft is being unwatered. To the southwest of the Mammoth lies the Fairmont group, which has been secured under lease to Mayor Johnston, of Boulder; a new shaft will be started about the middle of March.

Elk—The body of low-grade ore recently opened in this property, Breece hill, in one of the lower levels, has improved greatly in value within the last 10 days; today the lessees are sacking ore of high-grade value from a streak several inches wide found in the body of low-grade material.

Hibschle Shaft—This shaft, at the head of East Seventh street, in addition to shipping a good grade of iron, during the week in one of the lower levels opened a good-sized vein of lead carbonates, and this also is being sent to the smelter.

Coronado—This property is shipping at the rate of 400 tons daily of sulphides and lead silicious ores from the ore reserves. Development work is kept well ahead; the water is gradually subsiding until now the pumps are only lifting 1500 gal. of water per min.

Wolftone—Recently this property, Carbonate hill, resumed work, and now 200 men are employed. Ore is being broken at different levels to the amount of 300 tons daily, 200 tons going to the Adams mill and the balance to the smelter.

A. Y. & Minnie—This mine, California gulch, is sending out 200 tons daily, 100 tons being treated at the mill, and the other 100 tons going to the smelter. The concentrate from this mill is a clean product and finds a ready market.

Illinois

VERMILION COUNTY

Kelly Coal Company—The stock of this company, which owns a large coal property near Danville, has changed hands. It was bought outright by R. R. Hammond, J. K. Dering, Hugh Shirkie and Edward Shirkie, all of whom are connected with the Dering Coal Company. The purchase, however, is not by the Dering company, but by the four gentlemen named, and the stock is their individual property. The face of the stock is $3,500,000, but what figure was paid for it has not been made public. The property includes 13,000 acres of land, on which five mines have been opened, which are producing 6000 tons of coal a day. The new officers of the Kelly Coal Company are: President and general manager, R. R. Hammond; vice-president, Hugh Shirkie; secretary and treasurer, J. E. Hitt. The directors are R. R. Hammond, J. K. Dering, Hugh Shirkie, Edward Shirkie and J. E. Hitt.

Indiana

GREENE COUNTY

An eastern company will soon begin the opening of a new mine near Howesville. A year ago a fine vein of coal was found, overlaid with a bed of fireclay. The promoters took options and waited for the building of the New Monon Railroad so as to have shipping facilities. Work is now beginning in earnest.

KNOX COUNTY

Tecumseh Coal Company—The company has sunk a shaft to No. 5 vein, at Bicknell, and is now putting up one of the best tipples in Southern Indiana. All of the machinery will be run by compressed air. Altogether the cost of the mine, with sidetracks, etc., will be $75,000. The shaft is almost 160 ft. deep, and the vein is 6 ft 8 in., of a good bituminous quality. Valentine Martin has been made general manager and O. H. Martin secretary-treasurer.

Missouri

ZINC-LEAD DISTRICT

Atkinson Land—P. W. Atkinson has leased 30 acres of his land to McEntee, Turnidge & Co., of Webb City, who will

drill the ground for mineral. The land is located west of the Howard land at Webb City, on which several good strikes have recently been made.

Garrison Land—The Webb City Mining and Leasing Company has secured a lease on the old workings on this land, which is situated in the southeast edge of Webb City, and is doing much development work. The old 100-ton mill has been overhauled and remodeled into a 200-ton plant, a sludge mill added which is turning out a considerable amount of ore each week, and a new 350-ton modern concentrating plant has been contracted for, to be erected on the west portion of the lease, the old mill being on the east.

Henderson Land—Harley and Charley Wells, of Joplin, who discovered by drill the orebody of the now famous Morning Hour mine on this land, have made another rich strike on a sub-lease adjoining the Morning Hour, the drill showing a 25-ft. face of ore in two different holes. The land is situated just west of Joplin.

Schlessman Land—A strike made by Howard Luke, of Joplin, on this land, which is just west of the Schifferdecker land in the west edge of Joplin, gives promise of opening up a new producing section. This is the first prospecting done on this land and ore was encountered at the 170-ft. level.

Sheperd Land—James Campbell, of the Missouri Lead and Zinc Company, has purchased of the Muncie Mining Company the 200 acres known as the Sheperd farm, lying west of the Rex Mining and Smelting Company's 1000-acre tract and northeast of the Missouri Lead and Zinc Company's large holdings in Joplin.

Thompson Land—A. C. Roper and associates, of Carthage, have leased 400 acres of the Thompson & McFall land, four miles northeast of Carthage, on which they will do some prospect work by drilling. About 12 years ago some drilling was done on this land and showed a body of zinc with a sprinkling of lead ore. This new company has its own drill and will thoroughly test the land.

Madison County

The new smelter of this company at Fredericksburg, that cost $250,000, is now operating its shaft furnace and is turning out 5000 lb. of blister copper daily. This contains 4 to 6 per cent. of nickel and cobalt, which will be taken out by the electrolytic process as soon as the refining department is completed. While a little copper occurs with the Southeast Missouri disseminated lead ore, this is the first instance where the amount has been large enough to warrant a special plant for its recovery.

Montana

Butte District

A despatch from Butte, March 11, says: "The striking miners are now willing to enter into a contract to work on a sliding scale, based on the price of copper, with a maximum for underground men of $4 a day when the rate is above 25c. a pound, and a minimum of $3.50 with the price below 18c. Shaftmen will get from $4 to $4.50. It is understood that the companies have agreed to this compromise, and a contract for five years will probably be made."

Nevada

Esmeralda County—Goldfield

Miners' Union—Late telegraphic advices from Goldfield say that the miners have decided to sever connections with the Industrial Workers of the World and form a union of their own. The first shift of miners of the Consolidated Companies was called out March 11 by the old union because the carpenters would not join their order. The shift went on as usual, declaring that they would no longer bear the dictation of agitators.

Mohawk-Jumbo—The shaft at a depth of 350 ft. has encountered a change in the country rock and the miners hope to break into ore within a week or two.

Dixie—Arrangements are nearly completed for resuming development on the Dixie mine which is well located in the eastern portion of the field. In the workings above the 360-ft. level large bodies of milling ore are opened ready for stoping. It is proposed to resume sinking with the view of developing the lower ground.

Amethyst—The shaft has cut ore where the Red Butte and Great Bend veins junction. A new power hoist is being installed with the view of facilitating sinking. The newly formed company has decided to sink the shaft with the greatest possible speed as there are reasons for believing that both the veins will carry milling ore and possibly bonanza shoots will be met with at no great depth.

Combination Extension—The shaft has been sunk to a depth of 200 ft. and the mine has been furnished with a complete pneumatic drilling plant. The bottom of the shaft is in the andesite formation which yields promising assays.

Florence—Plans are completed for the immediate erection of a 10-stamp battery on the Florence. The ore is largely sulphide, and the mill will require a concentrating equipment. It is estimated that the ore already in the dump contains over half a million dollars worth of gold. It has been decided to erect a mill building capable of housing a battery of 30 stamps, as it is believed the requirements of the mine within the next twelve months will necessitate a mill of that capacity.

St. Ives—A rich find has been made in the Codd lease on the St. Ives mine, which gives every indication of developing into a bonanza. Careful samplings across the vein for a width of 3 ft. give assays running up to $2000 per ton. The shaft will be continued to a depth of 200 ft., with the greatest speed so that mining can be started at that level while the shaft is being sunk lower. This find has beneficially influenced the value of shares in a number of mining companies operating in the vicinity of the St. Ives, and there is a large amount of local trading in St. Ives shares at advancing rates.

Simmerone—A new 25-h.p. hoist has been installed by the lessees and a full force of men has been engaged to run the shaft down from the 140-ft. level to the 250-ft. level, with the greatest speed. The shaft will be a large one, and well timbered to enable a large output of ore to be made in as short a time as possible. This mine yielded some bonanza shipments about two years ago, and there are indications that it will be yielding well again within the next few months.

Nighthawk—The main shaft will be continued to a depth of 400 ft. from the 200-ft. level. When pumps are put in place to deal with the water, the manager will put men on to drift on the 200-ft. level.

Nye County—Bullfrog

Skookum—The new tunnel has been advanced for a total distance of 92 ft. The breast is in quartz carrying small values. The manager expects to cut the ore-shoot well within the next 50 ft.

Valley View—A new tunnel has been started in this property, which is located in the Mayflower section of the field. It is proposed to extend the tunnel a distance of 600 ft. with a view of developing a number of low-grade veins which outcrop on the hill.

North Star—Recently the tunnel encountered a promising vein and the management determined to test it by drifts. The results are most promising, and a rich shoot may be discovered at any moment.

Nye County—Fairview

Fairview Eagle—This mine will shortly enter the regular producing and shipping class. At this time there is a large tonnage of rich ore sacked, lying on the dumps and stored in tunnels and drifts about the workings. The Eagle adjoins the Nevada Hills on the north, and is said to have an equally fine showing for relative depth.

Aztec—The power hoist, which was ordered some months ago and which is the second to be installed in the Fairview district has been erected. The Eagle had the distinction of erecting the first power hoist in Fairview.

Nye County—Manhattan

Mammoth—The contract work on the main tunnel has been completed. The last 50 ft. of the tunnel is in ore and the

superintendent is of the opinion that the ledge is wider than it at present appears. Men will be put on in a few days to drift along the vein and stack the ore. The tunnel just finished is the longest on the field and is 608 ft. in length.

[illegible] driven into the hill for a distance of 450 ft. Numerous drifts have been run from it, and several promising ore-bearing veins have been cut. Prospecting work is being vigorously prosecuted.

[illegible] on this property during the winter on account of the bad weather. A meeting of the directors was held in Tonopah during the week, and it was decided to resume prospecting work immediately. Orders have been placed in San Francisco for a steam hoist.

Stray Dog—The shaft is down 248 ft. and the rich Stray Dog vein is expected to be cut again within the next 50 ft. The vein at a depth of 136 ft. is over 5 ft. in width, and recent assays have shown an average value of $200 to $250 per ton. The vein runs in a northerly direction, and has a steep dip to the west. In the lower levels sulphide ore is met with, which requires smelting.

Toquima—The shaft has reached a depth of 170 ft., and is still going down in the footwall. The orebody has been found to continue without a break to a depth of 150 ft., and assays from 5 to 16 per cent. copper per ton. If it continues to develop well in the next 200 ft., the owners will erect a smelter on the ground.

NYE COUNTY—OAK SPRINGS

Pomeroy United—This mine is situated 40 miles north of Johnnie Siding, on the Las Vegas & Tonopah Railroad, and only a few miles from the old Emigrant road. The formation is a contact of lime and porphyry with granite. The company has on exhibition at Tonopah several hundred pounds of fine ore that yields average assays of 17 per cent. copper, while picked samples run as high as 21 per cent. The ledge from which the samples were taken is apparently wedge-shaped, and at a depth of 20 ft. has widened out to 5 ft., with well defined walls. Iron gossan traverses the entire length of the property, and can be plainly traced for over a mile and a quarter.

New Mexico

GRANT COUNTY

Santa Rita Camp—The Santa Rita Copper Company has ceased stoping, but is working in the 100-ton concentrator several of the old dumps of oxidized ores, some of which assay as high as 10 per cent. copper, as malachite, cuprite and native copper. Lessees are doing some stoping in the Hearst mine, and are washing several old dumps by means of trommels, hand jigs and strakes. The Santa Rita company has begun a shaft south of town to penetrate the underlying lime stone formation at a depth of 1000 ft.

Hanover District—Of the Phelps-Dodge mines the Modoc is shut down and the Old Hanover is leased to Superintendent Kramer, by whom the old stope filling is being shipped, as it can be sorted to assay 6 to 8 per cent. copper. The Hermosa Copper Company, controlled by General Electric interests, is exploring several prospects, of which the Ivanhoe and the Humboldt are the largest. So far the expected copper has not materialized.

Fierro—The two iron deposits, the Union Hill and Jim Fair, are shipping more than 10,000 tons of ore monthly to Pueblo. Of this the first mine is responsible for twice the tonnage of the second, and also contains a much greater preponderance of magnetite over hematite, though both ores have ½ to ¾ per cent. copper, and are within the bessemer limit.

Boggs Mine—This lies on a recently discovered fissure in quartzite, west of the Ivanhoe mine. The ore is galena, which occurs in vertical shoots 5 to 15 ft. long, 1 to 7 ft. thick, and some 10 ft. apart. The lead is poor in silver, but the shoots could produce large quantities of the base metal were it not for the likelihood of a change at a shallow depth to copper.

SIERRA COUNTY

Hillsboro District—The Hillsboro Consolidated Company, which some time ago bought the mines of the Philadelphia Mining and Milling Company, at Andrews, is working 25 men and planning a machinery equipment. In the McKinley group, owned by Conoby & Co., a strike of rich gold ore has been made and shipments will soon be begun. The Empire Company will erect an air compressor to expedite the drilling in its 4000-ft. drainage adit, now started on the fifth level of the Bonanza mine. This mine is controlled by the Miller Bros., of Osage county, Kan. It has a 20-stamp mill.

The Sierra Company, with Ex-Senator Miller, of New York, as president, and J. J. May as superintendent, has been active for three months. It is erecting the steel building for a mill with 30 stamps of 950 lb. and 12 Wilfley tables, and is planning a cyanide-process addition. The power plant consists of two 175-h.p. crude-oil Diesel engines, each direct-connected to a dynamo to furnish electric power for mine and mill. There is a 500-ft. shaft on the Snake and a 600-ft. shaft on the Opportunity, and it is hoped to increase the present force of 70 men to 200, when production is started. There have been several mining revivals at Hillsboro, but so far with little success; perhaps this one will have better luck than its predecessors.

Caballo Mountains—The Victoria Chief Company recently bought up the defunct Black Peak Gold Mining Company, at a sheriff's sale. The Victoria has $500,000 in the treasury, and has started a national bank at Engle to handle this sum that is to be expanded in mine development and in the building of a $250,000 copper smelter on the west side of the range.

Pennsylvania

Gordon-Frackville Coal Company—This company is placing a large pump and set of boilers in the new opening west of Gordon, where a breaker is to be built this year.

Lehigh Valley Coal Company—The new Sayre breaker of this company, at Mt. Carmel, will be placed in operation within two weeks and will have a capacity of 2500 tons daily. It is equipped with many modern improvements, including an electric-alarm system which will stop the machinery in different parts of the breaker by pressing a button.

A disastrous explosion of dynamite occurred at the powder house of the Richards colliery of this company at Mt. Carmel, this week, when 45 were injured and damage done to the extent of $25,000 to the company's property. When the explosion occurred, there were stored in the powder house 5000 lb. of dynamite, 60 kegs of powder and 5000 caps. Fortunately the powder house was located about a mile from the town of Mt. Carmel and some distance from the colliery, otherwise the results would have been more serious.

Philadelphia & Reading Coal and Iron Company—Exceptionally thick veins of coal were recently cut in the Renny tunnel of the North Franklin colliery of this company. In this colliery an electric-haulage system is to be installed.

Delaware, Lackawanna & Western Company—This company broke the hoisting record at the Avondale mine, last week, when 707 cars of coal were hoisted in nine hours. The next best record was 662 cars in ten hours.

Lehigh Navigation Company—This company has plans under discussion for enlarging the business conducted along its canal. During the past few years more than $600,000 of the company's surplus earnings have been expended in rebuilding and repairing the canal.

BITUMINOUS COAL

Pittsburg Coal Company—This company reports its net earnings for January at $374,644, an increase of $36,651, or 10.8 per cent., over January, 1906. Depreciation and interest amounted to $236,277, leaving a surplus of $138,367 for the month.

South Dakota

Custer County

[illegible] of machinery have just been delivered, consisting of an air compressor and other necessary equipment. As soon as it is installed, the work of running the long tunnel to tap the ledge will be resumed.

Saginaw—The difficulties of this company have been adjusted, and the work of drifting will be commenced in a few days. The shaft is 400 ft. deep, good ore has been opened up on all the levels and the company plans to build a 100-ton mill.

Clara Belle—This company has now struck the orebody at a depth of 250-ft. The ore is the same as in the old workings, or free milling. The mill will start up at once. The 10-stamp mill is complete and will be worked for the cyanide plant. Tanks are on the ground ready to be erected. Railroads are built for hauling the ore to the mill, a distance of about 3000 ft.

The company has completed a fine shaft, and has all the necessary machinery for mining the ore economically.

Lawrence County

Columbus Group—A cross shoot running nearly north and south is showing up well. The shaft is 38 ft. deep, all in ore, which has widened from 18 in. at the surface to 5 ft. at the bottom of the shaft. The ore assays $9 a ton, free milling. The ledge can be traced a distance of 2000 ft. on the surface, and five other shafts sunk on the vein show the same results.

Safe Investment—This company has put its new mill to work, and 20 stamps are now dropping on ore. The entire 40 will be at work by the end of the week. The company is employing 60 men.

[illegible] the above group of claims comprising about 170 acres of land, the main ledge has been opened up at two points, showing a strong vein of ore averaging $9 a ton. At a depth of 175 ft. the ledge is 30 ft. wide, and the values lie chiefly in the concentrates. A 155-ft. tunnel has cross cut the vein a distance of 30 ft. and has not yet reached the foot wall. The ore also carries native copper.

Pennington County

Grand View—This company, operating at Silver City, has been running a five-stamp mill for the past eight months on free-milling ore, and is arranging to install machinery to sink the shaft from the 100-ft. level. Antimony ore is also found, and will be developed this spring.

Provident—Operations will begin within the next few weeks on the spodumene property, near Keystone. Preparations have been made to work it on a large scale.

Golden West—Work has been suspended temporarily on account of a break in the machinery. The mill, which has a capacity of 80 tons, will be increased to 150 tons. It is now operated by water power, but an auxiliary steam plant is to be installed so that operations can be continued in winter.

Utah

Juab County

Tintic Ore Shipments last week amounted to 151 carloads, the contributing mines and amounts being: Ajax, 1; Brooklyn, 2; Bullion Beck, 9; Beck Tunnel, 8; Carisa, 2; Centennial Eureka, 57; Eureka Hill, 12; Eagle & Blue Bell, 6; Grand Central, 7; May Day, 5; Mammoth, 17; Scranton, 6; Swansea, 4; Tintic Iron, 6; Uncle Sam, 1; Victoria, 6; Yankee Consolidated, 2 cars.

Lower Mammoth—The electric hoisting plants recently installed are in commission and shipments of ore will be made on the basis of 100 tons a day.

Salt Lake County

Columbus Consolidated—The management of this Alta mine has decided to sink a shaft to the 400-ft. level below the main tunnel.

Ohio Copper—Work is progressing on the excavations for the mill to be erected by this company in Bingham.

Summit County

Park City Shipments last week amounted to 3,290,200 lb., the contributing mines and amounts being: Daly Judge, 1,319,820; Little Bell, 21,200; Daly, 153,500; Daly Judge (zinc middlings), 228,300; Silver King, 1,319,820; Daly West, 1,020,000; Ontario, 196,000 pounds.

Ontario Drain Tunnel—This adit, which was closed a little over two years ago by a series of caves, has been opened as far as Ontario No. 2 shaft, or for a distance of about 3000 feet.

Naildriver—Work at present is being directed in the 200-ft. crosscut from the 950 level.

Tooele County

Ingot—The development of this property at Mercur has been resumed after several years of inactivity. It adjoins Consolidated Mercur and is controlled by practically the same interests.

Gold Hill—This property is owned by the Western Utah Copper Company and is being developed upon an extensive scale. It is to this mine that a branch line of the Western Pacific Railroad will be built this year.

Washington

Ferry County

Republic Mine—Some time ago this mine was sold by the Ferry county treasurer for taxes. Harry L. Rodgers, of Butte, Mont., met the county commissioners, Feb. 25, and secured a lease of and option for the purchase of the Republic and Cecelia Fraction in five years, the consideration being $50,000. In order to exercise his right, he must erect a mill at or near the city of Republic, to be of at least 100 tons daily capacity and be in operation by March 1, 1908. He must operate the mine, produce from it at least 1000 tons of ore per month, pay the county a royalty of 10 per cent. on all ore having a gross value up to $10 per ton and of 50 per cent. on all ore having a value of $10 or more per ton, the royalties to apply on account of the purchase price of the mine. Mr. Rodgers, who represents a New York syndicate, was at Republic last December and procured samples from the leading mines of the camp. Some of the principal shareholders in the Republic Consolidated Mining Company are said to be members of the syndicate. In connection with this deal Mr. Rodgers proposes to arrange for a consolidation of the Republic, Pearl Consolidated, Quilp, Trade Dollar, Ben Hur and Tom Thumb mines, and is now negotiating with the companies owning them. Mr. Rodgers stated that he expected to establish a new mill in the camp, at a cost of $250,000, to treat 500 tons of ore daily. The ore is to be treated by cyanidation.

Hitherto great difficulty has been experienced in mining and marketing the ores of the camp, owing to the irregularity of their deposition in the various veins. The higher grades of ore have always been found in streaks and bunches, separated by others of lower grades which would not pay to break and remove. The cost of mining ore in the camp has run up to $5 or $6 per ton, and the transportation to and treatment at the smelters has cost from $5 to $7.50 per ton. Any ore having a value of less than $10 or $11 per ton would not pay to handle under the past conditions. Not only that, the demand for Republic ores at the smelters was spasmodic, and the market for them was unsteady and unreliable. Under the proposed new conditions, if they can be carried out and the ore treated at a low cost, the ores of different values, instead of the higher-grade bunches being separately gouged, may be broken clear across the vein, from wall to wall, and sent to the mill without grading or sorting, the cost of breaking in that case probably not exceeding $1.25 per ton.

Pearl Consolidated—The annual stockholders' meeting is announced to take place at 600 Jamieson building, Spokane, Wash., March 19. The board of directors has sent out a circular setting forth that the directors have entered into a contract with Harry L. Rodgers, representing New York capital, for a lease and bond on the company's property on the following lines: "Price, $156,000. Time, three years from completion of the mill 120 days from Feb. 27. Mill to be completed not later than March 1, 1908. Must

[illegible] sinking the main shaft [illegible] Aug. 25 and work continued until an additional depth of 100 ft. has been attained. Must cut a station at that depth and drive a crosscut to the vein. Must mill a minimum tonnage of 1000 tons per month, keep development sufficiently in advance of ore extraction (if the ore is to be had), and pay a royalty of 10 per cent. of the gross assay value of $8 on ore milled and an additional 50 per cent. on all ores having a value in excess of $8 per ton. Royalty applies on purchase. Must pay all taxes during life of lease, beginning with 1907, and pay interest on the mortgage quarterly."

[illegible] Hur and Pearl Consolidated mining companies have entered into contracts with H. L. Rodgers, of Butte, Mont., for leasing and bonding their mines to him, with a view to consolidating them with the Republic mine under one management. Other companies remain to be heard from.

Canada

Ontario—Cobalt District

Brooks-Hudson—Fourteen men are at work on this property, Hudson township, which lies several miles northwest of Cobalt. A vein 5 in. in width has been struck a short distance below the surface.

Gordon-Cobalt—A vein of calcite on this propery, Cobalt, about half a mile south of Clear lake on the contact of diabase and Keewatin, on being followed down 45 ft. gradually gave place to quartz carrying gold. But little development has been done on the property.

Irwin-Gordon—Good surface samples have been found on this property, located up the Montreal river, some 15 miles from Latchford. Ten men are at work, with A. Chenette as foreman.

Lander Lake Proprietary Mines—This company has ordered a plant, comprising a five-stamp mill, a 20-h.p. engine and a 25-h.p. boiler.

McKinley Darragh—A new vein has been struck in this mine, Cobalt, while crosscutting on the 150-ft. level to connect shafts Nos. 1 and 2. It is a blind lead about 153 ft. distant from shaft No. 1, from 3 to 6 in. wide, with native silver and argentite, and will run at least 1000 oz. to the ton.

Nancy Helen—Superintendent J. F. Black reports the discovery of a 4-in. silver-calcite vein at a depth of 18 ft. in the shaft. A small steam plant and hoist have been ordered.

Right of Way—The shaft on the Timmins vein is down 40 ft. and No. 2 shaft 50 ft. At the 100-ft. level they will crosscut to the vein beneath the railroad track.

Rothschild—Three shafts have been sunk, one being down 50 ft., and there is a large open cut 30 ft. long by 20 deep. A four-drill compressor, 60-h.p. boiler and steam hoist have been installed. Stripping to the extent of 6000 ft. has been done. Twelve men are at work under Superintendent J. A. Herman.

Trethewey—A circular issued, announcing the payment of a 4 per cent. dividend to shareholders on March 30, states that the policy of the management has been to put more ore in sight by development work than is removed by stoping. The new ore-sorting plant has been installed and is in working order, with a capacity sufficient to handle a larger quantity of ore than is now being mined. Existing facilities for carying on operations will be sufficient until an increased output has to be dealt with.

Lake George Mining Company—An additional shaft is to be sunk on this company's location adjoining in Cobalt the Cleveland Cobalt property, with the object of tapping a rich vein containing native silver which was struck by diamond drilling in the bed of Clear lake.

Rochester—A rich strike has been made at this mine, Cobalt, a vein 4 ft. wide having been found 2 ft. below the surface. Large quantities of native silver have been taken out. The rich paying streak in the vein is about 5 in. wide, carrying calcite galena, smaltite bloom and silver. It has been stripped for 250 ft. At 18 ft. below the surface it assays 916 oz. to the ton. Another good vein has been discovered 50 ft. from the main vein. A first-class plant is being installed.

Ontario—Sturgeon Lake

St. Anthony Reef—From Sturgeon lake Manager A. L. McEwan, has brought to Port Arthur gold bullion of the value of $2500, the result of what is practically the last clean-up under the present management, the mine having changed hands. The principal promoter of the new company is Mr. Wendock, of Saginaw, Mich.

Nova Scotia

Dominion Coal Company—The report of the directors for the year 1906 states that the output was 3,552,746 tons, as compared with 3,189,657 tons for 1905. There was, however, a decrease in net earnings. This was partly due to the increasing demands of the Dominion Iron and Steel and the New England Gas and Coke companies, the contracts with which were filled at a loss. Owing to the rapid depletion of the older mines, arrangements had to be made years ahead for new mines, and an abnormal amount of development work, renewals and repairs was required. Large expenditures had been made and an extensive program mapped out including the sinking of a new shaft to the Emery seam at No. 5; a new mine at No. 8 International; the opening up of two new mines in the Lingan district, and the construction of a new branch railway to these mines. The profit and loss account showed net proceeds from sale of coal and other sources, $1,137,370, as compared with $2,573,832 in 1905. The balance after deducting interest and other fixed charges was $631,815, as against $1,023,071 in the previous year.

Spain

Rio Tinto—This company has put some new furnaces into operation at the mine to treat a portion of the poorer sulphide ore by the bessemer process, instead of by leaching as heretofore. The leaching method would not have released the copper for two to three years, and inasmuch as it is anticipated that 1000 tons of ore will be smelted daily, the quantity produced is likely to be from 4000 to 5000 tons of copper per annum. Unless, however, the output of ore is raised, this is merely an anticipation of the production. The move is considered to be a wise one, inasmuch as the water problem becomes more and more difficult every year; on the other hand, the sulphur content of the ore will be lost by the bessemer process.

Australia

Victoria

The question of utilizing the extensive deposits of brown coal in this State is again receiving consideration. At present the output is inconsiderable, and no attempt has been made to utilize the fuel save in the form of briquets, for which there is practically no demand, by reason of the abundance and cheapness of firewood. It is now suggested that the Victorian brown coal should be gasified, and the by-products utilized. Two of the best known Victorian brown-coal fields, Morwell and Laverton, are situated 89 and 13 miles, respectively, from the Victorian metropolis, and within the range of distances over which electrical power can be distributed at a profit. It is doubtful, however, whether under existing industrial conditions the conversion of the deposits into sources of electric power supply will become a readily accomplished fact.

New South Wales

The report of the Sulphide Corporation, Limited, for the year ending June 30, 1906, shows that the gross profits amounted to £[illegible] ing costs for amortization and providing £16,275 to cover the special expenses incurred at the company's mine at Broken Hill, N. S. W., on account of the creep and fire in the workings. The net profit was £94,400, which, together with the sum of £94,005 brought forward from the previous year, gave a total of £188,465. From this amount the directors distributed a 10 per cent. dividend on the preference shares and carried the balance of £133,465 forward to the next year's profit and loss account. No dividend was declared on the ordinary shares.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, March 13

Coal trade in the West shows a slight improvement in the matter of car service. This is partly due to a decreasing pressure of shipments as spring approaches. The trade is much disturbed by reports of increases in railroad rates. In some cases such advances have already been made, and operators are protesting.

In the East the trade is quiet, the demand for domestic fuel falling off. The steam-coal consumers, however, show no disposition to reduce their demands, and consumption remains steady.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to March 2 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	8[illegible]	857,592 D.	21,673
Bituminous	6,[illegible]5,665	6,256,010 D.	122,345
Coke	2,[illegible]7,340	2,329,[illegible]84 I.	167,004
Total	9,[illegible]88,800	9,410,576 I.	23,076

The coal production of the Cumberland region in Maryland and West Virginia for the year 1906 is reported as follows:

	Tons.	Per Ct.
Shipped by Baltimore & Ohio	3,651,330	50.8
Shipped by Pennsylvania R. R.	1,019,272	14.2
Shipped by Western Maryland	955,381	13.5
Shipped by Ches. & Ohio Canal	196,595	2.8
Total shipments	5,822,578	81.3
Used at mines and local sales	1,345,189	18.7
Total	7,188,037	100.0

The total reported in 1905 was 6,226,684 tons; showing an increase last year of 961,353 tons, or 15.4 per cent.

New York March 12

ANTHRACITE

The hard-coal market shows as much strength as during most previous months of March. It is usual for business to fall off heavily in anticipation of the reduction in prices which, it is believed, will occur April 1. Contracts have been canceled in some instances but as a whole March business is fairly active. Car supply is still poor but there is sufficient coal being moved to meet present requirements. There is nothing authentic known with regard to the actual time at which the reduced prices will go into effect, but it has been the custom heretofore and it is expected now that the new schedule will take effect April 1. Prices remain unchanged at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are still very scarce and are quoted nominally at $3 for pea, $2.25@2.50 for buckwheat, $1.50 for rice, $1.40 for barley, all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic Seaboard soft-coal trade is fairly strong; there seems to be a plentiful demand for coal and prices are firm. The season's prices are being made and contacts closed for the coming year. Contract figures are generally at an advance from 5 to 10c. per ton, and of this increase 5c. is due to the advance in through railroad rates.

Trade in the far East is calling for considerable coal consisting of balances on old contracts and orders from shoalwater ports that heretofore have been frozen and whose supply has become short. Trade along the Sound is calling for a large amount of coal and some of the larger companies, dealing in the better grades, are unable to supply the demand.

New York harbor trade is absorbing a large amount of coal; prices range around $2.70 per ton f.o.b. New York harbor shipping ports for fair grades of steam coal. All-rail trade shows good demand at fairly good prices. Transportation is reasonably good, but car supply for any particular mine is still dependent upon the main line on which the mine is located. On the railroads offending the least in this respect the supply ranges from 50 to 75 per cent. of the demand; other roads are very much behind with their cars and it is reported that some mines have been without cars for five or six consecutive days.

In the Coastwise vessel market there seems to be a sufficient supply of vessels and from the way they are accepting freight it would indicate that they are looking for lower figures before long. We quote freight rates from Philadelphia on large vessels to Boston, Salem and Portland at $1 and discharge; to the Sound 85c.; in both cases the loading and discharging clause is included.

Birmingham March 11

There is a steady production and every ton of coal is finding a ready demand. Operators of mines are well supplied with orders for the product and, as far as can be seen ahead now, there will be need for steady operation through the entire year. The effort being made by the railroads to give better service is having some effect and a larger tonnage of coal is being moved.

The legislature of Alabama has taken a recess until July and the proposed mining law goes over until that time. Members of the mining and manufacturing committees of the House and Senate will visit this district during the recess and investigate conditions and the desires of the miners and operators in the hope of arranging a bill that will be satisfactory all around. The disagreement between the interests mentioned heretofore in regard to the bill are still as wide as they were when the committees gave the two sides a hearing.

The report of the mine inspector for the first two months in the year shows nine lives to have been lost in coal mines in this State. Falling roof is given in the majority of cases as the cause of accident.

Chicago March 11

The local trade is still inactive. The receipts of Western coals—those chiefly in demand in the local market—are large, but consumption, owing to the mild weather and other causes, is not active. Consequently there is much coal on track, though not so much as a week ago, and a determination on the part of dealers to keep back consignments from the mines as much as possible.

Eastern supplies are afflicted with the difficulty of transporting to market coal that is ready for the consumer. Smokeless run-of-mine is the best selling variety. The price of smokeless continues $3.40, with prepared sizes selling for $4.30 firmly, and the market apparently tight against a reduction. The demand for smokeless run-of-mine continues unabated, but other grades are in large supply compared with the demand.

Illinois and Indiana sell for practically the same prices as last week—$1.75@2.50 for lump and egg, $1.65@2.15 for run-of-mine and $1.20@1.50 for screenings.

Hocking Valley is dull. Youghiogheny is selling at $3.20 list price, with the discount 10 to 20c. on certain shipments, most of the supply being kept up to the circular price closely. Pittsburg No. 8 is $2.90 for ¾-in., with the supply not too great for the demand.

Cleveland March 12

Spot coal is selling at easier prices. Ohio mine-run on Cleveland track is bringing 95c. This decline is caused by a lessened demand among local consumers and heavy receipts locally during the week. On this account considerable coal has ac-

cumulated. Quotations on ¾-in. coal are 10c. higher. General prices at the mines are $1 for run-of-mine and $1.10 for ¾-in. Coal rates to lake ports were advanced 5c. a ton on Wednesday. This applies to Ohio, West Virginia and Pennsylvania coal and will go into effect as soon as navigation opens, probably about April 1. Several boats are now being loaded on the river and a number of vessels already have their full cargoes.

The retail prices of coal and coke will be affected by the advance in freight rates. The wholesale trade will not be affected, as the purchaser must necessarily pay the freight on the mine price. Connellsville coke sold last week around $5.20 a ton. The present freight rate is $1.60 and the advance will make it $1.65. Coke dealers state that it is hard to furnish the product in sufficient amount to meet the demand and it is very probable that the price will be advanced to meet the situation.

Indianapolis March 11

The coal carrying roads of Illinois have decided to advance the rate on Indiana coal to Chicago 10c. per ton. Indiana operators say this will result in closing permanently half of the mines in the State. They complain because the advance for hauling coal from the East has been placed at 5c. a ton, which is not a proportionate advance. The Indiana operators say with the Indianapolis and gas belt markets almost entirely lost to them and the Chicago rate increased to 80 and 90c. per ton, not more than one-third of the 17,000 miners in Indiana will be able to make a living this summer.

The shippers' bill has been enacted into law by the Legislature. The reciprocal demurrage clause was cut out, but the section requiring freight to be moved at least 50 miles per each 24 hours remained in the act. This will, if enforced, prevent blockades of coal cars. Railroad companies are also prohibited from confiscating coal without first notifying the consignor and consignee. In case of any omission to so notify the consignor or consignee the owner may legally exact 50c. a ton in excess of the contract price of the coal confiscated.

Pittsburg March 12

Coal—The demand continues good and prices are firm, quotations of mine-run coal ranging from $1.15 to $1.25, f.o.b. mine. All the mines are being operated as fully as the supply of cars will permit. While there is no decided scarcity, more cars could have been used during the week. The river mines are running full and there is an unusual number of empty coal boats and barges. Another big shipment to Southern ports is expected before April 1. The railroads have made a concession in freight rates in this district that is satisfactory to independent operators, but not to the large producing interests. The freight rate from the mines to Pittsburg is 43c. a ton, and to owners of individual cars the rate averages about 33c. On April 1 there will be a uniform rate of 38c., and owners of private cars will not have any advantage over the smaller operator in the matter of freight rates.

Connellsville Coke—There was a slump in coke prices during the past week which will be only temporary. It was due to the closing of several blast furnaces and the suspension of coke shipments. Some sales of furnace coke were made as low as $3 a ton, but the tonnages were not large. Quotations on spot furnace coke range from $3.25 to $3.40. Foundry coke for prompt shipment is quoted at $3.60@3.85.

The production of coke for the week, according to the *Courier*, amounted to 282,898 tons in the Connellsville region and 128,350 tons in the Lower Connellsville region. The shipments aggregated 15,638 cars, distributed as follows: To Pittsburg, 5530 cars; to points west of Connellsville, 9194 cars; to points east of Connellsville, 914 cars.

Foreign Coal Trade

Imports of coal and coke into the United States for January are reported as follows, in tons:

	1906.	1907.	Changes.
Great Britain	99,841	1,097	D. 98,744
Canada	157,996	113,457	D. 44,539
Japan	4,950	1,953	D. 2,997
Australia	22,740	19,434	D. 3,306
Other countries	95	48	D. 47
Total coal	284,442	145,981	D. 138,461
Coke	19,651	19,868	I. 217
Total	304,093	165,849	D. 138,244

Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal is on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Exports of coal and coke from the United States for January are reported by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
Anthracite	164,136	169,680	I. 5,544
Bituminous	546,906	591,690	I. 44,784
Total coal	711,042	761,370	I. 50,328
Coke	62,049	59,569	D. 2,480
Total	773,091	820,939	I. 47,848

The exports do not include coal bunkered, or sold to steamships engaged in foreign trade. The coke exported went chiefly to Mexico and eastern Canada; the distribution of the coal was as follows:

	1906.	1907.	Changes.
Canada	494,854	521,340	I. 26,512
Mexico	44,489	85,441	I. 40,952
Cuba	51,420	6,441	D. 44,979
Other W. Indies	31,586	50,438	I. 18,852
Europe	5,339	4,360	D. 979
Other countries	13,854	43,414	I. 29,560
Total	711,042	761,370	I. 50,328

The exports to Europe were chiefly to Italy; those to other countries, to South America. The exports to Canada—68.5 per cent. of the total in 1907—were, in detail, as follows:

			Changes.
Anthracite		164,136	169,680	I. 5,544
Bituminous		330,708	351,660	I. 20,952
Total	....	494,844	521,340	I. 26,496

There was an increase this year in both anthracite and bituminous coal.

Iron Trade Review

New York, March 13

There is no special change to be recorded in the iron and steel markets this week. Pig-iron buying has been rather quiet, but prices are stationary, makers not being inclined to grant concessions. Finished material is more active, and new orders for structural steel and rails are coming forward. The mills continue to be pressed with work, specifications on contracts coming in freely.

Bessemer Steel Production—The total production of bessemer steel ingots and castings in the United States in 1906 is reported by the American Iron and Steel Association at 12,275,253 long tons, against 10,941,375 tons in 1905; showing an increase of 1,333,878 tons, or 12.2 per cent. Some comment on these figures will be found on another page.

Birmingham March 11

Spot pig iron, delivery within the month, is being sold by Alabama manufacturers at $24 per ton, though it is admitted that only small lots can be handled. Sales are being recorded right along for iron to be delivered during the last half of the year at $18.50@19 per ton for No. 2 foundry. By April 10 three furnaces will either be blown in or be ready to go into operation, one at Anniston, one at Rising Fawn, Ga, and one at Florence, Ala. Two other furnaces will be ready for the torch the latter part of the coming month.

The accumulated stocks of iron and pipe in this district are being reduced slowly. The railroads are doing a little better in the way of furnishing cars. The fact that the advance in freight rates on iron and kindred products is staved off until April gives encouragement.

G. H. Schuler, treasurer of the Southern Steel Company, will retire at the end of this month as treasurer and will be succeeded by A. R. Forsythe, assistant cashier of the Birmingham First National bank. Mr. Schuler will remain a director of the company and together with his brother, E. T. Schuler, and their friends will hold the control of the Southern Steel Company. The company is capitalized at $25,000,000 and has four blast furnaces, a steel plant, steel rod, wire and nail mills, coal mines, ore mines, limestone quarries, coke ovens and other properties. Several hundred thousand dollars are be-

ing expended in improvements about the various plants, especially at the steel works.

Baltimore March 12

[illegible] were 980 tons; of ferromanganese, 500 tons. Imports of iron ore were 8100 tons from Cuba and 5000 tons from Greece; 14,000 tons in all. There were 950 tons of manganese ore received from Cuba. Among the other imports were one cargo, 3702 tons, iron pyrites from Huelva, Spain.

Chicago March 11

The local iron market continues to be a waiting market. Consumers are not yet convinced that prices will not decline, and consequently are placing as small orders as possible. Furnace agents, on the other hand, are asserting confidently that prices will remain as they are or strengthen. To the impartial critic of the situation it would seem that the market is weakening somewhat.

Quotations remain practically the same as last week. Northern being sold at about $23.50 and Southern at $18@18.50, Birmingham, for second-half deliveries. The demand for quick-delivery lots continues unabated.

Coke is somewhat easier, with the best Connellsville selling at $6.65 for quick deliveries and about $6.40 for contracts on second-half delivery.

Cleveland March 12

Iron Ore—The lake-ore business this year is expected to be large, as there are many local furnaces in the market heavily at this time, and it is expected that their requirements will increase.

Pig Iron—Inquiries for pig iron for delivery during the second quarter continue to come out and those furnaces having metal to offer are getting good prices for it. Quotations f.o.b. Cleveland are as follows: No. 1 Northern, $26.25; No. 2, $25.75; No. 3, $25.25; bessemer, $23.50; No. 1 Southern, $28.10; No. 2, $27.60; No. 3, $27.10; 8 per cent. silvery, $31.95.

Lake package-freight lines are increasing their warehouse capacity to handle increased business. The Anchor line is erecting a new warehouse on the old Pittsburg coal company dock.

Philadelphia March 13

Pig Iron—The market, compared with a week ago, presents no decided change. The smaller consumers are drifting along and occasionally buying, but as a rule are satisfied. They are awaiting developments and have the impression that things will work in their favor. The larger consumers are buying in a quiet way, but every move made is known. Pig-iron makers received a shock not long ago and it has not been without its good effects, as they know the market will gradually take every ton of iron they can make. Forge iron is strong, there being quite a few sales of No. 2 foundry merely to fill up.

Steel Billets—The report is nothing more than a repetition of weeks and months past; the capacity is strained and prices strong.

Bars—There has been some run on steel bars and the demand was fully met. The mills are sold far ahead.

Sheets—Our sheet people say everything is working into their hands. They are managing to keep customers supplied, though not always at contract dates.

Pipes and Tubes—The tube market is apparently quiet and consumers have large stocks on hand. The mills are oversold and trying to catch up.

Plates—The plate-mill situation is about as it has been for some time past. A trifling restriction of output has occurred, but this is being remedied. Boiler plate is in good demand. Inquiries for tank for early summer deliveries are beginning to come in.

Structural Material—Our structural people say that from correspondence and general knowledge they anticipate a very large demand in the near future. It is certain that a number of new enterprises will appear in the market and place orders.

Steel Rails—While there is no great activity, there is a profound interest in the situation; there are big orders looming up and the question is what will people do with them.

Scrap—Scrap iron of all kinds is in active demand and there is a scramble to get every ton that can be had. Prices are stronger and needs urgent. Melting scrap is particularly hard to get.

Pittsburg March 12

Energetic efforts are being made by all mills to catch up on deliveries, and more attention is being paid to increasing production than to booking new business. The first week of the month showed a decided gain at the plants of the Carnegie Steel Company in every finished line over the record month of October. Every finishing mill is being operated to capacity, and provision has been made for a full supply of material. In addition to the output of steel-making pig iron from its 53 blast furnaces the company will have 5000 tons of outside pig iron, and 10,000 tons of heavy melting scrap. The Ohio works, which have been on sheet and tin bars for the past two weeks, went back on standard steel rails yesterday. All of the steel bars were shipped to plants of the American Sheet and Tin Plate Company, and that company is operating 100 per cent. of its sheet mills, and a fraction more than 90 per cent. of its tin-plate mills. All are being run to full capacity and it is expected to keep this pace up through the month. The National Tube Company and the American Steel and Wire Company, the other subsidiary interests of the United States Steel Corporation in this district, also are in the record-breaking contest. The tin-plate mills have more actual specifications than ever before, and it is almost impossible to place an order for delivery this side of July. There is likely to be a tin-plate famine this spring, although production is heavier than ever before. This is accounted for by the absence of mill stocks at the opening of the year, when usually there are fully 1,000,000 boxes on hand for the spring rush. New business in structural material, plates, bars and wire products has been booked this week. Despite reports to the contrary, no steel contracts of importance have been canceled and the mills will be under great pressure to take care of the orders on the books before the opening of the fourth quarter. The steel-bar producers, it is believed, will decline to make the usual concession to the agricultural-implement makers, and will positively refuse to accept any business for delivery this year at less than the established price of 1.60c.

The bi-monthly adjustment of wages under the sliding scale of the Amalgamated Association of Iron, Steel and Tin Workers was made today. Sales of tin plate in January and February averaged $3.60 a box, and the workers will receive an advance of 2 per cent. The base of the scale is $3.40 a box, and a 2 per cent. increase was granted at the January settlement. The examination of the sales sheets for bar iron and sheets also was made, but there will be no advance.

Pig Iron—The market is quiet although there were a number of small sales of foundry iron, but prices have dropped about 50c. a ton. Lots of 100 and 200 tons of No. 2 foundry for prompt shipment, aggregating about 1000 tons, were sold at prices ranging from $24 to $24.50, Valley furnaces. About 1000 tons for delivery in the last half were sold at $21.50 The sale of 5000 tons of bessemer iron to the Carnegie Steel Company by the Bessemer Pig Iron Association took all the available bessemer out of the market for March delivery. Bessemer is nominally quoted at $22@22.50 for prompt, No. 2 foundry at $24@24.50, and gray forge at $21, all f.o.b. Valley furnaces.

Steel—Prices of billets are purely nominal, quotations of bessemer billets continuing at $29.50, and open hearth at $32. No billets are being offered by the Pittsburg mills. Plates continue strong at 1.70c., and merchant steel bars at 1.60c.

Sheets—All the mills are away behind on deliveries and premiums are still being offered for both black and galvanized sheets for prompt shipment. The estab

lished price remains at 2.60c. for black and 3.75c. for galvanized for No. 28 gage.

Pipe Manufacture.—The market continues strong and prompt delivery is quoted at $75 to $80 per ton.

Cartagena, Spain Feb. 23

Iron and Manganiferous Ores.—Messrs. Barrington & Holt report for the week: Shipments were five cargoes, 10,125 tons, to Great Britain; two cargoes, 8450 tons, to Rotterdam; 18,575 tons in all. Prices continue firm.

Quotations are, f.o.b. shipping port: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; special low phosphorus ores, 10s. 9d.; specular ore, 55 per cent. iron, 12s. 6d. Manganiferous ore, 35 per cent. iron and 12 per cent. manganese, is 14s. 6d., same terms; no higher grades offered.

Iron Pyrites—Pyrites, 40 per cent. iron and 43 sulphur, are 11s. 9d. per ton, f.o.b. Cartagena.

Philadelphia March 13

The compiled figures collected by the American Iron and Steel Association show that the production of bessemer-steel ingots in the United States last year showed a ratio of increase somewhat higher than that of pig iron. The total output of ingots and direct castings in 1906 was 12,275,253 tons; an increase over 1905 of 1,333,878 tons, or 12.1 per cent., the gain in pig iron having been 10.1 per cent. The production for six years past has been, in long tons:

1901.....	8,713,302	1904..	7,859,140
1902.....	9,138,365	1905..	10,941,375
1903.....	8,592,829	1906..	12,275,253

There has been no intermission in the increasing tendency to convert our pig iron into steel, and this will be even more apparent when the figures for open-hearth steel are added to those for converter steel as given above. It may be mentioned that the total for last year is slightly in excess of our estimate given in the JOURNAL of Jan. 5 last; but the difference is only 0.75 per cent.

Bessemer steel continues to be the material chiefly used for rails, though open-hearth rails are beginning to be strongly in evidence. The total make of bessemer-steel rail in 1906 is given as follows, in long tons:

Sections:	Tons.	Per ct.
Under 45 lb.....	223,358	6.0
Between 45 and 85 lb....	1,608,793	43.5
Over 85 lb.....	1,873,491	50.5
Total.....	3,705,642	100.0

The total in 1905 was 3,135,729 tons, the gain last year being 569,913 tons, or 18.2 per cent. The use of the heavier sections, 85 lb. and over, steadily increases, notwithstanding the fact that there was last year an unusually large demand for light rails for industrial and mining purposes.

Pennsylvania, as usual, led in the production of bessemer steel last year, having made over 40 per cent of the total; Ohio following, with about 30 per cent. The Middle West is, and is likely to remain, the chief seat of the converter-steel industry.

Metal Market

NEW YORK, March 13

Gold and Silver Exports and Imports.

At all United States Ports in January and year:

Metal.	Exports.	Imports.	Excess.
Gold.			
Jan. 1907...	$2,443,441	$ 1,294,457	Imp. $ 74,016
" 1906 .	5,741 665	2,605,709	Exp. 3,135,956
Year 1907..	2 443 441	1,294,457	Imp. 74,016
" 1906..	5 741 665	2,605,709	Exp. 3,135,956
Silver.			
Jan. 1907...	4 766,874	3,620,888	Exp. 1,145,986
" 1906 ..	7,516,668	4,686,711	" 2,829,957
" 1907 ..	4 766,874	3,620,888	" 1,145,986
1906 ..	7 516,668	4,686,711	" 2,829,957

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Mar. 9 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 360,915	$ 14,697	$1,065,465	$ 51,394
1907.....	1,717,226	1,618,843	6,881,083	462,472
1906	3,027,379	459,157	1,985,230	367,331
1905.....	29,457,196	831,827	7,474,154	398,877

Exports of gold for the week were to Panama; of silver to London. Imports, both gold and silver, were from the West Indies, Mexico and South America.

The joint statement of all the banks in the New York Clearing House for the week ending March 9 shows loans $1,066,956,900, a decrease of $12,228,700; deposits, $1,019,889,100, a decrease of $18,542,700, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie.....	$178,668,600	$185,456,700
Legal tenders.....	78,278,100	71,567,300
Total.....	$256,946,700	$257,024,000
Surplus.....	$9,278,150	$2,051,725

The surplus over legal requirements shows a decrease of $1,806,925, as compared with the previous week.

Specie holdings of the leading banks of the world March 9 are reported as below, in dollars:

	Gold.	Silver.	Total.
Asset New York	.....	.....	$185,456,700
England.....	$180,443,440	.....	180,443,140
France.....	925,416,665	$196,440,425	721,[illegible]
Germany	166,910,000	55,635,000	222,545,000
Spain	77,095,000	123,890,000	200,985,000
Netherlands....	27,723,000	29,065,000	56,[illegible]
Belgium.....	[illegible]	[illegible]	24,070,000
Italy..	161,790,000	24,[illegible]	186,[illegible]
Russia.....	595,420,000	27,045,000	[illegible]
Aust.-Hungary.	231,490,000	61,300,000	292,790,000
Sweden ...	20,585,000	.....	20,585,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

On March 11 the director of the Mint bought 100,000 oz. of silver for delivery at the New Orleans mint at 69.43c. per ounce.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to Feb. 28:

	1907.	1906.	Changes.
India..	£ [illegible]	£ [illegible]	D £ [illegible]
China	[illegible]	[illegible]	[illegible]
Straits..	[illegible]	[illegible]	[illegible]
Total ..	[illegible]	[illegible]	D £ [illegible]

Receipts for the week were £150,000 from New York. Exports were £8750 in coin to the Straits; £215,600 in bars and £90,000 in Mexican dollars to India; £314,350 in all.

Indian exchange continues strong, and the Council bills offered in London were all taken at 16.09d. per rupee. Purchases of silver for coinage by the Indian government are still being made.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.	$0.[illegible]	$0.[illegible]
Peruvian soles and Chilean.	0.[illegible]	0.[illegible]
Victoria sovereigns	4.[illegible]	4.87
Twenty francs .	3.[illegible]	3.89
Spanish 25 pesetas .	4.[illegible]	4.80

SILVER AND STERLING EXCHANGE.

March.	Silver. Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	March.	Silver. Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
7	4.84½	68	31[illegible]	11	4.84	69	31¼
8	4.84½	68	30[illegible]	12	4.84[illegible]	68[illegible]	31[illegible]
9	4.84[illegible]	68[illegible]	31[illegible]	13	4.84	68[illegible]	31[illegible]

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

March.	Copper. Lake, cts. per lb.	Copper. Electrolytic, cts. per lb.	Copper. London, £ per ton.	Tin. cts. per lb.	Lead. cts. per lb.	Spelter. New York, cts. per lb.	Spelter. St. Louis, cts. per lb.
7	25	25	[illegible]	42	6.00	6.85	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	@6.90	[illegible]
[illegible]	25	25	[illegible]	[illegible]	[illegible]	6.85	6.70
[illegible]	[illegible]	[illegible]	[illegible]	42	6.00	[illegible]	@6.75
[illegible]	25	25	[illegible]	[illegible]	[illegible]	6.85	6.70
[illegible]	[illegible]	[illegible]	[illegible]	42	6.00	@6.90	[illegible]
[illegible]	25	25	[illegible]	[illegible]	[illegible]	6.85	6.70
11	[illegible]	[illegible]	[illegible]	42	6.00	[illegible]	@6.75
[illegible]	25	25	[illegible]	[illegible]	[illegible]	6.85	6.70
12	[illegible]	[illegible]	[illegible]	42	6.00	[illegible]	[illegible]
[illegible]	25	25	[illegible]	[illegible]	[illegible]	6.85	6.70
13	[illegible]	[illegible]	[illegible]	42	6.00	[illegible]	[illegible]

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the [illegible] quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The used [illegible] [illegible] [illegible]

Silver prices have been irregular this week, ranging from 31 11-16d. on March 11, on speculative buying, and reacting to 31 11-16d. on March 13. Lower prices have been caused by withdrawal of the Indian Government as a buyer, and selling for China account.

Copper—While domestic business has been very quiet, the revival in activity abroad has made further progress, and good-sized business is reported for shipment to Europe at advancing prices. The close is firm and higher at 25½@26c. for Lake copper; 25¼@25½c. for electrolytic in ingots, cakes and wirebars. Casting copper is quoted at 24⅝@24⅞c.

The standard market has reflected the better feeling, and active speculation took place from day to day. The close is cabled at £110 5s. for spot, £111 10s. for three months'.

Refined and manufactured sorts we quote: English tough, £114@115; best selected, £117@118; strong sheets, £125@ .

Exports of copper from New York for the week were 1904 long tons. Our special correspondent reports the exports from Baltimore at 1287 long tons copper. From Baltimore there was also exported 22,695 lb. copper sulphate.

The average price received by the Mass Consolidated Mining Company for its 2,106,739 lb. of copper sold in 1906 was 19.52c. The Quincy received 19.259c. as the average for 16,194,838 lb. The Osceola received 18.89c. as the average for 18,588,451 lb. The Allouez reports 19.145c. as the average on 3,486,900 lb. sold.

Imports of copper into Germany for the year 1906, according to Aron Hirsch & Sohn, of Halberstadt, were 130,770 tons. Exports were 11,215 tons, showing net imports of 119,555 metric tons for the year.

The total production of copper in Canada for the year 1906 is reported at 57,029,231 lb., of which the greater part came from the British Columbia mines, chiefly those in the Boundary district.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The market has been steady throughout the week, and a better demand is reported from consumers. The London speculative market has displayed a strong undertone, but closes easy at £192 5s. for spot, £190 15s. for three months', while business in this market has been done at 42¼ cents.

Lead—The quotation remains unchanged at 6c. New York.

The advance in the London market has made further progress and quotations at the close are firm at £20 for Spanish lead, £20 2s. 6d. for English.

[illegible] rington & Holt report from Cartagena, Spain, under date of Feb. 23: The price of pig lead has been 89.75 reales per quintal, silver being paid at 14 reales per ounce; exchange, 27.46 pesetas to £1. The price of lead, on current exchange, is equal to £18 6s. per long ton, f.o.b. Cartagena. Shipments for the week were 515 tons argentiferous and 500 tons desilver ized to Great Britain; 248 tons desilverized lead to Marseilles; 1263 tons in all.

Spelter—The market is unchanged and steady at 6.85@6.90 New York, 6.70@6.75c. St. Louis.

The London market, in sympathy with all other metals, has improved and closes at £26 10s. for good ordinaries, £26 15s. for specials.

Zinc Sheets—The base price is now $8.50 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of Feb. 23, that shipments of zinc ore for the week were 2580 tons blende to Antwerp, and 1300 tons blende to Stettin. No change in the market.

Antimony—The market is unchanged. Ordinaries, 23@23½c.; Hallett's, 23½@24¼c.; Cookson's, 24¼@25¼c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

The Canadian official report gives the following figures for nickel in Ontario for the year 1906: Ore mined, 343,814 short tons; ore smelted, 340,059; matte produced, 20,364; matte shipped, 20,310; copper contents of matte, 5265; nickel contents, 10,745 tons. Exports of nickel in matte were 11,985 short tons.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at $38 per oz. for ordinary and $41 per oz. for hard. For good scrap $31.50@32 is paid.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities, and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up over the price of ingots. Granulated metal is 2c. per lb. over ingots.

Imports and Exports of Metals

Tin—Imports of tin into the United States for January were as follows, in long tons:

	1906.	1907.	Changes.	
Straits	1,376	1,887	I.	511
Australia	5	26	I.	21
London	2,769	1,750	D.	1,019
Holland	53	45	D.	8
Other Europe	121	86	D.	35
Other countries	....	1	I.	1
Total	4,324	3,795	D.	529

The decrease this year in the totals was 12.2 per cent. Most of the tin received from Great Britain was Straits tin.

Antimony Imports—Imports of antimony into the United States for January were as follows, in pounds:

	1906.	1907.	Changes.	
Metal and regulus	898,675	940,295	I.	41,620
Antimony ore	82,777	305,511	I.	222,734

There was a large increase in the receipts of antimony ore this year.

Missouri Ore Market

JOPLIN, March 9

The highest price paid for zinc ore was $53.50 per ton, the assay basis $48 to $51 per ton of 60 per cent. zinc, and the average price $49.68.

The highest price paid for lead was $85.50 per ton, with medium grades selling at $80@83, and the general average, all grades, $82.92.

The several smelting companies purchasing ore in the district have, it is estimated, approximately $350,000 advanced on ore in the bins which they have been unable to move on account of the lack of cars. By using open coal cars they are enabled to keep the output moved each week, but sufficient cars to move the large amount on which money has been advanced are not forthcoming. Lighter buying at the close of the week indicates a desire to move ore already owned rather than make further advances, but the demand is so strong, with the new smelters in the market, that few of them care to drop out of the market. Never before in the history of the district was so much ore purchased ahead and left in the bins for so long a period. A rumor gained currency among some of the producers that spelter was likely to fall, and ore was freely offered on advances where the past two or three weeks no advance would be taken.

The lead market is notably weaker, there seems to be a concerted action on the part of lead smelters to move ore purchased in previous weeks before tying up money in additional supplies that cannot be shipped until the car situation shows some measure of relief.

Following are the shipments of zinc and lead from the various camps of the district for the week ending March 9:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin	[illegible]	[illegible]	[illegible]
Galena-Empire	[illegible]	[illegible]	[illegible]
Alba-Neck City	[illegible]	[illegible]	[illegible]
Duenweg	[illegible]	[illegible]	[illegible]
Badger	[illegible]	[illegible]	[illegible]
Granby	[illegible]	[illegible]	[illegible]
Springfield	[illegible]	[illegible]	[illegible]
Aurora	[illegible]	[illegible]	[illegible]
Prosperity	[illegible]	[illegible]	[illegible]
Oronogo	[illegible]	[illegible]	[illegible]
Baxter Springs	[illegible]	[illegible]	[illegible]
Carl Junction	[illegible]	[illegible]	[illegible]
Sherwood	[illegible]	[illegible]	[illegible]
Carthage	[illegible]	[illegible]	[illegible]
Cave Springs	[illegible]	[illegible]	[illegible]
Stiff City	[illegible]	[illegible]	[illegible]
Zincite	[illegible]	[illegible]	[illegible]
Totals	12,297,000	1,912,030	$384,743

Fen weeks [illegible] [illegible] [illegible]
Zinc value, the week, $305,160. 10 weeks, $2,737,591
Lead value, the week, 79,280. 10 weeks, [illegible]

Average prices for ores in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.58
February	47.37	47.11	February	72.83	84.53
March	42.68	.....	March	73.73	.....
April	44.63	.....	April	75.13	.....
May	40.51	.....	May	78.40	.....
June	43.84	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	44.56	.....	August	75.36	.....
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.14	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

PLATTEVILLE, March 9

The market opened strong, with last week's prices prevailing. It is reported that one of the principal buyers paid $52 for 60 per cent. ore the latter part of the week, and active business was in evidence throughout the week. It is expected that the present satisfactory prices will continue, but a much higher market is not looked for. The majority of the buyers of 45 per cent. ore report at least 10 weeks' supply on hand at the smelters.

The entire output of the Dall, which is equipped wih a magnetic separating plant, was sold at $54.50 per ton, the Empire output showing at $54. There was a change in the disposition of the different ores from the usual procedure. many of the different lots going to new buyers.

The camps of the district loaded ore for the week ending March 9 as follows:

Camps	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	[illegible]	[illegible]	[illegible]
Buncombe-Hazel Green	808,120	[illegible]	[illegible]
Linden	[illegible]	[illegible]	[illegible]
Cuba City	[illegible]	[illegible]	[illegible]
Lancaster	[illegible]	[illegible]	[illegible]
Galena	[illegible]	[illegible]	[illegible]
Rewey	[illegible]	[illegible]	[illegible]
Bonduel	[illegible]	[illegible]	[illegible]
Livingston	[illegible]	[illegible]	[illegible]
Elba	[illegible]	[illegible]	[illegible]
Highland	[illegible]	[illegible]	[illegible]
Total for week	[illegible]	[illegible]	[illegible]
Year to Mar. 9	16,524,994	685,020	20,480

The loading for the week reached somewhat over the average, showing that the output is increasing.

Chemicals

NEW YORK, March 13

Copper Sulphate—The demand continues strong and orders are coming in freely. Prices are unchanged, at $7.35 per 100 lb. in carload lots, or over; and $7.60 per 100 lb. for smaller parcels.

Nitrate of Soda—Spot supplies are still scarce and the market is strong, with an upward tendency. Quotations are unchanged, 95 per cent. for 1907 delivery, all positions, commanding $2.45@2.47½ per 100 lb., and 96 per cent. $2.50@2.52½. For 1908 delivery quotations are $2.42½ and $2.47½, respectively.

Mining Stocks

NEW YORK, March 13

The stock markets generally continue irregular, with obvious signs of manipulation and business largely professional. Today there have been heavy falls in prices, almost a small panic.

In the New York curb market the business has been limited chiefly to the coppers, with no special activity. Nevada-Utah, which has been a feature, has fallen off, both in activity and price. This is a striking instance of the impression which certain kinds of advertising make.

Boston March 12

Saturday last was the low day for mining shares in this market and liquidation seems to be almost complete. The effort to block by legislation in the Michigan legislature control of the Osceola and other properties by the Calumet & Hecla interest receives nothing but the severest condemnation, and well it might be so. However, the matter has been rectified and matters will be allowed to go as they were originally intended. In the mean time the Lake properties suffered severe declines. Allouez broke $6 to $59, with recovery to $63.50 today. Atlantic $2.25 to $16, recovering to $17.37½; Centennial, $4 to $36, rallying to $41; Copper Range, $5 to $84, rallying to $88 again.

Trinity has been quiet and fairly well supported. It ran off $1.50 to $25.50, recovering to $26.50 today. Quite a slice was taken off North Butte. It broke almost $10 to $97.50, but stiffened to $105 again. Utah Consolidated rose $3 to $63, on excellent buying, but reacted to $65, recovering to $66.75 today. U. S. Smelting fell $3.25 to $56.50, recovering to $58.75 today. Amalgamated dipped from $105.12½ a week back to $101.50, but rallied and touched $105.75 today. Bingham was a weak spot, falling $5 to $22, closing at $24.50 tonight, and Boston Consolidated fell $1.50 to $26.50. Butte Coalition fell $4 to $30, recovering to $33, and Calumet & Arizona, after falling $5 to $174, has recovered to $180. Calumet & Hecla went off $35 to $915 on slight dealings. Old Dominion, after touching $51, rallied to $57, and Shannon fell $1.50 to $18.50, recovering most of the decline. At today's annual meeting of the Allouez Mining Company, Calumet & Hecla people placed six of their members on the board, retaining three of the original, including President Harry F. Fay, who will continue as the chief executive officer. Calumet owns considerably over 35,000 shares of Allouez. The Osceola meeting occurs Thursday next, March 14, and the Centennial annual meeting comes April 2. Like changes will undoubtedly be made in these two companies.

Nevada-Utah furnished the curb feature. Lawson's announcement that he could not stand sponsor for this property, in keeping with his advertisements, caused the stock to break to $3.37½, with recovery to $4.50. It rose to above $9 a week or so ago. The curb did not entirely sympathize with the exchange prices as a rule, although Superior & Pittsburg fell over $4 to $21.50, with recovery to $23.75 today.

San Francisco March 6

Some time since a movement was commenced to effect a fusion between the San Francisco Stock and Exchange Board and the San Francisco Stock and Bond Board, the latter of which mainly deals in bonds, etc., and the former almost entirely in mining shares. Many meetings were held by a joint committee representing both, and the plan seemed to be about on the point of success when eight members of the Stock and Bond Board who had been counted upon to vote in favor, opposed and that ended the proposition. Now the Stock and Bond Exchange members have started on entirely independent organization known as the San Francisco Mining Exchange, to deal in mining shares, and there is already talk of a fusion with the San Francisco & Tonopah Exchange, which started up again last week for the first time since the great fire of April 18. This fusion would make an exchange which would bring a strong competition against the "old board" as it is called—the San Francisco Stock and Exchange Board. The new San Francisco Mining Exchange, while constituted principally of the members of the San Francisco Stock and Bond Board, is an entirely independent organization. The officers are: Walter Turnbull, president; A. W. Blow, vice-president; Mathias Meyer, treasurer; D. R. Wilson, secretary. Those who were present at the meeting of organization were Worthington Ames, Edward Barry, Jacob Barth, H. Beri, A. W. Blow, Robert C. Bolton, Milton A. Bremer, George Buckingham, Bert. F. Hecht, A. Heilbronner, A. C. Hellman, Fred S. Knight, Henry S. Mannheim, Mathias Meyer, J. R. K. Nuttall, Sol. E. Scheeline, Gustave Sutro, Walter Turnbull, D. R. Wilson. The new exchange also has as banking members the Ameri-

can National Bank, the California Safe Deposit and Trust Company, the Canadian Bank of Commerce, the Central Trust Company of California, the Crocker National Bank and the London, Paris and American Bank.

Colorado Springs March 9

The local mining market has been decidedly slumpy this week. There has been a decline in nearly the entire list; some of the stocks recovering a few points the latter end of the week. El Paso was the feature of the market, dropping from 57 [illegible] low prices have brought out buyers and the volume of trading has been heavier [illegible]

STOCK QUOTATIONS

NEW YORK	Mar. 12
Name of Comp.	Clg.
Alaska Mine	1
Am. Nor. M. & P. Co.	
Amalgamated	125
Atlanta	6
Balaklala	11
British Col. Cop.	8
Buffalo Cobalt	2
Butte & London	
Butte Coalition	
Butte Copper & Zinc	
Cobalt Contact	1
Cobalt Silver	½
Cobalt Silver Mining	1
Davis Daly	10
Dominion Cop.	
El Paso	5
Foster Cobalt	2
Furnace Creek	15
Giroux Mines	
Gold Hill	1
Greene Cobalt	1
Greene G. & S.	
Greene G. & S. Pfd.	13
Guanajuato	41
Guggen. Exp.	6
Hancock	1
Mines Co. of Am.	2
Mitchell Mining	1
Mont. Sho. C. (New)	11
Nev. Utah M. & S.	1
Newhouse M. & S.	11
Nipissing Mines	11
Ohio Copper	1
Silver Queen	2½
Tennessee Copper	70
Tonopah Exp.	½
Utah Apex	½
Utah Copper	61
Victoria	1
Yukon Gold	1

NEW YORK CURB	
Am. Agri. Chem.	2
Am. Smelt. & Ref.	73
Am. Smelt. & Ref. pf.	101
Bethlehem Steel	25
Colo. Fuel & Iron	40
Federal M. & S. pf.	85
Inter. Salt	17
Nevada Con.	17
National Lead, pf.	110
Pittsburg Coal	5
Republic I. & S.	30
Republic I. & S. pf.	93
Sloss-Sheffield	75
Standard Oil	1,300
Tenn. C. & I.	70
U. S. Steel & Ref.	9
U. S. Steel	43
U. S. Steel pf.	92
Va.-Car. Chem.	45
Va.-Car. Chem. pf.	110

ST. LOUIS	Mar.
N. of Com.	High. Low.
Adams	6 2
Am. Nettie	2 1
Center Creek	14 8
Cent. C. & C.	45 40
Cent. Coal	80 75
Columbia	5 4
Con. Coal	27 26
Doe Run	12 10
Gra. Bimet.	25
Sc.	5

BOSTON	Mar. 12
Name of Comp.	Clg.
Adventure	4
Allouez	63
Am. Zinc	42
Arcadian	9
Atlantic	17
Bingham	25
Boston Con.	28
Calumet & Ariz.	130
Calumet & Hecla	900
Centennial	40½
Con. Mercur	45
Copper Range	87
Daly West	17
Franklin	23
Granby, New	100
Greene Cn.	37½
Isle Royal	26
La Salle	10
Mass	7
Michigan	17
Mohawk	57
Mont. C. & C. (new)	1
Nevada	16
North Butte	100
Old Colony	
Old Dominion	54
Osceola	176
Parrot	20½
Phoenix	3
Quincy	137
Rhode Island	8
Santa Fe	1½
Shannon	10½
Tamarack	150
Trinity	6
United Cop., com.	74
U. S. Oil	10
U. S. Sm. & R., pf.	43½
Utah Copper	61
Victoria	3
Washington	1
Winona	10½
Wolverine	120
Wyandotte	1

BOSTON CURB	
Arcadian	10
Ariz. Com.	20
Black Mt.	7
Davis-Daly	28
East Butte	18
Hancock Con.	13
Keweenaw	2
Majestic	1½
Rhode Island	8
Shannon	25
Shawmut	1
Superior	13
Superior & Pitts.	23
Trinity	6

LONDON	Mar. 13
Name of Com.	Clg.
Dolores	£1 16s 3d
Stratton's Ind.	0 2 6
Camp Bird	1 2 6
Esperanza	2 2 6
Tomboy	1 7 6
El Oro	1 5 0
Mexico	0 18 6
Stratton	0 6 3
Utah Apex	1 0 0
Ariz. Copper Pfd	3 15 0
Ariz. Copper Def	3 12 6

S. FRANCISCO	Mar. 6
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.69
Best & Belcher	1.50
Caledonia	.17
Challenge	.13
Con. Cal. & Va.	.95
Crown Point	.31
Exchequer	.81
Gould & Curry	.30
Hale & Norcross	.71
Mexican	.85
Ophir	2.70
Overman	.15
Potosi	.16
Savage	.70
Sierra Nevada	.82
Union	.80
Utah	.05
Yellow Jacket	1.00
TONOPAH STOCKS	
Golden Anchor	.30
McNamara	.08
Montana-Ptts.ex.	.25
North Star	.35
Rescue	.20
GOLDFIELD STOCKS	
Black Ants	.11
Blue Bull	.47
Columbia Mt.	1.02
Comb. Frac.	4.52
Conqueror	.21
Daisy	2.50
Florence	3.10
Frances-Mohawk	1.00
Goldfield Con.	9.50
Grandma	.30
Great Bend	1.07
Red Hills	.25
St. Ives	1.85
BULLFROG STOCKS	
Amethyst	.45
Bonnie Claire	.40
Mayflower Con.	.39
Montgomery Mt.	.33
Original	.20
MANHAT'N STOCKS	
Gold Wedge	.13
Manhattan Mg.	.12
Pine Nut	.21
Ruby Wonder	
Stray Dog	.09
Yellow Horse	.07

NEVADA	Mar. 13
(Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	15.50
Tonopah Exten.	3.87½
Montana Tonop'h	3.00
Belmont	5.00
Tonopah Midway	1.97
West End Con.	1.45
Jim Butler	.98
GOLDFIELD STOCKS	
Sandstorm	.59
Kendall	.40
Red Top	4.12
Jumbo	4.12
Goldfield Mining	1.45
Diamondfield B. B. C.	.40
Atlanta	.65
Mohawk	18.00
Silver Dyke	1.28
Laguna	1.67
BULLFROG STOCKS	
Mont. Shoshone C.	11.50
Tramps Con.	1.16
Gold Bar	1.15
Bullfrog Mining	.28
Bullfrog Nat. B.	.40
Homestake Con.	1.20
MANHAT'N STOCKS	
Manhattan Con.	.69
Manhat'n Dexter	.28
Jumping Jack	.22
Stray Dog	.37
Indian Camp	.25

COLO. SPRINGS	Mar. 9
Name of Comp.	Clg.
Acacia	10
Black Bell	3
C. C. Con.	4
Dante	5
Doctor Jack Pot	7
Elkton	60
El Paso	57
Findley	67
Gold Dollar	
Gold Sovereign	6
Isabella	20½
Index	03½
Jennie Sample	7
Jerry Johnson	
Mary McKinney	64
Pharmacist	6½
Portland	1.17
Un. Gold Mines	9½
Vindicator	
Work	19¼

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Smg. & Ref., com.	Apr. 15	$1.75	$875,000
Am. Smg. & Ref., pfd.	Apr. 1	1.75	875,000
Bunker Hill & Sullivan	Mar. 1	0.50	180,000
Daly-West	Mar. 15	0.50	108,000
Dominion Coal	Apr. 1	1.00	150,000
Granby Con.	Mar. 30	0.40	296,000
Guggenheim Exp. Co.	Apr. 1	2.50	2,000,000
Hecla	Mar. 1	0.02	200,000
Homestake, S. Dak.	Mar. 30	0.30	1,000,000
Horn Silver	Mar. 20	0.05	250,000
Kendall	Mar. 25	0.05	15,000
Le Roi No. 2	Feb. 1	0.24	288,000
New Century	Feb. 1	0.01	5,000
Nova Scotia Steel & Coal	Apr. 15	1.50	74,556
Quincy Mg.	Mar. 30	0.04½	15,480
Standard Con.	Mar. 26	0.10	17,830
Teziutlan	Apr. 1	2.00	20,000
Trethewey	Mar. 1	0.04	40,000
U. S. Gypsum	Mar. 1	1.25	56,250
U. S. Red. & Ref. com.	Apr. 1	0.87½	656,250
U. S. Red. & Ref. pfd.	Apr. 1	0.87½	656,250
United Verde	Mar.	0.75	225,000
Utah Con.	Apr. 15	1.50	150,000
Work	Apr. 1	0.01	15,000

Assessments

Company.	Delinq.	Sale.	Amt.
Arizona Prince, Cal.	Mar. 25	Apr. 20	$0.04
Bullion, Nev.	Feb.	Mar. 6	0.05
Butler-Liberal, Utah	Mar. 14	Apr. 1	0.01
Clark-Virginia, Utah	Mar. 5	Mar. 12	0.00½
Con. Cal. & Va., Nev.	Mar. 21	Apr. 11	0.25
Etna-King, Cal.	Mar. 10	Apr. 3	0.01½
Independence, Nev.	Mar. 4	Mar. 25	0.05
Jacket, Utah	Mar. 15	Apr. 1	0.02
Julia, Nev.		Apr. 14	0.03
Oro Blanco, Cal.	Feb. 25	Apr. 22	0.03
Quincy, Jr., Idaho			0.10
Savage, Nev.	Mar. 13	Apr. 3	0.10
Sierra Nevada	Feb. 25	Mar. 18	0.10
St. George, Utah	Mar. 4	Mar. 25	0.01
Silver Dyke, Utah	Mar. 28	Apr. 16	0.02
Wabash, Utah	Mar. 12	Apr. 3	0.05
West Century, Utah	Mar. 6	Mar. 23	0.00½

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30 113	31.769
February	66.108	68.855	30 464	31 852
March	64.597		29.854	
April	64.765		29.984	
May	66.976		30.968	
June	65.394		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.967		31.483	
October	69.523		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.396	78.147	107.356
March	18.361		18.641		81.111	
April	18.375		18.688		84.793	
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.606	
March	36.662		September	40.516	
April	38.900		October	42.852	
May	41.343		November	42.906	
June	39.260		December	42.750	
			Av. year	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350		15.922	
April	5.404		15.959	
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.625	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209		6.056		24.563	
April	6.078		5.931		25.781	
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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Methods of Mining in Indiana Coal Fields

A Plan is Suggested for Preventing Squeezes Due to Hard Roof and Soft Bottom, a Condition Which Causes Heavy Loss

BY FLOYD W. PARSONS

[illegible] western Indiana do not differ materially from the system of operation used in Illinois. The coal seams are of the same geological formation and character, and many of the mines in both States are controlled by the same corporations.

Twin Mine No. 5

One of the interesting mines of the Terre Haute district is the Twin mine No. 5 of the Coal Bluff Mining Co., [illegible]. The mine is located [illegible] clay rock. The mine is generally dry so that no problems of pumping are present.

Method of Development

The method of working the seam is by the room-and-pillar system, with cross entries driven double, at right angles to the main entries, and 550 ft. apart. All entries are driven with 32-ft. centers, and are 12 ft. wide, thus allowing an 18-ft. pillar between; the crosscuts are driven at intervals of 45 feet.

[illegible]

Mechanical Mining

[illegible] electric-chain and the compressed-air punching types. The machines enter the room on the left road and undercut across the face; the apparatus is then loaded for removal on the right-hand track, thus saving the labor of moving the machines over ground once traversed.

The coal is delivered to the turnout from the room by mules, and from these partings to the shaft bottom by electric [illegible] are also operated at

FIG. 1. VIVIAN NOS. 1 AND 2 MINES, [illegible]

the western boundary of Greene county, Indiana, and operations are being carried on in the No. 5 seam of the Indiana coal, the product being used principally for steam purposes. The thickness of the seam varies from 6 to 8 ft., and lies at an average depth of about 75 ft. from the surface.

Above the coal bed is a layer of hard slate varying in thickness from 4 to 8 ft., and above this cover is a bed of limestone, which stratum affords an excellent roof for mining purposes. The underlying stratum, or bottom of the seam, is hardly less favorable since it consists of a strong fire-

the cross entries, with 45-ft. centers. All chambers are slightly necked and are 35 ft. wide, which leaves a 10-ft. pillar between. On those entries where mule haulage is employed, the track is provided with 16-lb. rails, while 35-lb. steel is used on the roads where the motors are run. The rooms in general are supplied with 12-lb. steel rails for track, each chamber having two roads, one branching off from the other inside the neck of the room. Each track is laid about 6 ft. from the rib, thus dividing the distance for the handling of the coal from the face to the car.

the face of each room by a mule which then brings out the loaded car on his return trip from the chamber. When each room is worked up to the required distance, the props are often drawn for use in other places, which practice on the part of the mine officials is rare in the operations of this district. The accompanying mine map, Fig. 2, shows the extent of the mine workings and the plan of development. It is the practice of the engineering department now in charge to place centers in all rooms as well as entries, and guided by this system of driving everything on line, it is expected to extract the

maximum amount of coal without incurring a serious squeeze.

The Lost Creek Mine

The Vandalia Coal Company is one of the largest operators in Indiana and Illinois, having been formed by the consolidation of a number of independent companies. The Lost Creek mine, called Vandalia No. 69, is not typical of the operations carried on by that company, and is here presented because of the difficult mining problem involved. The property is located near the city of Terre Haute, and can be reached by the Interurban trolley. The surface plant, shown in Fig 5, is in most particulars similar to the many other small mines in this district.

The power plant is equipped with three return tubular Fulton boilers, while the hoisting is accomplished with a Litchfield engine, operating a 6-ft. drum. In hoisting the coal a 1¼-in. Roebling twisted-wire rope runs over a 7-ft. sheave. The shaft is 115 ft. deep, and has a daily production of about 100 tons, although the mine has produced when working full capacity, 700 tons per day.

The ventilation is furnished by a Litchfield 12-ft. reversible fan, operating as a blower. This plenum system is preferred because the shaft is wet, and to draw the air down the main shaft would cause ice to form on the guides and cage, retarding operations during the winter months. The fan runs 60 r.p.m. and circulates about 20,000 cu.ft. of air per min.

Methods of Mining

The coal seam at this operation averages about 5 ft. 6 in. in thickness, and has a hard roof, being overlaid with a 45-ft. stratum of sandstone. The bottom is of soft clay, which makes the problem of mining both unusual and difficult. The general dip of the seam is in a northerly direction, but locally the coal bed is crossed by small rolls. None of the coal

FIG. 2. TWIN MINE NO. 5, COAL BLUFF MINING COMPANY, TERRE HAUTE, INDIANA

is washed, although it contains several small streaks of blackjack, and a small amount of sulphur.

It was formerly the custom, as is usual throughout this field, to turn all rooms and entries at right angles, driving the rooms at regular intervals. The entries were made 7 ft. wide, and the rooms 24 ft. in width. The nature of the heavy, hard top and soft bottom prevented this system from meeting with success, and resulted in driving the pillars into the bottom stratum, causing a serious squeeze, closing in twelve entries, and causing the loss of 320 acres of coal.

Proposed New System

In this serious squeeze that occurred after the coal has been removed. By this method, which is really the panel system on a small scale, it is hoped to prevent further squeezes and to secure a greater percentage of the seam.

Before the squeeze occurred, the mine employed 120 men, but has since used only 22 miners underground. Considerable water is encountered in the workings, and three small pumps are required to handle this flow. The present operators expect to install mining machines and electric locomotives, the dynamo for same having already been placed.

Southern Indiana Coal Company

On the Southern Indiana Railway, in Clay county, two miles northeast of Jasonville, are located the double-tippie mines of the Southern Indiana Coal Company. These operations, shown in Fig. 1, are destined to become large producers, and are now shipping from 1000 to 1500 tons per day.

The mines are known as Vivian Nos. 1 and 2, and were formerly the property of the O'Gara Coal Company. The present output is from the No. 4 and No. 5 seams, which produce a fairly good steam and domestic coal. The bulk of the production is mined with electric chain machines, while mules are used to gather the coal from the rooms. Recent statistics show that at Vivian No. 2, each machine produced on an average about 27 tons per day, figuring on a period of time extending over 12 months.

As to the composition of the coal in this district, an average analysis shows: Volatile matter, 38.40; fixed carbon, 45.50; ash, 9.80; moisture, 6.30. The coal is rather high in sulphur, but does not clinker to any objectionable degree.

Miners' Wages

The coal that is hoisted from the Indiana mines is often run over a 1¼-in. screen into the hopper, where the product is weighed and paid for by this weight. It is estimated that the run-of-mine coal loses about 50 per cent. in passing over this first screen. The lump coal in the hopper is paid for at the rate of 90c. per ton, which therefore makes the run-of-mine cost about 45c. per ton. In the No. 11 district, where typical conditions exist, the miners' agreement states that if the coal seam is less than 3 ft. 3 in., and more than 2 ft. 9 in. in thickness, the rate of pay shall be 98c. per ton of screened lump or 64c. per ton of mine-run. If the seam is less than 2 ft. 9 in., and more than 2 ft. 6 in., the price shall be $1.06 for screened lump, and 65c. for mine-run.

FIG. 3. TWIN MINE NO. 5, COAL BLUFF MINING COMPANY

the action was so slow that none of the miners was injured, and sufficient time was allowed to permit the withdrawal of all timber and iron. After much consideration on the part of the management, it is probable that the future method of operation will be to drive four rooms, leaving a 6-ft. pillar between each two rooms, and then after the fourth room, leave a solid block of coal 120 ft. wide, again driving four rooms beyond this. After the limits of the property have been reached in this manner, the retreat will be carried on by the longwall system, thus allowing the roof to cave in

Mine Tipple

The system of preparing the product at

the same general principles. In hoisting the coal, the usual plan is to operate a self-dumping cage, arranged as shown in Fig. 4. The detailed system of screening is also shown in this illustration, as well as the hopper for weighing the coal. In many instances, the coal is dumped and run over a 1¼-in. screen, thus separating the product into only two sizes; the oversize being caught in the weigh hopper, and paid for as screened lump; in other instances the large screen leading to the hopper is covered with steel plates, so that all the coal passes into the hopper and is weighed and paid for as run-of-mine, afterward being separated into four sizes by the shaker-screen equipment.

Many operators wisely prefer to have the shaker screens supported by a separate framework, and unattached to the main building, thus preventing any unusual strain on the general structure, which would be caused by the jar of the screens.

FIG. 3. VANDALIA MINE NO. 69.

SUMMARY.

The coal operations in Indiana are confined to 14 counties located entirely in the southwestern part of the State. The total output during the past year was approximately 10,000,000 tons, coming from about 200 mines. The famous Indiana block coal is produced in but three counties, the town of Brazil being about the center of this district.

There are 30 block-coal mines, 6 of which are equipped with mining machines; of the remaining 170 bituminous operations, 83 are machine mines and produce about 49 per cent. of the total coal output. As to the use of powder in the mines of this State, it has been found that each keg of powder used produced 25.7 tons of coal; this means that in the production of each ton of fuel, the powder consumed cost 6.8c. For the map and data concerning the Twin No. 5 mine, I am greatly indebted to W. G. Spears, chief engineer of the Coal Bluff Mining Company.

According to *Cosmos* an engineer of the Witkovitz society, Ostrau, has invented a liquid-air miner's helmet. A Breslau mining engineer was able to remain half an hour in a poisonous atmosphere, composed of coke-oven gas, without any ill effects. The apparatus is simple, having no valves and consists of a metal box containing an asbestos sponge saturated with two or three liters of liquid air. The latter evaporates and is conveyed to a mouthpiece. The carbonic acid exhaled congeals at a relatively high temperature, is solidified in a conduit which passes through the liquid-air receptacle, and the respirable air can again be utilized.

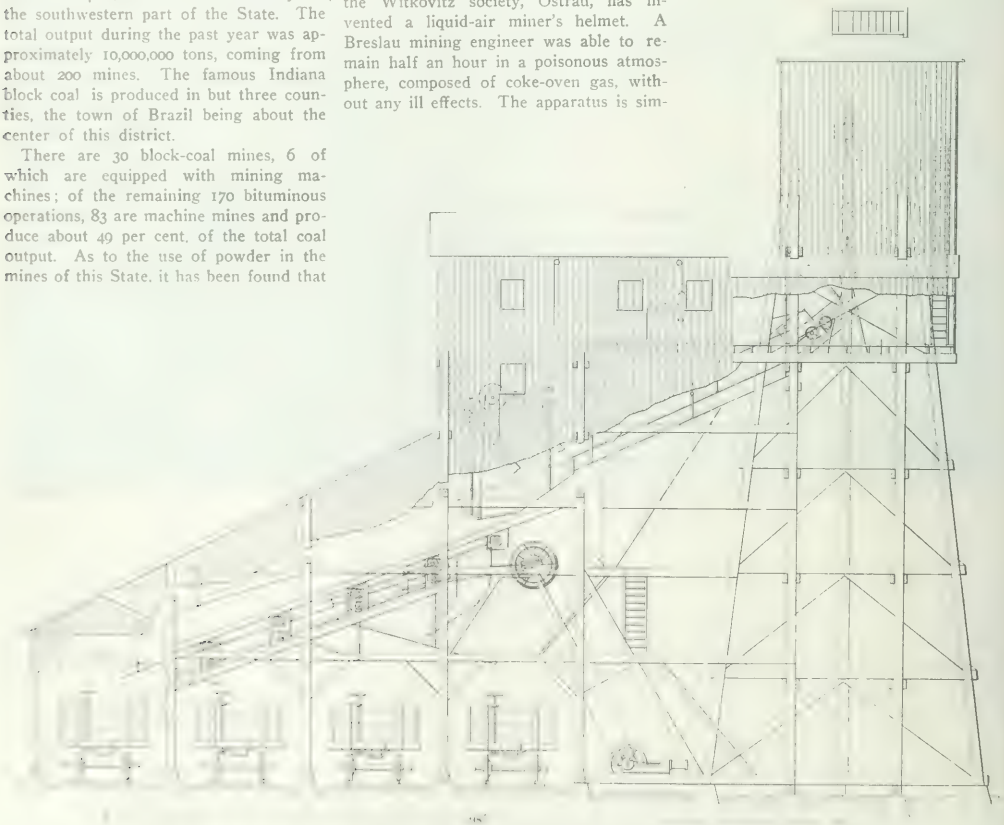


FIG. 4. [illegible] HOISTING AND SCREENING ARRANGEMENT COMMON IN INDIANA.

New Discoveries in Northern Quebec *

By J. Obalski†

Since last summer a number of prospectors have been in the field exploring the Chibogomo district, the valley of Bell river and the north of Pontiac county. In many cases the parties were formed under the auspices of small syndicates, the expense of traveling in these remote regions being considerable. In consequence of these investigations rather more is now known concerning the mineral potentialities of these areas, and this knowledge is strongly corroborative of the opinions previously expressed by geologists in charge of reconnaissance surveys. The writer last year personally visited the regions between the Hanicanaw river and Lake Abitibi.

In the Chibogomo district some work has been done on the big quartz vein of Portage island, showing the continuity of the vein at depth and its larger mineralization in the form of chalcopyrite. This development includes a number of open cuts on the vein, covering a distance of about 1000 ft., and the sinking of a shaft to a depth of 35 ft. From tests made the value in gold and silver appears to be greater than previously supposed. In the northwest section of McKenzie bay new discoveries of asbestos are reported, while northwest of Island bay magnetic iron has been discovered. Some large bodies of pyrrhotite carying high copper values have, moreover, been found northwest of Lake Dore.

Northeast of Lake Assinibastot and southwest of Chibogomo river, cobalt bloom was recently discovered, but too late in the season for the significance of the find to be ascertained. The discovery, however, is seemingly confirmatory of opinions expressed by A. P. Low and J. E. Hardman regarding the similarity of the geological formations here to that of the Cobalt area. It is probable that the district will be well prospected during the coming summer and other important discoveries will doubtless be made. Meanwhile a good winter trail is now completed from Lake St. John to Chibogomo.

In the north of Pontiac the writer has explored from the Baie des Guize, following the Ottawa and Kinonge rivers, Lake Kewegama, Lake Askikwaj and northward down the Hanicanaw river 20 miles north of the proposed route of the Transcontinental Railway and thence to Lake Abitibi, White Fish river and south to the Baie des Guize. Outcrops of Laurentian gneiss occur south of Askikwaj lake, north of Kewagama lake, north of Long bay of Kinonje river and south of the Height of Land on the shore of Lake Opasatica. The area south of that line is not all Laurentian, bands of Huronian being found in several places, as shown in Dr. A. E. Barlow's map of 1899. The country crossed by the Transcontinental Railway is covered by a thick layer of clay, but shows in places outcrops of rocks, undoubtedly of Huronian age.

The northeast shore of Lake Kewagama is Huronian, as is also the district around Askikwaj lake. Descending the Hanicanaw river, the same rocks outcrop for same distance; but further down the surface is covered by clay, with occasional outcrops of rocks. The exposures of rock down the river for the distance traveled of 40 miles, and also along the route of the Transcontinental Railway for 25 miles, were very few. Nevertheless, the rock in sight is Huronian, being diorite, serpentine, schist, and a granite similar to that found on the Height of Land, near Lake Opasatica. It is reported that chalcopyrite has been found on the shore of the Hanicanaw river, below the Transcontinental line.

In the serpentine above mentioned the writer has observed small stringers of asbestos. On the southern slope of the Hight of Land, some molybdenite occurs, and it is reported that another deposit has been found in the big peninsula of lake Kewagama. In a more westerly direction, the country is rocky and less difficult to prospect, and no important discoveries have been made except in the vicinity of Opasatica lake. To the northeast of this lake, not far from the Hight of Land, a very remarkable piece of quartz showing abundant visible coarse gold, was picked up, and exploration since has apparently resulted in the discovery of gold-bearing quartz in place. Two blocks of land have been purchased from the Quebec Government in that section, of which one was bought by the King of the North Gold Mines Company, recently organized to develop the property. The writer visited the district in July last, and although he did not see any visible gold in the quartz, he obtained good colors by panning the debris in the vicinity of the deposit. To the south of lake Abitibi and close to the shore, the party found some rock containing gold, and the fact was ascertained that rock of the same character, also showing gold was here *in situ*. Some indications of chalcopyrite have also been found close to the boundary line, not far from the 35th mile.

A number of lots have been prospected in the surveyed townships near Timiskaming lake, and a large variety of minerals found there, including galena, iron pyrites, copper pyrites containing some gold, cobalt bloom, and iron; one undertaking, the Jessie Fraser Mining Company, purchased a block of land in Fabre township, on which a small steam plant has been installed. The geological formation [illegible] a succession of bands of Huronian and Laurentian not yet accurately determined. On Bell river, some prospecting has been done, but no new discoveries of importance are reported.

Last season the Geological Survey explored from lake Abitibi, toward the east, following the surveyed lines of the Transcontinental Railway. W. J. Wilson gives a summary report of this exploration in the last publication of the Geological Survey. Dr. A. E. Barlow also reports on the geology of the eastern part of Timiskaming district, but neither of these reports indicates the occurrence there of minerals of economic value.

* Paper presented at the Toronto meeting of the Canadian Mining Institute, March, 1907.

† Director of Mines, Province of Quebec.

Method of Platinum Mining in Russia

The working of the platinum deposits of Russia is described in the *Canadian Mining Review* for January, 1907. The districts where platinum occurs in commercial quantities are situated on the eastern watershed of the Ural mountains, the richest deposits lying around the river Iss. The area is largely composed of peridotites, olivine-gabbros and their serpentine productions.

The deposits are all of placer type, averaging 4 ft. in thickness and extending from 200 to 800 ft. on each side of the river. They have an overburden of turf, which varies in thickness from 5 to 20 ft. To extract the mineral the overburden is stripped off and the gravel transported to sluices or to mechanical washers, the latter being usually employed in working on a large scale.

The washer consists of a cylindrical tub, at the bottom of which is a circular iron pan, 15 in. deep and perforated with holes ⅝ in. in diameter. Round the top of the pan runs an iron pipe, from which jets of water play into the interior. In the center is a vertical shaft carrying a stirrer, which revolves at the rate of 25 r.p.m. The gravel is fed continuously and the large stones remain on the pan, while the sands and clayey matter pass with the water through the holes directly to the riffle table. Washing is carried on uninterruptedly for about 11 hours. The concentrates are then washed on tables several times until reduced in bulk to a fine gray slime, from which the gold is removed by means of mercury. The residue is sold as crude platinum.

Within the last few years, says the *Northwest Mining Journal*, the raw cyaniding of arsenical ores from the Cascade region of Wyoming has been very successful and experiments on a small practical scale have shown that the extraction of gold can be run as high as 80 to 90 per cent., at an estimated cost of $1 50 per ton at a 100-ton plant.

Belt Elevators for Ore and Water

The Troubles of Belt Elevators Handling Wet Materials and Expert Advice as to Methods for Overcoming Them

BY EDWARD S. WIARD*

The notes in this article are an outline of the writer's experience with these very essential, though at times troublesome, machines in wet concentrating mills. What he has to say, especially as to wear and tear, may not strike with much force those fortunate millmen whose experience with this type of machine has been confined to elevators of low lift and of a capacity ample to raise a moderate burden of fine material. Such an elevator gives little trouble.

A Comparison

The writer at one time had in charge an elevator raising about 100 tons of ore in 24 hours, ranging in size from 4 mm. to 0 mm., to a hight of 43 ft., and the belt and buckets, after being in continual service for four years, deducting occasional periods when the mill was shut down for repairs, and not exceeding 48 hours, finally fell into the boot.

It was almost a forgotten machine in the mill. Evidences of much wear were lacking, the belt giving way from the deterioration of the rubber and the breaking of the threads of the plies from much passing around the head pulley. In the same mill was an elevator which every 24 hours raised about 700 tons of ore ranging in size from 60 mm. to 0 mm., and was a constant source of trouble. Its belt could not be depended upon to last longer than six months

These two elevators serve admirably for comparing the factor of wear due to size and quantity of material, the hight, speed, quantity of water raised, etc., being very nearly the same in both. Data for these two elevators as well as for the other elevators mentioned in this article will be found in a table at the end of this article.

Elevator belts are generally of what is known as special belting, a belt with an extra heavy coating of rubber. The net prices for the various widths and plies of the highest grade with the heaviest cover, at Denver, are shown in the following table.

Rubber deteriorates rather rapidly with age and for this reason an elevator belt is made up by the manufacturer upon receipt of an order for it. Belts subjected to extra hard wear cannot be depended upon to last longer than six months, and as three months will usually elapse between the receipt of the order by the manufacturer and the arrival of the belt at the mill, it is a good plan to order a second belt immediately upon the arrival of the first one. Not infrequently, owing to the exasperating delays in receiving elevator belts, the millman is forced to keep in use a belt that should properly be on the scrap heap.

On receiving a new belt the rubber should be carefully examined. The millman will prefer a tough, whitish rubber offering considerable resistance to compression by the thumb. A piece of the rubber, after being stretched, should promptly assume its original shape. Any shortness or permanent distortion of the rubber, especially when accompanied by softness and a brownish black color, should be looked upon as evidence of unsoundness. The extra coating of rubber on the back or pulley side of the belt is of very little service in belts subjected to hard wear. Particles of ore lodging between the boot pulley and the belt are driven into the rubber and soon loosen it. The writer has frequently had to remove the entire back coating from belts which had been in service only a few weeks.

Power Required

It is possible to arrive at a very close approximation of the power required to drive elevators under normal conditions, but it must be remembered that elevators are frequently subjected to sudden and severe shocks, and this factor must be considered in estimating the power required to drive them.

The ordinary millwright usually pays no attention to the question of the power required to drive an elevator other than to assign an arbitrary horse-power, usually ten. Calculations will be entered upon here to determine the horse-power required to drive the elevator shown in Figs. 1, 2, and 3, the details of which will be found in column 4 in the table at the end of the article. This is an elevator of extraordinary size. The writer has frequently stood over the hood and watched this elevator discharge. The buckets came up in a steady line and were filled with ore and water to within 1 in. of the top. There was a heavy overflow from the boot and the aim was to raise as much water as possible with the tailings for the purpose of sluicing. The buckets were 8x18 in. of the "AA" form and held 9.4 liters when filled to within 1 in. of the top.

The total length of the belt was 126.33 ft. and the number of buckets with 20-in. spacing was 75; 350 tons of rock were raised in 24 hours. This weight multiplied by 56.91 ft., the vertical lift, gives the number of foot-pounds of work per day, or 27664.5 foot-pounds per minute. The bucket holds, when filled to within 1 in. of the top, 573.62 cu.in.

The elevator delivers 486.11 lb. of ore per minute and the number of buckets passing any point per minute is 297; consequently the ore per bucket is 1.64 lb. and occupies 16.43 cu.in., on the assumption that its specific gravity is 2.8. Deducting this volume from 573.62 cu.in., the capacity of the bucket, we have 559.09 cu.in of water which weighs 20.13 lb. This weight multiplied by 297 will give the weight of water raised per minute and this multiplied by the lift will give the theoretical number of foot-pounds required to raise the water.

	Foot-pounds (per min.)	Horse-power.
Ore	27,664.5	0.84
Water	340,242.69	10.31
Total	367,907.19	11.15

The water elevated is 716 gal. per minute or 1,031,040 gal. per 24 hours. Assuming that of the total power required to drive the elevator, 30 to 33 per cent. is used in shaft friction, the normal horse-power required would be about 15.

Tension on Belt

The strength of rubber belting is about 4000 lb. per sq.in. A 20-in., 10-ply belt will therefore break under a load of about 40,000 lb. The tension in the belt due to raising the ore and water will be,

$$T = \frac{h.p. \times 33{,}000}{V},$$

where V = velocity in feet per minute, and h.p. = theoretical horse-power. This, in the elevator under consideration, will amount to 741.5 lb. Neglecting the inclination of the elevator as it is so nearly vertical, we must add one-half the total weight of buckets and belt and, say, 300 lb. for the tightening tension applied when the belt is bolted together, giving as a total maximum tension at the head pulley, 2341.5 lb. The belt weighed 1100 lb., the buckets 20 lb. apiece. This gives a factor of safety of 17.1 when the belt is new. For this particular elevator this factor seemed to be sufficiently large.

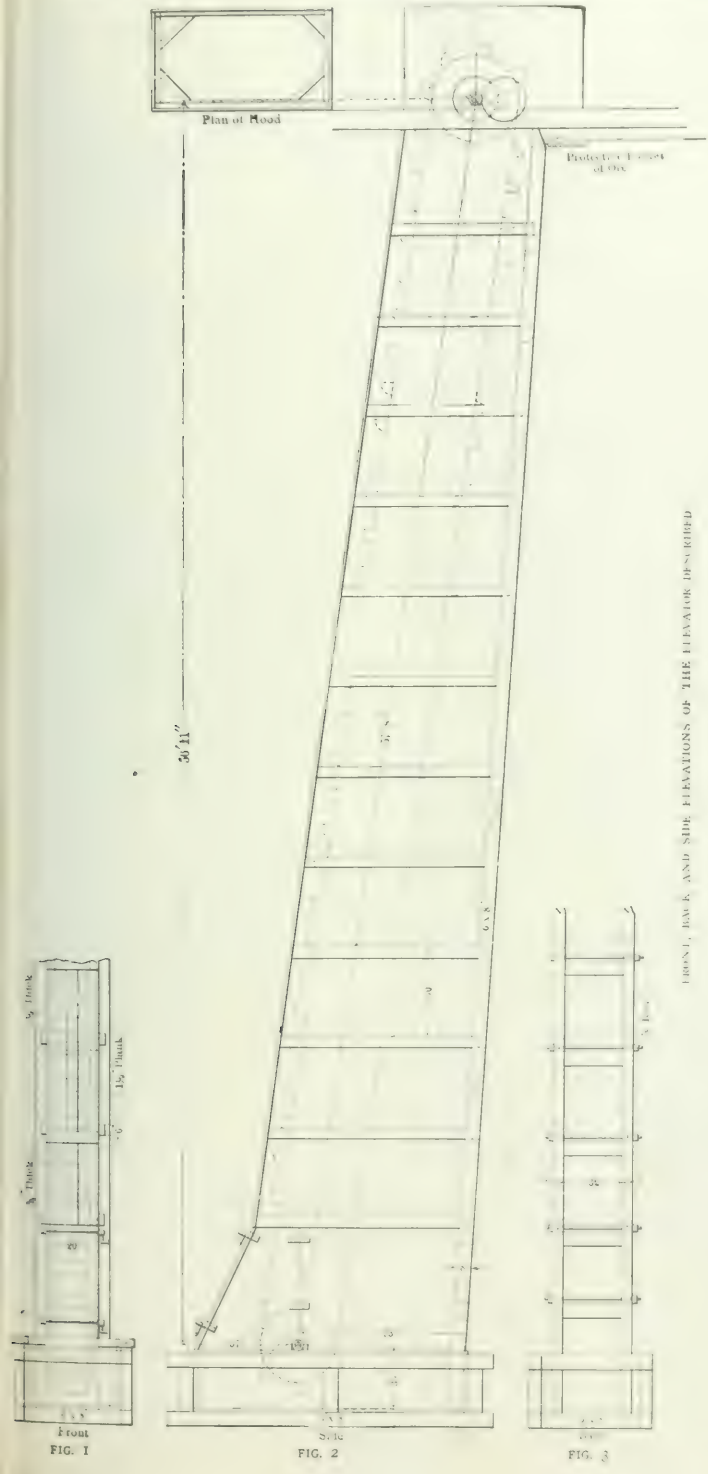


FIG. 1 FIG. 2 FIG. 3

FRONT, END AND SIDE ELEVATIONS OF THE ELEVATOR DESCRIBED

Metal housings, boots and hoods are seldom used in ore mills. They do not adapt themselves to the wooden construction in vogue in western mills, are difficult to repair and their first cost is great. Certainly the forms of housing and boots used in the grain trade, and confidently proposed for use in ore mills, would not answer for elevating wet ore. This is especially true if the elevator is given a slope, for in that case the back must be vertical or nearly so in order to prevent undue wear of the housing. This will necessitate a long boot.

The boot should be wider than the casing so as to allow the bearings to be placed entirely outside the housing proper. The boot should be of such a size that sufficient ore can accumulate around the sides and bottom to protect the lining from the wash of the elevator. In an elevator having an overflow, a roomy boot will help to check the flow of material from the entering spout. All the rock will then be elevated and as much as possible of the water. A boot pulley 24 to 30 in. in diameter is sufficiently large for most elevators.

The rim and the rim end of the spokes should be cast extra thick since these are the places of greatest wear. The boot boxes should be covered if possible as an additional precaution against the entrance of grit. It is a custom among millwrights to place the boots of elevators below floors or in the darkest corner to be found, whereas, if possible, they should be exposed to the light on all four sides. Necessarily when in a dark and disagreeable situation, the boot bearings are neglected. A well designed and accessible elevator can be kept in as well ordered a condition as any machine about the mill.

Although he has never seen it tried, the writer believes that four bonnet-shaped collars, together with the placing of the bearings outside the housing, would amply protect them. In many mills the entrance of water between the shaft and the babbitt of the boot boxes is so great that it is impossible to keep the journals and bearings greased, in fact no attempt is made to do it. With a bonnet collar the coat of grease which would accumulate between it and the box would materially assist in keeping out sand.

Vertical and Inclined Elevators

The necessity for using tightening devices is a serious objection to vertical elevators; they must also be run faster in order to discharge with the same facility as an inclined elevator. It is impossible to keep these tightening devices in good working condition. A hinged boot of the size needed for wet elevators would be a very cumbersome affair to handle, but is very serviceable for elevators of small size, which have a tendency to stall, or for making repairs. With a stationary boot provided with a number of plugs of ample

...ste if a sufficient quantity of water is used. The water must be high pressure hose, to free the pulley and buckets. If possible a line of hose attached to a high-pressure cock should be provided near all elevators that are subject to being stalled.

Elevators fed from the side should be provided with heavy plates of iron on the bottom to receive the impact of the ore. If a Blake form of crusher is used, the old worn plates will serve admirably for this purpose.

An elevator fed from the front, at first glance, appears to be far more efficient than one fed from the side; but, as has been pointed out elsewhere, a certain amount of ore must necessarily be thrown from the buckets which has to be scooped up from the boot. Elevators fed from the front cause less wear on the boot pulley, less wear on the corners of the buckets and less attack on the back of the belt due to ore being forced in between the pulley and the belt. The writer is inclined to advocate a front feed for fine material; but for coarse material, especially if the elevator is overdriven, the wear on the front side of the belt would more than offset the advantages enumerated. It is also necessary for material fed from the front to enter high, causing a loss of head room and making it rather difficult to protect the bearing from grit.

Improved Housings

The housing shown in Figs. 1, 2, and 3 is the result of the experience of many millwrights and millmen. The back timbers are the only ones that enter the boot and they are at the rear end, out of the way. The doors which swing back above the bearing are the only parts of the elevator that are ordinarily necessary to open in making repairs, but if any further opening is desired, only boards need be removed, no framed timbers being in the way. The whole front of the elevator from top to bottom can readily be removed. Fig. 1 shows that it consists of 8-ft. sections screwed to the ends of the casing. The lowermost section of the front and the two doors are held securely together when the elevator is closed, by the device shown. Each door contains two lugs firmly secured at the top and the bottom. These are bored to receive the threaded rods shown. When the elevator is closed the rods are run through the lugs and plain nuts are screwed on the left-hand end. The right-hand nuts, to which have been welded handles, are then screwed on and the doors are tightened to place. The boards of the casing proper are 1½ in. thick and were grooved for tongues at the sawmill. Wherever possible the elevator casing was secured to the timbers comprising the mill frame. No foot support was found necessary for the side and front of the casing. The back timbers at the top are framed into the heavy timbers supporting the upper bearings, the weight of the upper pulley, and the belt and buckets. These timbers in turn rest directly on the timbers of the mill frame. The diameter of the upper pulley in this elevator was 48 in. and the speed of the belt about 500 ft. per minute.

Diameter of Pulley and Speed

Nothing is to be gained in gripping power by increasing the diameter of the head pulley or widening the belt and the face of the pulley, the load remaining the same. But, as will be shown later, the tendency to break the plies of the belt increases as the diameter of the pulley is reduced. Since the centrifugal force would diminish as the diameter of the pulley was increased, the belt speed remaining the same, there would finally arrive a point in increasing the diameter of the head pulley, where the buckets would not discharge cleanly into the receiver.

The writer's rule for the minimum speed at which the belt should be run is four times the diameter of the head pulley in feet multiplied by one hundred. This would give as a safe speed for a 36-in. pulley 300 ft. per minute, for a 48-in. pulley 400 ft. per minute, etc. A much higher velocity than the safe speed is allowable. Elevators with head pulleys of ordinary diameters, 30 to 40 in., have been run with belt speeds as high as 650 ft. per minute on dry material.

By increasing the diameter of the head pulley we are enabled to increase the belt speed and hence the capacity of the elevator, and reduce the belt tension without unduly increasing the centrifugal force. With curved buckets and so mobile a substance as ore and water, there is no danger of material being carried back to the boot by the adhesion of the ore to the face of the bucket from centrifugal force. The effect of increasing the speed of the belt, as the writer has observed, has been to cause the ore to rise in a higher crested curve and to land farther back in the receiver pocket.

The elevator illustrated in this article threw the ore and water in a beautifully curved stream to the far or discharge end of the receiver pocket. The wear on the receiver iron was small and no coarse ore fell back into the boot. On placing the hand into the stream of ore descending into the receiver, one finds that there is a gradation from water, at the top of the stream, to the coarsest ore nearer the buckets. This seems to indicate that an elevator raising coarse material should run faster than one raising fine. The elevator illustrated in the article raised tailings from 40 mm. to 0 mm. in diameter. The writer advocates adding 100 ft. per minute to the minimum-speed rule given above.

Receivers, Pulleys and Buckets

As to the placing of the receiver iron no rule would be complete without taking into account the speed of the belt, the diameter of the upper pulley, and the size and weight of the ore particles. The writer fails to see what advantage is to be gained by placing the edge of the receiver iron much below the center line of the pulley. If the elevator discharges properly, 12 to 16 in. should be ample. Discharge from a vertical elevator into the receiver cannot take place after the bucket is completely reversed. The receiver iron is placed on a slant to prevent the accumulation of ore at the bucket end of the pocket.

The head pulley should be forced on its shaft as well as keyed. Owing to the sudden shocks to which many elevators are subjected, ordinary keying is not sufficient to keep the head pulley tight. The hood for the receiver is made in two pieces and is open at the top, the two sections fitting snugly around the shaft. The front section is tapered at the forward edges, the point being inside so that the splash of the elevator will not be cast through the opening. The two sections can of course be readily removed. It is a very great advantage to be able to look into the elevator and to be able to hear the warning sounds which it gives out. A heavy eye over the top of the elevator is a very great convenience in changing pulleys and shafts and in making repairs. The buckets used for elevators are of steel and malleable iron of the "AA" or deep form. For elevating fine ore the lightness of the steel buckets makes them preferable. Malleable-iron buckets are 3/16 in. thick. The steel buckets are of varying gage from 23 to 12, the thickness increasing with the size. The seamless steel bucket is much to be preferred to the riveted type.

DIMENSIONS OF MALLEABLE IRON ELEVATOR BUCKETS.

Length, In.	Width, In.	Depth, In.	Approx. Capacity. Cu. In.	Gals.
10	6	5	160	0.61
11	6	5	176	0.66
10	5.5	5	210	0.78
12	6	5	205	0.75
14	6	5	235	0.88
12	5.5	5.5	260	1.00
14	5.5	5.5	310	1.16
16	5.5	5.5	360	1.35
18	5.5	5.5	410	1.53
12	8	6.5	360	1.31
14	8	6.5	415	1.55
16	8	6.5	480	1.79
18	8	6.5	515	2.03
18	9	9	710	2.63

In ordering a new lot of buckets it is wise to send a templet showing the spacing desired for the double row of holes through which the elevator bolts pass.

	Number of Teeth	Width of Face In.	Bore, In.	Hub. Width, In.	Hub. Dia., In.	Arms.
Pinion	15	4.0	1½	....	....	....
Gear	60	4.0	3 7/16	5¾	6¾	6
Pinion	12	4.0	2 7/16	....	....	....
Gear	48	4.0	3 7/16	5¾	6½	6
Pinion	18	3.0	2 7/16	....	....	....
Gear	60	3.0	3 7/16	5	7¾	Web.

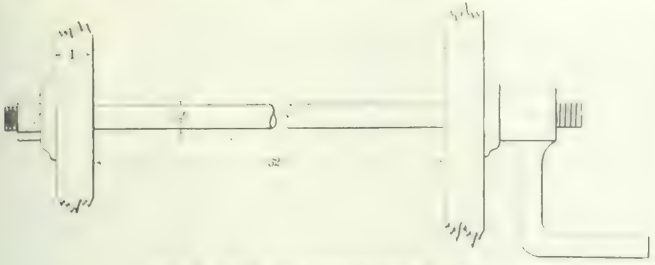


FIG. 4. DEVICE FOR HOLDING BOOKS IN PLACE.

The gearing to be found in mills is generally of cast iron. The accompanying table shows three examples of gear wheels and pinions, and may be of service to those constructing elevators.

Elevators of moderate length can be driven directly with a belt.

Mounting the Belt

The belt is received at the mill in a coil securely sewed up in burlap. If it is to be put into place at once a piece of pipe is slipped through the center and the pipe and belt are suspended on a pair of horses. Horses are set out at regular intervals, on which is placed a line of boards. The belt is then dragged out on the boards, the pipe which serves as a shaft being prevented from advancing by a couple of cleats nailed on the horses. When a good part of the belt is stretched on the boards, it is laid off in equally spaced distances with a pencil and carpenter's square. The writer generally made the distances equal to the width of the belt from one bucket to another.

The effect of wear on the belt due to the bucket can be readily seen on any old belt lying on the scrap heap. Below the position occupied by each bucket is a deep scar due to the intensity of the scouring action in the boot on these parts, and the chafing of the buckets on the belt, the wear being accentuated by grit lodged between the buckets and the belt. Since the holes in the buckets are larger than the bolts, the buckets are able to shift about to some extent. As the buckets in passing over the upper pulley are thrown out by centrifugal force, the edge of the bucket presses into the belt and tends to break the plies. To a much less degree the backs of the bolts have the same effect. The most dangerous breaks will generally be found just above the buckets.

Because of the effect of wear due to the buckets, and because of the smaller load on the belt with widely spaced buckets, the millman will put them as far apart as possible. It would seem preferable to space the buckets rather widely and increase the belt speed to get a greater capacity.

After the belt is laid off by equidistant pencil lines, a bucket edge is placed up to these lines, and the position of the bolt holes marked on the belt. For punching the holes only the best quality of punch should be used. Bemis & Call's punches, especially those with the extra long shank, are very serviceable. The No. 10 punch is the size generally used.

The operations of marking, punching, placing the bolts and buckets and screwing up the nuts can be done most rapidly by a number of men working in succession. The nuts are screwed on with the rounded face to the bucket. The stamping out of the blanks for the nuts leaves a bur which is not ground off by the maker. The brace for tightening the nuts is shown in Fig. 5.

Splicing

If a scarf splice is decided upon, a cut is made across the end of the belt to the depth of the first ply, and at a distance from the end equal to the width of the belt, and the ply is torn off from the cut to the end. A cut is then made in the second ply at a distance from the first equal to the width of the belt divided by the number of plies, less one, and this is then torn off to the end. With this same width of step the lower plies are successively removed. Fig. 6 is a diagram showing the completed scarfing for a 20-in. 10-ply belt. The writer's rule for obtaining the proper number of plies for the belt is to divide the width by two.

The writer prefers a butt joint with a covering piece equal in length to twice the width of the belt, as shown in Fig. 7. This form of joint is of course much stronger than the scarf joint and should be used on extra heavy belts. Its disadvantages are that a bucket placed on the covering piece is apt to catch on the receiver iron, or, if the covering piece is left blank, an undue strain is thrown on the bucket below the joint every time it dips into the ore in the boot.

Fig. 8 shows the method of bolting together the scarfed lap joint and the relation of the advance of the ends of the joint upon the head pulley. This is exactly opposite to the principle employed in splicing leather belts, the point being the last part to go on the pulley. There being often considerable slippage on the head pulley of an elevator, and it being

FIG. 5. BRACE FOR TIGHTENING BELT NUTS

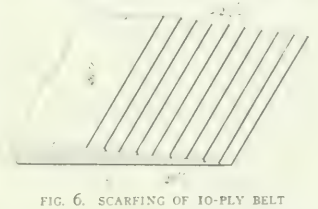


FIG. 6. SCARFING OF 10-PLY BELT

impossible to make a bolted joint lie smoothly, a slip of the belt, if the joint was the reverse of that shown in the figure, would cause the end of the belt to roll up. As shown in the figure, a slip of the belt would tend to lay the scarf piece smooth.

Placing a New Belt

If the old belt is still in the housing, it will assist materially in raising the new one; for, if the new belt is attached to the old one at the boot, the latter, after being cut, will very nearly counterpoise the weight of the new one, and as the new belt is raised the old one can be drawn out. Large screw eyes should be placed at convenient points for holding snatch blocks. A rope can then be run over the head pulley and the ends dropped down through the casing and out at the wing openings at the boot, one end being secured to the end bucket on the new belt.

The other end passing out of the boot is caught on the snatch blocks and connected with the winch. Two men will generally stand at the wing openings to pass in the

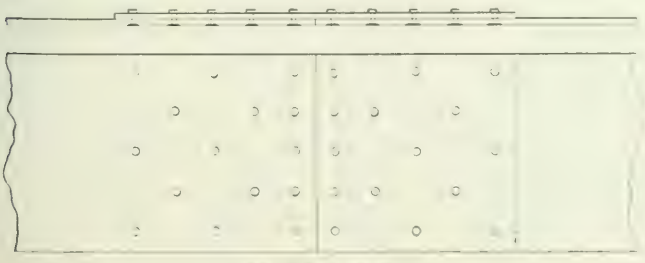


FIG. 7. BELT SPLICE

is well at that point, and others will man the winch.

When the end reaches the boot pulley it is drawn up around it, and the clamps put on. Fig. 9 shows a belt clamp. A mill having a number of elevators should have three or four pairs of these clamps. For the heaviest belts a clamp with 1-in. rods with machine-cut threads should be provided. After the belt is stretched the superfluous belting is cut out and the joints are bolted together.

After the belt has been in service a short while the clamps will again have to be put on and another piece of the belt removed. If a scarf has been cut the unscarfed end is punched while in the clamps, one man holding a block behind the belt. The two ends are then laid together, and the position of the holes for the scarfed end are marked with red paint. The red paint consists of a little red lead mixed in linseed oil. The covering piece of a butt joint is punched before bolting into place. Wood clamps are convenient for holding the joint together while the belt is being marked.

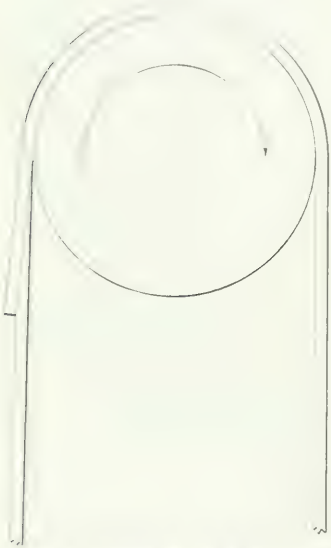


FIG. 8. WRAP OF BELT ON PULLEY

Patching Elevator Belts

Patching is often resorted to to prolong the life of the belt. Not infrequently, owing to the great delays occasioned in getting belting, one is forced to prolong the life of the belt in use. The most dangerous breaks are the horizontal ones across the belt above a bucket. A break of this kind, which appears to penetrate only through the rubber, is often a number of plies deep. The back of the belt is often studded with pieces of ore, which have been forced into the belt, giving the appearance, described by mill men, as "shot." Wherever needed the buckets are removed and a piece of new belting is bolted on to strengthen the belt. No task is so disagreeable as making repairs in a wet elevator housing or raising a fallen belt. The grit-laden drippings on the skin cause an irritation which is the acme of discomfort. While patching the belt is going on, an examination of the boot should be made for broken buckets or anything likely to stall the elevator. If the elevator is the one below the No. 1 rolls, bolts, pieces of drill steel and other iron brought in with the ore from the mine, may be found.

The receiver iron should be given attention. If badly worn it will allow ore to drop out into the boot.

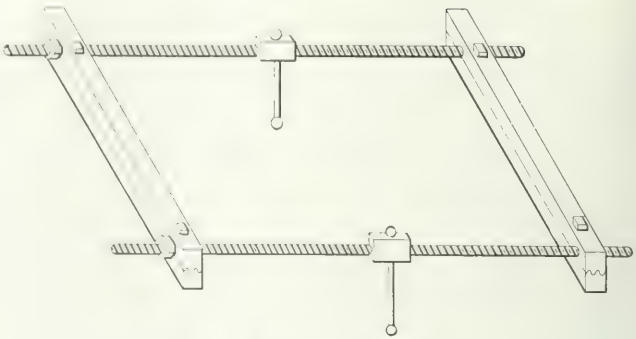


FIG. 9. ELEVATOR BELT CLAMP

Buckets

Elevator buckets dipping into ore wear down most rapidly at the corners. Buckets subjected to much wear and tear should be watched rather closely. After they are worn down to a certain point, putting on new ones will cause the elevator to stall or break the belt. The front of the buckets receiving no support from the worn-down corners is readily doubled up by any obstruction in the boot.

A bucket distorted outwardly is apt to catch on the receiver iron. The writer has seen heavy malleable-iron elevator buckets, of which all that remained attached to the belt was the back plate.

If the elevator is gear-driven, a spare pinion shaft, pinion and pulley complete, should be kept on hand near the receiver ready to be dropped into the boxes in case the teeth of the pinion are stripped or the pinion shaft is broken.

No. 1 elevator was subject to great and sudden shocks, Nos. 3 and 4 were subject to shocks, though in a lesser degree, and No. 2 was free from shocks.

The figures for the first set of gears, given in the table on gears, are for elevator No. 2. The second pair is for elevators Nos. 1 and 3, and the third set is for elevator No. 4.

A German company has been formed which is to exploit deposits of iron ore in Norway, says *Engineering*, of London. The iron ore is not of very high class and will have to be briquetted. The annual output is expected to be 200,000 tons, all of which will be consumed by the German firms who have acquired the deposits, and who are forced to pay the Norwegian government a considerable sum for their concessions.

FOUR ELEVATORS DETAILS AND OPERATION.

	No. 1.		No. 2.		No. 3.		No. 4.	
Vertical distance between shaft centers.	47.85		42.77		31.67		56.92	
	Deg.	Min.	Deg.	Min.	Deg.	Min.	Deg.	Min.
Vertical angle of line connecting centers of pulleys	8	20	11	6	5	7	7	34
Horizontal offset, inches per foot rise	1.76		2.36		1.07		1.59	
Belt: Width, inches	16.0		16.0		16.0		20.0	
Number of plies	8.0		8.0		8.0		10.0	
Travel, feet per minute	440.0		440.0		440.0		500.0	
Buckets: Style	AA		Steel		AA		AA	
Size, inches	8x14		7x14		8x14		8x18	
Spacing, inches	16		16		16		20	
Tons ore raised per 24 hours	700		100		450		350	
Average size of ore raised, cubic ft.	40.0		4.0		40.0		40.0	
Tons water raised in 24 hours	601		601		2405		4305	
Gallons water raised per minute	100		100		400		716	
Head Pulley: Diameter, inches	40		40		40		48	
Face, inches	18		18		18		22	
Bore, inches	3		3 5/8		3 7/8		4 7/8	
Boot Pulley: Diameter, inches	40		40		36		40	
Face, inches	18		18		18		22	
Bore, inches	3 5/8		3 7/8		3 5/8		3 15/16	
Horsepower	1.50		1.08		4.89		15.0	

The Location of Smelting Works

The One-level Plan has Several Advantages as Compared with the Terrace Site. The Plant of the Future will be on Level Ground

BY HERBERT LANG*

The relative advantages of the side-hill or terrace as compared with the so called one-level site for smelting works were much discussed in the columns of this journal some years ago, as many readers will remember. It is an interesting question, but one that time and the experience of many builders alone can settle. Little of a really conclusive nature was said at that time, and it is scarcely probable that any converts were made to one side or the other. For my part I have always been an advocate of the one-level site, and as such I took part in the discussion; but at this late day it appears to me that neither side was presented in quite the proper light, or perhaps it may be that subsequent reflection has brought up new arguments more cogent than the former ones.

The experience of the iron-furnace men, whose widely extended operations require vast spaces for buildings, stock yards and the like, make decidedly against the terrace system, and we find them seeking, and in some cases absolutely making by filling in marsh lands and other apparently undesirable grounds, the large and level areas that they design to occupy. You never see them going to side hills to found their works. As to the lead, and more particularly the copper smelters, it seems to me that we can trace the gradual substitution of the one-level for the terrace idea, although the natural conservatism of engineers and a perhaps misplaced reverence for habit and tradition, have done much to keep them in the old-fashioned groove.

Altered Conditions

The wide introduction of railways into mining regions and the extensive use of this means of transportation, together with certain other advances due to the progress of the times, have brought forcibly before metallurgical designers, and especially those who deal with smelting plants, several new and important considerations, and have given additional force to old ones. The most obvious effect of railway building upon smelting works in general has been their amazing increase in capacity, coincident upon their widened scope of usefulness, which now extends in some cases for thousands of miles. Several modern copper works, built or building, have a daily capacity of not less than a thousand tons of ore. The handling of this immense weight, implying as it does the handling also of a proportionate amount of fluxes and fuel, as well as of the liquid products of the process, necessitates the use of mechanical appliances of corresponding power and range, and the discarding of the old and outworn apparatus of the past era.

The wheelbarrow and push-car age of metallurgy has departed, never to return. I think we may justly say the same of the side-hill or terrace plan of smelter location; for with the application of the railway to the transport of materials within the works themselves, and the necessity of having extensive level areas over which the rolling stock may be safely and rapidly run, the sloping grounds which were formerly almost invariably chosen as the preferable sites for such plants are now seen to present obstacles to the proper construction and development of the works.

The railway about the great steel and iron works of the East is no novelty, having for a long time been the chief means of handling the vast weights there dealt with; but even there the lay-out of the trackage does not appear to have been reduced to perfection. It is in precisely this feature that the terrace plan of smelting works is inferior to the one-level plan. In the latter, when properly laid out, all parts of the establishments may be connected together, and all the needs of transportation amply provided for by the simplest and most economical means ever discovered.

Disadvantages of Gradients

It is practicable sometimes to join the different levels of the terraced works by the same means; but this implies gradients, or else the lifting bodily of the trains, or at least the cars, by means of elevators, usually hydraulic, and at an expense for installation which generally precludes the idea. We may, if the contour of the side hill permits, lay out our trackage so as to perform the elevating or lowering with the cars themselves; but no one who has ever had experience with grades about such works would fail to recognize them as a nuisance which it would be better to do without. At any rate, if we must have them they should be so laid out that the slope is away from and not toward the works, thus avoiding the imminent danger of runaway cars.

A side-hill plant, in order to get the amount of fall desirable, and to secure what are deemed to be the full benefits of gravity, must be laid out downward along the slope, or transversely to the contours. Railways, however, must follow in the direction of the contours or nearly so; thus the tracks must be transverse to the central line of the works, or approximately so. It follows, therefore, that the roads cut the works transversely; while, in order to subserve convenience to the utmost, they should be parallel to the central line or longest diameter of the plant.

From this it follows that more trackage must be laid in order to bring all desirable parts into communication. We have then not only a longer railway, but that railway has the additional disadvantage of consisting largely of gradients, which are in themselves objectionable.

Advantages of Gravity Overestimated

One of the worst features of side-hill plants lies in the fact that they cannot employ the best means of transport. When, in recognition of the force of gravity, the engineer locates his works on the side hill, he finds that certain unforeseen contingencies have to be provided against. It is customary to lay out the works with the charging bins at the highest level. The power required to bring the materials of smelting to this level, and the fact that the weights require to be lifted to it, irrespective of the plan chosen, is also ignored. If the reader will examine the plans of any given number of smelting works he will find that in every case it is necessary to elevate the materials, usually by railway gradients, and the favorable effects of gravity are, therefore, to a large extent, counterbalanced.

It appears, then, that the influence of gravity as applied to the movement of smelting materials is of less consequence than is generally supposed, and that those engineers who have advocated plans wherein this force is a predominant feature have uniformly overestimated the advantages to be derived therefrom. It is very curious that engineers who should know better have laid such stress upon this feature, and continued to advocate a form of construction wherein first cost and working economy are sacrificed to the fancied advantages of an abstract principle. There is absolutely nothing in the prevailing contention that gravity aids better in the side-hill plant than in the other, or that anything more is saved in the handling of smelting materials, when those materials have to be elevated in the first place.

Relation of the Different Levels

Although we may condemn the terrace plan as containing an unnecessary number of levels which are not easy of access from each other, and praise the one-level plan as the acme of simplicity, still a thorough understanding of the subject shows that the difference between them

*Mining and metallurgical engineer, Oakland, Cal.

lies not so much in the number of levels [illegible] other. If we regard a level as a horizontal space upon which work is done, then there are about as many different levels in the one plan as in the other. The practical difference between them lies in that in the one plan they are or may be superposed on each other, while in the other they are set off in successive steps—facts that have a very important bearing on the details and the utility of the establishment.

The conveyance of materials from one level to another, which may be effected by the simplest means when those levels lie one above the other becomes a very different and far more complicated affair when in addition to the vertical lift we have at the same time to transfer the materials sidewise, as we must do when we employ the terrace plan. In the one-level plan the work done on the upper levels should be confined to the feeding of the various furnaces, for which no great space is necessary, nor, with proper designing, should there be any need of heavy framing or extensive roofs. The effort should be, of course, to place the apparatus entirely upon the main or ground level, called usually the slag floor, where the best foundations are secured, where there is ample room, and where the constructions are much less costly.

Movement of Material in Smelting Works

The path of the ore through a smelting works is made up of a series of vertical and horizontal lines, after the manner of a stairway. Gravity takes care of the straight downward movements, but the horizontal transfers have to be effected by some application of mechanical force. In the simplest form of the terrace plan, the ore, having been brought to the upper level, is fed downward through hoppers, or else shoveled into barrows or cars, by which it is transferred to the tops or feed floors of the roasting furnaces. Having passed through these it is in condition to be fed into the smelting furnaces, which stand upon the next level below. Thence, after smelting, it proceeds in the form of metal, matte or slag, to the dumps near by, but horizontally distant from the furnaces.

Herein we note three horizontal movements and two vertical drops, and the problem before us is to simplify the three former so as to carry them on in the most economical manner. This infers the use of a single means of propulsion wherever possible or practicable. But the conditions forbid such simple applications of force in the terrace plan, for the same apparatus which draws the ore from the bins or beds on the top level can scarcely be brought into use for transferring the roasted material from the calcining furnaces on the second level to the feed doors of the smelting furnaces. To meet this emergency it is customary to provide hand propelled cars or barrows, or in better or larger establishments electrically propelled vehicles, by which the material is advanced on the horizontal plane.

In some works it is the custom to draw the ore from the bins into barrows, which run on the charging floor, and by which it is taken to the furnaces after being weighed. In others it is the practice to draw it into cars provided with scales, by which the charge is not only transferred, but also weighed during the passage. The only fault that we as engineers can find with the latter practice is that it involves the use of tracks and rolling stock on a different system from that with which the works in general are provided.

Chief Objections to the Terrace Plan

Stated briefly, the principal objection to the terrace system is that it is impossible to adopt any simple and thorough-going system of transport which will answer all purposes throughout the works. The ore may be brought to the furnaces by means of hand cars or barrows; the slag flowing from the smelting furnaces may be carried to the dump by hand pots, horse-drawn pots, or even by steam or electrically propelled vessels; but both operations cannot be carried on by the same means. In the one-level system it is different. The ore may be brought to the bins, from the bins the charges may be brought to the furnaces, and from the furnaces the slag, matte or metal may be transported to the dump or storage house by a single means, the railway.

In the common run of smelting plants the distances by which the furnaces are separated from the bins, and from the slag dumps are so small as in the opinion of the designer to render it not worth while to introduce any extensive, costly or ponderous means of transport. In a few works, of late design, a tendency is manifested to separate these parts of the plan, and to introduce a more adequate means of transport. Temporizing with the necessities, they have generally adopted a half-way method, which while marking something of an advance on ordinary practice, is not accepting in full the lesson taught by the iron-smelting engineers.

There is an inexplicable reluctance among copper and lead smelters to take the bull by the horns and build as the experience of others has shown is best. The present era may be called the transition stage of smelter building, where electric trolleys and undersized ore cars with four wheels are made to perform the work which could be done better and more cheaply by the full-sized broad-gage steam locomotive with its regular equipment of cars, running on rails of standard section. I do not by any means condemn the light apparatus named, for I recognize its advantages when taken in comparison with the older contrivances once in use. The electric trolley is of course an improvement on the horse, as the horse is an improvement on man power; but the steam locomotive is quite as great an advance on all.

Disadvantage of Trestle Work

The observer will notice in all this a growing tendency to substitute heavier and better apparatus for this part of the smelting work, but he will observe also certain accompanying disadvantages in its use, especially when a certain new fashion is followed. This is where the tracks proceeding from the charging bins to the furnaces are made to pass over long and lofty trestles, to bring the loads quite to the feeding doors, thus necessitating very heavy and expensive constructions, not only of the trestles, but also of the furnace building itself. Such a disposition of parts is most objectionable, because, first, being of wood, the trestles are neither durable nor fire-proof; and, second, because the tracks necessarily cover valuable space about the furnaces which ought to be left free for other apparatus and other operations.

The Smelting Works of the Future

The tendency of modern design shows clearly enough, in spite of present aberrations, what the smelting works of the future will be. The future plant will stand upon a large level space, where the room is ample for all the buildings, tracks, curves, switches, and the extensive paraphernalia of such an establishment. The rails will radiate from a common center, which may be called the focus of the works, and will reach all sources of traffic, the principal points being the furnaces, the sampling mill, the weigh scales, the slag and ore dumps, the storage and feeding bins, and the store-houses.

In order to make the best use of the facilities of transport, the structures will be located with their longer dimension parallel with the tracks, and not the shorter dimension, as in many, if not most, of the present plants. In small plants, which, by the way, are growing less common, there may be two connected tracks through the works, but ample provision must be made for cars to pass each other, so as not to block the way.

The tracks will be laid on a single level, to avoid gradients, and especially to avoid the necessity of employing a locomotive every time a car has to be shifted a few feet. Curves, which cannot be wholly avoided, must be of the greatest permissible radius, never less than 200 ft. The gage, it is hardly necessary to add, must always be that of the connecting lines, and as a matter of the greatest convenience should never be less than standard. Nothing is saved, but much is lost, by installing narrow-gage tracks under the impression of economy, for reasons with which railroad men and some metallurgical designers are familiar. Finally, these tracks, on which so much depends, should be laid out first of all, and before anything else has been so placed as to interfere with their proper location.

The use of the broad-gage railway as

the sole means of transport tend remarkably toward the simplification of the design, construction and operation of the smelting works. Not only are the different units, the engines and cars, of great individual capacity, power and durability, but they are correspondingly few in number. One substantially built switching locomotive, with a train of two 50-ton steel ore cars and an equal number of Weimer cinder pots, is sufficient to do the carrying for a very large plant, and more economically than it can be done by any other means. The simplification of the transporting apparatus involves or permits a corresponding improvement in several other features, obvious to designers and engineers.

Improved Methods of Charging

Once the reader has grasped the idea of performing all the work of making up the charges and transferring them upon cars to the neighborhood of the furnaces, it will be natural for him to inquire, how are the materials to be raised to the top and charged into the furnaces? The iron-furnace men are our teachers again in this regard. They employ almost invariably a sloping runway upon which travels a skip containing the charge, which upon its arrival at the top, often a hundred feet above ground, is dumped into the hopper and in due time dropped into the furnace, entirely without the intervention of human effort, other than that required to pull levers and touch buttons.

We may imitate them profitably in much of this, but I for one do not follow them in advocating the installation of the skip-way, for the conditions in copper and lead smelting occasionally demand that the charges, or a part of them, at times be dropped on the feed floor which is impossible with the skip as ordinarily constructed. It appears to me that a preferable method would be to substitute for the skipway a revolving mechanical crane of suitable radius, which should stand out in front of the furnaces and hoist the charges in a bucket, with provision for dropping them either into the furnace or upon the floor alongside. This method would have considerable advantages over the skipway, first because it leaves the feed floor entirely free from posts, tracks, etc., and, again, because it may be arranged so as to command two furnaces or more if advisable, which the skipway cannot do. Further, it may revolve over one, two, or perhaps three different tracks laid on the ground below, so as to command a considerable number of the cars on which the charge buckets are brought.

Furnace

With this means of transport it scarcely matters where the ore beds or bins are placed, and it happens occasionally that the smelting works may be so located with respect to the mine that the ore for the charges may be taken directly from the mine dumps to the furnaces without interruption. Such a favorable conjuncture seldom occurs, but I have had the opportunity of designing and building a plant where this plan was feasible. In this case I provided alternative methods, so that when desirable the ore may be passed through bins, but at other times it is dug up from the dump by a locomotive crane working a dredge bucket, which fills the regular charging buckets.

In these designs I have drawn somewhat upon the practice of our skilful brothers, the ironworks engineers, to whom we owe so much and to whom I wish to acknowledge my indebtedness.

Slag to Replace Mine Timbers

I believe, however, that I have in this instance gone somewhat beyond them, in proposing to "timber" the mine with the slag from the works. I propose to cast it in prismatic blocks, and to fill the vacant spaces solidly with this durable, incombustible and cheap material. The lay of the land and the distance from the works are such as to make this proceeding feasible. I will not say that this method of utilizing waste slag is entirely novel, since it appears that in a European coal mine it is the custom, it is said, to shoot the granulated slag from the neighboring furnaces into the worked-out spaces. I believe, however, I can lay claim to the idea of casting the slag in solid blocks, which anyone will recognize as more suitable for such use than granulated material.

Unquestionably, there should be methods of treating furnace slag to fit it for useful purposes. The subject has always seemed to me likely to become fertile in practical results. Thus far, however, it has been studied, so far as I am aware, by only one engineer, Mr. Elbers, who has made himself the authority on the subject of slags, by his articles in this journal. Considerations of this sort will always have their bearing upon the broad subject of this paper.

Soft Iron Ore in Tennessee

By Edward K. Judd

For a continuous distance of three miles along a range of low hills near Sweetwater, Tenn., a body of soft iron ore has been traced, and has been extensively opened at two points. The origin of this ore has been much of a puzzle to the geologists who have studied it. It is probably associated in time of origin with the fossil ores of the Clinton horizon which are so extensive in this district of the South, but its physical condition is altogether different from that noticed at other localities where the Clinton ore is mined.

The ore is found in a body of indefinite dimensions, in which traces of stratification are slightly perceptible, and suggest [illegible] bedded deposit. The ore has a fine granular texture like moist sand, although streaks and bands of clayey and loamy ore occur. Small nodules of manganese oxide are also found. The surface of the area is strewn with fragments of a fossil limestone, rich in iron, but not sufficiently rich to be valuable.

The body varies from place to place in color, being at some points a brilliant red, which material would be suitable for paint, in others a bluish shade, and at others nearly black. It is a difficult matter to judge of the smelting value of the ore from its color, or from its consistency, whether sandy or clayey.

A determined effort to exploit this ore has been made toward the northern end of the range, not more than 1000 ft. from the railroad, the Bristol & Chattanooga division of the Southern Railway. A siding has been put in here, but up to the present the ore is transported from the mines to the cars by wagons only. The deposit is opened in a simple manner by driving a narrow cut and exposing a face of ore which is then brought down by pick and shovel. The ore is regularly shipped to iron works, notably the Virginia Iron, Coal and Coke Company, the Chattanooga Iron and Coal Company and the La Follette Coal, Iron and Railway Company, who appear to be satisfied with the nature of the ore. Its only drawback is its fine granular texture, but this difficulty will probably be overcome in the same manner as the soft ores of Lake Superior ranges are utilized. Some of the ore approaches bessemer grade, as to phosphorus, while its manganese content is highly prized.

Some analyses of carload shipments of the ore to iron works are given in the following table:

	I.	II	III.	IV	V.	VI.
Fe....	43.20	47.84	48.18	49.30	57.00	59.20
P.....	0.11	0.51	0.42	0.20	0.15	0.22
Mn	1.37	2.78	1.64			
SiO_2	21.00	16.22	18.41	5.70	7.50	5.30
Al_2O_3		11.41	9.30			
H_2O	25			15.00		

I reported by the Virginia Iron, Coal and Coke Co. II and III by the Chattanooga Iron and Coal Co., IV, V and VI by the La Follette Coal, Iron and Railway Co.

These ores ought to have a considerable demand since they are situated within easy railway distance (70 miles) of Chattanooga, which is rapidly becoming an important center for the production of pig iron. Proximity to a main line of railroad is another point in their favor. Owing to the intercalation of poor and rich streaks in the ore, it is doubtful if large-scale operations with the steam shovel will be applicable, but the size of the deposit is such as to warrant working on a considerable scale. It is the property of William D. Gilman, of Sweetwater Tennessee.

The Nordberg Piston Blowing Engine

The Design Provides Unusually Large Valve Seats and Avoids the Drag Due to the Friction of Large Air-cylinder Parts

BY FREDERICK A. HALSEY*

In air-compressor and blowing-engine work the valve problem grows rapidly with decrease of pressure, areas of opening which are ample for high pressures being entirely inadmissible with low. This, to many, unknown fact arises from the circumstance that the lost work due to forcing air through the valves becomes a larger and larger percentage of the useful work as the pressure is reduced, a loss becoming entirely inadmissible when considered as a percentage of the work involved in compressing to a low pressure.

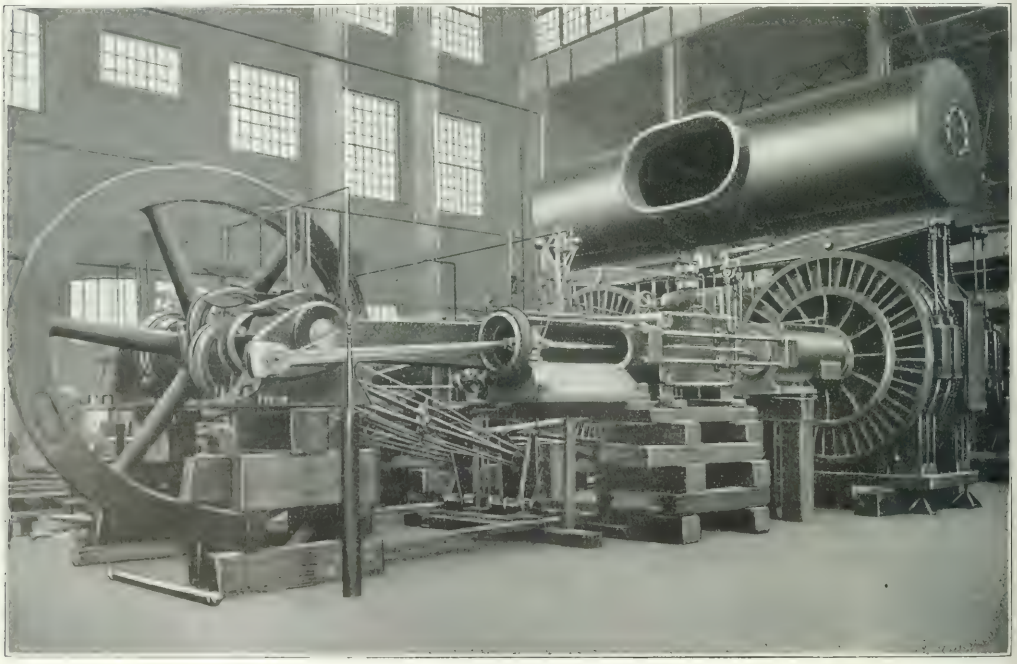


FIG. 1. NORDBERG BLOWING ENGINE.

Losses in High- and Low-pressure Machines Compared

When compressing air to, say, 80 pounds, the theoretical mean effective pressure is about 35 pounds. A suction loss of, say, ½ pound would represent a $\frac{0.5}{35}$ = 1.43 per cent., which would not be a serious matter. When compressing, however, to five pounds the theoretical mean effective pressure would be about 4.5 pounds, and the same suction loss would represent a power loss of $\frac{0.5}{4.5}$ = 11.1 per cent., which has a very different look. Obviously the lower pressure requires the larger port opening. The same consideration applies to the loss due to forcing the air through the discharge valves, but to a still greater degree. The loss here, when compressing to high pressures and measured by the pounds by which the pressure within the cylinder exceeds that within the receiver, is much greater than the suction loss; but the length of the surplus area on the indicator card is but a small portion of the length of the card, and hence the area representing lost work is again but an insignificant percentage of the area of the entire card. As the pressure is reduced, not only does the surplus pressure become a larger percentage of the mean effective, but the length of the lost-work area occupies a larger part of the length of the card, and hence the percentage of lost work increases in a compound manner.

Different Constructions Necessary for High and Low Pressures

In the style of compressor having poppet valves in the cylinder heads, it has always been the practice to utilize the entire available space for valves, but to give the larger part of it to the inlet valves and, for high pressures, this practice is sound. The first necessity is to get the air into the cylinder, and the effect of the short length of the discharge line is to make admissible an excess of pressure at this point which, considered from the lost-work standpoint only, could not be tolerated if it appeared as a suction loss.

With reduced pressures, however, the lengthening of the discharge line makes additional discharge-valve area imperative; but with the construction now under consideration this is possible only by reducing the inlet-valve area, although, as shown above, an increase is called for by the conditions.

*[illegible] American Machinist, Feb. [illegible]
†[illegible] of the American Machinist, 505 [illegible] New York.

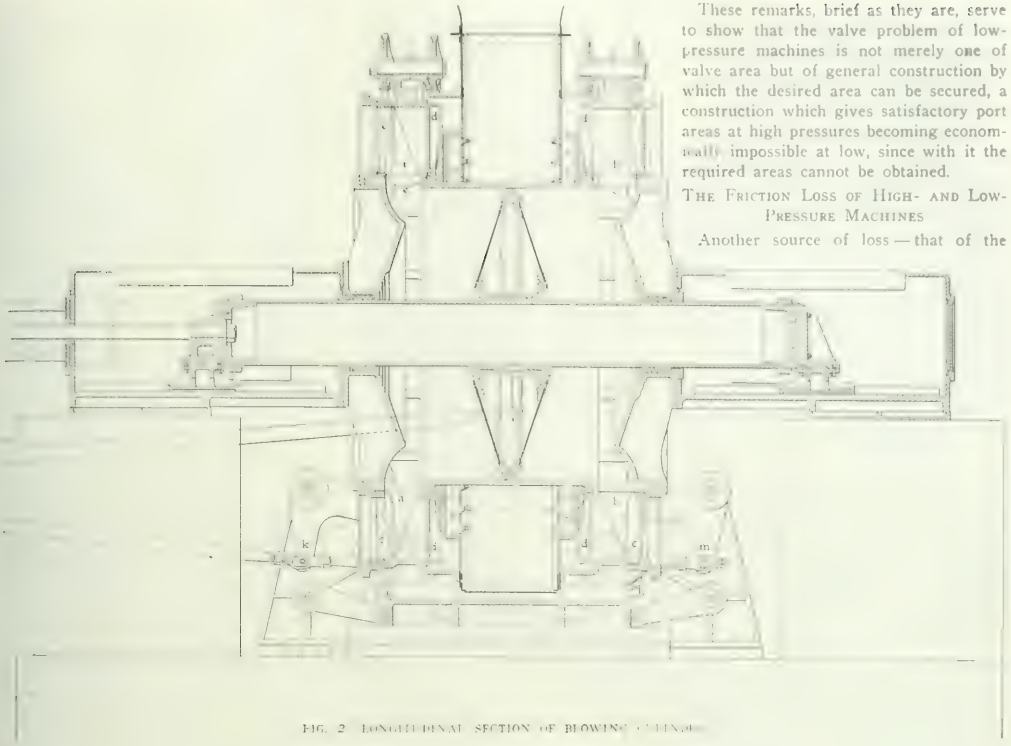


FIG. 2. LONGITUDINAL SECTION OF BLOWING CYLINDER.

These remarks, brief as they are, serve to show that the valve problem of low-pressure machines is not merely one of valve area but of general construction by which the desired area can be secured, a construction which gives satisfactory port areas at high pressures becoming economically impossible at low, since with it the required areas cannot be obtained.

The Friction Loss of High- and Low-Pressure Machines

Another source of loss — that of the friction involved in driving the machine itself—becomes of increasing importance as the pressure is reduced. Comparing a blowing engine with an air compressor of the same horse-power, we have in the former a large air cylinder attached to a small engine. The air pistons and valves cannot be lightened with the reduced pressure; but, on the contrary, they naturally grow heavier as the cylinder bore is increased. The result is a combination of large, heavy parts doing very light duty and a much larger friction loss than in the case of a compressor of the same horse-power.

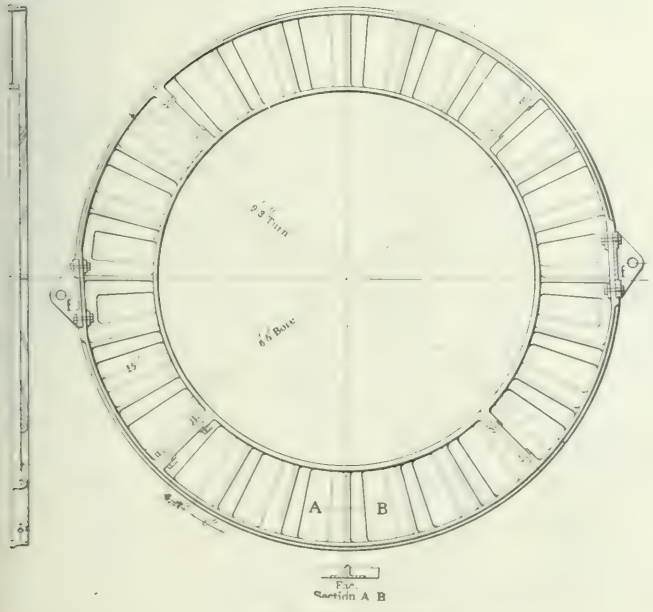


FIG. 3. INLET VALVE

A New Construction

We illustrate herewith a highly novel and interesting—and, we may add, entirely successful—blowing engine, which was recently supplied to the Tennessee Copper Company by the Nordberg Manufacturing Company, of Milwaukee, Wis. Its design is intended, first, to provide unusually large valve areas, and, second, to avoid the drag due to the friction of large and heavy air-cylinder parts. The machine was designed for an ultimate air pressure of 40 oz. per sq.in., the running pressure at present being, however, but 34 oz. The engine is compounded with Corliss cylinders of 15 and 33 in. bore, the air cylinders having a bore of 70 in. The stroke is 42 in. The blow-

this figure belonging to both inlet and discharge valves, and being, we believe, unapproached in any previous machine of this character.

The Ports and Valves

General views of the machine as it stood on the erecting floor are given in Fig. 1, while Fig. 2 shows a longitudinal section of the air cylinder. Referring to Fig. 4, it will be seen that annular ports *a a b b* are built up around each end of the cylinder. These ports involve, of course, considerable clearance space; but, at the pressure for which the machine was designed, the effect of clearance is inappreciable. Clearance loss decreases with the pressure, and at the pressure here used the action more nearly approaches that of a pump, where it disappears entirely, than that of a compressor, as that term is commonly understood.

The opposing sides of these ports are formed into ring gridirons, on which the corresponding ring gridiron valves *c c d d* work, *c c* being the suction and *d d* the discharge valves. Fig. 3 is a detail of one of the inlet valves, with some of the leading dimensions, and Fig. 4 shows a portion of a valve seat.

The valves are in four segments in order to permit placing them in position. In action they oscillate over the port seats, opening and closing them as required. While of light section, they are, of course, in the aggregate heavy, and as they have a wide and free motion, they would, if supported on trunnion bearings of their inside diameter, give a very appreciable

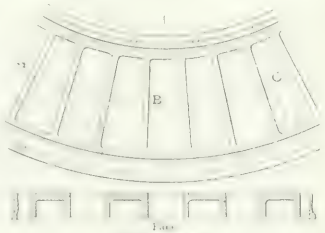


FIG. 4. INLET VALVE SEAT

friction load to the engine as well as be subject to wear. To avoid this, they are bored to a diameter considerably in excess of the outside of the cylinder, clearing it freely, as shown at *e*, Fig. 2. Ears *f*, Fig. 3, are bolted at the ends of the horizontal diameters, and from these ears the valves are hung by swiveled suspension rods, which pass up through stuffing boxes and are attached at their upper ends to walking beams, as shown in the half-tones, and more clearly in the end view, Fig. 5. These beams are supported on trunnions at their centers, the friction of which is all to which the weight of the valves gives rise. The beams are extended inward and are driven by rods *g*, which, at their lower ends, are connected to Corliss wrist-plate mechanisms, by which the valves are positively driven. The suspension rods by which the valves are hung are shown at *h*.

The Wrist-plate Mechanism

Fig. 6 shows the support of the wrist-plate mechanism and the mechanism by its center lines. The inlet and discharge valves are driven by separate eccentrics, *i* being the inlet and *j* the discharge-valve eccentric rods. Rod *i* connects at *k* with the inlet, and rod *j* at *l* with the discharge gear. A rod *km* connects the plates for the inlet gears for the two ends, as shown also in Fig. 2, while a common plate at the center serves for both discharge gears. Each wrist-plate motion is double, two such plates intervening between each eccentric rod and the valve rod, both plates passing their idle arcs at the same time. The second plates are centered at *n* and *o*. The effect is to greatly increase the characteristic dwell of the device, extending the range of the idle arc and making it more nearly completely idle than with a single plate. The idle arc is, of course, made use of in order to reduce the movement of the valve after closure, by which two results are secured—first, reduced friction and wear when the valve is closed with the load upon it; and second, a larger aggregate port area than would otherwise be possible. The last result is not obvious at the start, but will appear presently from the description. As a matter of fact, the 40 per cent. port area which these valves give would be impossible without this double wrist-plate mechanism.

The Action of the Mechanism

Fig. 7 shows the action of the mechanism by comparing the movements of the inlet valve with the movements which would take place if the eccentric rod were connected directly to the valve. The full lines show the valve on its seat, and in a succession of positions, such as would be

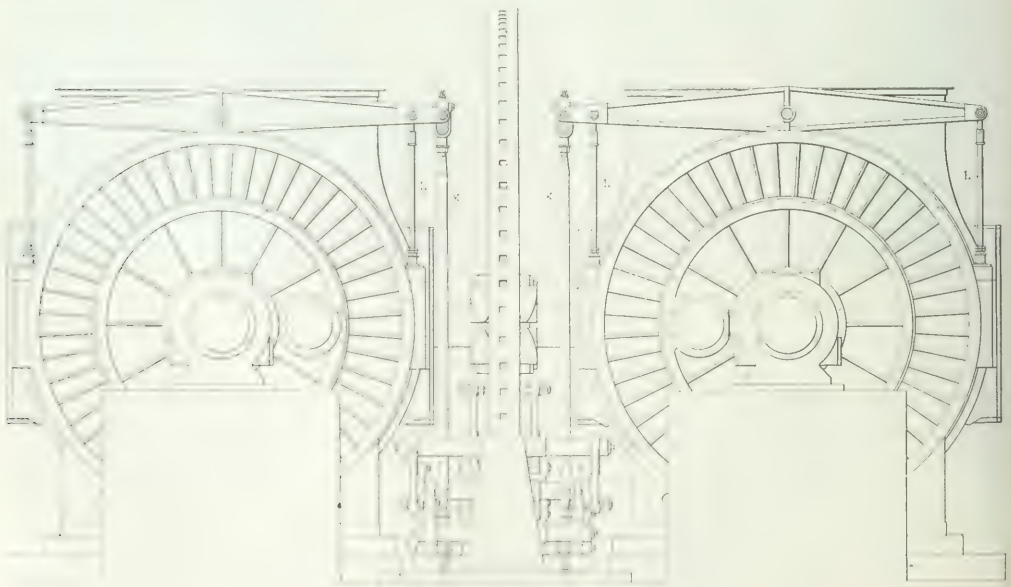


FIG. 5. END VIEW OF BLOWING CYLINDER

given it by a direct connection to the eccentric, while the dotted lines show the corresponding positions actually given it by the plates. Beginning at the top, the valve is fully open in both cases from which point the action is not markedly different until closure at *p*, when a marked change takes place. With the direct connection the valve continues to move until at *q* it covers the port by a width equal to its previous opening, this being characteristic of slide valves having no lap;* but with the actual mechanism the dwell of the wrist plates comes into play as soon as the ports are closed, the result being that the valve covers the port but a small amount, the extreme cover being at *r*, from which it gradually decreases. Were the opening movement to be plotted, it would simply retrace the positions shown in reverse order.

FIG. 7. THE ACTION OF THE WRIST PLATE MECHANISM ON THE VALVE

Increased Port Area

The width of the valve in order to prevent reopening by the rear edge must obviously be determined from the position of extreme cover and, with the direct motion, its value is obviously *q s*. Laying down this width on the top section, we have the point *t* where the edge of the next port must be located in order to prevent that port being covered by the back edge of the valve in its open position. With the actual motion the width of the valve is reduced to *r u* and, laying down this width on the top section, we have the point *v* for the position of the edge of the next port. Comparing the two constructions, we have the distance *w* for the space occupied by a port and seat with the valve directly driven, and *x* for the corresponding space when the wrist plates are used, the width of the port being the same in both cases. The total circumference of the valve divided by *w* and *x* obviously gives the number of ports which can be got into the circumference by the two arrangements. The total port area being proportional to the number of ports, the ratio of the reciprocals of *w* to *x* obviously gives the increased port area which is made possible by the wrist-plate mechanism.

*As a matter of fact the valves have a slight lap, but this has been ignored in making the diagrams.

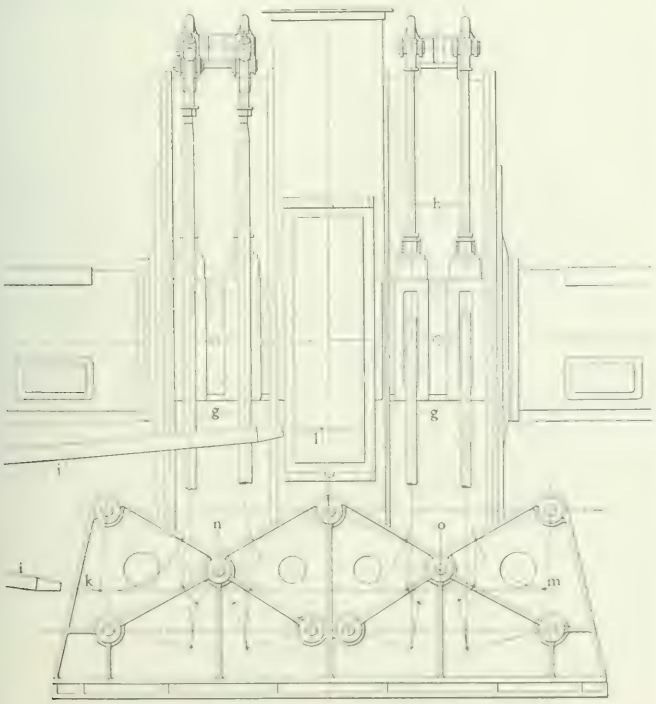


FIG. 6. WRIST-PLATE MECHANISM AND SUPPORT

The Construction of the Air Pistons

The light duty added to the large diameter of the air pistons has led to the special construction, shown in Fig. 8. The pistons are made of ⅜-in. boiler plate, each side in one piece and dished to the form shown. Lateral stiffness is provided by riveting the plates at the outer diameter to a ring spider in halves, the piston-ring groove being between the halves. The piston is turned 2⅜ in. smaller than the bore of the cylinder and the ring does not bottom in its groove. The piston is thus a floating piston, and its weight cannot be carried by the cylinder, but is carried by the piston rod. This rod, as befits its duty, and as shown in Fig. 3, is extremely light. It is made of steel pipe and its diameter provides ample stiffness. Each end carries a shoe for supporting the weight of the piston, the shoes and their guides being shown in Fig. 2.

Indicator Diagrams

Fig. 9 shows a pair of indicator cards (reduced in size) from the blowing cylinder, the speed and pressure being noted thereon. The discharge lines will be seen to contain the usual undulations, but in estimating their size the scale of the spring must be kept in mind. In the original cards the scale is two lb. per in. and, scaling them, the extreme rise above the receiver pressure line scarcely exceeds ½ lb. Such a rise on a card taken with the usual spring would hardly be noticeable, and the card would be passed as, in this respect, perfect.

As a matter of fact the undulations in these cards are not due to the valve action, but to the inertia of the air surging through the receiver and pipe line. There is plenty of other evidence that this inertia is very appreciable, both in air and steam. Indicator cards from the steam chests of cut-off engines often show a rise in pressure above the boiler pressure immediately after the closing of the valve, the rise being due to the inertia of the steam developed by its surging forward after stoppage of its flow to the cylinder. The present cards also give evidence of the inertia action in the dropping of the dis-

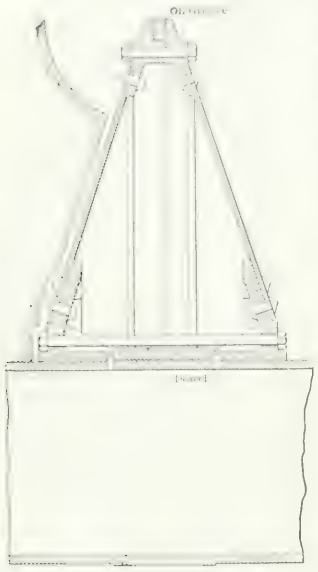


FIG. 8. AIR-PISTON CONSTRUCTION

CYLINDER

charge lines below the receiver pressure line. Were the rise in pressure above the receiver pressure line due to the forcing of the air through the ports, the pressure would necessarily lie entirely above the receiver pressure line.

It will be observed that the removal of the two rows of bolts which hold the two sides of the piston together permits the sliding back of one of them on the piston rod, thus giving access to the packing ring.

The suction line will be seen to be remarkable. Remembering the scale of the spring, a single ounce of suction loss would show in the original cards by a drop of 1.32 of an inch in the suction line below the atmospheric line. In point of fact no drop is visible.

Mount Morgan Gold Mining Company

The Mount Morgan Gold Mining Company owns, in Queensland, one of the most valuable properties in Australia. Originally a gold mine only, it is becoming a large copper producer, as the depth of the workings increases. The report for the half-year ending Nov. 30, 1906, shows income as follows:

Gold, copper, etc., produced	£ 146,815
Miscellaneous	1,324
Total earnings	£ 148,138
Working expenses at mine	£ 253,581
Freight, taxes, royalties, etc.	21,102
Total expenses	£ 274,683
Net earnings	£ 173,455
Balance from previous half year	4,922
Total	£ 178,377

Appropriations were £24,699 for depreciation, and £75,000 for dividends; leaving a balance of £78,678 forward.

The mine report shows the quantity of material handled and delivered to works as follows, in tons:

	Open Cut.	Undergr'd.	Total.
Oxidized ore	60,445	.....	60,445
Sulphide ore	5,060	54,151	59,211
Converter linings	1,708	.....	1,708
Copper-gold ore	.....	33,022	33,022
Pyritic flux	.....	13,916	13,916
Pyrite for acid	.....	519	519
Waste & overbur'n	134,571	7,214	141,785
Total	201,784	108,822	310,606

The deliveries of gold ore to the old works were: West works, 60,445 tons oxidized ore; Mundic works, 59,211 tons sulphide ore; Lower works, 10,183 tons tailings; total, 129,839 tons. The fine gold recovered was: Oxidized ore, 19,440 oz., or 0.32 oz. per ton; sulphide ore, 31,199 oz., or 0.52 oz. per ton; tailings, 1240 oz., or 0.12 oz. per ton. The total was 51,879 oz., giving an average of 0.40 oz. per ton for all gold ore treated.

The smelting works treated 62,539 tons of material, including 46,665 tons ore, 14,889 tons pyritic flux, and 985 tons old matte, etc. They were used in smelting 21,957 tons of limestone and 959 tons of ore as flux, with 6668 tons coke. The matte made was treated in the converters, yielding 1767 tons of blister copper, containing 1751 tons of fine copper and 20,838 oz. gold. The blister copper is sent to the DeLamar works, in New Jersey, to be refined. On the basis of ore treated, this shows 0.44 oz. gold per ton and 3.75 per cent. copper.

The total yield for the half-year, from all ore treated, was 72,717 oz. gold and 1751 tons fine copper.

The directors' report says: "Temporary advance, which at the date of last report stood at £75,000, has been repaid, leaving the company entirely free from debt. The payment of dividends quarterly in place of monthly has been sanctioned by the board, the first of such quarterly dividends being at the rate of 9d. per share, paid Jan. 2. Owing to additional works authorized and contemplated, and to the necessity of creating a reserve fund, the board is unable to increase the rate of dividend now being paid.

"The ore treated at the Mundic works has maintained the value obtained last half-year, but the oxidized ore treated at the West works shows a falling-off in value of 5s. 9d. per ton. This was expected. The copper reduction works have produced 1751 tons of copper, containing 20,838 oz. gold, which have been shipped to America under advance in terms of contract entered into with the DeLamar Copper Refining Company. The board has authorized the erection of an additional blast furnace, extensions to the converter plant and power house and other expenditure, estimated to cost approximately £125,000. The board is now considering the advisability of erecting an electrolytic copper refinery.

"With a view to insuring an abundant supply of suitable ironstone flux, several leases have been acquired, and are being opened up. An option has also been secured over a property known as the Many Peaks copper mine, which contains an extensive lode of pyritic ore. Owing to the increased consumption of water, provision is being made for the additional storage of about 56,000,000 gal. by raising the wall of No. 7 dam. When the work is finished the total capacity of all dams will be 376,000,000 gallons."

Future of the British Cement Industry

Bertram Blount predicts that both the distribution of the industry and demand for cement will increase, and that eventually it must become the standard building agent. He adds that it is more than likely there will be great development of the use of armored concrete, especially in massive, permanent and fire-proof structures, and says that the commercial preparation of portland cement by fusing the raw materials together is the task now before the manufacturer. In conclusion Mr. Blount says there is no cause for discontent over the progress made. The very appearance of a modern works, with machinery, kilns, etc., almost like engines, and engines kept like a gun, is sufficient contrast with the wonderful old collections of tumble-down sheds full of discarded millstones and toothless harrows, and with nearly as much cement on the floor and in the air as in the warehouse.

The Brazilian Government is about to levy a heavy export tax upon monazite sand, says the *London Engineer*, which is bound to have a very serious effect upon the use of thorium in the manufacture of incandescent gas mantles.

The Oriental Consolidated Mining Company, Korea

The report of this New York company which is operating gold mines in the Wunsan district, in Korea, deals with the operations in the year ended June 30, 1906. Although the Russo-Japanese war ended in October, 1905, a large amount of trouble was experienced at the mines through scarcity of competent labor and lack of transportation facilities. This resulted in a reduction in tonnage crushed in the mills of 21,230 tons as compared with the returns for the previous fiscal year. The total amount of ore mined in the company's properties was 233,157 tons valued at $1,177,487, or an average of $5 per ton. In addition to the above the mines operated on tribute, or lease agreements, produced 3260 tons of ore valued at $20,150. The average mining cost, including all underground development work done during the year, was $1.14 per ton. The operating profit was $367,882, and of this amount a sum of $140,637 was expended in new construction, leaving a net balance of $227,245. Six of the company's mines were operated during the year, and their returns were as follows: Chittabalbie produced 8946 tons of ore valued at $26,753; Tabowie produced 43,473 tons valued at $213,367; Taracol produced 91,936 tons valued at $497,954; Kuk San Dong North produced 28,146 tons valued at $142,964. Kuk San Dong South produced 23,065 tons valued at $93,660; and the Charabowie produced 37,591 tons valued at $202,788. Milling costs varied from 0.45c. per ton in the Kuk San Dong ore, to 0.80c. for the Chittabalbie. The combined operations of the Tabowie and Taracol cyanide plants resulted in the treatment of 31,611 tons valued at $395,271. The bullion return was valued at $255,518, and the percentage extraction 64.6. In order to improve the extraction a small plant was built at the Taracol mill consisting of a tube mill 24 in. in diameter by 12 ft. in length, fitted with two agitators, gold tanks, zinc boxes and sump tanks. The results of experimental runs of 6-ton lots, lasting 30 hr., aproximated a theoretical extraction of 93 per cent. The average extraction at the Kuk San Dong mill was 80 per cent., and a net profit of $7795 was obtained by retreating 12,529 tons taken from the old Taracol cyanide dump. The results of the experiments carried out in the various cyanide plants during the year clearly demonstrate that it is essential to re-grind all the material going to the vats in order to raise the percentage of cyanide extraction.

Development in the various mines was vigorously carried out during the year. It was estimated in 1905 that the Chittabalbie mine, which, with the Charabowie, is situated on a distinct line of reef from the other mines, and lies toward the southern portions of the concession, had an ore reserve of 7600 tons, valued at $22,375, and during the period under review an additional tonnage of 1346 tons was opened up. All this was mined, and it is intended to continue to develop the reef by sinking the main shaft deeper. The ore reserves in the Tabowie mine are estimated at 405,130 tons, valued at $2,739,327. The prospects in this mine are so favorable that it has been arranged to enlarge considerably the Tabowie mill. In the Taracol mine the reserves amount to 308,758 tons, valued at $1,765,452. The vein is 16 ft. wide, and averages $10 per ton in value about 700 ft. out from the shaft on No. 2 level west. Above the No. 3 level west the ore averages $4 per ton. The main shaft has been sunk to a depth of 629 ft., and No. 5 level having been run out, it is proposed to continue sinking another 100 ft. during the present year, and developing Nos. 6 and 7 levels.

The development work in the Kuk San Dong North mine was most satisfactory and resulted in opening up by rises and cross cuts above and to the east of No. 7 tunnel over 37,000 tons of ore of an average value of $5 per ton. The ore reserves in the Chintui mine amount to 20,000 tons valued at $100,000.

During the year the company's placer ground was prospected with a Keystone traction drill. Frozen ground stopped the work in December, after 17 holes had been drilled; but work was resumed in April, 1906, and up to the end of June over 50 holes were put down. The average value of the ground thus prospected was found to be 6c. (U. S. gold) per cu.yd. About 40 of the holes were sunk near the electric power house, 5 miles south of the Tabowie camp. It does not appear that any of that ground is rich enough to yield a working profit. Beginning at the power house and extending down the valley in a southeasterly direction a distance of 4000 ft., there is a narrow channel, the width of which has not yet been determined, averaging 12c. per cu.yd. in value. At a point 5 miles lower down the river there is another channel a mile in length, which was found to average between 10 and 12c. per cu.yd. The depth of the deposit runs from 9 to 23 ft., with an average depth of 16 ft. The gold is mostly found close to the bed-rock. The bed-rock is fairly soft, and the gravel is fine and free from clay, and it is possible that it would be suitable for dredging. The gravel deposits in the concession similar to the above, but which have not been prospected yet, consist of some 40 or 50 miles of river valleys varying in width from a few hundred feet to a mile. Although the early prospects are not very encouraging, the superintendent proposes to continue prospecting the gravel deposits with the drill during the present year.

The Chorrie dam, which supplies the mines and mills with water and water power, was repaired, and the dam now holds over 120,000,000 cu.ft. of water. The Taracol and Tabowie camps are furnished with electrical equipments, the power for which is furnished by hydraulic turbines.

General Manager H. F. Meserve reports that local conditions due to the Russo-Japanese war, which disturbed the supplies of labor, cordwood and mining timber, and made transportation difficult, are slowly improving, and it is expected that he will be able to keep the Taracol, Tabowie and Kuk San Dong mills running steadily throughout the present year. He estimates the ore reserves at present developed in the company's properties at over 1,000,000 tons, or $5,300,000 in value.

Determination of Tin and Tungsten

E. Donath (*Zeit. f. angew. Chem.*, 1906, XIX, 473-474) gives the following method for the analytical separation of tungsten and tin: The mixed tungstic and stannic oxides are heated in a covered porcelain crucible with zinc dust or zinc filings, for a quarter of an hour, and after cooling, the mass is heated with 1:2 hydrochloric acid till no more hydrogen is evolved, and all the metallic tin is, therefore, dissolved. To the cooled liquid, potassium chlorate is cautiously added till the blue color has entirely disappeared, and the tungsten is entirely in the form of dioxide. The liquid is now diluted with at least 1.5 times its volume of water, and allowed to stand for 24 hours, when the whole of the tungstic oxide is deposited. It is filtered off, washed first with water containing nitric acid, and finally with a hot dilute solution of ammonium nitrate, dried, ignited, and weighed. In the filtrate the tin is precipitated as sulphide.

Japanese Mineral Output

The *Chugai Shogyo Shimpo*, a Japanese paper, states that the mining output generally showed more or less increase in 1906. The production of coal amounted to about 13,000,000 tons, an increase of 1,500,000 tons; the output of petroleum to 1,510,000 koku (koku = 40 gal.), an increase of about 200,000 koku; the gold produced up to the end of November was 720 kwamme, equal to about 5976 lb.; silver, 19,000 kwamme, or about 157,700 lb., both showing a slight decrease. The output of iron ore was 17,000,000 kwamme, or 70,550 tons, an increase of about 6,000,000 kwamme, and of sulphur 50,000,000 kin (kin = 1⅓ lb.), also showing some increase. The exports of refined copper from Japan during 1906 up to November were valued at $10,729,000, as against exports of $8,000,000 and $6,380,000 during the same periods of 1905 and 1904.

The Bauxite Industry of the South

Orebodies are Easily Found, Quickly Developed and often Speedily Exhausted. Number of Producing Mines Varies with Market

BY EDWARD K. JUDD*

The Georgia-Alabama bauxite district, extending along the Coosa valley from Adairsville, Ga., to Jacksonville, Ala., while second to the Arkansas district in point of output, yet yields an ore so pure that it has altogether outdistanced the other producing territory in its supply of aluminous material suited to the chemical trade. Arkansas, on the other hand, has been the mainstay of the aluminum reduction plants, but, just at present, the Southern area too is being called upon to furnish aluminum ore.

Unlike the Arkansas bauxites, which were plainly derived by the decomposition, in place, of highly aluminous igneous rocks, the Southern bauxites offer no unmistakable clue as to their origin. The orebodies are found in the shape of irregular funnels, tapering from a diameter of 200 to 500 ft. at surface to less than 100 ft. at a depth of, say, 75 ft., which is as far as any mine has yet been operated. The inclosing walls of these bodies consist entirely of boulders and gravel, while an exceedingly fine and unctuous clay, beautifully colored in red and blue, accompanies the bauxite, forming streaks throughout its mass, and often extending into the surrounding gravel. The ore itself is markedly pisolitic, the spherules varying from a minute size to that of marbles. Occasionally the globular concretions themselves constitute almost the entire substance of the ore, but more often they are imbedded in a much larger proportion of fine and granular matter

Distribution of the Industry

At the present moment active bauxite mining in this district is confined to three centers—in the vicinity of Hermitage, Ga., Cave Spring, Ga., and Rock Run, Ala.

Around Hermitage only four mines are now active. The Julia, five miles east, and the Ward mine, two miles south of Hermitage, are worked by the Republic Mining and Milling Company, of Philadelphia. The Pittsburgh Reduction Company is taking ore from the South Watters, one of a group of several mines three miles south of Hermitage, which it recently acquired from the General Bauxite Company; and J. H. Hawkins, of Rome, Ga., maintains a steady production from his mine, two miles south of the Julia. The Republic company operates a drier at the Julia mine and another at Hermitage, hauling crude ore to the latter from the Ward and one or two other mines whose stocks of mined ore are not yet depleted. Mr. Hawkins also has a drier at his mine.

At Cave Spring, Ga., the National Bauxite Company, which has lately been organized by the leading interests in the former General Bauxite Company, is operating the Hampton mine and ships its ore for drying to its excellent plant at Rome This same company is also developing mines at East Lake and Sherman Heights, near Chattanooga. Both the Pittsburgh and the Republic companies own other ore-bearing land at Cave Spring, but neither is mining extensively. The Pittsburg company has a drier at this place.

At Rock Run, Ala., the Republic Mining and Milling Company owns a group of four mines, of which only one, the Dykes, is now productive; the others, however, are not all exhausted. The same owner has a drier in the vicinity.

Another small mine now operating is the Bigelow, 12 miles south of Rome, owned by Harrison Bros. & Co., of Philadelphia.

This list accounts for all driers and all the now active mines in the South, but the catalog of the district's bauxite resources does not end here. Exploration for new deposits is constantly in progress and as the orebodies are easily found, quickly developed and often speedily exhausted, the number and location of producing mines is variable and is influenced mainly by the market demand for bauxite. It may safely be stated that in no case has one of the orebodies been completely exhausted; for, owing to the system of mining, hereafter described, the mines reach their economical limit long before all ore, even that of shipping grade, is removed. Then there are numerous instances of mines with abundant reserves abandoned for reasons not apparent to an outside observer.

Bauxite Mining

The customary method of winning bauxite, as exemplified in the South Watters and the Julia mines, may be briefly described. The South Watters is singularly fortunate in being opened on a hill top and is, in fact, the only important mine in the whole district so situated. A narrow cut was dug into the hillside, 30 ft. below the top of the orebody, a trestle extended outwardly from it to facilitate the handling of both waste and ore, and the breaking down of the orebody began. Pick and shovel were the only tools employed; blasting, although it would have greatly assisted in loosening the ground, was out of the question on account of the intimate association of bauxite, clay, gravel and soil.

The pit now presents a series of benches, the bottom being a level floor over which movable tracks radiate to the various points on the wall at which bauxite predominates over clay. Everything taken down, ore, clay, gravel, and even overburden, is loaded into the same wooden cars and pushed out over the trestle. Ore is deposited at a point convenient for wagons, but the rest is conveyed as far as practicable. The chief difficulty in bauxite mining is to keep the ore uncontaminated with worthless material. It is usually accomplished by removing waste alone until a good face of bauxite is uncovered, which is then attacked. This process occasionally renders it permissible in a richer mine to employ a blast in the bauxite, thus reducing the expenditure of pick labor. In this mine it is found necessary to move about six tons of material to recover one ton of bauxite. Some analyses of ore shipped from this mine show the following compositions:

	Al_2O_3	Fe_2O_3	SiO_2
I	36.96	3.90	30.60
II	54.70	0.66	16.70
III	56.77	1.43	11.15
IV	53.10	0.46	17.84

This ore is usually sold on guarantee of 52 per cent. alumina, and not more than 2 per cent. ferric oxide, nor over 5 per cent. silica.

The adjoining North Watters mine, now nearly exhausted, was not amenable to this same treatment, since it was some distance from a convenient hillside. A tunnel was therefore driven to tap the orebody at a depth of 65 ft., and through this opening, besides securing drainage, all the ore was extracted by the glory-hole method. This body presented an unusually clean mass of ore, so that this process, whose principal drawback is the impossibility of keeping things separate, could be applied. In this mine, six tons of material moved were found to yield about five tons of ore.

The Julia mine more truly displays the usual adverse conditions of bauxite mining in the district. The ground is low and level so that not only are natural drainage and level car tracks not obtainable, but the cavity made by taking out ore acts as a collector for all the surface water within reach. At the Julia an inclined track

extends with a 30-deg. slope to the level bottom of the pit, and there branches. A steam hoist at the top pulls the cars from the bottom and they then proceed by trestle to the drier. A small plunger steam pump at the bottom is required to run nearly constantly to keep pace with the water. In the hope of restricting the inflow of water, a trench was once dug around the entire circumference of the pit, draining at the lowest point, but the results were not the ones anticipated, for some of the water, taking an underground course to the bottom of the excavation, made a slippery plane down which most of the adjacent earth slid into the pit. The most successful method for retaining the loose banks is to leave a skin of bauxite, wherever this can be done, but even then so large a part of the circumference is devoid of ore, and composed entirely of clay and gravel, that a heavy rain will wash in enough mud to retard mining for several days.

Bauxite Drying

As the mine output has, in nearly all cases, to be hauled several miles to railroad, and as a long train haul is then required to get the ore to market, it becomes a matter of economy to remove as much water as possible before shipping the bauxite. The Julia drier may be described as typical of the plants commonly employed. Some of the Julia ore is obtained in hard lumps; these are shipped, with no preliminary treatment, to Niagara Falls to be used in the manufacture of alundum, an artificial abrasive analogous to the natural corundum.

As the crude ore arrives at the drying plant, some of that which is most contaminated by clay is first put through an inclined double-log washer. The ore is fed into the low end of the trough, and a copious stream of water falls into the high end. The logs work the bauxite up the incline, and discharge it, cleaned, at the upper end, while the clay goes off at the bottom, through a launder. A number of shallow settling boxes are provided at points along this launder, and a considerable saving of fine bauxite is effected in them.

This washed ore, together with the higher-grade crude, is then put through the drier. This apparatus is a simple sheet-iron cylinder, of 3-ft. diameter and 26 ft. long, inclined at about 10 deg. from horizontal, and rotated slowly by a sprocket chain. At the low end are a firebox, and a bucket elevator for raising the dried ore to the shipping bin; the damp ore is shoveled into the upper end, whence the smoke and steam pass up the chimney. The interior of the cylinder is not lined, but is provided with three rows of buckets precisely like those on a bucket elevator. The rows are set staggering, so that a forward and downward motion is given to the ore as the buckets raise it and then let it fall through the current of hot air.

The drier has a capacity of 25 to 30 tons in 12 hours. Wood is the most satisfactory fuel for bauxite drying, not because it is cheap, but because the smoke from soft coal blackens the ore. With the present inadequate supply of labor for obtaining firewood, this plant has actually had to haul in coke to burn in its drier. The fireman maintains a thick bed of burning coke and occasionally throws in a heavy chunk of wood to provide a flame.

This mine is now shipping one carload of ore per day, mainly to chemical manufacturers, with some to basic open-hearth steel plants, and to Niagara Falls, as noted. The highest-grade, or so-called "Alum," ore ranges between 56 and 58 per cent. Al_2O_3 and around 8 per cent. SiO_2. The No. 2 ore averages 50 per cent. Al_2O_3 and 12 per cent. SiO_2. All the ore from this mine carries less than 1 per cent. iron, and some of the hard lump ore is said not to exceed 2 per cent. of silica.

The mine is 5 miles from the nearest railroad point, Halls, on the Western & Atlantic Railroad, and the ore is hauled out in wagons, eight of them making two trips each, per day, over exceedingly difficult roads. The necessity for this kind of transport seems inherent in, and must be a heavy burden on the bauxite industry. The difficulty has been solved at Hermitage, in particularly favorable circumstances, by building a narrow-gage track, down which a couple of loaded cars run by gravity 1½ miles to Shannon, on the Southern Railway, whence the empties are hauled back by mule. As a rule, however, the mines are too widely scattered, too remote from the railroads, and of too doubtful endurance to warrant any elaborate arrangement for transporting the bauxite.

Rock Drill Lubrication

The Chicago Pneumatic Tool Company, Chicago, Ill., is supplying an independent rock-drill oiler which may be attached to the hose connection by using a standard nipple and tee joint.

The upper part of the oiler body is made to form a reservoir for the oil, and

LUBRICATOR FOR AIR DRILL.

is of sufficient capacity to hold from 50 to 60 oilings, which are measured out to the drill by turning a star wheel. One filling of the reservoir chamber will last a day's run.

The device is constructed so that at each quarter turn of the star wheel a definite quantity of oil is delivered and passes into the drill with the operating fluid.

The positions of the arms on the star wheel and the measuring pockets in oiler coincide and provision is made for automatically latching at each quarter turn of the star wheel.

A strainer in the mouth of the filling chamber prevents dust and grit from being introduced with the oil. This strainer is easily removed for cleaning.

The addition of one teaspoonful of flake graphite to each pint of oil will be found to be very beneficial. The graphite and oil should be mixed as thoroughly as possible before placing in the oiler.

Roasting at the Washoe Smelting Works

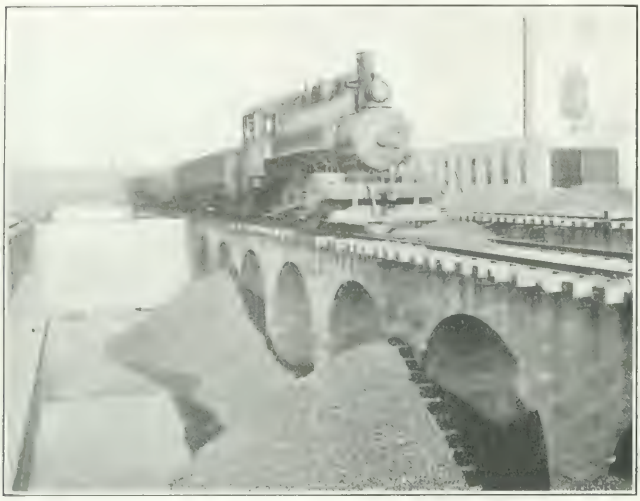
At the Washoe smelting plant, described in a pamphlet issued by the Anaconda Copper Mining Company, there are 64 McDougal calcining furnaces of the Evans-Klepetko type. These furnaces have six hearths, 16 ft. in diameter, and are 18 ft. high; they have revolving water-cooled shafts and arms, driven by suitable gearing from the top. The rabbles are so set as to move the material from circumference to center, and *vice versa*, on alternate hearths until it finally drops into the calcine hoppers immediately over tracks for transportation to the charge floor of the reverberatory building.

No fuel is used other than the sulphur in the concentrates, the burning of which furnishes sufficient heat to do the calcining, except on occasions when the furnace is not hot enough to ignite the sulphur, at which times fine coal is fed. The gases are taken through brick flues into large brick and steel dust chambers, where a large proportion of the flue dust is settled. This dust chamber is so arranged that the bottom is a series of hoppers, so that the entire contents of the dust chamber can be drawn into the flue-dust cars and sent directly to the reverberatory furnaces for smelting.

The material which sticks to the rabble arms, center shaft, etc., called "barrings," is barred off and sent to the blast furnaces. Fine limerock and the screenings from first-class ore in sufficient quantities to produce the slag desired in the reverberatories are charged with the fine concentrates through the feed hoppers of the roaster for the purpose of getting an intimate mixture. Each furnace is capable of handling 45 tons of material in 24 hours.

Coal-storage under Water at Hawthorne, Ill.

About 1902 the Western Electric Company, at Chicago, Ill., after carefully investigating the question of uncertainty of coal supply due to strikes and other conditions beyond its control, decided to provide for the storage of a considerable amount of this fuel. As experience with coal bunkers at one plant showed very clearly that the Illinois coals, which the Western Electric Company makes use of, when stored in ordinary bins exposed to the air, suffered materially from spontaneous combustion, it was decided to dig a hole in the ground at the Polk street plant, and store a large quantity of coal under water. This was carried out with satisfactory results inasmuch as no trouble has ever been experienced there from spontaneous combustion.



A PIER BEFORE FILLING WITH ARCH

Concrete Pits

When it was decided to provide for a large storage of coal at the new plant at Hawthorne, Ill., the same scheme was followed, and a storage pit, built of concrete, divided up into three sections and covering a ground area of about 310x114 ft., was decided upon. It is arranged for filling with water so as to entirely cover all the coal that may be placed in it. As constructed, each section is approximately 15 ft. in depth, and the whole pit has a capacity of about 10,000 tons, which reserve is kept exclusively for emergencies.

Three railroad tracks are carried on concrete piers and arches running the entire length of the pit, thus dividing each of the three sections into four equal divisions. There are also two railroad tracks, one on each side outside the pit, running the entire length, so that coal cars may be emptied into or loaded from the storage pits while on any one of five railroad tracks.

A locomotive crane, fitted with a grab bucket, is provided for taking the coal out of the storage pit and loading it into the coal cars. No provision is made for drying the coal before use as it is believed that the handling of the coal will result in its being dry enough for all practical purposes by the time it reaches the boilers.

LOADED CARS IN POSITION FOR DUMPING INTO STORAGE PIT

Loss of Heating Value Due to Exposure

In *The Engineer*, London, for Sept. 4, 1903, commenting on a report that Lord Charles Beresford had stated that possibly 50 per cent. of the heating value of coal is lost when the coal is stored for a considerable length of time in piles exposed to the open air, the statement is made that the loss in calorific value will probably be found in practice to be between 10 and 15 per cent., with a possible maximum of 20 per cent. In the same paper for Sept. 18, 1903, Lieut. Carlyon Bellairs, R. N., in a communication to the editor, states that from second-hand evidence he believes that the coal stored at Hong Kong loses from 20 to 30 per cent. of its calorific value with a probable average of about 25 per cent.

John Macaulay, general manager of the Alexandre Docks and Railway, of Newport, Monmouthshire, Wales, contributed an article on the same subject, in which he stated that as a result of his experiments and observations he believed that coal submerged to a considerable depth in water, so that the coal would be stored under pressure, would not lose more than 3 per cent. of its calorific value after being stored for twelve months, whereas if the same coal were stored in the open air in England, at least 12 per cent. would be lost and in a hotter climate 18 to 24 per cent.

These opinions apparently all refer to bituminous coals running probably 30 to

35 per cent. volatile combustible matter similar to the Illinois coals which the Western Electric Company makes use of. The company has never made any careful tests to verify the opinions expressed above, but there is very little doubt that these opinions are amply borne out by practical experience.

Mr. Macaulay, referred to above, found that coal submerged in salt water showed an apparent increase in heating value which may or may not have been caused by the salt in the water, but the Western Electric Company has not thought it worth while to go to the expense of throwing salt into its storage pits with the idea of enriching the coal.

Cost of Producing and Distributing Oil

A report of the chairman of the Interstate Commerce Commission gives a concrete illustration showing the cost of producing and distributing petroleum products.

The Standard Oil Company erected, in 1899, a refinery at Sugar Creek, Mo., which is within the switching limits of Kansas City, Mo., and the superintendent of this refinery testified at some length upon the hearing at Kansas City. From his testimony, together with other testimony taken upon the same hearing, the following facts appeared:

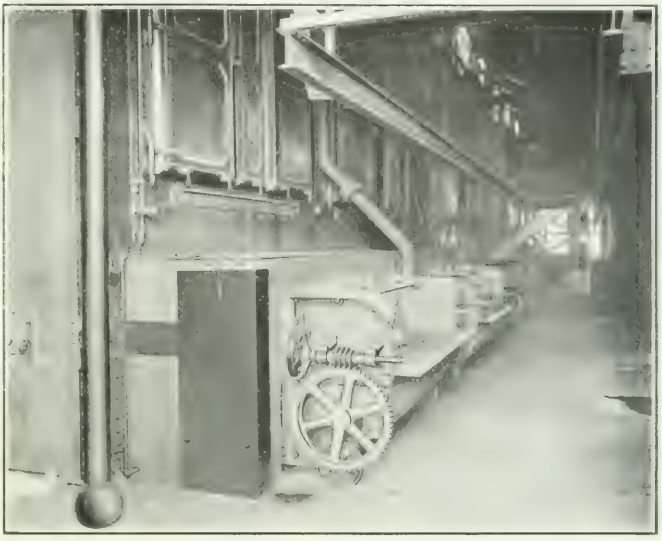
This plant refines 1000 bbl. of crude petroleum daily, and its superintendent stated that the cost of refining a barrel of 42 gal. was from 15 to 20c. Crude oil of the kind refined here produces about 10 per cent. gasolene, 25 per cent. refined oil or kerosene, and 65 per cent. fuel oil. What is known as fuel oil is also further treated to produce gas oil and gas coke, but it may all be considered as though disposed of as fuel oil.

The crude petroleum refined at Sugar Creek comes from the Kansas and Indian Territory fields, and at the time of this hearing was worth to the producer about 50c. a bbl. The Sugar Creek refinery is connected by pipe line with these fields and the crude oil is pumped at an expense not exceeding 5c. per bbl. from the fields to the refinery. The entire cost of crude at the refinery, when this hearing occurred, in March, 1906, was not far from 55c. per barrel.

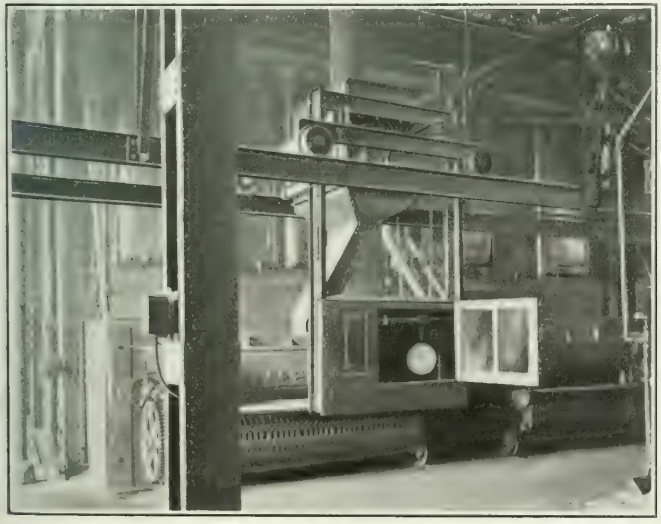
The fuel oil was largely disposed of in Kansas City for the making of steam in competition with coal, and was bringing at that time from 67 to 80c. per bbl. Much of this fuel oil, as already indicated, was further treated, and sold for other purposes, but when so treated its value to the Standard Oil Company was no less, and probably somewhat more, than when sold for fuel oil. It is conservative to say that at Sugar Creek in the process of refining no loss occurs in the production and sale of that part of the product known as fuel oil over the cost of the crude and the cost of refining; in other words, that the residuum takes care of itself.

The cost of refining the gasolene and kerosene would be approximately ½c. per gal., and the original cost not far from 1½c. per gal., so that the Standard Oil Company was producing at this refinery 900 bbl. of gasolene and 2250 bbl. of kerosene daily at a cost to that company of about 2c. per gallon.

The price realized by the Standard company from the sale of the products of this refinery varied according to the locality in which they were sold. Competition in the sale of the products of petroleum in Kansas City was acute, and the price there was from 8 to 9c. per gal. to the retail dealer. The cost of taking it from the refinery and delivering it to the retailer in Kansas City would be from 1 to 2c. per gal., leaving a net profit to the Standard Oil Company upon this oil of [illegible]



AUTOMATIC SCALE



AUTOMATIC SCALE SHOWING AMOUNT OF COAL USED

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

A large deposit of anthracite coal has recently been discovered in Russia. The coal beds are 60 miles broad, but the length and thickness have not yet been determined.

In prospecting for coal with a diamond drill, it is well to remember that any bit smaller than 2 in. in diameter is likely to grind and break the coal, producing an imperfect core, especially in soft coal.

In the satisfactory operation of a coal washery, it is necessary to feed the jigs slowly and regularly. It is also important to have the material jigged to a uniform size, if the separation of the refuse from the coal is to be complete.

In mines where the water is gritty and acid, it is generally best to use an outside packed pump, on account of the fact that the water containing such elements will cut the packing and make the pump leak in a short time; also it is much easier to repair a pump packed on the outside than one packed on the inside.

Experience has shown that in breaking coal through rolls, the waste may be increased as much as 5 per cent. by overfeeding. It has also been proved that the amount of waste is less when the coal is not broken at once into small sizes, but is passed through two sets of rolls, the second set being closer together than the first.

In fighting a mine fire or going into old workings where an accumulation of carbon dioxide is suspected, the use of patent electric pocket lamps is not advisable, as they emit light in carbon dioxide as well as in air; whereas, an ordinary safety lamp will go out when this gas is present in quantity, thus warning the men to retreat.

In laying tracks on a slope or plane (at head and foot wherever necessary), the knuckles should be provided with vertical curves, the radii of which are determined by the car base, so that while the cars are running over the knuckles, both the front and back wheels of the car rest on the rails. If the curve has too short a radius the cars will leave the track when they pass over the knuckle.

On a gravity slope, rollers must be provided for the rope so that no part of the latter will slide on the ties. The distance between rollers should not be more than 12 to 15 ft. near the foot of the plane, which gradually flattens off. Rollers on level tracks should not exceed 20 ft. Having tracks in good condition, and the average distance between rollers from 12 to 15 feet, the friction due to the rope for slopes having grades from 4½ in. to 7½ in. in 10 ft., varied in one case from 6 to 16 per cent. of the weight of the ropes used.

It has been found after many careful observations, that the size of a flame in a safety lamp is governed by the proportion of oxygen present in the air in which it burns. If the proportion of oxygen be increased the flame is shortened, while a decrease in ogygen lengthens the flame. It is therefore true that a lengthening of the lamp flame in an air containing firedamp is due to less oxygen in the atmosphere than in the normal air. This causes the combustible gas to seek food in the form of oxygen, and the less the supply of oxygen present, the greater is the need for an extended flame surface.

West Virginia will have a coal exhibit at the Jamestown Exposition that will eclipse any display of the kind ever made by that State. The exhibit will be in the shape of an obelisk, 125 ft. high, and built of soft coal from the many producing counties of the State. The base will be 40x40 ft., and the coal will be placed in horizontal strata, one layer for each producing county. The structure will be brilliantly illuminated at night, and as it is to be located on the water front, it will serve as a landmark both by night and by day. This obelisk will be an addition to the regular State exhibits of West Virginia.

In estimating an anthracite coal measure, it is the practice to look first for the percentage yield of prepared sizes per foot acre. This ratio varies from 50 per cent. to 77 per cent. of all the coal produced, depending upon the manner in which the coal is mined, handled and prepared in the breaker. The production varies from 70 to 85 per cent. of all coal in the area worked. One-foot acre of coal land contains 1825 tons; of this amount from 640 to 1200 tons of prepared sizes is obtained. However, if it is necessary to leave 40 to 50 per cent. of the coal as pillars to support the roof and surface, only from 320 to 720 tons per foot-acre will be won.

Sulphuretted hydrogen, which is sometimes called "stink-damp" by miners, is colorless and has distinctly poisonous properties when inhaled in its pure state. In certain proportions it forms an explosive mixture with air. The production of this gas in a coal mine is usually a forerunner of gob-fires, and also an indication of coal heating spontaneously. Furthermore, it is a valuable indication to the miner that he should be on the lookout for the deadly white-damp, which together with black-damp is always given off from gob-fires. Stink-damp may be easily detected by its effect upon metallic silver, such as a watch-case or silver ring, which becomes covered by bluish-black deposits after being exposed to the air for a while. This is due to the union of the silver with sulphur, forming silver sulphide.

In conjunction with the United States Forestry Department, the Reading Coal and Iron Company is meeting with much success in its experiments dealing with the preservation and economical use of mine timbers. During the past decade, the proportionate increase in the consumption of lumber has been 50 per cent. greater than the increase in our country's population. In 1890, we consumed 27,000,000 ft., while at the present time we are annually using upward of 40,000,000 ft. In re-foresting our timber lands, the most careful management will not insure an average growth of more than 50 cu.ft. of wood per acre each year; at this maximum figure, our forests would not furnish by annual growth the amount of wood we now use. As to the waste in manufacture, it may be stated that present practice secures only about 30 per cent. of the cubic contents of a tree, the remaining 70 per cent. being almost wholly wasted. For fuel purposes, our available statistics show that we consume about 115,000,000 cords of wood annually.

Sawdust in cake form was recently used in Germany, with promising results. The briquets weighed about one-half pound each. In the district surrounding the factory where the briquets were made, the schools were heated with this fuel, the combustion leaving very little ash and proceeding without a large flame. No binding material was used, the sawdust being dried and pressed into the desired shape, and owing to the absence of tarry matters there was no smoke in burning. The weight of such a briquet indicates the heavy pressure under which it takes its shape, and the edges look like polished oak; in fact, it is heavier than a piece of hardwood of the same size. The demand created by the popularity of the fuel exceeded the supply of sawdust obtainable in the vicinity of the factory, and shiploads were, therefore, procured from Sweden and carloads from distant manufactories. Sawdust, which previously could be had for the asking, soon commanded a market price. Unfortunately, the factory was destroyed by fire, and operations have temporarily been suspended.

The United States Steel Corporation

The annual report of this company for the year 1905, which has just been issued, covers fully the operations, as usual. The important portions of the report are summarized here, and form a valuable indication of the course of the iron trade during the year.

The capital account shows that on Dec. 31 there was outstanding $508,302,500 common stock and $360,281,100 preferred stock. The total bonded debt was $564,670,876, a reduction of $5,801,389 during the year.

Earnings and Income

The general statement of earnings and expenses may be summarized as follows:

	1906.	1905.
Gross receipts	$ [illegible]	[illegible]
Operating expenses	$ [illegible]	$ [illegible]
General expenses	[illegible]	[illegible]
Total	[illegible]	[illegible]
Net earnings	$ [illegible]	$ [illegible]
Interest on investments	[illegible]	[illegible]
Total	$132,805,064	$165,925,156
Account, subsidiary cos.	13,017,406	9,300,883
Final net earnings	$ [illegible]	$ [illegible]

The increase in gross receipts last year was $111,425,190, or 19 per cent.; in net earnings, $30,017,362, or 23.7 per cent.; in final net earnings, $36,836,615, or 30.8 per cent.

The disposition of the net earnings for 1906 is reported as follows:

Net earnings, as above	$ [illegible]
Depreciation and replacement funds	[illegible]
Interest and sinking fund	[illegible]
Adjustment of sundry accounts	[illegible]
Dividends, preferred stock, 7%	25,219,077
Dividends, common stock	[illegible]
Special appropriations—new work	[illegible]
Total	$ [illegible]
Surplus for the year	$ 12,742,869

The total undivided surplus, as of Dec. 31, 1906, amounted to $97,720,714, which represents the working capital of the company.

The expenditures for new property and construction during the year were: Gary plant, $4,720,159; other manufacturing properties, $12,875,066; coal and coke properties, $1,089,379; iron-ore properties, $3,878,295; transportation properties, $9,227,466; miscellaneous, $344,781; total, $32,155,146. The total expenditures under these heads from the organization of the company, April 1, 1901, to the end of 1906 were $208,231,164.

Production

The report of production from the various properties of the company is as follows, in long tons, except cement, which is in barrels:

	1905.	1906.
Iron ore mined	18,486,556	20,645,148
Coke manufactured	[illegible]	[illegible]
Coal mined, not including that used in making coke	[illegible]	[illegible]
Limestone quarried	[illegible]	[illegible]
PIG IRON AND FERRO-ALLOYS		
Pig iron	[illegible]	[illegible]
Spiegel	[illegible]	[illegible]
Ferro-manganese and silicon	[illegible]	[illegible]
Total	[illegible]	[illegible]
STEEL INGOTS AND CASTINGS		
Bessemer ingots	[illegible]	[illegible]
Open-hearth ingots	4,616,051	5,438,494
Total	[illegible]	[illegible]
ROLLED AND OTHER FINISHED PRODUCTS		
Steel rails	[illegible]	[illegible]
Blooms, billets, slabs, sheet and tin-plate bars	1,253,692	1,096,727
Plates	780,717	836,399
Heavy structural shapes	[illegible]	[illegible]
Merchant steel, skelp, hoops, bands and cotton ties	982,782	1,240,548
Forgings and pipe	[illegible]	[illegible]
Rods	[illegible]	[illegible]
Wire and products of wire	1,283,943	1,399,717
Sheets—black, galvanized and tin-plate	[illegible]	[illegible]
Finished structural work	404,732	643,622
Angle and spike bars and joints	150,265	176,730
Spikes, bolts, nuts and rivets	61,496	70,233
Axles	[illegible]	[illegible]
Sundry iron and steel products	[illegible]	[illegible]
Total	9,226,386	10,678,433
Spelter	[illegible]	[illegible]
Copperas, sulphate of iron	[illegible]	[illegible]
Universal portland cem't, bbl.	1,735,343	2,076,000

The iron ore mined in 1906 was from the following sources: Marquette ranges 1,442,290; Menominee, 1,874,680; Gogebic, 1,465,375; Vermillion, 1,794,186; Mesabi, 14,068,617 tons.

Employees

The average number of employees in the service of all companies during 1906, in comparison with 1905, was as follows:

	1905.	1906.
Manufacturing properties	130,614	147,048
Coal and coke properties	20,883	21,929
Iron-ore mining properties	12,068	14,393
Transportation properties	14,524	16,638
Miscellaneous properties	2,069	2,449
Total	180,158	202,457
Total annual salaries and wages	$ [illegible]	$ [illegible]

The offer to the employees to subscribe for the preferred stock of the United States Steel Corporation was again renewed at the end of the year 1906 on substantially the same conditions as offered in previous years, except the price was fixed at $102 per share. Under the offer subscriptions were received from 14,169 employees for a total of 27,032 shares. At Dec. 31, 1906, there were 15,568 employees who had purchased preferred stock under offers made by the corporation, and who on that date either held the certificates for the stock or were making monthly payments on account of the purchase price thereof.

An increase was made on Jan. 1, 1907 (on March 1, 1907, in case of the coke companies), in the wages and salaries of approximately 131,000 employees, or 65 per cent. of the total employees of all companies. The advance applied to practically all employees who are paid on basis of day rates, and to a considerable number of those paid on basis of a monthly salary. The average rate of increase in wages and salaries of the employees affected equaled 6.6 per cent. The amount of increase in the total pay-roll attributable to above advance will be approximately $6,000,000 per annum. The average rate of pay received by all employees is now the highest paid at any time since the organization of the corporation.

Following the practice heretofore adopted, a substantial amount was distributed as a bonus for the year 1906 to a large number of employees who merited the same. Included in the distribution were about 21,000 shares of common stock which were previously purchased in the market for that purpose, and which will not be delivered until the expiration of three years and the compliance with various conditions named for the protection of the companies. From the bonus fund to be ascertained at the end of 1907 in the usual way it is proposed to establish a separate fund to be known as the pension fund and to be used for pension purposes.

General

In common with practically all lines of industry throughout the United States, the business of the subsidiary companies during the year 1906 reached a new high level. The average prices received during the year for all steel products shipped to the domestic trade exceeded by 5.3 per cent. the average received in 1905, and were about 8 per cent. lower than the prices which prevailed in 1902. The condition of the trade has been such that prices of many of the commodities produced could have been advanced; and as wages have been largely increased and freight rates raised, it has been argued by some of the manufacturers of steel that prices of their manufactured commodities should be correspondingly advanced; but it has been decided by the management of this corporation and of its subsidiary companies to make no changes in prices at this time.

The orders for steel products of all kinds, both for immediate and for future shipments, were received in large volume up to the close of the year. Since Jan. 1, 1907, the orders received have been somewhat less than they were during the months immediately preceding that date, but they are larger than they were during the same months in 1906, and have about equaled the productive capacity of the mills, notwithstanding the tonnage of unfilled orders on the books at close of the year equaled 8,489,718 tons of all kinds of manufactured steel and iron products, in comparison with 7,605,086 tons at the close of 1905.

The export business of the subsidiary companies continues to show material improvement. Export shipments during the year amounted to 1,079,319 tons of various products, an increase of 13 per cent. over the tonnage shipped in the previous year, while the gross receipts exceeded those of 1905 by 28 per cent. Since the export business of all the subsidiary companies was concentrated, late in 1903, in the hands of a single selling organization, there has been steady and systematic development in all foreign markets.

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To Our Canadian Subscribers

The present postal treaty between Canada and the United States expires on May 7 next. The Canadian Government has before it a proposition to increase the rate of postage on periodicals from the United States to such an extent as will make it necessary for us to about double our subscription rate to Canada.

If Canadian friends of this paper object to such a raise it would be well if they wrote their postal authorities protesting against such action.

Pennsylvania Mine Inspectors

We learn that our recent editorial on the proposed legislation dealing with the election of mine inspectors in Pennsylvania is stimulating thoughtful discussion in the anthracite districts. This is as it should be. There are few public positions where the lives of so many men depend upon a conscientious, fearless performance of duty as that of mine inspector, and it would be surely ill-advised to make that office merely a place to be given as a political reward, instead of keeping it for the efficient regulation of an industry attended by many hardships and dangers.

The advocates of the present proposed measure have so far advanced no plausible reason that would justify lowering the standard of qualification for the post of mine inspector. The assertion that the miners would be better represented if all those holding mine-foremen's certificates were eligible as mine inspectors is in error, as the majority of the present inspectors have risen from the ranks of the more intelligent mine foremen, and they are no more likely to be influenced by unscrupulous mine operators than any of the present mine foremen would be.

Anyone who reads the questions that were recently asked of the candidates for a mine-foreman's certificate and compares them with the examination for mine inspectors will see how much more elementary and narrow is the former. Yet the present requirements do not render it impossible for any ambitious miner or mine foreman to attain to the position of mine inspector, providing a sufficient amount of conscientious effort is expended in preparing for the duties.

Many of the present mine inspectors have been attracted to the position by reason of the standard of the qualifications established. They have felt, and properly so, that to win the office in this way gives them a certain rating among their associates in matters pertaining to mining that is honorable and in other respects worth while. For this reason, among others, any lowering of the standard would be an injustice to all who have honestly worked to become eligible for the position. However, the prime reason against any change in the present law for the worse is that it would be directly contrary to the most solemn interests of the miners themselves.

A fact important to remember is that there are upward of 1000 mine-foremen's certificates that have been issued to men who have abandoned mining for other pursuits in life, and each of these holders, regardless of present inexperience or occupation, would be eligible for the office in question under the proposed legislation. Popularity, rather than ability and fitness, is generally the magic virtue that leads to success in the political field, and this same condition is unfortunately true with respect to the office of mine inspector, and will be as long as the position is controlled by political parties.

We do not pretend to be satisfied with present conditions nor content with the position as it is now administered, and we would heartily indorse any reform that might give greater independence and higher efficiency to the mine inspectors; however, all mining men, including both operators and the thousands who work with their hands underground, should strongly oppose any measure that will tend to lower the standard of qualifications for a position that should be characterized by dignity, prestige and ability.

The Location of Smelting Works

In an interesting and valuable article, published elsewhere in this issue, Herbert Lang raises again the old dispute among metallurgical engineers as to the relative advantages of flat sites or hillsides for the location of smelting works. As he remarks in his introductory paragraph, little of a really conclusive nature was said in the former discussions, and it is scarcely probable that any converts were made to one side or the other. Mr. Lang has excellent reason for re-opening this discussion, at the present time, because the increasing magnitude of metallurgical plants constructed during the last few years has introduced new con-

ditions, appreciation of which must necessarily have affected views on the subject.

It would be ridiculous, for example, to contemplate the location of a plant of the magnificent distances of the Copper Queen works, at Douglas, Arizona, on a hillside with the idea of securing some advantage, real or fancied, from gravity. However, the change in conditions in such respects, which is especially the theme of Mr. Lang's present article, has not by any means led yet to unanimity in opinion. We have seen recently a large metallurgical works in course of construction—not so large as that at Douglas but large enough to warrant classification among the great metallurgical plants of the country, comprising many buildings and interdependent departments—for which the builders have selected a steep hillside.

Probably a conclusive answer to the relative merits of flat and sloping locations can be given only by designing a works of the same type and capacity for either kind of location, and carefully estimating the cost of construction and the probable cost of operation in each case. However, that would involve practically the engineering of two plants, which would be an expensive matter, and is doubtless the reason why no one has yet contributed to the discussion on that basis. The same difficulty will hold true at the present time, but nevertheless a general discussion of the subject on the new phases which have been presented by Mr. Lang, will be distinctly useful. We hope that our metallurgical readers will take up the matter and contribute their criticisms upon the points which Mr. Lang in-

Mine Explosions and Atmospheric Pressure

We note with gratification the interest that is being evinced by colliery operators in the principle we are advancing (we make no claim to originality in its formulation) with reference to the relationship of barometric pressure and outflow of gas into a mine. Our Scranton correspondent in his letter this week reports that: "The recent editorial in the JOURNAL calling attention to two nearly simultaneous gas explosions in the anthracite region, and their connection with atmospheric conditions, has attracted general attention, and was copied by several daily papers. The editorial was indorsed everywhere, and caused increased watchfulness among the officials at the various collieries. It is interesting to note that a few days afterward, work was suspended at the Dorrance colliery, of the Lehigh Valley Coal Company, owing to the excessive amount of gas found in the workings. The workmen were not allowed to enter the mine, and the officials stated that there was no doubt that the atmospheric conditions were responsible for the accumulation."

During the last few weeks we have been assured by many practical mining men of their positive belief in the statements we have made concerning this matter; however, it is our opinion that few mine managers fully realize what actual good may result from a better understanding and more careful observance of the problems involved. It is only from a widespread understanding that the greatest benefit will be derived, and we therefore urge all mine inspectors, engineers and managers to write us their experiences and ideas concerning the subject, so that the resulting discussions will bring forth the technicalities, and cause a better solution of the questions included.

The Steel Corporation Report

The report of the United States Steel Corporation, an abstract of which is given on another page, excites attention if only by the magnitude of its figures. The gross earnings last year were close to $700,000,000, and showed a gain of more than $111,000,000 over the previous year, while its working capital is over $100,000,000. Moreover the report is of value as indicating the general course of the iron trade, of which the corporation controls over 60 per cent. In this sense there is every indication of remarkable growth. The business of the company increased last year sufficiently to require increased outputs of 1,095,229 tons of pig iron, 1,915,910 tons of steel ingots and 1,352,047 tons of finished iron and steel. To supply its furnaces and mills the production of coke was increased by 1,052,166 tons, and that of iron ore by 2,158,589 tons.

The report is, as in former years, to be commended for giving a full and fair exposition of the company's work and finances, its expenses and profits. There is no concealment, and the actual condition of its affairs can readily be ascertained.

The corporation is still comparatively weak on the pig-iron side, though some progress has been made toward the correction of this condition. On the other hand, it has done much to strengthen its iron-ore position, as has been heretofore recorded. In steel and finished material there was little change during the year, though preparations were made for a great increase in both.

Pig-iron Production of the World

We have now the reports of the three great iron-producing nations for the year 1906, giving their output of pig iron for the year. The figures are as follows, reduced to metric tons, for purposes of comparison:

	1905.	1906.	Changes.
United States..			
Germany			
Great Britain			
Total			

Germany showed last year the largest proportional gain, 13.6 per cent. The increase in the United States was 10.1 per cent., and that in Great Britain 5.8 per cent.; the total gain for the three countries being 10 per cent. The United States production last year exceeded that of the other two countries combined by 2,922,061 metric tons.

In 1905 the three countries named furnished 81.6 per cent. of the world's supply of pig iron. Assuming that the same ratio held in 1906—and there was probably little change—the total output of pig iron last year was approximately 59,400,000 tons. To make this iron it was necessary to mine some 120,000,000 tons of iron ore and to assemble at the blast furnaces over 200,000,000 tons of ore, flux and fuel.

THE NEW BUILDING of the engineering societies, at New York, will be dedicated April 16. On April 17 there will be addresses by representatives of the founder societies, greetings from sister societies, and presentation of medals. On April 18 the American Institute of Mining Engineers and the American Society of Mechanical Engineers will open their spring meetings. The union of the mining, mechanical and electrical engineers in this magnificent building, received through the munificence of Mr. Carnegie, is a noteworthy event in our professional history and the formal inauguration of their joint occupancy of it will be a red-letter occasion.

Calumet & Hecla, Osceola, and United Metals Selling Company

The recent contest between the Bigelow party in the Osceola and the Calumet & Hecla management has brought out some interesting statements. In a meeting of business men at Detroit to protest to the Governor of Michigan against the Gordon-Fuller amendment to the mining laws of that State (since recalled), Vice-president Livermore, of the Calumet & Hecla, spoke vigorously in denunciation of the methods which had been employed to pass the bill, riddled the arguments which had been made in favor of its passage, and asserted that the bill, if it became a law, meant confiscation of property which had been clearly conveyed to the Calumet & Hecla Company, strictly in conformity with the previously existing laws.

In reply to the charge that the Calumet & Hecla was seeking control of the entire copper industry of the State, it was pointed out that the real copper trust was the United Metals Selling Company which stood in danger of losing the sale of Osceola copper. Of the total copper production in this country today of 1,100,000,000 lb. per annum, the United Metals Selling Company has the disposal of 600,000,000 and it has made, during the last eight years, repeated but unsuccessful attempts to secure the sale of Calumet & Hecla copper. The commission of 1½ per cent, on the sale of 600,000,000 lb. of copper per annum at 19c. per lb. means $1,710,000 to the United Metals Selling Company. In this company President Bigelow and G. M. Hyams, of the Osceola, are stockholders.

In this connection it may be remarked that the directors of the United States Metals Selling Company last week declared a quarterly dividend of $7.50 per share, placing the stock on a $30 per share basis. Hitherto the company has declared an annual dividend in December, and for the last few years this has been $20 per share on a capital of $5,000,000, calling for the annual distribution of $1,000,000. However, besides profit from the sale of copper, the company derives profits from the electrolytic refining of part of the product which it sells. It owns the Raritan works at Perth Amboy, which has a capacity for treating 300,000,000 lb. of copper per annum.

Since the Gordon-Fuller amendment was recalled, the Bigelow interests have secured an injunction preventing the Calumet & Hecla from voting its Osceola stock. The bill of complaint, filed in the United States Circuit Court for the western district of Michigan, states that Albert S. Bigelow is the owner of 1000 shares of Osceola stock and that Calumet & Hecla is now the owner of record of 20,000 shares, and on information and belief Mr. Bigelow charges that Calumet & Hecla is the owner of a large number of shares which have not yet been transferred on the books of the company.

The bill states that Calumet & Hecla has acquired a majority of the stock of the Centennial and Allouez companies and charges that it is seeking to acquire further controlling holdings in Tamarack, Isle Royale and Ahmeek.

The bill further alleges that Lake copper is sold at a higher price, and is used exclusively in certain important industries demanding the use of copper of a superior tensile strength and ductility, "and that the control of the copper output of the mines of Michigan would establish an absolute and complete monopoly in the production of copper of a certain high standard, independent of any ownership of any mines now in operation within the United States or elsewhere. . . The control of Osceola and Tamarack by one corporation will create a practical monopoly in the supply of such copper, and would eliminate all competitive bidding as between said two companies." The bill further alleges that the annual production and sales of Calumet & Hecla are 90,000,000 lb. of copper, of Osceola, 19,000,000 and of Tamarack, 15,000,000 to 18,000,000, and that Tamarack and Osceola are in active competition with Calumet & Hecla in the production and sale of Lake copper throughout the United States and in foreign countries.

Winona Copper Company

The Winona Copper Company is opening up a large mine in the Lake Superior copper district. The report is for the year ended Dec. 31, 1906. The rock stamped during the year was 19,399 tons, from which 457,775 lb. mineral was saved; the final result being 278,182 lb. refined copper. The average yield was 23.59 lb. mineral, or 14.34 lb. refined copper per ton stamped. The average price obtained for the copper was 22.664c. per pound.

The income account is as follows:

Copper sold	$63,326
Interest	1,175
Calls on stock	294,871
Total receipts	$359,372
Mine expenses and construction	292,991
Balance	$66,381

Adding $12,828 brought forward from 1905 made a total surplus of $79,209 carried over to current year.

President Stanwood says: "Our plans for 1907 call for improvements at an approximate cost of $100,000, which will be provided from our present resources and from the profits of the mine. No. 4 shaft was started May 7, 1906, on land formerly belonging to the King Philip Copper Company; whose territory adjoins on the south. The old boundary line between the two properties ran diagonally across the Winona lode. By an arrangement providing for an exchange of about five acres of mineral land, the boundary line has been made to run at right angles with the outcrop of the lode, so that each company can mine out more economically its ground lying between No. 4 Winona shaft and No. 1 King Philip shaft. Our No. 4 shaft commands all the territory to the south of it, so that no more shafts will be required.

"At present we are sending daily 360 tons of rock to the stamp mill and we expect to increase our shipments from time to time, so that with the beginning of 1908 they should reach 800 tons daily. The mine has improved greatly in appearance during the year, and there are indications that there will be further improvement as the shafts attain greater depth. A statement of the actual cost of production from the beginning in October to the close of the year would be misleading, as some time was required to get things running smoothly. In December, which may be taken as a representative month on the present basis of production, the cost was 17.15c. per pound, including all expenses except construction. This cost will diminish materially as the tonnage of rock is increased."

The Gordon Drill

SPECIAL CORRESPONDENCE

Much is being made of the success of a stoping drill, the Gordon drill, which has been brought out by local people, to work in narrow stopes. On the Rand many of the stopes must be carried 30 in. or under. The drills commonly in use are unsatisfactory in such narrow stopes Hence the Gordon drill. On the Robinson mine where this drill has been tried, satisfactory results have been obtained. It is claimed that the average stoping width is as low, if not lower, than with hand labor, and that with these machines one white man and five Kafirs can break as much rock as one white man superintending 30 Kafirs. It is also claimed that the Gordon drill will make for better health among the miners, because of the use of a water jet which lays all dust.

This drill has not been tried on a scale extensive enough to prove whether it will accomplish all that its advocates claim for it. If it is really a success, the mines can work with fewer unskilled laborers than at present, and it will do much to solve the labor problem. The Gordon drill has been floated in a company. A large order has been placed for these drills by two of the leading groups.

Basic lead sulphate, $2PbSO_4, Pb(OH)_2$, is produced by adding the calculated quantity of sulphuric acid to lead oxide with continuous stirring.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Copper in North Carolina

Having had numerous inquiries of late from all parts of the country regarding copper in this State, I take this opportunity of giving my ideas based on some 30 years' experience in the State.

Within a radius of 100 miles, Salisbury being the center of the mineral belt, I have examined more than 200 localities showing copper ore. For most part the veins are quartz incased in stratified country—Huronian slates with dikes of diabase, altered slates, brecciated porphyry, cherts, etc.; the general trend being northeast and southwest. The ore is pyrite with the resulting carbonates and silicates, always terminating in shallow depth to the first named. Native copper has been found in a few localities as the result of precipitation. These copper ores are, as a rule, accompanied by gold and silver, which is contained generally in the iron pyrites; this always furnishes a part of the vein filling. As a deduction and considering the deposits of this belt in their entirety, they would be classed as veins of auriferous iron and copper pyrites, and as such must be treated. To convey the idea in a simple form, the gold, silver and copper must be recovered at one operation, and on a large scale in order to insure permanent and commercial results. This would require the establishment of a metallurgical plant whereby the by-products could be utilized, copper converted direct from the ore into sulphate; sulphur recovered as sulphuric acid, and used in the manufacture of fertilizers and other acids and chemicals.

Every by-product, even to the sand, is in great and increasing demand in this section, yet strange to say, thousands of tons of Virginia pyrites are shipped in for the manufacture of sulphuric acid in connection with the fertilizer industry.

The Union copper mine, in Rowan county, has shipped to smelters in the past two years not less than 14,000 tons of crude ore, on which the freight and smelter charge has been approximately $10 or $12. This is cited as an instance of the cost, and what can be done with low-grade ore under able management. The probable average of the ore has been 4 per cent. copper, $2 gold and silver. This rate of shipment is being kept up at the present time with much better results on account of the advanced price in copper.

The Gold Hill copper mines have struck, on the 800-ft. level, a new vein of auriferous pyrites, which at present is producing paying results in gold, while the concentrates are accumulated for shipment to smelter. In these mines are thousands of tons of low-grade copper-gold ore blocked out for future treatment.

The Ashboro copper mine shipped some 200 tons of ore which ran 8 per cent. copper and $4 in gold and silver. They have a quantity of low-grade exposed, and are preparing to develop in a businesslike manner. They have a strong vein fully 8 ft. in width, with mineralized country rock. Near this mine is a large belt of copper-bearing strata worthy of attention.

Ore Knob, in Ashe county, has a record of several thousand tons of 6 per cent. ore, which was smelted at the mines with a profit that paid dividends for some time. Here, too, there is a large reserve of low-grade pyrites. Several other localities in the same county have produced ore worthy of development. The Copper Knob mine made one shipment of picked ore that ran 25 per cent. copper with $150 per ton in gold and silver. The Hercules Gold and Copper Company had on the dumps in 1903 some 6000 tons estimated at 5 per cent. copper and $2 in gold. This company are still mining and blocking out ore. The Conrad Hill, in Davidson county, is a large developed family of veins of low-grade gold-copper ore, which they are preparing to put in operation at an early day. The Salisbury copper mine, in Rowan county, is a remarkable deposit of rich ore on the surface; chalcopyrite running 30 per cent. copper and $5 in gold and silver. The development is limited to two prospects. The property is under option to New York capitalists. The Virgilina district of North Carolina and Virginia has some 20 localities that have produced high-grade shipping ore.

Many localities in Rowan, Mecklenburg, Cabarrus, and adjoining counties, have prospects showing copper ore with gold and silver, all of which require development that will justify the erection of concentrating plants. Many instances are cited in this district where good copper ore has been worked for a small gold result, allowing the copper pyrites to pass off in the tailings. A systematic development would result in exposing a large quantity of these ores, which in turn would justify the erection of works for their treatment here in this State.

Respectfully,

RICHARD EAMES, JR.

Salisbury, N. C., March 7, 1907.

Shear Zones in Sonora

In a recent contribution in the JOURNAL on "Heretical Veins in Sonora" I called attention to the prevalence in this Mexican State of impregnated shear zones as important ore deposits. Since that communication was written some further facts have come to my notice which seem worth putting on record. In the camp of Minas Prietas it appears that the ore deposits of the Grand Central and Creston-Colorado properties are of this type.

The practical point about the impregnated shear zone type of ore deposit is that the ore is country rock in various stages of alteration or decay, saturated with metal and without foreign vein stone, as is usually the case with the so-called true-fissure vein. The impregnated shear zone is usually without distinct walls, though sometimes a more clearly defined fault surface, which may be slickensided, serves as a lateral boundary or wall to the field of impregnation. Further, where the shear zone is wide, the impregnation may not occur throughout its whole extent.

Again, the zone of impregnation or orebody may meander in its vertical or oblique course, through the zone of faulted and shattered rock. In other words, the limits of the orebody may not always be parallel to the surfaces of faulting.

As Sonora is so new a field that many of its mines are still in the zone of oxidation and little is accurately known of its ore deposits in the zone of primary mineralization, the aid of trained observers is solicited in placing on record full details of the orebodies and their characteristics.

F. J. H. MERRILL.

Mina Las Animas, Sonora, Mex., March

Economy in Abundant Supplies

There is nothing that adds so much to the expense of mining as a shortage of supplies. I once worked where the shift-boss gave out nails only upon request. Nails are cheap; it is better generally to even waste a pound of nails than to have a miner lose a quarter of an hour "chasing up" nails. It is far cheaper to have too many blacksmiths than to have the miners have too many pieces of dull steel. Especially in machine drilling is it necessary to have the miners supplied with an abundance of steel.

C. T. RICE.

Bisbee, Ariz., March 10.

New Publications

"Manual of Topographic Methods." By Henry Gannett. Pp. 88; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"The Assay of Tin and Antimony." Second Edition. By L. Parry. Pp. 49. 5½x8½ in.; cloth, 3s. 6d. London, 1906: *Mining Journal* Office.

"Mining Law in Practice." By G. W. Miller. Pp. 292; illustrated. 4x5½ in.; leather, $2. Denver, 1907; Ores and Metals Publishing Company.

"Geological Survey of Canada. Section of Mines, Annual Report for 1904." Pp. 162. 6½x9½ in.; paper, 10 cents. Ottawa, 1906: Geological Survey of Canada.

"State Geological Survey of Illinois: Administrative Report for 1906." By H. Foster Bain. Pp. 37; illustrated. 6x9 in.; paper. Urbana, Ill., 1907: University of Illinois.

"Les Richesses Minérales de la Serbie. I. Les Gisements aurifères." By D. Iovanovitch. Pp. 107; illustrated. 7½x10½ in.; paper, 10 fr. Paris, 1907: H. Dunod et E. Pinat.

"Report on the Chibougamau Mining Region in the Northern Part of the Province of Quebec." By A. P. Low. Pp. 51 6½x9½ in.; paper. Ottawa, 1906: Government Printing Bureau.

"Summary Reports of the Geological Survey Department of Canada for the Calendar Years 1905 and 1906. Two volumes. Pp. 350; illustrated. 6½x9½ in.; paper, 40c. Ottawa, 1906: Geological Survey of Canada.

"Results of Primary Triangulation and Primary Traverse, Fiscal Year 1905-6." By Samuel S. Gannett. U. S. Geological Survey, Bull. No. 310. Pp. 248. 6x9 in.; paper. Washington, 1906: Government Printing Office.

"Annual Report of the Director of the Mint for the Fiscal Year ended June 30, 1906. Treasury Department, Document No. 2457. Pp. 270; illustrated. 6x9 in.; cloth. Washington, 1906: Government Printing Office.

"Switchboards for Power, Light and Railway Service—Direct and Alternating Current—High and Low Tension." By Wm. Baxter, Jr. Pp. 192; illustrated. 5½x8 in.; cloth, $1.50. New York, 1906: Derry-Collard Company.

"Etude Expérimentale du Rivetage." By Ch. Frémont. Mémoires publiés par la Société d'Encouragement pour l'Industrie Nationale. Pp. 146; illustrated. 9x11 in.; paper, 10 fr. Paris, 1906: Siège de la Société, Rue de Rennes, 44.

"Determination of Stream Flow During the Frozen Season." By H. K. Barrows and Robert E. Horton. U. S. Geological Survey, Water Supply and Irrigation Paper No 187. Pp. 93; illustrated. 6x9 in.; paper. Washington, 1907; Government Printing Office.

"Transactions of the American Ceramic Society, volume VIII, containing Papers and Discussions Read at the Meeting Held at Philadelphia, Pa., Feb., 1906, With Some Other Contributions." Pp. 409; illustrated. 6x9 in.; paper. Columbus, O., 1906: Secretary's Office.

"Annual Report of the Board of Regents of the Smithsonian Institution, Showing the Operations, Expenditures and Conditions of the Institution, for the Year Ending June 30, 1905." Pp. 556; illustrated. 6x9 in.; cloth. Washington, 1906: Government Printing Office.

"Eighth Report to the Alloys Research Committee on the Properties of Alloys of Aluminum and Copper;" by H. C. H. Carpenter and C. A. Edwards. Advance copy of report read before the Institution of Mechanical Engineers. Pp. 201; 20 plates. 5½x8½ in.; paper. London, 1906: Institution of Mechanical Engineers.

"A Bibliography of Ohio Geology. Part I—A Subject Index of the Publications of the Geological Survey of Ohio, from its Inception to and Including Bulletin Eight of the Fourth Series," by A. G. Derby. "Part II—A Bibliography of the Publications Relating to the Geology of Ohio, Other Than Those of the State Geological Survey." By Mary W. Prosser. Bulletin 6, Fourth Series, Geological Survey of Ohio. Pp. 332. 6½x9½ in.; cloth. Columbus, O., 1906: Geological Survey of Ohio.

" Electrical Engineering." By E. Rosenberg. Translated by W. W. Haldane and Carl Kinzbrunner. Revised by E. B. Raymond. An elementary text-book suitable for persons employed in the mechanical and electrical engineering trades, for elementary students of electrical engineering, and for all who wish to acquire a knowledge of the chief principles and practice of the subject. Pp. 347; illustrated. 6x9 in.; cloth, $2. New York, 1907: John Wiley & Sons.

Contents: Fundamental Principles. Magnets—magnetic lines of force. The continuous-current dynamo. The electric motor. Accumulators. Working of direct-current dynamos in parallel. Electric lighting. Alternating currents. Alternators. Alternating-current motors. Multiphase alternating current. High tension.

"The Manufacture and Properties of Iron and Steel." By Harry Huse Campbell. Fourth edition, fully revised. Pp. 640; illustrated. 6x9 in.; cloth, $5. New York, 1907: Hill Publishing Company.

Contents: The main principles of iron metallurgy. Primitive methods of making iron. The blast furnace. Wrought iron. Steel. High-carbon steel. The acid bessemer process. The basic bessemer process. The open-hearth furnace. Fuel. The acid open-hearth process. The basic open-hearth process. Special methods of manufacture and some items affecting the costs. Segregation and homogeneity. Influence of hot working on steel. Heat treatment. The history and shape of the test-piece. The influence of certain elements on the physical properties of steel. Classification of structural steel. Welding. Steel castings. The iron industry of the leading nations—United States, Great Britain, Germany, France, Russia, Austria, Belgium, Sweden, Spain, Italy, Canada. Factors in industrial competition. Statistics.

This well known work is one of the classics of metallurgical literature. It is an example of the highest art in the preparation of a modern treatise in its field, describing not merely the means by which things are done, but also discussing the reasons why, and illuminating those discussions by the analysis of specific examples and by directing attention to the principles of physics and of chemistry which bear upon them. It is such handling of his subject that characterizes the master. Touching upon this, it is interesting to repeat a story which the author told in the preface to his second edition. A great electrician laughingly but earnestly declared that the chapter on the open-hearth was too abstruse for his intellect, while an uneducated open-hearth melter reported that he had learned, from that same chapter, how to build a furnace, how to run it, and how to make a good livelihood. "The melter understood my language, but to Edison it was a foreign tongue," said Mr. Campbell.

However, one does not have to be an open-hearth melter, or even an iron and steel metallurgist, to derive profit from Mr. Campbell's work. It is a treatise that may be read and studied profitably by every metallurgical engineer who has to do with furnace work. He will learn from it much about the practical principles of the combustion of fuel and the economical production of high temperatures that will be useful to him, besides many other things of value.

In preparing the fourth edition, Mr. Campbell has made many changes. By constant additions the book had grown too big to be convenient, so that every line has been gone over to eliminate unnecessary phrases or words. The detailed calculation by the method of least squares in chapter XVII has been omitted, and it has been deemed unnecessary to print the standard specifications in full, since they are constantly subject to change. On the other hand, much new matter has been added. A new determinaton of the effect of certain elements upon steel is given in chapter XVII, and at a hundred places new knowledge has been interpolated as suggested by recent progress, or by friends, both here and abroad, who have volunteered information, looking to the improvement of this book.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. B. Risque, manager of the Utah Consolidated Mining Company, is in New York.

L. R. Johnston, of Boulder, Colo., has gone to New York City this week on mining business.

H. F. A. Riebling has gone to western Chihuahua, Mexico, on some special metallurgical work.

J. H. Plummer, president of the Dominion Iron and Steel Company, was in Toronto recently.

W. W. Degge, an operator in Boulder county, Colo., has gone to Norfolk, Va., on a business trip.

J. Eaton, manager of the Dives-Pelican mines at Silver Plume, Colo., has gone on a visit to Florida.

George P. Earle, representing large interests in the Nipissing mine, was in Toronto March 12 last.

A. J. Carlson, of Idaho Springs, Colo., has returned from a trip on mining business to eastern points.

G. F. Crawford, of Kansas City, Mo., has been in Clear Creek county looking after interests in the Kinda Mining Company.

William Loack, manager of the Wolf Tongue Mining Company of Boulder, Colo., is on a business trip to eastern points.

Vivian P. Strange recently conducted an examination of the Ludwig and Nevada Douglas copper mines at Yerington, Nevada.

Harold I. Brosius has accepted the position of assayer and chemist to the Imperial Gold Mining Company at Apex, Colorado.

Richard Wallace, of Boulder, Colo., has gone to Chihuahua, Mexico, to examine mining property in the interests of Pittsburg people.

J. B. Woodworth, formerly manager of the Nova Scotia mine, Cobalt, and H. V. Somerville, an English engineer, have left Cobalt for Mexico.

J. M. Cameron has left Goldfield, Nev., and has accepted the position of manager for the Butte Central & Boston Copper Company at Butte, Montana.

Carl E. Ambrosius, a member of the Colorado School of Mines class of 1888, who is located at Guanacevi, Mexico, has been in Colorado, on a business trip.

Walter H. Weed, mining geologist of New York, returned March 9 from an extended visit to Haiti, where he has been engaged in examining mining properties.

W. H. Knowles, a mining operator of Gilpin and Clear Creek counties, Colo., has gone to Los Angeles, Cal., having become interested in the new Greenwater camps.

Marshall S. Walker has gone to Cable, Montana, representing J. V. N. Dorr, consulting engineer. He is to plan an installation of the Moore process at the Southern Cross mill there.

Arthur H. Collbran, of the Colorado School of Mines class of 1902, who is superintendent for a syndicate at Seoul, Korea, has been visiting in Colorado during the past month.

F. G. Scheffer, a German mining expert, has been looking at the mines of the Waldorf Company in Argentine district near Georgetown, Colo., in the interests of a London syndicate.

Albert A. Ireland, of Golden, Colo., superintendent of the Dewey and Waukegan companies in Summit county has also been appointed superintendent of the Atlantic Mining and Milling Company.

J. J. Bonner, formerly connected with the Revenue tunnel at Ouray, Colo., and with the Commodore property at Creede, Colo., has taken charge as manager of the Charter-Raton mines at Empire, Colorado.

H. Hayman Claudet, of Claudet & Wynne, Rossland, B. C., has been in Sonora, Mexico, the past few months and is now in Mexico City, in connection with installations of the Elmore vacuum oil separator.

W. D. Newcomb, chief engineer of the Osage Coal and Mining Company, and the Great Western Coal and Coke Company, of South McAlester, I. T., had an attack of heart failure a few days ago and is at Eureka Springs recuperating.

Harry D. Easton, of Hartshorne, I. T., assistant engineer for the Rock Island Coal Company, has resigned his position to accept that of division engineer of the Deering Coal Company, with headquarters in Chicago, and mines in Indiana and Illinois.

G. C. Hewett, of Colorado Springs, Colo., has been appointed consulting engineer of the London mine, in the Mosquito pass section, Leadville. Mr. Hewett is now on a trip to the East, his address being at Wyncote, Montgomery county, Penn., for the next month.

Dr. Robert Bell, of the Canadian Geological Survey, in giving evidence before the Canadian senate committee on Hudson bay, stated that he had gone into Hudson bay half a dozen times and was satisfied that the straits were navigable from the middle of July to November.

Philip Argall, of Denver, Colo., who was last year consulting metallurgist for the Golden Cycle Mining Company of Cripple Creek—but no longer connected with that company—is now busy designing two mills for the treatment of Cripple Creek ores on the mines in the district.

N. V. Hansell, of Hamilton & Hansell, mechanical, electrical and mining engineers, of New York, has just returned from Sweden, where he has been making a special study of the magnetic separation of iron ores and the magnetometric instruments for investigating iron-ore deposits.

T. H. Oxnam has succeeded Charles E. Finney as general manager of the Arizona Smelting Company, of Humboldt, Ariz. Mr. Finney has become president of the Dripping Springs Mines and Smelters, a new company, which has been organized to develop mines about 25 miles south of Globe.

Col. William Busby, of South McAlester, I. T., president of the Osage Coal and Mining Company, and the Great Western Coal and Coke Company, and Carl Scholz, of Chicago, president of the Rock Island Coal Company, have been in Washington, D. C., during the past week on business connected with their Government coal leases in the Indian Territory.

Henry White, of Spokane, Wash., is developing a copper property in the Inyo mountains, California, two miles east of Mt. Whitney station. Mr. White was the original owner of the property now being operated by the Granby Company at Phoenix, B. C., and was associated with Jay P. Graves in the early development of that property.

Charles S. Morris, for four years superintendent of the Utah Consolidated Mining Company's smelter at Murray, Utah, has resigned and will go to the Cerro de Pasco Mining Company, in Peru, which is now being operated under the direction of R. H. Channing, former manager of the Utah Consolidated. Mr. Morris is succeeded by Alexander Laist, formerly of the Washoe Smelting Company, at Anaconda, Montana.

Crowell & Murray, mining engineers, chemists, assayers and metallurgists, of Cleveland, O., succeeded to the business of Crowell & Peck last month. C. B. Murray, who has joined Benedict Crowell in the new firm, was formerly chief chemist at the Edgar Thompson works of the Carnegie Steel Company, and for the last three years has been president of the Metallurgical Laboratory at Pittsburg, Penn. The new firm has its office and laboratory in the Perry-Payne building, Cleveland, O. The entire office and technical force remains as previously.

Obituary

Sir Francis Tress Barry, head of Mason & Barry, Ltd., owning mines in Portugal, died recently in England at the age of 83 years.

Henri Moissan, the distinguished French chemist and metallurgist died in Paris, March 2. He was born on Sept. 8, 1852, and for the past 20 years his

life was devoted to scientific research. M. Moissan was one of the most brilliant students in the Ecole de Chimie Minerale and later (1877), while nominally employed by the National History Museum of Paris, he published a paper on the oxides of the iron group which obtained for him the doctorate of science at the University of Paris. Great chemical researches stand to the credit of M. Moissan. Taking up the work where Davy, Faraday, Fremy and others had failed, for instance, he succeeded in 1886 in isolating the element fluorine by the electrolysis of anhydrous hydrofluoric acid. Of late years Moissan devoted his attention to the study of the electric furnace, the preparation of refractory substances and a series of new chemical compounds. He succeeded in producing a number of artificial diamonds. They were extremely minute, but nevertheless diamonds. Other elements which were prepared by Moissan were chromium, tungsten, molybdenum, uranium, titanium, etc. Only the purely scientific side of these investigations appealed to the chemist and he did not develop his discoveries commercially. Other investigators carried on the work and made commercial successes of the preparation of calcium carbide and ferro-alloys. As a lecturer, as a chemist and as a man Henri Moissan will long be remembered among scientists.

It is reported that William Monroe, of Lansing, Mich., was among the passengers lost in the wreck of the "Berlin" at the Hook, Holland. Wm. Monroe was a native of Lansing, and graduated from the Michigan College of Mines. He was for several years after graduation an assistant in an assaying establishment in Houghton, and was then appointed to the management of several silver-lead mines in British Columbia. He subsequently opened an assaying office in Spokane, Wash., which he successfully conducted for several years. Later he removed to Tonopah, Nev., to look after the mining interests of an eastern mining syndicate. Wm. Monroe resided in Nevada for two years. For short intervals he was an assistant in the assaying offices of Messrs. Hewitt, Symonds & Atkins in Tonopah. Two years ago he was appointed managing engineer to an American corporation which is developing a colliery in Spitzbergen. He was on his way to Norway in connection with the corporation affairs when he met his death. He was a cultivated man, of high moral character, and his loss will be distinctly felt by many mining men who had the privilege of making his acquaintance on the various fields on which he was engaged.

Industrial

The Central Iron and Coal Company, operating Holt furnace at Tuscaloosa, Ala., is adding to its mine equipment, being in receipt of a No. 3 Thew automatic steam shovel to be used at its Woodstock brown ore mines. The delivery of a third large three-stage, Ingersoll-Sergeant air compressor, a compound air locomotive built by H. K. Porter & Co., and a duplex pump built by the Herron Pump and Foundry Company, Chattanooga, to be used at its Kellerman, Ala., coal mine, is expected.

The American Spiral Pipe Works, of Chicago, have taken over the entire business and good will of the American Forged Steel Flange Company, which has had a large business in making forged steel flanges for every class of work.

The plant, assets and good will of the St. Louis Portland Cement Company, manufacturer of the "Red Ring" brand Portland cement, have been purchased by the Union Sand and Material Company, of St. Louis. The manufacture of portland cement will be under the direct management of H. Struckmann, chief engineer and general manager, as heretofore. The capacity of the plant will be increased to 10,000 barels per day. The new plant will be equipped with gas engines and producer gas will be used as fuel for the kilns, the whole plant being driven electrically.

Societies and Technical Schools

Senior Mining Society, Columbia University—This society, which consists of a limited number of students of the senior class of the School of Mines and some members of the faculty, has been in existence for a number of years. The object of the society has been to meet men prominent in the mining profession in an informal way, and to learn from them points of interest which they have gathered from their work in the field. The society has been addressed at one time or another by most of the prominent mining men of this country. So far this year the following gentlemen have addressed its meetings: A. A. Blow on "The Copper Deposits of Butte;" Juan Felix Brandes on "Mining as a Business;" Emil Weinheim on "Placer Deposits of Alaska," and John A. Church on "Mining Experiences in China."

American Society of Mechanical Engineers—This society was addressed on March 21 by John W. Lieb, Jr., vice-president of the society. The subject was "Vesuvius and Pompeii," and was illustrated by lantern slides from original photographs taken by F. A. Perret, who was in the Vesuvian observatory during the last eruption, and from photographs taken by Mr. Lieb during a visit to Vesuvius and Pompeii shortly after the eruption. A series of lantern slides, showing the state of the mechanic arts in Pompeii, had been especially prepared for this lecture. Through the courtesy of E. Burton Holmes, a series of original moving pictures of Vesuvius in eruption, and of a flowing stream of lava were shown by Oscar B. Depue. The meeting took place in the spacious auditorium of the new Engineering Societies building at 29 West Thirty-ninth street, New York.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

B. F. Sturtevant Company, Hyde Park, Mass. Bulletin 125. Sturtevant Engineering Series. Pp. 8, illustrated; paper, 6x9 in.; February 1907.

The Westinghouse Machine Company, East Pittsburg, Penn. Catalog S. The Westinghouse Storage Battery for Stationary Use. Pp. 31, illustrated, paper, 6x9 inches.

Allis-Chalmers Company, Milwaukee, Wis. No. 4002. Allis-Chalmers Direct Current Motors and Generators Type "K" and Monthly Calendar. Pp. 4, illustrated, paper, 3½x6 in.; March, 1907.

Construction News

Enterprise, California—The Calonois Mining Company will soon put in a 10-stamp mill. W. C. Fowler is president and general manager.

Breckenridge, Colorado—A new hoist and pumping plant are to be installed at the Sallie Barber mine. J. C. Putner, of Denver, is the president.

Idaho Springs, Colorado—An electric plant is to be installed at the Gold Hammer group. H. J. Mortelon, Idaho Springs, Colo., is manager.

Black Hawk, Colorado—The Pewabic Consolidated Gold Mines Company is preparing to enlarge its mill. J. C. Fleschutz, Central City, Colo., is president.

Georgetown, Colorado—The Mendota Mining Company is considering the erection of a mill to treat 150 tons of ore daily. Mr. Gordon, of Georgetown, is manager.

Central City, Colorado—The School Hill Mining Company intends to add an air compressor and a new hoisting engine to its equipment. John N. Mackey, Black Hawk, Colo., is superintendent.

Phoenix District, Gilpin County, Colorado—The Champion Mining Company is preparing to put in pumps, hoists and a wire-rope tramway. S. P. Weller, Rollinsville, Colo., is president and general manager.

Loon Creek, Idaho—The Loon Creek Hydraulic Placer Company is preparing to equip its property with a complete hydraulic plant, including pipe, dynamos, giants, tailing stackers, etc. J. Frank Judge, Salt Lake City, Utah, is president and manager.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

March 23—The [illegible] Mountain Copper Company, Keswick, Shasta county, has sent out circulars in that [illegible] for fluxing purposes which shows that the company is again in the market for ore. This means a good deal to the small mine owners in this district and in Flat Creek, Lower Springs, Whiskey Town, Shasta and Old Diggings districts. There are scores of small mines as well as a few big ones that can now be worked profitably, for the company is willing to treat the ore for practically nothing, deriving its profit from the quartz for flux. The Mountain Copper Company will not be able to get flux as readily as it did before; the smelter company at Kennett has since entered the field, consuming nearly all the gold ore it can purchase, even making shipments from Oregon and Tonopah.

Owing to the increase of working hours from nine to ten hours daily, most of the men employed by the Grouse Creek Hydraulic Mining Company, near Callahan, Siskiyou county, have quit work. In years prior to this it has been the custom at placer mines in that vicinity that nine hours should constitute a day's work. This year, with the scarcity of miners, the same hours were adopted in the placer as in the quartz mines.

Negotiations are in progress for the purchase of the Sargent & Jacobs hydraulic mine, at Quaker Hill, near Nevada City. It is the intention of the men interested to run a bedrock tunnel from Dry Creek and work the ground by the drift process. The mine has lain idle for years. It was originally the property of the late A. A. Sargent and the late George F. Jacobs. They took out several hundred thousand dollars in gold by the hydraulic process. The drifting process will only handle the richer gravel nearest bedrock instead of washing the entire bank as in hydraulicking.

The Folsom Development Company, which is engaged in gold-dredging near Folsom, Sacramento county, is about to utilize the vast piles of cobblestones piled up by the "stackers" during the process of the work. It is these unsightly piles of cobbles which arouse the ire of those opposed to the dredging industry. The cobbles are now to be crushed on a large scale, and the crushings sized, to be used for railroad ballast, macadam and cement rock. It is estimated that the cobbles will be used as fast, if not faster, than the dredge turns them up. In this event it would be but a short time until all the cobble pile between Folsom and the settlement of Dredge would disappear, and the land, which was previously in poor shape because of former mining operations, left level and solid and in condition for cultivation. It is a well known fact that the rock quarries which supply the Folsom prison crusher will probably give out within twelve or eighteen months. This rock has been in great demand from all parts of the State, and it is probable that the rock to be crushed by the Folsom Development Company will be in equal demand. It would not be surprising if in the future the new industry proved as profitable as the dredging operations. Crushed rock is in a very great demand all over the State, and especially in San Francisco, where vast quantities of concrete are being used.

Modoc county, in the extreme northeastern portion of California, is coming to the front as a mining county. Numbers of prospects have been found, and are being developed to prove their worth. There have been numerous sales recorded lately, and preparations are being made for very active work this coming summer. Moreover, in addition to gold, prospecting is going on for coal at Stone Coal Valley, near Canby. It is thought that the coal deposits are quite extensive along the Pitt river, not only where the Pitt River Coal and Fuel Company is at present at work, but elsewhere.

Not only in the Greenwater mines, Inyo county, but elsewhere throughout the State good miners are scarce. At Greenwater the scale of wages is high: $5 for men underground and about $6 a day when work is done by contract. More miners could be employed if they could be obtained, so that development work is being retarded materially. A number of mines in the upper part of the State are being worked by one shift only when three shifts are wanted. The men can get work in San Francisco at from $3 to $6 per day, where there is more amusement for them than in the mountains and foothills, so they prefer the city. The $3 a day rate does not satisfy them in the mines.

Salt Lake City

March 14—Slow progress has been made on the new Western Pacific Railroad, which is building westward from Salt Lake, during the past two months. [illegible] down and the line is beyond the Nevada State line a considerable distance. All along the route of this new route much mining activity is in evidence; particularly in the Deep Creek district, in western Utah and eastern Nevada.

The washouts on the line of the San Pedro, Los Angeles & Salt Lake Railroad, in southern Nevada, have put through traffic on that road out of the question for several weeks, at least. In the meantime the southern districts are cut off from the Salt Lake markets. The trouble experienced last year and again this year has set the management to thinking about the advisability of building a new line to the west of the present one, in order to avoid the Meadow valley wash. Should this be done the main line would run within a few miles of Pioche.

The management of the Cactus mine, in Beaver county states that this month's net earnings will exceed $250,000. About a car of crude ore and two cars of concentrate are being shipped per day.

Two sections of the new mill of the Utah Copper Company will be in operation by the end of March, by which time the power plant will be ready for commission.

The Alta Mizpah Copper and Gold Mining Company is the name of a new corporation that has just been organized to develop a property near Alta. The incorporators are: J. U. Eldridge, Lewis Levine, Jasper Billings and C. J. Jenkins, of Salt Lake. Considerable milling ore has been developed in the property.

The ore and bullion settlements in Salt Lake during the past week were reported by Salt Lake banks as being $602,000 in [illegible]

Denver

March 15—The State inspector of coal mines has just issued his twelfth biennial report, which shows that the tonnage in 1906 was 10,308,421. During the past year a large amount of capital has been invested in new fields, especially in Boulder, Weld and Las Animas counties, with modern equipment at the new mines.

Judging from the latest reports, the State's attorneys in Idaho believe that they have stronger cases against Haywood and Pettibone than against Moyer, the president of the Western Federation of Miners. A strong effort for a change of venue is being made on the part of the defense.

A suspension of operations was urged by President Bernard, of El Paso Con-

solidated Gold Mining Company, at the annual meeting of the stockholders, a few days ago, until the second drainage tunnel, on which work has just been commenced, shall be completed. A portion of the property is being worked under lease and that work will continue. The new tunnel will strike the property at a depth of about 1350 ft. During the year 1906 the mine produced $801,447 worth of ore and up to date has paid $1,242,045 in dividends. The average value of the ore shipped by the company was $36.95. No change in the management of the company's affairs was made.

A strong effort is being made to get the railroad companies hauling the Leadville manganese ores to reduce the rates on the same. A large amount of these ores is shipped to the Illinois Steel Company at Chicago.

It looks as if the Union Pacific Railway Company will have trains running to Craig, Colo., in Routt county, before the Moffat line reaches that point. A large force of men and 200 teams are building a branch line from Wamsutter, Wyoming, and down Fortification creek. The heavy work of construction through Gore cañon will delay the completion of the Moffat line through Routt county.

A consolidation of the Central Colorado Power Company, capitalized at $22,000,000, and the Northern Colorado Power Company, capital $10,000,000, seems to be probable. The deal practically represents a consolidation of all the important small electric plants in the State. Former Governor M. T. Herrick, of Ohio, who is supposed to represent General Electric Company interests, has been here for some time. It looks as if all the electric lighting and power plants in Colorado are to be absorbed. The amount of capitalization of the combination is reported to be $50,000,000.

An electric locomotive, the first one in the Telluride district, has recently been installed in the Tomboy mines at the Cincinnati tunnel, supplanting the horse-power used so long, and it seems to work satisfactorily, reducing the expense of haulage considerably.

Scranton

March 19—A unique action has been tried during the past week in the United States Court in Scranton, in which the Lehigh Valley Coal Company was sued for the royalty on coal mined under Scovel island, at the confluence of the Susquehanna and Lackawanna rivers, near Pittston. Experts from all parts of the anthracite region have been called to give testimony and a continuance has been made for 12 months, so that an amicable settlement will, in all probability, be made. The real issue in the case was the amount of coal underlying the island. Comparatively little mining has been done in that section since the caving in of the workings in the Twin shaft, in 1895, when the whole formation collapsed, including that part now in dispute. For the time the gangways leading to the workings in the Scovel island tract were closed, rendering mining of the coal impossible until the new gangways were driven. The lease of the coal to the Lehigh Valley, however, provided that the company should pay a minimum royalty each year. These payments continued, until finally the Lehigh company claimed that the value of the coal workable under the island had been paid for. Thereupon Mrs. Bunnie L. Harris, one of the lessors of the coal, brought suit against the company, alleging that the royalties paid did not represent the aggregate value of the coal under the tract. During the case, to determine the amount of coal under the island, the cores from several bore-holes were brought into court and experts were called to give testimony as to what the cores revealed concerning the value of the coal veins. The coal men who watched the progress of the action claimed that the bore-holes could not be relied upon to prove the value of the coal veins on account of the variations in the seams. Finally a temporary agreement was reached, whereby two of the claims of the plaintiff were allowed, and the other claims are to be referred to arbitrators. The case has attracted great interest among coal operators throughout the anthracite region.

The anthracite miners are entitled to an increase of 6 per cent. in their wages for the month of March, according to the report of Commissioner C. P. Neill.

Some dissatisfaction is being expressed throughout the anthracite region at the delay on the part of the umpire in rendering his decisions in the cases which have been referred to him from the Conciliation Board. At the meeting of the board, held March 16, it was decided to communicate with Mr. Neill and ask that immediate action be taken by him in connection with these cases. These grievances have been sent to him since last July. One of them is the famous "bony" case from the employees of the Delaware & Hudson Company, in Plymouth, which he decided once previously, but which was again taken before the board and again sent to the umpire.

Cobalt, Ont.

March 15—Shipments of Cobalt ore for the week ending March 9 over the Timiskaming & Northern Ontario Railway were as follows: Buffalo, 60,000 lb.; Coniagas, 62,850; Cobalt Central, 34,920; Colonial, 34,250; La Rose, 65,000; Nipissing, 128,840; O'Brien, 64,740; Trethewey, 193,590; total, 644,190 pounds.

There is a considerable influx of prospectors to James township and adjacent localities up the Montreal river, lying immediately east of the Temagami timber reserve, and partly included in it. Some native silver has been found, and the similarity of the formation to that of the Cobalt area is a stimulus to exploration. From 300 to 400 claims have been staked, and the arrivals are estimated at about a hundred per day.

London

March 9—The prospectus of the Vancouver Copper Company, Ltd., has been issued this week. This company has been formed to float the Lenora mine, on Mt. Sicker, Vancouver Island, together with other property, including the railway to Crofton, the local hotel, and a number of town sites. Your readers may remember that the mine was first opened up in 1899, and that it adjoins the property of the Tyee Copper Company. For some years it was worked, and large amounts of ore extracted, but latterly it has been shut down. During the time it was not worked the care-takers discovered other bodies. The plant is still in place and is capable of handling 140 tons a day. Now that copper is so high in price it is expected that a good profit can be made by handling the ore. It is intended to ship it to the Crofton smelter. The capital of the new company is £110,000, of which £80,000 is being offered for subscription. There are also £20,000 in debentures. The purchase price is £100,000, payable as to £20,000 in debentures, £30,000 in shares, and the remainder in as much cash as is available. The reports on which the company is floated are by E. P. Gilman and Henry Croft.

Although the Champion Reef and Coromandel mines, in India, have shown signs of coming to the end of their life, their old original parent, the Mysore Gold Mining Company, continues to prosper. During the year 1906, the amount distributed in dividends was £418,674, which is practically identical with the distributions during 1903, 1904, and 1905. Since the commencement of operations in 1886, the total distribution has been nearly five million pounds. During 1906 the ore crushed was 185,900 tons, yielding 184,163 oz. of bar gold. By cyaniding, 21,755 oz. were extracted from 158,848 tons of tailings. The total production was 205,918 oz., which realized £809,413. The expenditure during the year was £318,923. The new orebody referred to in last year's report has continued to open up well, and promises to be a most valuable addition to the resources of the mine. The unreliability of water falls for the purpose of generating power at mines has been well exemplified at Mysore this year by the failure of the Cauvery falls to supply the expected amount of power. The stamp batteries and other metallurgical and mining plant have had to fall back on their steam engines during part of the year, and the amount of development has been curtailed, all through the droughty nature of the season.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

KNIGHT'S ISLAND

Wm. Egan has made a sale of the copper property in Two Arm bay, southeast end of Knights island, for $100,000 to Paul Denhart, of Nome, Ed. Becker and John Kirn, of Fairbanks.

COPPER RIVER

Alaska-Bremner—This company is preparing to work this summer a group of 16 claims on Bremner creek, a tributary of Copper river. George Davison is in charge.

Arizona

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports the production of its works at Clifton for the month of February at 1286 short tons of copper.

YAVAPAI COUNTY

Commercial Copper Company—The parties leasing on this company's property in Copper Basin are shipping two cars of ore per day to the Humboldt smelter.

Logan Copper Company—Parties from Chicago have taken over the majority interest in this company, and will commence development work on a large scale in the near future.

California

AMADOR COUNTY

Bright—This property is being unwatered under direction of Geo. Tucker for intending purchasers, and a careful examination will be made.

Bay State—While the mill on this mine has not yet been started, it soon will be. A good-sized body of ore of fair quality has been found.

BUTTE COUNTY

Calonois Mining Company—This company has been organized, with W. C. Fowler as president and general manager, to work a mine near Enterprise, in which a shaft has been sunk 400 ft. A two-stamp prospecting mill is in use and this will be enlarged to 10 stamps.

EL DORADO COUNTY

Last Chance—A new 10-stamp mill has been placed on this mine at Nashville, owned by Dr. A. Smith, of Portland, Oregon, who has been developing the property several years.

Shaw—Arrangements are being made to reopen and work this mine near El Dorado.

Delwich—This mine, near Georgetown, is being examined with a view of reopening it and working on a larger scale than formerly.

Mount Pleasant—In this mine, near Grizzly Flat, a 3-ft. ledge carrying high-grade ore has been found at the crosscut on the 1000-ft. level.

INYO COUNTY

Gladstone-Greenwater Company—The tunnel to tap the ledge of this property at Greenwater, R. E. Tally, superintendent, is now in 300 ft. and will be continued for about 200 ft. further.

Greenwater-Calumet Copper Company—In this property, west of Furnace, a new ledge has been found. This group was recently sold for $100,000.

Greenwater Copper Mines and Smelting Company—This company has been incorporated in Delaware with a capital of $25,000,000. The company was formed to take over the Greenwater-Death Valley, United Greenwater and various Brock claims in that district. The head of the new company will be Charles R. Miller, vice-president of the Tonopah Company, of Nevada. Charles M. Schwab has a large interest in the new company. The directors will be C. R. Miller, J. W. Brock, C. M. Schwab, W. Heyward Drayton, 3d, M. R. Ward, L. H. Dessar, Malcolm MacDonald, D. B. Gillies, J. E. Brown and Frank Keith. M. R. Ward will be vice-president.

Rice's Camp—This section of Greenwater district is about 20 miles south of the town of Greenwater. W. M. Alter has obtained options on several claims at Rice's, carrying lead, silver and copper. Some rich rock has been found in that locality recently.

Strike—A new strike of gold ore has been made seven miles northeast of Rhodes Springs, and a number of locations have been made by C. W. Patrick, John Perdue, W. H. McElvain, J. J. McLaughlin, Thomas Bradbury, A. J. D'Arcy and others.

KERN COUNTY

Tungsten—Another carload of tungsten ore has been shipped from Atolla to Germany.

MODOC COUNTY

Discovery—Kafader Bros., owners of this mine in Hoag district, 10 miles north of Bidwell, have struck the 5½-ft. ledge for which they have been tunneling this winter. The rock is of satisfactory value.

NEVADA COUNTY

Mineral Point—At this mine, near Gaston, owned by Arthur C. Smith and J. B. Grissel, they have a 30-ft. ledge of quartz upon which two tunnels are being run.

Coan—At this mine, near Nevada City, owned by Thomas N. Coan, a four-stamp mill has been erected and started up by water power.

Maryland Consolidated Mining Company—It is stated that this mine at Grass Valley will be re-opened shortly, General Manager Bray Wilkins having succeeded in obtaining necessary funds. It is the intention to sink the shaft 1000 ft. deep and open up a large area of virgin ground.

Colorado

CLEAR CREEK COUNTY

Cardigan Mining and Leasing Company—Pittsburg, Penn., people have taken up the option on the Cardigan, paying the sum of $25,000, and are installing new machinery. Herman Karpeles, Idaho Springs, is manager.

Arapahoe Group—A syndicate of English capitalists is reported to have purchased this property, paying $40,000 spot cash to J. J. White and others of Georgetown. High-grade gold and silver ores have been found in the property, and heavy developments will be carried on.

GILPIN COUNTY

Calhoun Tunnel and Mining Company—Chicago and Denver people have purchased the Calhoun group of claims in Leavenworth gulch, for a reported sum of $40,000, have started operations on the 1000-ft. shaft and intend to drive a lateral from Newhouse tunnel to open up property with increased depth. H. C. Eastman, Central City, is manager.

Chase—St. Louis, Mo., people, the owners and leasers, have opened up ore in the 300 east level which gives high values. J. A. Gilmour, Central City, is manager.

Santa Loreta—It is reported that arrangements are being made to install an air-compressor plant at the Colorado-Carr mine. Heavy developments will be carried on, and the leasing system will be inaugurated. F. H. Symonds, Providence,

R. I., is president and Joseph Tuckfield, Central City, Colo., is superintendent.

Sharon—Manager G. P. Goodier, Central City, Colo., has arranged for the installation of an air-compressor plant, heavier hoisting machinery and enlargement of shaftbuildings on the Gem in Russell district. The property is producing high-grade mill and smelting ores.

Castleton—Cleveland, O., people are interested, and they have resumed operations, and are making tests with cyanide treatment on their ores at the Woods establishment in Denver. If the treatment is a success it is reported that they will purchase a mill at Idaho Springs and will treat their tonnage at that point. Large bodies of low-grade ores have been opened up in the property. W. M. Kirk, Russell Gulch, Colo., is superintendent.

Gold Collar—A compressor plant is to be purchased and heavier developments will be carried on. A. Skeels, Central City, is manager.

LAKE COUNTY—LEADVILLE

Black Prince—This property, Breece hill, is under lease to Hanifen & Reynolds, who sunk the shaft deeper, drifted and caught a fair body of ore from which they are shipping regularly. The same parties are also leasing on Penn No. 1 and shipping a car of good iron daily; the ore is being taken from the old Breece shoot that was opened a number of years ago.

Bug Gold—Recently a sample carload of free milling ore was sent from this property, English gulch, to Denver and netted ½ oz. gold per ton. Another car will be sent out during the week and if the returns are as satisfactory a mill will be erected on the property this summer to treat the body of this grade of ore that is in sight.

Cloud City—In this mine, down-town section, the main shaft is down 625 ft. and exploration work is being carried on from this point with the diamond drill. Prospect work is also being carried on in the main portion of the property.

Dome—This shaft, Rock hill, belonging to the Iron Silver Mining Company, has been sunk to the lime contact and extensive prospecting is being carried on in various directions.

Forest City—This mine, Yankee hill, is owned by the Small Hopes Consolidated Mining Company. The Kerens shaft has been leased to Thomas Gilroy, who has started work in the old workings. There is still a large body of ore left which Gilroy will work and also extend the drifts into virgin territory. Isaac Nylander is leasing on the Result shaft, 400 ft. southwest of the Kernes shaft and shipping oxidized iron from the 200-ft. level.

Green Mountain—The lessees on this property, Ball mountain, have secured the right to drive the Tiger tunnel ahead to cut the Green Mountain vein. When the vein is caught, all of the work will be carried on from the tunnel level.

Ibex—Albert Hahnewald and associates are leasing at the 800-foot level of No. 4 shaft, and have opened the richest body of ore that has been found in the mine for a number of years. The orebody is 8 ft. wide, and 2 ft. of it runs high in gold. All of the rich ore is sacked, and the lessees are shipping.

Midland—This company, Iowa gulch, is driving a tunnel from the base of the hill to cut the Mansfield shaft at a depth of 175 ft.; the shaft is down 700 ft. and the water is up to the collar. At the 175-ft. level there is a good streak of ore which will be developed with the hope that it will lead to an orebody. The same company is working the Helena and shipping a good grade of galena and sulphide ores.

Morocco—This company, Harrison avenue, is shipping 600 tons a month of manganese ore to the Pueblo steel works; the ore comes from the 400-ft level.

O'Donovan Rossa—In this mine, on the southern slope of Carbonate hill, improvements on the surface are completed and the shaft, 330 ft., is being re-timbered; when this is completed the shaft will be sunk 270 ft. deeper. Development work will be carried on from this point toward the Wood fraction.

R. A. M.—This mine, on the northwest slope of Iron hill, has been leased to the Langlola Mining Company, with Edward Hanifen, manager. Work will be carried on at the 1018-ft. level where bodies of zinc ore are available; in addition to this work will be carried on in the iron ore channel.

Silent Friend—This mine is in South Evans and located on Little Ellen hill. A new plant of machinery has been installed and the lessees will sink the shaft another lift of 100 ft.; the present depth of the shaft is 387 ft. From the upper workings the lessees have shipped considerable ore.

SUMMIT COUNTY

Abundance—This company has just held its annual meeting in Kansas City, at which Dr. S. B. Prevost was re-elected president. The company has laid out a plan for extensive operations this year.

New York—This group, on Gibson Hill, is receiving attention. A trial shipment of the complex ore containing lead, zinc and iron pyrites has been made to the sampler, where its value will be determined and thence to testing works where the best method of treatment will be ascertained.

Sallie Barber—This silver, lead and zinc property, on Bald mountain, has been sold to J. C. Putner, of Denver. A hoisting and pumping plant is to be installed immediately on the top of the main shaft.

Beaver Creek—This company has been reorganized under the title of the Swastika Mining Company, with a capital of $2,000,000. S. H. Dunlap is manager.

Reliance Dredging Company—J. A. McDonald, the dredgemaster, has been having his plant thoroughly overhauled but is now awaiting the decision of the Colorado Consolidated Mining and Electric Power Company in connection with the intended sale of the Gold Pan plant to the large placer company now owning the Swan and Blue river placer lands. The dredges to be operated on the Swan and Blue rivers are to be propelled by electric power and the Reliance Company is trying to make arrangements for like power. Ben Stanley Revett is at the head of both of these enterprises.

Swandyke Gold—This company has been carrying on a series of experimental tests on ore obtained from the Three Kings mine and, on good authority, it is stated that the results were better than was expected. It is the intention of the company to further exploit the orebodies and their treatment with the idea of installing a large treatment plant.

Idaho

CUSTER COUNTY

Loon Creek Hydraulic Company—This company has commenced work on its big ditch, and is preparing to work its placer property on Loon creek, on a large scale.

Illinois

Ohio Oil Company—This company, the local representative of the Standard Oil Company, shipped about a million barrels of petroleum from Illinois in February. In addition, three other companies shipped small quantities of oil.

Indiana

PIKE COUNTY

William Jackson, who recently resigned as superintendent of the Princeton Coal Company, has begun testing several hundred acres of land north of the Massey mines, on the Evansville & Indianapolis Railway, with a view of sinking a shaft and opening a coal mine. The Massey vein is 7 ft. in thickness, and the mine has doubled its output during the past year. Although the shaft is in Gibson county, the coal is being mined from under Pike county.

Blyth Hendricks, of Petersburg, has also leased a thousand acres of land east of Jackson's investment, on the Southern Railway, and he is preparing to operate an extensive mine this year.

Michigan

HOUGHTON COUNTY—COPPER

Osceola Consolidated—The annual meeting, which was called for March 14, in Boston, was postponed until April 1, the Bigelow party having obtained from

the United States Circuit Court a temporary injunction against the voting of the stock and proxies held by the Caumet & [illegible] at the meeting. The hearing on the preliminary injunction is set for March 25 next.

Missouri

[illegible]

Connor Land—The Hawkeye Zinc Mines Company, recently organized, has purchased the 20-acre lease of the Lyon Mining and Investment Company on the Connor land, south of Carterville, and will soon begin the erection of a modern 300-ton concentrating plant at the shaft on the south 10 acres.

Deep Drilling—Much interest has been shown in the deep well being drilled by the Mercantile Metal Milling Company at their Congress mine on the Guinn land, north of Webb City. The well was drilled for the purpose of supplying pure water for the boilers at the mine, but the different strata penetrated by the drill have been studied with much interest. The drilling was stopped at 1000 ft. From 50 ft. down to 300 ft. mineral was found at intervals, but at that depth hard rock was penetrated, and the drill continued in very much the same ground until the drilling ceased. Of course, the finding of no ore below 300 ft. was a slight disappointment, but does not signify that there is no ore, even in that locality, as there are several blank holes down to 200 ft., and some of the best mines in the entire district are on this land. Deep deposits of ore have been found near Joplin, and other points, in drill-holes that were sunk below 1000 ft. Up to the present time, however, it seems that the largest bodies of ore are found not deeper than 300 feet.

Guinn Land—The Ice Plant Mining Company, operating on the Guinn land, north of Webb City, is erecting a modern 250-ton concentrating plant, which will be operated by electricity. Drifting on an 11-ft. face of ore, sufficient development work has been done to insure steady operation. The company owns a lease on 10 acres.

[illegible] Land and [illegible] Company—This company has begun the installation of an addition to its electric power-house in Joplin, enlarging the capacity to 1600 h.p. A steel and concrete structure, 45x60 ft. is to be erected beside the present frame building.

Porto Rico—This camp is between Prosperity and Duenweg, southeast of Webb City. Eighteen months ago the only producing mines in that vicinity were the three or four on the north end of the Porto Rico tract, more commonly known as the Ground & Irwin lease. Today there are between 15 and 20 new concentrating plants in operation, all of which have been built within the past year, while as many more shafts are being sunk.

Montana

Butte District

Anaconda—Shipments of ore from the mines of this company are heavy, all work having been concentrated on the veins. The output for March will be large, barring trouble. The Neversweat, Anaconda, High Ore and Mountain Consolidated are the leading producers, the new vein struck recently in the latter adding materially to the output.

Boston & Montana—The company has suspended all development work, pending a settlement of all differences between it and its employees concerning wages, but expects to resume soon. It began pumping water from the shaft on the Greenleaf March 12, with a view of confining the seepage to the lower openings. This shaft is 700 ft. deep and contains 200 ft. of water. The company is mining and treating more ore in its smelter now than it has in several months, the quantity averaging about 5600 tons a day. The two blast furnaces from which the fire was drawn early in the winter, on account of a shortage of coke, are again in commission. Sinking will be resumed in the Badger State and West Colusa mines within a week.

Davis-Daly—Drifting is progressing east and west on the 10-ft. vein struck recently south of the 500-ft. station of the Smokehouse. This vein contains some commercial copper-silver ore, but the quantity is limited. It is better in the west drift than in the east. The face of the former is 170 ft. from the crosscut and that of the latter 126 ft. The shaft on the Colorado is 730 ft. deep and that on the Mt. Moriah 600 ft. The face of the crosscut south of the 1800-ft. station of the Original has advanced 1450 ft. without having cut ore in paying quantity.

North Butte—The company announces an increase in ore production, a total of 1300 tons a day. It has crosscut the Edith May vein at a depth of 1800 ft., and is finishing a station in the main shaft at this depth. There are large ore reserves on the 1600-ft. level.

Nevada

[illegible] County [illegible]

Ore Shipments—Shipments over the Tonopah Railroad for the week ending March 7 were: Tonopah Company, 900 tons; Tonopah Belmont, 380; Tonopah Extension, 290; Midway, 42; Montana Tonopah, 74; total, 1686 tons. Additional shipments from Goldfield were 400 tons, making a total of 2086 tons.

Montana-Tonopah—The general manager has issued a report dealing with the company's operations during the three months ended Feb. 28. In that period 1463 ft. of development work was done, including 1327 ft. of drifting and 136 ft. of raising. Over 6000 tons of material was mined and raised, including 1368 tons of shipping ore, 999 tons of mill ore and 3926 tons of waste. Mining costs average $7.99 per ton when the ore is sorted in the mine and ore only is raised, and $3.64 per ton when ore and waste are mined together and sent to the surface. The gross returns from 2315 tons of ore shipped recently averaged $53.53 per ton. The mine is developing well. The second and third levels have been prepared for stoping ore of mill grade. The ore in the 515-ft. level is from 4 to 6 ft. in width and averages $16 per ton. The shaft has been sunk to a depth of 862 ft. and drifting will shortly be commenced. The power employed in the mine is compressed air generated by electric machinery, supplied with an electric current by the Nevada Power, Mining and Milling Company. Rapid progress is being made with the erection of the new 40-stamp mill, and the company is negotiating with the Nevada Power Company for the supply of an electric current for the mill machinery.

Edgar A. Collins, of the Combination mine, has been appointed superintendent of the Montana, and Henry Pengelly has succeeded Owen Owens as mine foreman.

New Mexico

Sierra County

Victoria Chief—Our local correspondent communicates the following: The company owns practically all the claims on the west flank of the Caballos mountains. The ore occurs in shoots, in vertical fissures in quartzite. The minerals are malachite, cuprite, chalcopyrite and bornite in quartz and calcite. Sorted ore goes 25 per cent. copper. The chief work—adits from side-hill on two claims—shows shoots 50 to 100 ft. long and up to 10 ft. wide, but few in number. The opinion of several engineers who have visited the property is that the ore deposits are probably shallow and confined to the quartzite. There is lead above, in the limestone, and gold below, in the granite. A small tonnage of copper ore from the Oahu claim was shipped on burros, years ago, by the former owners. The impression received on a recent visit was that the money being spent on roads, etc., would be better used in finding ore. The ore deposits of the Caballos mountains were described in the JOURNAL of July 29, 1905, page 149.

Oregon

Baker County

Virtue—This mine is now the property of an Eastern syndicate under the local management of J. K. Romig, of Baker City. While doing development work on the Foster vein, a strike of rich ore was made. The ore is a white quartz. Mr. Romig has just completed the electric power line from Baker City to the mine, and has received the first 85-h.p. motor,

which will be installed at once. The Baker City power will be used until Mr. Romig can utilize the power which he is developing on Main Eagle.

Pennsylvania

Anthracite Coal

Delaware, Lackawanna & Western—This company has resumed operations at the Hampton colliery, Scranton, after a thorough renovation of the plant at a cost of $40,000. New patent pickers have been installed in the breaker, which is now electrically equipped and among the best in the company's system. Its capacity has been doubled and it will deal with 3000 tons of coal per day.

Kingston Coal Company—Notwithstanding the award of the Strike Commission, which provides that no miner or laborer shall leave work without first filing a grievance with the Conciliation Board, the men employed at Nos. 2 and 4 collieries of this company, at Edwardsville, went on strike, March 18, because the foreman discharged two men who absented themselves from work on pay day.

Plymouth Coal Company—This company will sell its Plymouth washery to the Kingston Coal Company, which will make some extensive alterations and enlarge the plant.

Philadelphia & Reading Coal and Iron Company—By the ignition of gas in one of the gangways of the Shenandoah colliery of this company, caused by the flame from a miner's lamp, a fire was started which threatened to ruin the colliery. No explosion attended the ignition of the gas, which set fire to the timbers and gained considerable headway before the water could be obtained.

A number of changes have been made among the mine foremen of this company in the Shamokin district. Adam Reiland, for many years foreman at the Burnside colliery, has resigned, owing to advancing years, and Thomas Myers, foreman at the Sterling colliery, has been transferred to the Mahanoy City district. Reiland will be succeeded by William Quinn, of Burnside, and Myers will be succeeded by David Blystone, of North Franklin.

South Dakota

Custer County

Caledonia—Superintendent Pilger has opened up a ledge in the 45-ft. tunnel giving good values in gold. Only one wall has so far been encountered. This property has just been purchased by the Hartwell Mining Company.

Interstate—This mine has been sold to a New York company, which is now patenting the ground and will commence active work at once. A large vein of copper ore has been discovered, and a mill is built on the property.

Lawrence County

Blue Bell—A shaft is being sunk on a vein of ore which is believed to be a continuation of the vein on the Finlander group. The shaft is now 35 ft. deep and will be sunk at least 50 ft. more. The vein, which was 2 ft. wide at the surface, widened until at the present depth it measures almost 6 ft. It is a partly decomposed blue quartz carrying free gold.

Globe—The mill building is being put in shape for the installation of the machinery, which has been ordered. The boilers have been received and will be put in this week. A new body of ore about 10 ft. wide was encountered about 50 ft. northwest from the mill. It will be necessary to pump out the shafts and tunnels before work can be continued. The litigation which has caused delays for the past two years is practicaly setled.

Hercules—Two tunnels are being run to tap the orebodies; one will have to be put in about 350 ft. and the other 430. This latter will intersect the old Cooper tunnel and at the point of meeting a winze will be sunk until the second contact of ore is reached. The company owns 700 acres of land.

Pennington County

Deep Down—A large block of stock in this company was sold to Ontario people and the proceeds will be devoted to development work to begin at once. There are two 50-ft. shafts on the ground, and one of them discloses ore.

Keystone-Holy Terror—Some difficulties among the management have caused the temporary closing of this property. At a recent meeting in Deadwood it was decided to commence operations in a short time, when arrangements would be such that the mine would be operated steadily. All back taxes have been paid. Work will be done in the Holy Terror and the old mill renovated.

Utah

Box Elder County

Wasatch Copper Company—The management is about to inaugurate shipments from the property of this company, which is located near Brigham City. W. D. Pyper, of Ogden, is manager.

Salt Lake Copper Company—This corporation, which is controlled by the Lewisohns, of New York, is conducting a vigorous campaign of development at the Copper Mountain mine in the New Foundland district.

Iron County

Big Fourteen—Sensational ore has been developed in this property at Stateline. A 3-ft. body has been disclosed that carries high gold and silver values.

Juab County

Tintic Ore Shipments—Bad condition of roads reduced the ore shipments from the district last week to 124 carloads, the contributing mines and respective amounts being: Ajax, 2; Beck Tunnel, 6; Bullion Beck, 9; Eureka Hill, 2; Gemini, 4; Godiva, 2; Grand Central, 11; Mammoth, 10; May Day, 3; Scranton, 6; Swansea, 3; Tintic Iron, 6; Uncle Sam, 2; Victoria, 2; Yankee Consolidated, 6 cars.

Centennial Eureka—It is expected that work will begin on the foundations for the new shaft house within 10 days.

Lower Mammoth—The two electric hoists installed recently are in service and the company is working the usual force of men again.

Colorado—Very satisfactory reports come from the 250 level of this property where one of the most important orebodies ever found in the mine was recently opened.

Uncle Sam Consolidated—A new orebody has been opened on the 800 level of this property, containing values of about $40 per ton. There is a full breast of it.

Utah Mine—Shipments of high-grade ore continue from this property in the Fish Springs district. The values run principally in silver.

Carisa—This company has been reorganized under the laws of the State of Maine, without any change in the capital stock. Heretofore the company has been operated under Utah laws.

Bullion Beck—The directors have declared a dividend of 10c. a share, payable to shareholders this month.

Salt Lake County

Bingham Mary—A body of 6 per cent. copper ore has been encountered in a cross-cut from the 100-ft. level of the shaft.

Bingham Amalgamated—An electric hoist is being installed at the Illinois property, owned by this company.

City Rocks—This Alta company has straightened out some entanglements about titles, and is now ready to proceed with the opening of the property upon a broader scale than heretofore, and to resume ore shipments at an early date.

Tooele County

New Stockton—An upraise from the 850-ft. level has broken into a 10-ft. body of shipping ore, the values running about 50 per cent. lead and 30 oz. silver.

Washington

Ferry County

Washington & Great Northern Railway—In the injunction case of this company against the Spokane & British Columbia Railway, the former has given notice of appeal from Judge Carey's decision in the Superior court to the Washington State Supreme Court.

Straight Mines Company—A body of iron sulphide ore was struck on the lower adit level 375 ft. from the portal, the extent of which is not yet known. The first sample taken assayed $8 in gold and 13c. in silver per ton.

Winnipeg—A sample of ore from a streak in the adit assayed well in gold, silver and copper.

Sunset—This mine, near Northside, on the Columbia river, looks well. Machinery, good for 1000 ft. depth, has been installed, consisting of a duplex hoist and Sullivan air compressor.

Silver Crown—At this mine, on Iron creek, about 40 miles southeast of Republic, the adit is in over 300 ft., and a vein of ore, assaying in copper, nickel and silver, has been intersected across 3 feet.

West Virginia

Deepwater Railway Company—This company has been organized, with $33,500,000 capital stock, to consolidate the Deepwater and Tidewater railroads, now under construction as a new outlet for West Virginia coal to tidewater at Lambert's Point, near Norfolk. The Virginian Terminal Railway Company has also been organized to build docks, etc., at the seaboard terminus. As is well known, H. H. Rogers, of New York, is the chief backer of the enterprise. Another purpose of the company is the development of coal fields in the Gauley mountain region around Ansted. Surveys have been made also for an extension from Surveyor Station to the Ohio river, about 90 or 100 miles. About 60 miles of track have been completed on the Deepwater Railway from Deepwater, on the Kanawha river, to Mullens, W. Va., and this is being operated. On the Tidewater Railway in Virginia 60 miles of track are also in operation between Jarratt and Algren, the latter point being near Suffolk.

The officers of the Virginian Terminal Company are Walter H. Taylor, president; W. H. T. Loyall, vice-president; William H. White, Jr., secretary. The officers of the Virginian Railway Company include William N. Page, president, Ansted, W. Va.; Thomas D. Ranson, vice-president, Staunton, Va.; George H. Church, treasurer, 44 Wall street, New York.

Wisconsin

Zinc District

Calvert—This mine, at Benton, is one of the most recent of the rich strikes to attract attention. It has also the strongest water to contend with of any of them. At a recent meeting of the directors, held at Darlington, Wis., it was decided to install one of the best pumping and power plants obtainable, and a contract was awarded the Galena Iron Works Company, of Platteville. There will be two 80-h.p. high-pressure boilers, two double, extra strong 12-in. Galena pattern crosshead pumps, a double cylinder cut-geared steam hoist and an Ingersoll-Rand piston inlet class A compressor, having a capacity of 194 cu.ft. of air.

Platteville Lead and Zinc Company—The annual meeting of this company was held at Platteville recently and an entirely new board of directors was elected. With the retirement of the old president, it is claimed a new policy in the management will be instituted. Owing to the fact that a great deal of the stock has changed hands during the last six months those in favor of a new policy were in the majority. The capitalization has been held at the original figure so far, but it is now proposed to increase the stock.

Canada

Nova Scotia

Dominion Coal Company—At the recent annual meeting in Montreal it was announced that the differences with the Dominion Steel Company would be settled shortly and the suits pending withdrawn. The following directors were elected: Lord Strathcona, R. B. Angus, Jas. Crathern, J. Dimock, Senator McKeen, W. D. Matthews, J. K. Osborne, James Ross, W. D. Ross, F. L. Wanklyn, J. R. Wilson. At a meeting of the directors James Ross was re-elected president and F. L. Wanklyn vice-president.

Dominion Iron and Steel Company—For the past two months mining experts and a large force of laborers have been at work boring for coal on the Burchell areas, and on other properties at Point Aconia recently bonded by this company, and they have made good progress. A 7-ft. seam has been struck on the Plant farm, with a surface of 156 ft. The company has bonded nearly 500 acres on the western side of Little Bras d'Or, which is said to be rich in coal.

Ontario—Cobalt District

Beaver Mine—The new power house at Cobalt is completed and ready for the installation of the plant.

Foster—It is the intention to connect the three shafts which are down, respectively 85, 72 and 78 ft., by tunnels, considerable drifting having been done. An eight-drill compressor and an electric-light plant are in operation, and four new drills are ordered. A cage for the hoisting of ore cars is being installed.

Kerr Lake (Jacobs)—In all 15 veins have been discovered on this property, Cobalt, where a 14-drill compressor is being installed. One shaft is down 180 ft. and the other some 60 ft. About 350 ft. of drifting has been done. No second-grade ore has been shipped.

O'Brien—A large cage is being installed in the shaft, which will enable ore cars to be run right into the shaft at the different levels, hoisted and run to the ore-house. Stoping is being done at the 50-ft. level.

Progress—On this property, Cobalt, which adjoins the Timiskaming mine, a steam plant has been installed. The shaft, which is now down 70 ft., will be sunk to the 200-ft. level. The vein has a width of 4-in. cobalt carrying good silver values.

Silver Leaf—There are four shafts being put down, the main one being 100 ft. deep, with considerable drifting at the 80-ft. level. A six-drill compressor is in operation.

Mexico

Coahuila

Mexican Coal and Coke Company—Complete order is said to have been restored at the mines at Esperanzas where the most appalling disaster in the history of Mexican mining occurred on the night of Feb. 18. The total deaths were 67 Mexican and Japanese and one American. Whether the explosions were due to coal dust or gas has not been determined, and will probably never be known to a certainty.

Sonora

Cananea Consolidated Copper Company—At Corcorit, this company is preparing to blow in its new 250-ton smelting plant. This property is showing up with some 4000 ft. of development work.

Belen Copper Mining Company—T. B. Bassett, manager of this company at Cumpas, is quoted as saying that his company will soon start on the construction of a railroad from the property to connect with the Southern Pacific, a distance of about 40 km. This company is just completing the construction of a 40-ton copper-smelting plant. The ores run about 8 per cent. copper and it is the intention to produce 50 per cent. matte. The difficulty of obtaining labor is the only thing which has prevented the erection of the 100-ton plant that was at first contemplated.

El Tigre—The Federal district judge at Hermosillo has given a decision in favor of the Ensenada Mining Company, of Kansas City, Mo., as claimant to this mine, and against B. F. Graham and associates. The decision will support the title of the Kansas City people to the property. The case has been through various courts.

Asia

India—Mysore

Kolar Goldfield—The production in February is reported at 43,224 oz. bullion. For the two months ending Feb. 28 the total was 101,552 oz. bullion in 1906, and 89,234 oz. in 1907; a decrease of 12,318 oz. The bullion reported this year was equal to 80,311 oz. fine gold, or $1,660,028 in value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

The chief topic in the coal trade in the West is the general advance in freight rates made by the railroads, which varies from 5 to 10c. per ton. This is especially felt by mines which have contracts to deliver through the balance of the year, and by others which are shipping coal under sharp competition from other districts.

In the East there is little or no change in conditions, except as they are affected by the approach of spring and milder weather.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to March 9 were as follows, in short tons:

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Coal tonnage originating on the lines of the Southern Railway for the year 1906 was: Tennessee district, 1,496,253; Alabama district, 1,874,654; total, 3,370,907 short tons.

Coal receipts at Boston for the two months ending Feb. 28 are reported by the Chamber of Commerce as follows:

	1906.	1907.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The foreign coal comes chiefly from Nova Scotia, with some from Great Britain.

The Chesapeake & Ohio Railroad reports coal and coke tonnage for the seven months of its fiscal year from July 1 to Jan. 31 as follows, in short tons:

	Coal.	Coke.	Total.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Deliveries this year of tonnage originating on the line were: Points west of mines, 2,487,688 tons coal and 123,539 tons coke; points east, 1,059,002 tons coal and 41,587 tons coke; tidewater, 1,729,078 tons coal.

Anthracite-coal shipments in January were 4,563,720 long tons; being 684,226 tons less than in January, and 148,379 tons less than in February, 1906. For the two months the shipments were as follows, in long tons:

	1907.		1906.	
	Tons.	Per Ct.	Tons.	Per Ct.
Reading	[illegible]	20.4	1,998,118	20.3
Lehigh Valley	1,784,891	17.6	1,665,770	17.0
N. J. Central	[illegible]	13.1	1,237,919	12.6
Lack. & West.	[illegible]	16.1	1,623,031	16.5
Del. & Hudson	[illegible]	9.5	969,053	9.8
Pa. R.R.	[illegible]	3.3	316,329	3.3
Erie	974,341	9.6	990,218	10.1
N. Y., Ont. & W.	423,141	4.2	[illegible]	4.4
Total	10,170,183	100.0	9,813,666	100.0

The total decrease this year was 356,517 tons, or 3.5 per cent. The tonnage of the Delaware, Susquehanna & Schuylkill—Coxe Brothers Company—is now included in that of the Lehigh Valley Railroad. The chief decreases this year were on the Reading, the Lehigh Valley and the New Jersey Central.

New York

Anthracite

March 20—The hard-coal market during the past week has been inactive, consumers holding off until the new schedule of prices goes into effect; it is generally understood that this schedule will show the usual discount of 50c. per ton on prepared sizes and will take effect April 1. Nothing official has been announced, but operators show no hesitancy in speaking about it. There is a great scarcity of small steam sizes, especially Nos. 2 and 3 buckwheat. Broken, egg, stove and chestnut are in plentiful supply, and little or no trouble has been experienced from lack of car supply during the week. Until April 1 prices remain at $4.75 for broken, $5 for egg, stove and chestnut. Small steam sizes are quoted nominally at $3 for pea, $2 to $2.50 for buckwheat, $1.50 for rice, $1.40 for barley, all f.o.b. New York harbor shipping points.

Bituminous

The Atlantic seaboard soft-coal trade is fairly active, consumers endeavoring to get all the coal they can before the increased prices go into effect April 1. Contracts are being closed daily and, up to the present time, about 50 per cent. of the total have been taken care of. Car supply seems to be in better shape, with the exception of one main line.

Trade in the far East is active and consumers are taking on all the balances procurable on old contracts. Trade along the Sound is calling for more coal than can be delivered.

New York harbor trade is fairly active. Prices are quoted at $2.70@2.75 for fair grades of steam coal f.o.b. New York harbor shipping ports. Transportation from mines to tide is fairly regular; car supply has been much improved during the week with the exception of the Baltimore & Ohio, which has been very unreliable.

In the coastwise vessel market vessels are in fair supply. We quote freight rates from Philadelphia on large vessels at $1@1.05 and discharge to Boston, Salem and Portland. The rate from New York to the same points is $1 and discharge for small vessels. In both cases the loading and discharging clause is included. With the coming of spring, lower freight rates are expected.

Birmingham

March 18—The railroad car shortage is interfering again with coal production in Alabama, and time is being lost at several collieries. The production, however, is equal to what it was at this time last year. Development in this State is being pushed; no less than eight new mines will be ready to produce coal daily as soon as transportation facilities can be provided.

There is a demand for every ton of coal that can be mined, and contracts in hand will provide for steady operation at the mines for months to come. Inquiries among the coal operators in this district indicate that there will be no time lost during the summer, now fast approaching. Good prices obtain, and the operators are making effort to get delivery.

Chicago

March 16—The local market for coal continues weak, owing to large supplies, notwithstanding a general effort on the part of shippers to reduce supplies. Eastern coals, which have heretofore been stronger than Western, are sharing in the dullness, owing chiefly to better transportation conditions, though the demand is naturally easing with the coming of spring. Anthracite is, of course, in very light demand, with the prospective April discount so near.

It is reported that some of the Illinois mines are about to close for a time, to get rid of the demurrage surplus that has forced prices down. Prices of Illinois and Indiana continue about the same as last week: $1.85@2.50 for lump and egg, $1.65@2.15 for run-of-mine, and $1.25@1.50 for screenings.

Smokeless run-of-mine continues in good demand, but other kinds are dull; run-of-mine brings $3.40, the circular

price [illegible] ply, but the demand is not great; such coal as is moving brings $3.40. Youghiogheny likewise is in light supply and demand, with ¾-in. selling at about $3.20. Pittsburg No. 8 is in fair demand at $2.90 for ¾-in. Cannel coal is in good demand.

Cleveland

March 19—Owing to the heavy rains and washouts in the Ohio river and Pittsburg district, local soft-coal values were advanced 5c. per ton this week. This applies to spot shipment. Deliveries on future dates remain about the same, with Pittsburg run-of-mine at $2. The local coal market was very weak last week, owing to a heavy supply on track, coal being sacrificed to save demurrage at 35 to 40c. below cost. Absence of deliveries to the city during the week has cleared up this supply and dealers predict a steady market.

Indianapolis

March 16—At a conference with Union B. Hunt, president of the Indiana State Railroad Commission, operators of the coal mines representing 85 per cent. of the coal output of Indiana filed with the commission a formal complaint protesting against the proposed advance of 10c. a ton in rates on coal hauled from points in Indiana to Chicago, and asked the commission to take the matter up with the Interstate Commerce Commission. In compliance therewith a committee of Indiana operators, W. J. Woods, of the Indiana commission, and John Mitchell, of the Mine Workers, entered a formal complaint before the Interstate Commission in Washington, March 15. The commission held that it had no jurisdiction to prevent the railroads from ordering a 10c. increase in freight rates, but sent a letter to each of the railroads stating that, "while the commission can have no opinion as to the justice of the proposed changes, but in view of the serious consequences which will apparently result, it does seem to us that opportunity should be given these parties to be heard before the new rates are put in force. The commission is inclined to hold that complaints may be directed against a rate which has been filed, but which has not yet become effective. If, therefore, your rates were to be made effective not less than 60 days after filing notice of intended change, sufficient time would be allowed in which to file a complaint and have the same heard by the commission. You are asked to give this matter prompt and careful attention." The Indiana operators are greatly pleased over the letter.

The Indiana operators and miners allege that the proposed rates will disturb the differentials which have been long in effect, thereby disarranging the various wage scales now in force. They further allege that many contracts for coal are in effect which do not expire until April, 1908, in which the price was based upon the present freight rate, with the assurance upon the part of some of the railroads that rates would not be increased.

Pittsburg

[illegible] sion of coal-mining operations in the Pittsburg district for several days, as the railroads were paralyzed, and could not furnish cars. None of the mines was affected by the high water and yesterday a good supply of cars was received at most points and conditions are fairly good. It is expected that all will be running to capacity before the end of the week. Some damage was caused to a few tipples along the river, but it is being speedily repaired, and there will be no delay in getting all the river mines started. Despite the large tonnage loaded and ready for shipment there were no losses of any consequence, and when the rivers become navigable there will be a large shipment to the Southern ports. Prices are firm on a basis of $1.15@1.25 for mine-run coal at the mine.

Connellsville Coke—The railroads leading into the Connellsville coke region suffered severely by the flood, and shipments were seriously retarded. Most of the blast furnaces and foundries had a few days' supply, and there are few instances where any serious inconvenience was occasioned. Prices are firmer, furnace coke for prompt shipment and for last half being quoted at $3@3.10, and foundry coke at $3.75@3.85 for spot. The *Courier* gives the production in both fields for the week ending March 9 at 413,572 tons. The shipments aggregated 14,640 cars distributed as follows: To Pittsburg, 5231 cars; to points west of Connellsville, 8565 cars; to points east of Connellsville, 844 cars.

Foreign Coal Trade

March 20—Imports of coal into Germany in January were, in metric tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total.....	1,329,661	1,430,857	I. 101,196

Imports of coke this year were 19,911 tons; of briquets, 3266 tons.

The production of coal in Germany in January is reported as below, in metric tons:

	[illegible]	[illegible]	[illegible]
Coal.....	11,881,344	12,296,774	I. 415,430
Brown coal	5,116,227	5,131,531	I. 15,304
Total mined..	16,997,571	17,428,305	I. 430,734
Coke made..	[illegible]	[illegible]	[illegible]
Briquets made.	[illegible]	[illegible]	[illegible]

The briquets made are largely from brown coal, or lignite.

The exports from Germany for January were, in metric tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Exports of coke for the month this year were 304,624 tons; of briquets, 104,243 tons.

Iron Trade Review

New York, March 20—The iron and steel trades show little change from last week. Pig-iron buying has been comparatively quiet, but in finished material there is a fair volume of business. In some quarters there is a fear that prices have reached a point where they may serve as a check to consumption, and this feeling seems to have some reason to support it. However, new business continues to come in, though not in as great volume as in November and December.

The floods at Pittsburg last week caused a good deal of damage, and interfered seriously with the working of mills and furnaces. As most of them are already behind in deliveries, some trouble will result. Moreover, the floods and their resultant damage made the railroad situation still worse than it had been, causing further delay in deliveries.

Pig-Iron Production—On March 1 there were 319 coke and anthracite furnaces in blast, with a total weekly capacity of 511,000 tons. This is the highest ever reported, with the exception of Dec. 1, 1906, when the total was 513,900 tons. Taking the estimate made by the *Iron Age*, with an allowance for the charcoal furnaces, the output of pig iron in January was 2,240,600 tons; February, 2,078,000; total for the two months, 4,318,600 tons. The average daily output for January was 72,278 tons; for February, 74,214 tons, showing a gain of 1936 tons.

Baltimore

[illegible] the week were 310 tons; of ferromanganese, 1149 tons. Imports of iron ore were one cargo, 4815 tons from Farrucha, and three cargoes, 10,074 tons from Beni-saf, Algeria; a total of 14,889 tons.

Birmingham

March 18—The Southern pig-iron market is strong. The railroad car shortage is being felt. The consumers are giving indications of a shortage of raw material. The inquiry for iron for delivery during the latter part of the year is strong. More furnaces now report having sold up the probable make to October. The furnace companies are not willing to sell their product for delivery to the last of the year at a reduction on quotations. If there is any iron being sold under $18.50 per ton, No. 2 foundry, it is being done in a quiet way, and several companies announce that the price is $19 per ton. Sev-

eral consumers were in this market recently hunting small lots of iron for immediate delivery, offering a strong premium, but were not successful. Spot iron brings $24 per ton, No. 2 foundry, what little there is to be found. The Woodward Iron Company has blown out a furnace for repairs. The Tennessee Company has blown out a furnace for repairs. The Tennessee Company is rushing repairs on three furnaces, but it will be a month yet before they can go into operation.

Chicago

March 18—The iron market continues firm, and is, to all appearances, a waiting market, as last week. No disposition exists on the part of melters, to judge from orders, to buy more raw material than they need to keep business moving. Such purchases as are being made are at the prices of last week—$18@18.50 Birmingham for Southern No. 2, for second-half deliveries—and $23.50 for Northern. On quick-delivery and second-quarter lots prices run $2 to $3 higher. The demand for early lots is not large.

Local furnaces are taking advantage of the lull to go out of blast for repairs, and the market is likely to be dull for the next month. It is the prophecy of well informed men in the pig-iron trade, however, that after a spell of dullness the market will be stronger than ever, all prospects being for continued heavy consumption of iron.

Coke is in good supply and moderate demand, the best Connellsville bringing $6.65 for quick deliveries and $6.40 on contracts, which are increasing.

Cleveland

March 19—Iron-ore prices on the docks remain steady and the market is reported without change from last week. At present writing it is figured that vessel capacity to move between 35,000,000 and 36,000,000 tons of ore has been tied up for the season, which promises to be a record-breaker from the opening. An estimate of 42,000,000 tons of ore is placed for this year. Vesselmen are refusing yearly contracts in anticipation of advances in lake rates later in the season.

Pig Iron—Iron for spot shipment is perhaps a little firmer, owing to low supplies, but there is not much activity. Prices are quoted at $25@26 at furnace.

Philadelphia

March 20—The pig-iron situation is practically the same as it has been for a number of weeks. There is a large number of small buyers who either through inability or lack of foresight have not been carrying large stocks. This element constitutes a steady demand for delivery of material between now and June 30. The market is active, particularly for those brands of iron used in engineering plants and for special purposes. Foreign iron is not attracting quite as much attention as usual. It is a very difficult matter to size up all of the various conditions and influences that are at work, in the trade; but it is not an unsafe judgment to say that present conditions will continue. Basic iron is $25; standard forge $23; No. 2 foundry $25.25, for the earliest possible deliveries. For later deliveries differences of about $1 are observable.

Steel—The steel manufacturers have all they can possibly do to keep their customers supplied. Soft steel, of course, is very active and small orders command $31.

Bars—While there is not the slightest weakness there are some slight modifications made to secure certain desirable orders as to size and quality of iron. Contracts are being placed for refined iron for delivery six months hence. Steel bars are very strong.

Sheets—The mills continue to strain their capacity in order to keep their customers in good humor.

Pipes and Tubes—The pipe market is as strong as at any time for months, and the tube situation could not be improved upon. Discounts are entirely nominal and premium prices are the rule. A further advance is thought to be imminent.

Plates—Buyers of plate are not so urgent in ordering for future requirements as they were a few weeks ago. A great many have already made satisfactory arrangements for early summer supplies.

Structural Material—A great deal of local work is to be prosecuted this summer, calling for structural material. The mills are making special efforts to accommodate the small trade.

Rails—Light sections and rails for trolley purposes are being inquired for in liberal quantities, but no heavy transactions have been recently announced.

Scrap—There is an active demand for all kinds of scrap. Some big sales of railroad scrap have been made at high prices. Heavy melting scrap is being hunted for and badly wanted. Machinery cast is worth about $20 per ton.

Pittsburg

March 19—The flood that visited this section during the week was the greatest ever known, and affected nearly every blast furnace, iron and steel plant along the Allegheny, Monongahela and Ohio rivers. Some rapid cleaning up was done and operations were resumed at most of the plants on Sunday; with but few exceptions all will be going again before the end of this week. It is impossible to give an intelligent estimate of the loss, but several attempts have been made, and included in them is millions of dollars for loss in production. This is not regarded as a loss, as all orders on the books must be filled, and there will be only a further delay in delivery. The actual loss is the expense of cleaning up and putting the machinery in shape, and also the loss in wages of the thousands of men who were thrown out of employment for several days.

The Carnegie Steel Company, as usual, recovered more quickly than other large interests. Twenty of its blast furnaces, the Edgar Thomson, Carrie, Isabella and Lucy groups, were closed on Thursday night, and all were started again on Saturday night without any damage having been done. The Edgar Thomson, City Mills, Painters and Lindsay & McCutcheon plants were entirely closed by the high water, and the big Homestead and Duquesne works were slightly affected. All were running in full on Sunday night. The Mingo plant, near Steubenville, O., suffered more than the rest, and did not get started until this morning. The other plants of the Carnegie Company were not affected at all. The idle furnaces would have produced over 20,000 tons of pig iron during the two days' suspension, but it was asserted today that this will not have to be made up by the purchase of outside iron, as the mills that would have used the iron were out of commission at the same time.

Among the greatest sufferers was the American Sheet and Tin Plate Company. All the mills in the Vandergrift department up the Allegheny river, La Belle, Aetna and Wellsville plants in the Wheeling district, which were closed Thursday, were started this morning. The large Wood plant and the United States works at McKeesport will not be in shape for operation for some time. It is not known when the Monongahela works, in this city, will get started, as they were more unfortunate than the others. While the plant was surrounded by water, a fire broke out and destroyed the warehouse and sorting rooms. The firemen were compelled to fight the flames by carrying the hose to the fire in skiffs.

All the plants of the American Steel and Wire Company, which are located along the Monongahela river, resumed operations yesterday. The National Tube Company was hit hard by the closing of four of its plants in this city, and the big works at McKeesport. Its three blast furnaces were banked, and it will be impossible to resume operations before the end of this week.

As a result of the flood the iron and steel markets are decidedly quiet. One of the events of the past week was the withdrawal of all quotations by the National Tube Company, and independent pipe interests advanced prices from one to two points, or $2 and $4 a ton. In sending out notices of the withdrawal of prices the leading interest announced that it would accept orders for delivery after June 1, subject to the new quotations

which are to be made some time before that date. The fact that prices will be higher, and that the majority of the plants of the company are temporarily idle did not deter buying, as orders aggregating 10,000 tons were received on Saturday, and as large a tonnage was booked yesterday. The business in merchant pipe and boiler tubes is enormous.

Pig Iron—The pig-iron market appears to be stronger, although buying for second-half delivery is still being delayed. Furnaces are holding firmly for $21.50, Valley furnaces, for bessemer iron, but consumers evidently believe that a concession will be made. There is no prompt bessemer iron, and for second quarter $22, Valley, is quoted. It is reported that about 30,000 tons will be available for that delivery. No. 2 foundry iron remains firm at $24 to $24.50, Valley; second-quarter is quoted at $23@23.50. Sales for the last half are being made at $21.50@22. Gray forge is not in demand, and is quoted nominally at $21.85, Pittsburg.

Steel—There is no change in the steel market. Bessemer billets are quoted nominally at $29.50, and open-hearth at $32. Steel bars continue at 1.60c., and plates at 1.70c.

Sheets—The mills are filled up and cannot guarantee deliveries this side of July. Prices remain unchanged at 2.60c. for black sheets and 3.75c. for galvanized for No. 28 gage.

Ferro-Manganese—Prompt ferro continues to be quoted at $75@76 per ton.

By Telegraph

Pittsburg, March 20—The Cambria Steel Company today bought 36,000 tons bessemer pig, second-quarter delivery, and the Carnegie company 8000 tons, April; all at $22, Valley.

London

The British Iron Trade Association has reported the production of pig iron for the year as follows, in long tons:

	1905.	1906.	Changes.
Forge and foundry	4,276,943	4,587,606	I. 310,663
Hematite	4,050,222	3,990,820	D. 59,402
Basic	1,057,999	1,264,617	I. 206,618
Spiegel, etc.	187,593	307,645	I. 120,052
Total	9,572,747	10,149,688	I. 576,951

The total gain was 5.9 per cent. In 1904 the total make was 8,562,658 tons, and in 1903 it was 8,811,204 tons. Last year there was a decided gain in the later months, the make for the first half having been 4,905,424 tons, while for the second half it was 5,243,964 tons. Stocks at the close of the year were low.

The total number of blast furnaces standing was 517, and the average number working last year was 367¾. This makes the average output per furnace 27,598 tons. The largest average make was 45,127 tons, in the Cleveland district; the smallest was 14,158 tons, in Derbyshire.

Metal Market

NEW YORK, March 20

Gold and Silver Exports and Imports.

At all United States Ports in February and year:

Metal.	Exports.	Imports.	Excess.
Gold			
Feb. 1907	$1,027,058	$ [illegible]	Imp. $2,248,875
" 1906	8,486,330	[illegible]	Exp. [illegible]
Year 1907	3,477,130	[illegible]	Imp. [illegible]
" 1906	14,227,995	[illegible]	Exp. [illegible]
Silver			
Feb. 1907	4,223,970	3,693,061	Exp. [illegible]
" 1906	[illegible]	4,480,149	" 1,954,680
Year 1907	[illegible]	7,350,102	" [illegible]
" 1906	13,951,797	9,167,160	" 1,784,637

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York.

For week ending Mar. 16 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$	$ [illegible]	$ [illegible]	$ [illegible]
1907	1,717,220	1,681,810	7,501,188	482,827
1906	3,027,470	482,185	10,365,871	594,360
1905	30,158,971	2,220,115	5,041,840	591,840

No gold was exported during the week; the silver went to London. Imports for the week, both gold and silver, were from South America and the West Indies.

The joint statement of all the banks in the New York Clearing House for the week ending March 16 shows loans $1,053,576,600, a decrease of $13,380,300; deposits, $1,003,574,500, a decrease of $15,914,700, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie	$180,151,700	$183,454,400
Legal tenders	77,630,600	70,572,300
Total	$258,082,300	$254,026,700
Surplus	$5,174,175	$3,033,100

The surplus over legal requirements shows an increase of $981,375, as compared with the previous week.

Special holdings of the leading banks of the world, March 16, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$183,454,300
England	$159,918,580	.....	159,918,580
France	522,750,965	$146,193,175	668,944,140
Germany	166,245,000	55,415,000	221,660,000
Spain	77,115,000	123,615,000	200,730,000
Netherlands	26,320,000	28,562,000	54,882,000
Belgium	16,810,000	8,405,000	25,215,000
Italy	161,790,000	24,718,000	186,508,000
Russia	595,420,000	27,045,000	622,465,000
Aust.-Hungary	231,785,000	61,505,000	293,290,000
Sweden	20,550,000	.....	20,550,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to March 7:

	1905.	1906.	Changes.
India	£ 4,109,910	£2,661,610	D. £ 1,448,300
China			
Straits	.....	85,050	I. 85,050
Total	£ 4,109,910	£2,746,660	D. £ 1,363,250

Imports were £8000 from the West Indies, £123,000 in bars and £91,000 in Mexican dollars from New York; a total of £212,000. Exports were £38,000 coin to Adelaide, £258,900 in bars and £56,500 in Mexican dollars to Bombay; £353,500 in all.

The foreign trade of the United States for the two months ending Feb. 28 is reported as follows by the Bureau of Statistics of the Department of Commerce and Labor:

	[illegible]	[illegible]
Exports	$ [illegible]	$ [illegible]
Imports	[illegible]	[illegible]
Excess, exports	$101,615,207	$99,073,447
Add excess [illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]
Deduct excess [illegible]	[illegible]	[illegible]
Net export balance	$98,644,972	

The gold and silver movement in detail is given in the table at the head of this [illegible].

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.51	$0.51
Peruvian soles and Chilean	0.484	0.51
Victoria sovereigns	4.854	4.87
Twenty francs	3.86	3.89
Spanish 25 pesetas	4.78	4.80

SILVER AND STERLING EXCHANGE.

March.	Sterling Exchange.	Silver. New York. (Cents.	Silver. London. (Pence.	March.	Sterling Exchange.	Silver. New York. (Cents.	Silver. London. (Pence.
14	4.83⅛	67	31 1/16	18	4.83	66⅞	31 1/16
15	4.83⅛	67⅛	31⅛	19	4.83⅛	66⅞	31
16	4.83	67	31 1/16	20	4.82⅞	66⅛	30¾

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

March.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
14	25¼ @26	25¼ @25¾	103 1/16	42	6.00	6.85	6.70
15	25¼ @26	25¼ @25¾	107	41¾	6.00	6.85	6.70
16	25¼ @26	25¼ @25¾	.....	41¾	6.00	6.80 @6.85	6.65 @6.70
18	25¼ @26	25¼ @25¾	106½	41¾	6.00	6.80 @6.85	6.65 @6.70
19	25⅜ @26	25¼ @25¾	105⅝	41	6.00	6.80 @6.85	6.65 @6.70
20	25⅜ @26	25¼ @25¾	106⅜	40¾	6.00	6.80 @6.85	6.65 @6.70

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

well provided for their immediate requirements, through previous purchases, and, owing to the unsettled financial conditions, both on this side and in Europe, they have become indisposed for the moment to contract for such small supplies as are still needed and have withdrawn from the market. Consequently, the premiums which have been ruling for nearby shipment have disappeared, owing to small offerings from second hands for which a ready outlet could not be found. The market closes dull at 25¼@26c. for Lake copper; 25@25¼c. for electrolytic in ingots, cakes and wirebars. Casting copper is quoted at 24½@24¾c.

In sympathy with the liquidation in the share markets, there has been a great deal of selling of standard copper, for long and short account, which brought about a serious break in the market. The closing is cabled at £106 5s. for spot, £107 10s. for three months.

Statistics for the first half of the current month show a decrease of 200 tons in the visible supplies.

Refined and manufactured sorts we quote: English tough, £113@114; best selected, £116@117; strong sheets, £124@125.

It was stated in this column last week that the average price realized for Lake copper by the Quincy Mining Company last year was 19.259c. per lb. This was an error, the correct figure being 19.5c. as the average for 16,194,838 lb. copper.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The London market shows an extreme decline, and although prices here have been lowered correspondingly, buyers do not show any inclination to take hold. At the close the London market is cabled at £186 for spot, £183 15s. for three months. The metal is offered in this market at 40.75c.

Lead—The quotation for desilverized remains unchanged at 6c. New York; 5.92½c., St. Louis.

In sympathy with the other metals, there has been a shading off in the London quotation, which at the close is reported at £19 13s. 9d. for Spanish lead, £19 16s. 3d. for English lead.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is very quiet. Latest sales are on a basis of 6.05@6.07½c. for Missouri brands.

Spelter—The demand for this metal has subsided and a weaker tendency prevails. Offerings are on a somewhat freer scale, particularly for future delivery. The close is nominal at 6.80@6.85c. New York, 6.65@6.70c. St. Louis.

The London market for spelter is an exception to the general rule and closes steady at £26 7s. 6d. for good ordinaries, £26 12s. 6d. for specials.

Silesian Spelter Market—Paul Speier writes from Breslau, Germany, under date of Feb. 28, that the market weakened during the month, but recovered toward the end. Spelter was quoted at 52.50@53.75 marks per 100 kg.—5.67@5.80c. per lb.—f.o.b. works. Zinc sheets were unchanged. Zinc dust was in demand, closing at 50.75@51.50 marks per 100 kg.—5.48@5.56c. per lb.—delivered at Stettin. The movement of zinc and zinc ores in Germany for January was, in metric tons:

	Imports.		Exports.	
	1906.	1907.	1906.	1907.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The larger exports of spelter this year were 3329 tons to Great Britain and 1342 tons to Austria-Hungary.

Zinc Sheets—The base price is now $8.50 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The market is very dull, but quotations are substantially unchanged; Ordinaries, 22¾@23½c.; Hallett's, 23½@24c.; Cookson's, 24½@25½c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at $38 per oz. for ordinary and $41 per oz. for hard. For good scrap $31.50@32 is paid.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities, and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 36c. per lb.; No. 2, over 90 per cent., 34c. Small lots are 1 to 3c. higher, according to size. Rods, according to size, are 1c. per lb. up over the price of ingots. Granulated metal is 2c. per lb. over ingots.

British Imports and Exports

Copper—Imports and exports in Great Britain for the two months ending Feb. 28 were as follows, in long tons; the totals giving the copper contents of all materials:

	1906.	1907.	Changes.
Copper ore	19,146	17,115	D. 2,031
Matte and precipitate	14,261	11,141	D. 3,120
Fine copper	10,927	13,290	I. 2,363
Total imports	19,973	20,573	I. 600
Exports	7,261	8,556	I. 1,295
Re-exports	2,943	4,375	I. 1,432
Total exports	10,204	12,931	I. 2,727
Balance	9,769	7,642	D. 2,127

Of the total imports the United States furnished 61 tons of matte and 5020 tons of fine copper in 1907; against 937 tons.

Tin—Imports and exports of tin in Great Britain for the two months ending Feb. 28 were as follows, in long tons:

	1906.	1907.	Changes.
Straits	[illegible]	[illegible]	D. 1,025
Australia	774	947	I. 173
Other countries	[illegible]	721	I. 365
Total imports	[illegible]	[illegible]	D. 494
Re-exports	[illegible]	[illegible]	D. 1,302
Exports	1,089	1,671	I. 582
Total exports	[illegible]	[illegible]	D. 720
Balance	[illegible]	669	I. 220

The re-exports are largely of Straits tin sent to the United States.

Lead—Imports and exports of lead in Great Britain for the two months ending Feb. 28 were as follows, in long tons:

	1906.	1907.	Changes.
United States	[illegible]	[illegible]	D. 536
Spain	15,572	16,712	I. 1,140
Australia	8,814	10,025	I. 1,211
Germany	[illegible]	[illegible]	D. 180
Other countries	[illegible]	[illegible]	D. 48
Total imports	30,431	32,044	I. 1,613
Exports	[illegible]	[illegible]	I. 764
Balance, imports	22,315	23,164	I. 849

The lead credited to the United States is chiefly foreign lead, refined here in bond.

Spelter—Imports and exports of spelter in Great Britain for the two months ending Feb. 28 were as follows, in long tons:

	1906.	1907.	Changes.
Spelter	17,214	13,737	D. 3,477
Zinc sheets, etc.	[illegible]	[illegible]	I. 877
Total imports	20,087	17,187	D. 2,900
Exports	960	654	D. 306
Balance, imports	19,077	16,783	D. 2,294

Imports of zinc ores are not reported separately.

Quicksilver—Imports of quicksilver into Great Britain for the two months ending Feb. 28 were 7882 lb. in 1906, and 797,122 lb. in 1907; an increase of 789,240 lb. Re-exports were 569,006 lb. in 1906, and 567,430 lb. in 1907; a decrease of 1576 lb. this year.

Missouri Ore Market

Joplin, Mo., March 16—The highest price reported paid for zinc ore was $53.50; the assay basis price was $49 to $51 per ton of 60 per cent. zinc, and the average price was $49.16.

The highest price for lead ore was announced at $83.50, a decline of $2 per ton, and the average price was $82.92 per ton.

The combined value of the zinc-lead shipment for the week was $435,846, a sum $40,000 greater than any previous week of record. Purchasing agents de-

voted their time more to shipping than to buying, and as a consequence the demand for unpurchased ore was lighter throughout the week; closing, however, with a stronger demand, as soon as it became apparent that the enormous shipment would cut down the reserve stock in the bins.

Following are the shipments of zinc and lead from the various camps of the district for the week ending March 16:

	Zinc, lb.	Lead, lb.	Value.
[illegible]	[illegible]	[illegible]	[illegible]
Tronogo	344,990	20,640	14,444
[illegible]	[illegible]	[illegible]	[illegible]
Prosperity	315,140	37,710	9,223
[illegible]	[illegible]	[illegible]	[illegible]
Baxter Springs	118,500	[illegible]	2,962
[illegible]	[illegible]	[illegible]	[illegible]
Totals	14,366,760	2,018,470	$435,846
Eleven weeks	130,977,430	18,600,850	$4,870,000

Zinc value, the week, $353,219; 11 weeks, $3,090,810
Lead value, the week, 82,627; 11 weeks, 779,190

Average prices for ores in the district, by months, are shown in the following table:

Month.	1906.	1907.	Month.	1906.	1907.
January	[illegible]	45 84	January	75.20	[illegible]
February	47.37	47.11	February	72.83	84.58
March	[illegible]	[illegible]	March	73.73	
April	44.63		April	75.13	
May	40.51		May	78.40	
June	43.93		June	80.96	
July	[illegible]		July	74.31	
August	43.56		August	75.36	
September	[illegible]		September	79.64	
October	41.55		October	79.84	
November	44.13		November	81.98	
December	43.68		December	81.89	
Year	[illegible]		Year	77.40	

Wisconsin Ore Market

[illegible] market is still strong, and the buyers purchased every pound produced. The strength of the market, in view of existing local conditions, is quite noticeable. The gain during recent months has brought the price of 60 per cent. ore up from $40 to $52. The majority of the mines in this district pay handsomely on a $40 basis.

The camps of the district loaded ore for the week ending March 16, as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	489,710	[illegible]	[illegible]
Buncombe-Hazel Green	429,000	[illegible]	[illegible]
Linden	[illegible]	[illegible]	[illegible]
Benton	20,500	[illegible]	[illegible]
Galena	[illegible]	[illegible]	[illegible]
Highland	66,000	[illegible]	[illegible]
Dewey	[illegible]	[illegible]	[illegible]
Centralia	[illegible]	[illegible]	[illegible]
Mineral Point	[illegible]	[illegible]	[illegible]
Total for week	1,601,810	[illegible]	[illegible]
Year to Mar. 16	18,725,814	[illegible]	[illegible]

The scarcity of labor, in and about the mines, is quite a factor in the production of the district. The early spring has created a demand that will be hard to supply. The cry for more cars is still heard. The various camps produced on an average about the same as last week, but the loading facilities vary so that the tonnages reported at shipping points do not this week represent total production.

Chemicals

New York, March 20—The chemical markets are generally strong, with good demand for nearly all sorts of material.

Copper Sulphate—Under strong demand from the agricultural and export trades, prices have again advanced. For carload lots and over, we quote $7.50 per 100 lb., while smaller parcels bring $7.75 per 100 lb. in the local market. Supplies are quite large, but hardly equal to current demand.

Nitrate of Soda—Spot supplies are still scarce and the market is strong. Quotations are unchanged, 95 per cent. for 1907 delivery, all positions, commanding $2.45 @2.47½ per 100 lb., and 96 per cent. $2.50@2.52½. For 1908 delivery quotations are $2.42½ and $2.47½, respectively.

Phosphates—Exports of phosphates through the port of Savannah in February, as reported by J. M. Lang & Co., were 5643 tons to Germany and 2501 tons to Holland; 8144 tons in all.

Mining Stocks

New York, March 20—The general overturn of last week on Wall street was exciting enough while it lasted; at one time it looked as though something like a panic would develop. It was followed by speedy recovery, however, though the general market has continued weak and uncertain.

Mining stocks have been affected, and have followed the course of the general market. At the close there is still a downward tendency, and the heavy liquidation of the past week will be felt for some time.

Boston

March 19—Copper mining shares received one of the worst setbacks, the past week, ever witnessed. "Terrible" Thursday it was well named. The recovery the following two days was about 75 per cent. of the decline, but renewed liquidation the past two days has been pronounced, although the market has absorbed stocks well and the tone tonight was considerably improved. Whether liquidation has been completed or not, it is hard to say; but one thing can be said, and that is, brokerage houses have reduced their liabilities amazingly. A great deal of cash buying has been going on in the market at the reduced level of prices, which has strengthened the position amazingly. Money has been snug and continues so, call money ranging from 8 to 10 per cent. in this center, and time from 6½ to 7, with copper shares not considered the best collateral.

[illegible] Thursday, a drop of $24.37½ in 24 hours, from which it recovered to $97 in the next 24 hours; it closed at $92 tonight. Copper Range broke $14, to $73.50, closing at $82 tonight. One of the worst declines occurred in North Butte, which broke from $103.25 a week back to $77.75, a fall of $25.75; subsequently it recovered to above $92. Butte Coalition took a $10 drop to $23, selling to above $30 since. Bingham tumbled $6.50 to $18.50, closing at $21 tonight; Boston Consolidated $6 to $22, going back to above $27.

Greene Consolidated went off $5.62½ to $21.87½, recovering to above $25, and Michigan fell $2.75 to $14.75, recovering to $16. Mohawk made its low price at $74, a drop of $14; it has touched $86 since. Old Dominion broke $14.75 to $44, recovering over $5, and Osceola broke $26 to $130, with a $15 recovery. Quincy's low was $109, a fall of $16, selling at $120 later the same day. Trinity slumped $8.75 to $19.25, later rising to above $25, with the final $24 today. Utah also suffered a decline of $14.62½ to $51.50, recovering to $63 and closing at $60.50 tonight. Calumet & Hecla touched $875 and Calumet & Arizona $148.

The Osceola annual meeting last Thursday flushed out and owing to the injunction proceedings the meeting was adjourned to a later date. Calumet & Hecla people control the stock and will take charge of affairs in due time.

Curb stocks suffered in the general decline, but not in the same proportion as listed shares. Several changes have occurred in the Raven directorate. This company will double its capital to 1,000,000 shares, par $1, and offer 100,000 shares to stockholders, retaining 400,000 shares in the treasury.

Colorado Springs

March 15—The local stock market has been decidedly off color this week. Trading in most of the stocks has been dull and lifeless. El Paso, Isabella and Jennie Sample have shown slight activity. The report that El Paso mine was about to be closed down and the denial of the report have caused this stock to fluctuate in price. The work on the drainage tunnel is progressing slowly.

San Francisco

[illegible] San Francisco Mining Exchange and the San Francisco & Tonopah Mining Exchange have consolidated as the San Francisco Mining Exchange, with the following officers: Walter Turnbull, president; E. H. Kramer, vice-president; S. E. Hertel, secretary, and M. Meyer, treasurer. On Monday of this week active business was started and there is already considerable rivalry between the new mining ex-

change and the "Old Board." The San Francisco & Tonopah Exchange has now ceased to exist. It was the first to call the stocks of the new Nevada camps, when the old board declined to do so. Meantime the San Francisco Stock and Exchange Board is proceeding in the direction of rejuvenation. The committee on constitution and by-laws, consisting of W. H. Moise and W. C. Ralston, has engaged the services of a prominent attorney to advise in the construction of a new plan of procedure for the board which shall be in conformity with the methods adopted by the large exchanges in the Eastern States. The present constitution and by-laws are based on the San Francisco custom of 40 years and are somewhat antiquated.

STOCK QUOTATIONS

NEW YORK Mar. 1	
Name of Comp.	Clg.
Alaska Mine	1⅜
Am Nev M&P Co	⅛
Amalgamated	92
Anaconda	42
Bataklan	1⅝
British Col. Cop.	8
Buffal Cobalt	2
Butte & London	⅛
Butte Coalition*	36
Butte Cop. & Zinc	5¾
Cobalt Contact	⅛
Colonial Silver	1⅝
Cum. Ely Mining	10
Davis Daly	1½
Dominion Cop.	¾
El Rayo	3
Foster Cobalt	2
Furnace Creek	1⅛
Giroux Mine	8¾
Gold Hill	⅛
Greene-Gold	1½
Greene G. & S.	1⅝
Greene-T. & D. Val.	1⅝
Guanajuato	4
Guggen. Exp.	20⅞
Hancock	⅝
McKinley-Dar	1
Mitchell	1½
Mines of Am.	1
Mitchell Mining	1
Mont. Shos. Cons.	1⅛
New Utah M. & S.	⅛
New Cornelia M. & S.	21
Nipissing Mines	13
Old Hundred	3½
Stewart	1
Tennessee Copper	20
Tonopah Copper	⅛
Utah Apex	⅞
West	1⅛

N. Y. INDUSTRIAL	
Am. Agri. Chem.	
Am. Smelt. & Ref.	8
Am. Sm. & Ref. pf	9
Bethlehem Steel	1
Colo. Fuel & Iron	8
Federal M. & S. pf	8
Inter. Salt	1
National Lead	1
National Lead, pf	1
Pittsburg Coal	1
Republic I. & S.	1
Republic I. & S. pf	1
Sloss-Sheffield	5
Standard Oil	5
Texas C. & O.	
U. S. Leather	
U. S. Leather pf	
U. S. Steel	
U. S. Steel, pf	9
Va.-Car. Chem.	4
Va. I. Coal & Coke	7

BOSTON Mar. 19	
Name of Comp.	Clg.
Adventure	4⅜
Allouez	
Am. Zinc	
Arcadian	8
Atlantic	1
Bingham	2
Boston Con.	2
Calumet & Ariz.	10
Calumet & Hecla	88
Centennial	3
Con. Mercur	5
Copper Range	8
Daly-West	1
Franklin	2
Granby, New	13
Greene Con.	2
Isle Royal	2
La Salle	1
Mass.	
Michigan	1
Mohawk	8
Mont. C. & C. (new)	
Nevada	1
North Butte	9
Old Colony	1
Old Dominion	2
Osceola	1
Parrot	2
Phoenix	
Quincy	1
Rhode Island	
Santa Fe	
Shannon	1
Tamarack	1
Trinity	2
United Cop., com.	
U. S. Oil	1
U. S. Smg. & Ref.	
U. S. Sm. & R. pf	
Utah Copper	6
Victoria	
Washington	
Winona	
Wolverine	1
Wyandotte	1

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Adventure	
Ariz. Com	2
Black Mt	
Cobalt Contact	
Coniagas (xd)	1
East Butte	1
Raven	1
Keweenaw	
Mackinac	
Nevada	2
Shawmut	
Superior	1
Superior & Pitts.	2
Tenn. Mar.	

LONDON Mar. 20	
Name of Comp.	Clg.
Camp Bird	1
Esperanza	2
Tomboy	1
El Oro	1
Mexico	
Oroville	
Rhodesia	
Utah Apex	
Ariz. Cop., pfd.	3
Ariz. Cop., def.	1

Cabled through Hayden, Stone & Co., N. Y.

S. FRANCISCO Mar. 13	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.70
Best & Belcher	1.45
Caledonia	.41
Chollar	.11
Con. Cal. & Va.	.86
Crown Point	.32
Exchequer	.25
Gould & Curry	.30
Hale & Norcross	.74
Mexican	.56
Ophir	2.50
Overman	.15
Potosi	.11
Savage	.75
Sierra Nevada	.76
Union	.72
Utah	.05
Yellow Jacket	1.00
TONOPAH STOCKS	
Golden Anchor	.31
McNamara	.52
Montana-Pitts.ex.	.25
North Star	.30
Rescue	.17
GOLDFI'D STOCKS	
Black Ants	.09
Blue Bull	.43
Columbia Mt	.90
Comb. Frac	4.30
Conquerer	.21
Daisy	2.05
Florence	3.25
Frances-Mohawk	1.00
Goldfield Con.	8.50
Grandma	.24
Great Bend	.95
Red Hills	.28
St. Ives	1.70
BULLFROG STOCKS	
Amethyst	.40
Bonnie Claire	.41
Mayflower Con.	.41
Montgomery Mt.	.26
Original	.18
MANHAT'N STOCKS	
Gold Wedge	.13
Manhattan Mg	.13
Pine Nut	.17
Ruby Wonder	.33
Stray Dog	.34
Yellow Horse	.06

NEVADA Mar. 20 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	16.75
Tonopah Exten.	4.00
Montana Tonop'h	3.25
Belmont	4.12½
Tonopah Midway	1.85
West End Con.	1.27
Jim Butler	.96
GOLDFI'D STOCKS	
Sandstorm	.48
Kendall	.34
Red Top	4.00
Jumbo	4.00
Goldfield Mining	1.35
Dia'dfield B. B. C.	.35
Atlanta	.56
Mohawk	10.75
Silver Pick	1.07
Laguna	1.45
BULLFROG STOCKS	
Mont. Shoshone C.	10.25
Tramps Con.	1.05
Gold Bar	1.00
Bullfrog Mining	.24
Bullfrog Nat. B.	.38
Homestake Con.	1.15
MANHAT'N STOCKS	
Manhattan Con.	.68
Manhat'n Dexter	.23
Jumping Jack	.20
Stray Dog	.35
Indian Camp	.18

COLO. SPRINGS Mar. 16	
Name of Comp.	Clg.
Acacia	11½
Black Bell	
C. C. Con	5½
Dante	6¾
Doctor Jack Pot	
Elkton	59
El Paso	45½
Findley	
Gold Dollar	7
Gold Sovereign	6¾
Isabella	22
Index	
Jennie Sample	7¾
Jerry Johnson	
Mary McKinney	
Pharmacist	6¾
Portland	1.19
Un. Gold Mines	8¾
Vindicator	91
Work	18

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Agri. Chemical, pfd	Apr. 1	$3.00 *	$544,590
Am. Smg. & Ref., com	Apr. 15	1.75	875,000
Am. Smg. & Ref., pfd	Apr. 1	1.75	875,000
Beck Tunnel, Utah	Feb. 20	0.40	40,000
Bullion Beck & Champion	Mar. 1	0.10	10,000
Daly Judge, Utah	Apr. 12	0.37½	112,500
Dominion Coal	Apr.	1.00	150,000
General Chemical, pfd	Apr. 1	1.50	165,000
Granby Con	Mar. 30	0.30	405,000
Guggenheim Exp. Co	Apr. 1	2.50	262,500
Homestake, S. Dak	Mar. 25	0.50	112,200
Horn Silver	Mar. 30	0.05	20,000
Mines Co. of America	Mar. 24	0.02	40,000
North Star Mines, Cal	Mar. 28	0.20	50,000
Nova Scotia Steel & Coal	Apr. 15	1.50	74,555
Quartette Mg	Mar. 30	0.02½	15,000
Standard Con	Mar. 26	0.10	17,839
Texas & Pacific Coal	Mar. 31	1.50	360,000
Tezuntlan	Apr. 1	2.00	20,000
Trethewey	Mar. 31	0.04	40,000
United Metals Selling		7.50	375,000
U. S. Red & Ref., com	Apr. 15	0.87½	656,250
U. S. Red. & Ref., pfd	Apr. 15	0.87½	656,250
Utah Con	Apr. 15	1.50	450,000
Va.-Carolina Chem. pf	Apr. 15	2.00	360,000
Work	Apr. 1	0.01	15,000

Assessments

Company.	Delinq.	Sale.	Amt.
Arizona Prince, Cal.	Mar. 25	Apr. 20	$0.04
Butler-Liberal, Utah	Mar. 14	Apr. 1	0.01
California, Cal.	Apr. 5	Apr. 20	0.05
Con. Cal. & Va., Nev.	Mar. 21	Apr. 11	0.25
Etna-King, Cal.	Mar. 10	Apr. 3	0.01½
Hecksher, Nev.	Mar. 4	Mar. 25	0.05
Herbner-Grunwal, C.	Mar. 29	Apr. 15	0.04
Ingot, Utah	Mar. 15	Apr. 1	0.02
Lida, Nev.		Apr. 14	0.03
Lloyd-Searchlig't, N.	Mar. 29	Apr. 18	0.01
Oro Blanco, Cal.	Feb. 25	Apr. 22	0.03
Posey Canon, Cal.	Apr. 1	Apr. 15	0.01
Quincy, Jr., Idaho			0.10
Savage, Nev.	Mar. 13	Apr. 3	0.10
St. George, Utah	Mar. 4	Mar. 25	0.01
St. Ives, Utah	Mar. 28	Apr. 16	0.02
Wabash, Utah	Mar. 12	Apr. 3	0.05

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.118	31.769
February	66.108	68.835	30.464	31.852
March	64.597		29.854	
April	64.765		29.984	
May	66.976		30.968	
June	65.394		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.927		31.483	
October	69.523		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.789
February	17.869	24.869	18.116	25.236	78.147	107.366
March	18.361		18.641		81.111	
April	18.375		18.688		84.793	
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.686		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.606	
March	36.662		September	40.616	
April	38.900		October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.628
February	5.464	6.000	16.031	19.631
March	5.350		15.922	
April	5.404		15.959	
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.525	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209		6.056		24.563	
April	6.078		5.931		25.781	
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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Geology of the Ely Trough Iron-ore Deposits

The Orebodies at Ely, Minnesota, are Replacement Deposits Inclosed in a Greenstone Trough under a Cap of Jaspilite

BY GLARENCE E. ABBOTT*

The lenticular body of iron formation and its including walls of greenstone at Ely, Minn., has been termed the "Ely trough." It has a northeast-southwest trend, parallel to the longitudinal axis of the Vermilion range. Longitudinally and transversely its structure is synclinal. Transverse sections show that it is characteristically U-shaped at some points. This is especially true of its western portion, where the Chandler and Pioneer deposits are located. Here in places the bottom of the trough has been reached, showing that greenstone forms the impervious basement.

To the east, in the Zenith, Sibley and Savoy mines, the greenstone walls and included iron formation dip at a high angle. Both east and west ends of the trough are canoe-shaped, the west end pitching east and the east end pitching west. At the Zenith, and about midway in the trough, is an anticline, subordinate in nature. This anticline separates the Zenith ore deposit in two portions, one upon either limb. It also has separated the trough longitudinally into two great synclines, one between the Pioneer and Zenith, the other between the Zenith and Savoy.

The ores of the district lie at or near the bottom of the trough and upon the impervious basement of Ely greenstone. At only one point of the trough did the ore reach the surface, at the west end of the Chandler deposit. As a result of the trough's steep pitch to the east the orebody rapidly passed under the capping of jaspilite, and all the orebodies lie beneath a jaspilite capping. In the upper portions of the trough, and nearer the surface, the jaspilite lies in contact with the greenstone; lower down the ore is in direct contact with greenstone. Horses of greenstone are present in the orebodies in a number of cases. These can, in almost every case, be traced into the foot wall, showing that their presence in the orebody is due to infolding.

At the east end of the area, while the formations form a pitching trough, the structural conditions have been formed in a different manner.

The Chandler-Pioneer Body

The Chandler-Pioneer orebody is the largest yet developed in the area. It occurs at the bottom and comes part way up the sides of the eastward pitching trough. The inclosing walls are of greenstone, as is also the impervious basement upon which the ore lies. The rocks have been closely folded and as a result many irregularities in structure occur.

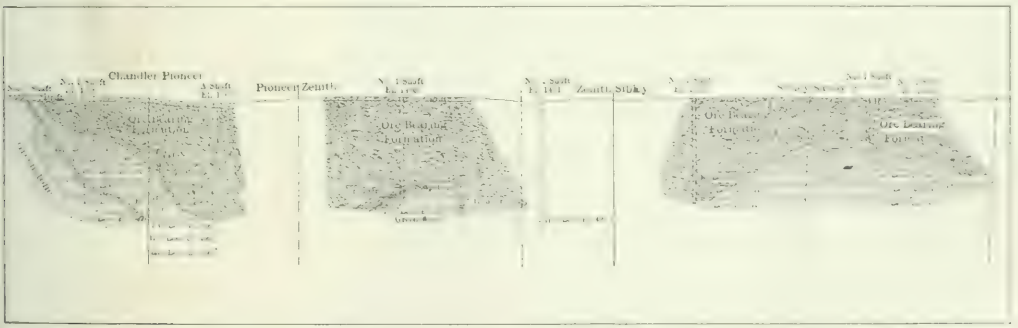
The north and south walls at one point in the Chandler dip at an angle of about 70 deg. to the north. Farther east, in the same orebody, the south wall becomes more inclined, while the north wall dips at a high angle to the south.

In many cases the intense folding has caused a reversal of dip of the walls. These points are illustrated in sections A—B, C—D and E—F. These sections also show an increased depth to the trough as it pitches east. The longitudinal section illustrates this fact very clearly.

One especially interesting feature is the presence of a number of subordinate rolls at or near the bottom and sides of the trough. In all cases they are protuberances from the inclosing walls of greenstone. On section A—B the subordinate anticline is very prominent. This has separated from the orebody a small lens of ore. Infolding probably explains its occurrence. Where examined underground it lay between two walls of greenstone, and was very compact in structure.

No paint rock was present, the ore being in direct contact with the greenstone. This subordinate roll in the Chandler can be traced into the Pioneer workings where it has become of great importance. Here it entirely separates a small orebody from the main body. It may eventually cut out this orebody entirely, as did a similar roll in the upper workings, and connect with the south foot wall.

The north and south walls of the trough are of greenstone altered to soap rock or paint rock. The soap rock is the altered equivalent of the greenstone and grades into it in most every case. At the



LONGITUDINAL SECTION—CHANDLER, PIONEER, ZENITH, SIBLEY, SAVOY MINES

Note—Abstract by D. E. Woodbridge of a paper read by title at the summer meeting, 1906, of the Lake Superior Mining Institute.

*Mining engineer, Bessemer, Ala.

soap rock is very schistose and shows much broken. There is at many points of brecciated matter. This consists of ore.

The jaspilite being a much more resistant rock, did not break and crush as readily as the greenstone. This, together with the slickensides, indicates that great movements have taken place at the contact of the two formations. The plane of contact has afforded ready access to descending waters. As a result the greenstone has altered to soap rock, and iron oxide has been infiltrated, giving the soap rock a chacteristic red color.

Lying next to the soap rock is the ore; above the ore is the capping of jaspilite. The contact of the ore and jaspilite is very irregular. Jasper bunches project into the orebody at many points. Both ore and jasper have been much broken and crushed. This is due to the forces which produced the folding and formed the trough in which the ore lies.

The banding in the ore is very similar to that of the jasper; in fact, there is a gradual change from merchantable ore to lean ore and from lean ore to jasper. In general the brecciated ore has been recemented by iron oxide and to all appearances is massive in structure.

The Zenith Orebodies

The Zenith orebody lies between two walls of greenstone dipping at an angle of about 75 deg. to the north. The north and south walls are approximately parallel. More intense folding has taken place at this point in the trough than at the west end in the Chandler-Pioneer properties.

The relations of the greenstone, paint rock, ore, and jasper are in general similar to those at other points of the area.

There are two separate orebodies in the Zenith mine. These orebodies are separated by an anticline which has had considerable influence upon their deposition. The axis of this cross-fold lies approximately in an east-west direction. The orebodies appear to be upon either limb. The first orebody found in the Zenith was that lying upon the south limb of the anticline. As depth was reached, this orebody was found to follow down this limb until at the tenth level it is some 300 ft. west of where it was first found in the old upper workings.

Development work has shown that this anticline has a core of greenstone which has altered to soap rock upon either limb and upon its crest. The jaspilite capping lies immediately upon the crest.

The main orebody of the Zenith was located by means of diamond drills from the bottom levels near the shaft. It lies upon the north limb of the anticline.

Both bodies lie mainly upon the foot-[illegible] of the formation. The main orebody occupies the full width between walls as increased depth is reached. The ore lies higher up on the foot-wall than upon the hanging-wall side. It is quite evident that the major circulation of de-[illegible] water was upon the south side of the fold, and because of this more work of concentration was accomplished.

The soap rock is also much thicker upon the foot wall, showing that descending waters have been unusually active at that point. The main body is pitching to the east under the jaspilite capping. From the ninth to the tenth levels it has gained nearly 500 ft. As to whether it will eventually connect with the Sibley deposit, we are not certain. Everything points to that conclusion, however.

The ore of the Zenith mine does not contain much more than 2 per cent. of lump ore. In its iron content and structure it is probably the best iron ore that the Oliver Iron Mining Company is producing.

The Sibley-Savoy Deposit

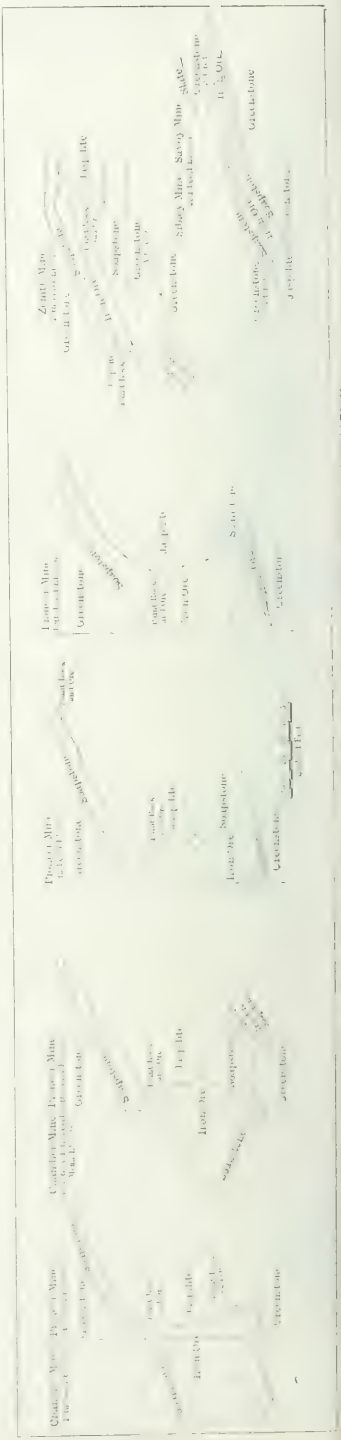
The Sibley-Savoy ore deposit lies in a westward pitching trough. The inclosing walls are of greenstone, which dip at a high angle to the south. Here, as in the Zenith, the rocks have been closely folded.

The ore lies mainly upon the foot-wall side, but with increased depth occupies the full width between the walls. The orebody itself is lenticular in shape, being about 150 ft. wide in places and narrowing to nothing at the east end. At this point the foot and hanging walls came together like a V and the ore pinches out. The main body, and that from which the most ore has been mined, lies upon the Savoy side, but with increased depth the greater orebody will no doubt be found upon the Sibley property. The Sibley deposit is rapidly gaining to the west under the heavy capping of jaspilite.

In the mines of this district red paint rock, or soap rock highly impregnated with iron, is considered to be a favorable sign for ore. The absence of this at the east end of the Savoy merely emphasizes the barrenness of the formation at this point of the deposit.

The ore in the Savoy is harder and more compact than that in the Sibley. Pillars 15 ft. square stand without crushing, while in the Sibley a pillar of that size would stand for but a short time.

As stated above, this orebody, especially in the Savoy mine, is pitching to the south at a high angle. Facts seem to point to a rapid flattening of this angle, approaching nearer 45 deg. In the bottom of the Savoy mine is a long, narrow lens of greenstone and paint rock. This seam, or lens, first appeared in the second-level workings. It seemed to be a projection from the foot wall. As depth was reached it grew to be of more importance, until upon the third level it has completely divided the orebody into two portions. Fu-



LEVELS OF CHANDLER, PIONEER, ZENITH, SIBLEY, SAVOY MINES, GEOLOGICAL FORMATIONS

ture developments may show it connecting with the foot wall, or it may continue as a narrow sheet. Facts seem to point to its connecting with the foot wall throughout its entire length.

Origin of the Deposit

At the contact of the ore with the hanging wall in the Sibley mine, the banding of the ore is approximately parallel to the dip of the soap rock. At this point the paint rock and ore are intimately associated, there being a considerable amount of brecciated matter composed of pieces of ore, jasper and paint rock. In some places the ore lies against a clean face of paint rock, its bedding planes being parallel to the dip of the paint-rock hanging wall. The paint rock always shows slickensides, an indication of the great movements that have taken place at these points.

In the Savoy and Sibley deposit a large amount of iron carbonate is found. This occurs as yellow and reddish crystals in the cavities and seams in the ore. It has in many cases recemented the brecciated ore as the old fracture planes may be easily seen. This carbonate is clearly of secondary origin.

It is very evident from a study of the sections through the Ely trough that the contact of the iron formation and the greenstone has strongly influenced the concentration of the ores. These planes of weakness were the means by which the descending waters reached the bottom of the trough.

The formation of the orebodies as a result has been dependent upon this means of ready access to the iron formation. Where the descending waters converged and met at the bottom of the trough in the Chandler-Pioneer deposit, there the largest orebodies were found. This is true to within certain limits, there being in a number of cases a pinching of the walls with an enlargement of the orebody below.

Abundant circulation of water for a long period of time, together with ideal structural conditions, has made the concentration of the ores in their present position a possibility.

The relations of the orebodies to the trough are very definite in that they conform very closely to it in outline. They have evidently been deposited in their present positions after the main period of folding had been finished. However, some of the ores and most of the jaspilites are now, or have been, in a brecciated condition. It is plain that movements have taken place while they were near the surface, and that considerable movement was necessary, as both ore and jaspilite are exceedingly hard when in massive state.

Evidences of Movements

I do not believe that great movements of the rocks of the trough have taken place since the formation of the orebodies in the present positions. There are in many places along the contact of the iron formation and the Ely greenstone considerable amounts of fragmental material. This material consists chiefly of pieces of soap rock and ore, with a matrix consisting of a mixture of both. The soap rock was formed by alteration of the greenstone; this alteration must have taken place while the orebodies were being formed in their present position, for it was at that time that circulating waters were most active at the contact.

If these movements took place after the alteration to soap rock no angular pieces would be present, as it is a very soft rock. It is therefore evident that the fragments of greenstone were detached from the wall and placed in their present position before they had altered to soap rock.

Where we find the ore lying against the soap rock without fragmental matter, although the soap rock shows slickensides it is evident that the movements causing the slickensides occurred previous to the alteration of the soap rock, and, therefore, also before the main concentration of the ore. If the waters were descending, as seems to be now proved in general, alteration was first begun at the contact of the iron formation and the greenstone.

As the great thickness of soap rock on the hanging- and foot-wall sides of the trough must have been formed contemporaneously with the ore, it is evident that any movements tending to strain and fracture the ore would have caused a different state of affairs than we now find at the contact. In most cases the banding and fracturing of the ore is similar to that of the jaspilite.

It seems evident that the main fracturing of the ore formation occurred previous to the formation of the orebodies in their present positions, for they now rest in places most favorable for the circulation of underground waters. Any great movements would have changed these positions. The ores have been formed by a process of replacement, and they retain, as a whole, practically the same structure as that existing in the jaspilite at present.

Replacement Deposits

The iron formation and the inclosing greenstones were at one time deeply buried. That the iron formation was in the zone of flowage is evidenced by the intricate folding it has undergone without a sign of fracture. From the zone of flowage the rocks were elevated to the zone of fracture for ore and jasper; here they were subjected to further movements and were crushed and broken. This brecciation increased the openings in the iron formation, and thus afforded an easier access to the circulating waters. As a result infiltration and recementation took place, and the brecciated ores are now cemented by hematite, calcite and siderite.

The iron ores are replacement deposits.

Wherever actual contacts with the jaspilite were observed the ore graded into it. The ore in the Sibley and Zenith mines has the mashed, banded structure so noticeable in the iron formation. This is true to a greater or less extent in the remaining mines of the district. Thus it is clear that the rock from which the ore was derived by a process of replacement was a banded rock.

Infolding or Interbedding

About 1300 ft. south of No. 2 shaft, Savoy, a vertical drill hole passed through 85 ft. of ore at a depth of 1253 ft. Midway in this ore was a seam of altered greenstone 13 ft. thick. This orebody lying so far south of the Savoy deposit, and buried under such an enormous thickness of greenstone, seems to indicate that it has been interbedded rather than infolded.

In the Zenith mine, drilling done to a depth of 700 ft. below the tenth level also reveals some startling facts. The iron formation and greenstone form a fold shaped like the letter J. The formations dip to the north at a high angle until, at a depth of 400 ft. below the tenth level, they turn back upon themselves, rise toward the north to a point 70 ft. below the tenth level and 400 ft. north of where the hanging wall is encountered on that level.

To explain this occurrence by infolding must necessarily involve a very complicated series of movements of the formations. As in the Savoy, the facts seem to point to interbedding rather than to infolding. In both deposits long seams of altered greenstone are encountered in the orebody. In the Savoy especially we have a seam that has divided the orebody into a north and south lens. This, as in the drill hole mentioned above, is evidence of interbedding.

It may be asked how it is possible that infolding could have occurred at one end of the trough and interbedding at the other, it all being in a continuous iron formation. Such an occurrence could easily occur without violating geological principles. It is evident that after the interbedding of the iron formation at the east end of the area that great movements took place. This is evident because of the position of the slates and their dip to the south. It is certain that nowhere in the Lake Superior region has there been folding that will enable us to explain the relations of the different formations at the east end of the Ely trough.

Pre-glacial Concentration

Conditions in pre-glacial and glacial times were very different from those existing today, and it is certain that the concentration of the ore was well along in those periods. A study of the topography of the area does not enable one to form an opinion as to the possible depth of the effect of circulating waters.

Circulation of underground waters at all points observed in the Ely trough is downward. The Pioneer mine, whose workings are below those of the Chandler, to the west, is pumping practically all the water of that deposit. This does not average much more than 400 gal. per min. At the east end of the trough we have a somewhat similar state of affairs. The Sibley and Savoy bottom workings are about upon a level. The east end of the Savoy, and especially near the converging walls of greenstone, is very wet.

This indicates that the main circulation of water is now down the end of the canoe-shaped trough. The Sibley shaft is, however, very wet compared with the Savoy, and all the water from both properties is pumped through this shaft. At the Zenith less water is being pumped than at the Pioneer; this is also true of the Sibley. When the orebody is tapped from Zenith No. 2 shaft, a much larger flow than now encountered in No. 1 shaft is expected. In all of the properties the main circulation of water is upon the foot-wall side of the formation.

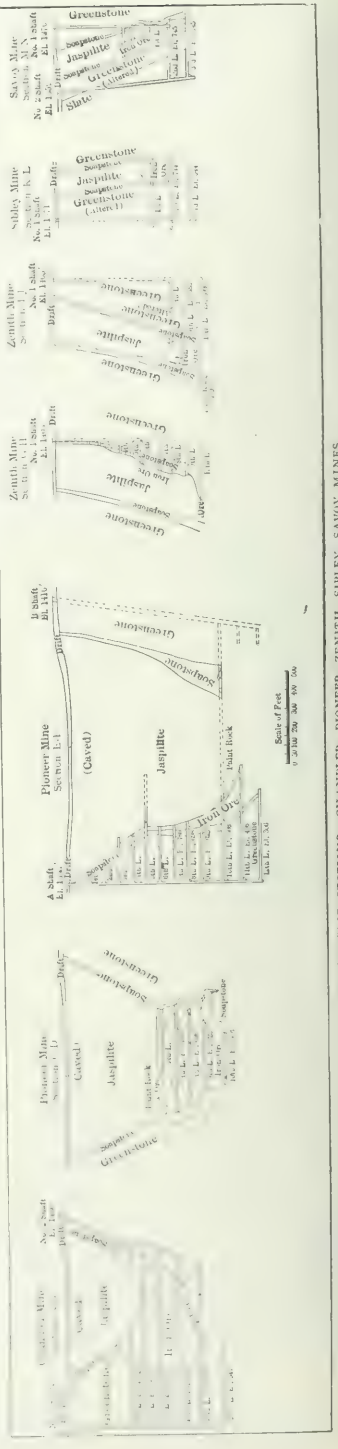
It is evident from the above facts that the flowage of underground water at present is very small compared with what must have circulated at one time. We may assume, however, that present-day circulation is in practically the same channels as during the formation of the orebodies.

Explorations

It may be said that the Vermilion range is the most difficult to explore of any of the iron-bearing districts in the Lake Superior region. From a study of the deposits of the Ely trough it is possible to arrive at a few conclusions regarding exploration. In the first place, the iron formation and adjacent formations should be mapped in a careful manner, with their strikes and dip. When possible, a careful magnetic survey should be made, showing the lines of maximum variation. This sometimes enables the iron formation to be traced under the heavy covering of glacial drift encountered at so many points. The iron formation, where of considerable width—is most favorable for exploration, although the smaller exposures should not be wholly neglected.

As shown in the maps and sections the iron formation is about 1400 ft. wide at one point in the Ely trough, yet it narrows to scarcely 150 ft. at its east end. Good deposits of ore were found at the narrowest point of the formation.

As shown in the cross section of this area, the orebodies lie in pitching troughs with impervious basements. Where the ends of the formation can be found they should be carefully examined for evidences of such structure. At only one point in the Ely trough did the ore reach the surface. This occurred at the west end of the Chandler mine. The remain-



TRANSVERSE SECTIONS—CHANDLER, PIONEER, ZENITH, SIBLEY, SAVOY MINES

ing deposits of the area were found beneath a heavy capping of jaspilite, varying from 300 to 800 ft. in thickness. It is, therefore, not probable that all of the ore deposits yet to be discovered will be found at or near the surface.

VERTICAL DRILL HOLES PREFERABLE

In the early days considerable drilling was done at the narrow east end of the Ely trough. Low angle drill holes were put down. Those holes, in most cases, were located on either the foot- or hanging-wall side and passed from foot to hanging through jaspilite. As is seen from the cross section, they cut the formation above the main ore. Ore was encountered, but it was mainly small bunches in jaspilite and not a main body.

It is, therefore, evident that exploration should be done by means of long, high angle holes, as the orebodies in almost all cases lie at considerable depth. Low angle holes are drilled with considerable difficulty, owing to their liability to cave readily. To ream a hole and case it is very expensive. In most cases vertical holes can be sunk with far better success.

The Savoy main orebody was discovered by means of a vertical drill hole, and its extension to the south was located in the same manner. The explorer should aim to prove the formation at considerable depth, as it is evident that the orebodies lie at or near the bottom of the troughs. Some explorers claim that steeply inclined drill holes are liable to follow a seam of ore, and thus give inaccurate information.

As the iron formation of the Vermilion range has been folded in a most intricate manner, that a drill hole should encounter a continuous seam of ore is highly improbable.

Lehigh Coal and Navigation Company

This company owns a large estate in the Lehigh district of the anthracite region. It also owns the Lehigh and the Delaware Division canals, and the Lehigh & Susquehanna Railroad. The railroad, however, is leased to the Central Railroad Company of New Jersey. The property also includes a large interest in the Lehigh & Hudson River Railroad.

The gross earnings of the Lehigh & Susquehanna Railroad were $7,611,667. There was a decrease due to the stoppage of anthracite mining in April and May.

The income account for the year was as follows:

Lehigh coal lands	$851,307
Railroads	2,305,053
Miscellaneous	213,267
Total	$3,369,627
Less loss on canals	37,885
Net earnings	$3,331,742
Interest, rentals, taxes, etc.	$1,327,131
Depreciation and sinking funds	319,163
Total charges	$1,646,294
Surplus	$1,685,448

From this dividends were paid of 8 per cent. on the stock, amounting to $1,387,604 leaving a surplus of $297,844 for the year.

The coal mined and shipped was as follows:

Coal shipped			
Used at mines			
Total			

The coal consumed by the company and its tenants in mining operations was 10.4 per cent. of the production, as compared with 8.4 in 1905. This increase is due to the fact that the consumption of fuel to make steam for pumping, etc., continued while the collieries were idle during the strike and no coal produced. The smaller sizes are used for this purpose, and a large proportion of the amount used was waste coal that could not be sent to market. The output per day of 10 hours was 9920 tons, and the average time worked by each colliery was 229.5 days of 10 hours each, or 255 days of 9 hours each, the present working day. The cost of mining and preparing coal was $1.72 per ton, a decrease of $0.03 compared with 1905.

The report says: "During 1906 improvements under way were pushed vigorously and others undertaken, all of which will ultimately lead to an increase in the production of coal. The amount expended on colliery improvements during the year was $442,476. Out of the current earnings of the company $200,000 has been charged off for depreciation. Capital charges under the head of coal improvements have been increased by the sum of $242,476. During the period of eleven years there has been expended on new collieries, additions and betterments the sum of $2,740,409, of which $1,659,203 was charged off out of the net earnings and $1,081,206 added to capital account.

It is proposed to drive a tunnel from high-water mark on the Lehigh river, near Mauch Chunk, in a southwesterly direction, a distance of 7500 ft., to a point of intersection with the Buck Mountain or one of the underlying coal seams. From this point, a drainage gangway will be extended westward in one of the coal seams, from which connections will be made with all the collieries now in operation on the company's property between Mauch Chunk and Tamaqua. The tunnel and gangway will have a descending grade to the Lehigh river for every 100 ft. The distance from the outlet of the tunnel to the western extremity of the drainage gangway will be about 12 miles. Six collieries will be placed above water level, and in five others pumping will be reduced vertically an average of about 360 ft.

"Plans have been prepared for the construction of the main tunnel, starting on the Lehigh river at the junction with Nesquehoning creek, near an old site known as Lausanne, at a level of 546 ft. above tide. The main tunnel, the drainage gangway and the connecting tunnels call for 24,000 ft. of tunnel and 54,000 ft. of gangway, making a total of nearly 14 miles. The total cost is estimated to be something over $700,000. It is believed that the direct saving at the present time in the cost of mining coal will be nearly $150,000 per year. In addition, the amount to be saved annually in freedom from drown-outs, while a difficult one to state absolutely, will, in the course of years, represent a very large sum of money. Work on the tunnel was started in July last. It will take several years to complete.

"The operation of our canals shows a loss for the year of $37,885, which is $11,305 less than for the year 1905. The results are still very unsatisfactory. Some extraordinary expenditures are responsible for part of this loss, the largest item being the rebuilding of the Taylorsville aqueduct, at a cost of $10,588. In the last few years over $600,000 has been expended out of surplus earnings in rebuilding and making substantial repairs. Plans are now under discussion for enlarging this portion of the company's business, and the sentiment is to give them favorable consideration, provided the probable returns will justify the very large expenditure required.

"During the year improvements have been made on the property known as the Ballstown Yard, situated on the Delaware river front, to enlarge the coal storage plant at that place and give additional facilities for unloading canal boats and distributing coal. When this plant is completed it will be possible to increase the traffic over the canal during the navigation season, as room will be provided for storing more coal for distribution during the winter months. In addition to increase in business, it is believed the facilities will decrease the cost of handling the coal. There is a frontage on the river of 450 ft. In addition to the unloading facilities now planned, it is possible to build two large modern piers for general merchandise purposes. These piers, being located on the deep-water channel, would be in demand, and would add to the facilities so badly needed in the harbor of Philadelphia."

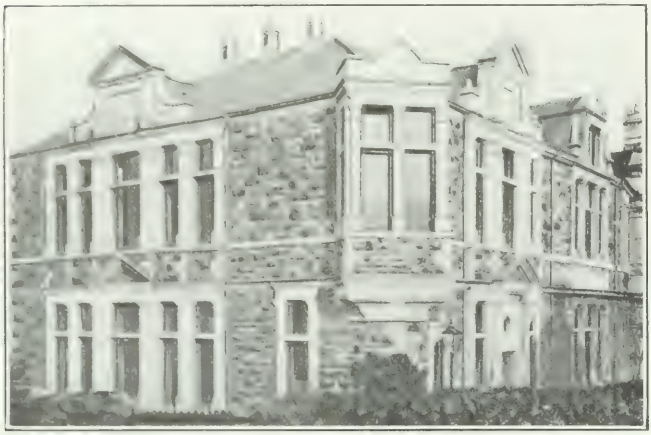
Depth of Death Valley, Cal.

The Geological Survey has just completed a line of spirit levels through Death Valley, California, and has ascertained that the depth of that area is not so great as was supposed. Preliminary figures give for the lowest point a depth of 276 ft. below sea level. Bennetts well, which is near this point, is 266 ft. below sea level. Previous estimates of the depth of Death Valley based on barometer readings gave for the lowest point figures varying from 250 to 450 ft. below sea level.

The Mining School at Camborne, Cornwall

By [illegible]

Though mining in Cornwall has been under a cloud during the last 20 years, and progress in general has lagged be- [illegible] is not



THE CAMBORNE MINING SCHOOL.

pen to this reproach. I refer to the mining school at Camborne. Its progress during recent years has been a matter of congratulation and affords a proof that the Cornishman is not such a slow and backward individual as some of his unkind critics would paint him.

Like many institutions of this character, the Camborne mining school is an outgrowth of other things. It is now over 50 years ago since Sir Charles Lemon attempted to found a mining school at Truro. His efforts were not successful. A few years afterward, viz., in 1859, a committee of local and other gentlemen interested in mining, among whom was the late Robert Hunt, formed the Miners' Association for the purpose, among other things, of establishing courses of lectures at various centers in Cornwall, and for 20 years this particular scheme was worked with satisfactory results.

Some of the lecturers have subsequently risen to fame, such as Richard Pearce, late of Colorado and now connected once more with Cornish mining and metallurgy, Sir Clement Le Neve Foster, J. H. Collins and Benedict Kitto.

In 1877 these lecture courses became centered at Camborne by the building of a metallurgical and chemical laboratory by Mr Basset, and it is this event which is officially considered as the foundation of the school. In 1882 a school building and lecture rooms were erected, and in 1890 new wing was built.

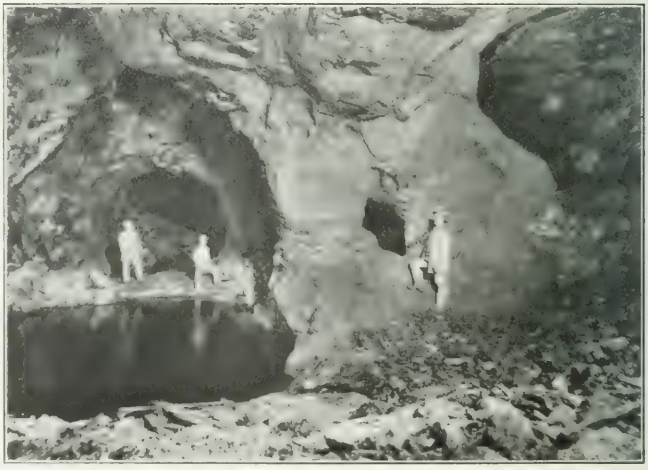
Perhaps the most important step was taken in 1897, when the eastern portion of the South Condurrow mine was leased [illegible] and made into a mediums for teaching mining in all its operations, as well as surveying and ore dressing. This mine is now known as the "King Edward Mine." For many years J. J. Beringer, well known as author of the "Textbook of Assaying" which bears his name, has been principal of the school and head of the departments of chemistry, metallurgy, assaying, mineralogy and geology.

The mining, surveying and ore-dressing departments have been in the charge of William Thomas and Benjamin Angwin. Recently William Thomas has resigned in order to take up the management of the Botallack mine now being reopened, and he is to be succeeded by James G. Lawn, who has for some time held a similar position at the South African School of Mines, and is the author of the book on "Mine Accounts and Mining Bookkeeping."

The growth of the school has been continuous, and the number of students has increased from 80 ten years ago to 230 last session. There are also mining schools at Penzance and at Redruth. These have not flourished like that at Camborne, and they ought to be and very likely will eventually be amalgamated with their more robust brother.

The course of study at the Camborne school extends over three years. In some cases, where the student can satisfy the authorities that he has efficient preliminary training, the courses may be taken in two years. In no case can the diploma of the school be awarded to a student who has spent less than two whole years there. The courses include mining, assaying, surveying, ore dressing, metallurgy, geology, mineralogy and crystallography, physics, chemistry, mathematics, pure and applied, mechanics, mechanical-laboratory work, mechanical drawing, electrical engineering, ambulance and mining hygiene.

During the three years constituting the school course two days a week are spent at practical work at the mine. In the first year special attention is given to driving in hard and soft ground by hand tools, stoping operations, and sampling. The second year's course includes timbering and the use of machine drills. The third year's work consists of a study of ore dressing and mill practice. Concurrently with practical work there are series of lectures on mining to extend and elucidate the knowledge gained at the mine, and the courses on mining also include lectures and practical work on geology and mineralogy. Mine surveying is dealt with during the second year, and metallurgy and assaying during the third.



WORKED OUT TIN LODE, KING EDWARD MINE, CAMBORNE.

the mining man first, that more of the instruction is given in the mine field and laboratory than in the class room, and secondly, that the courses dealing with allied or collateral subjects such as electrical and mechanical engineering, mathematics, physics and chemistry are specially designed for the requirements of the mining man and metallurgist.

Henri Moissan *

The death of Henri Moissan deprives France of one of her most distinguished contemporary chemists. Born in Paris in 1852, he studied at the Museum of Natural History, and in 1879 became connected with the School of Pharmacy, where he became professor of toxicology in 1886, and of mineral chemistry in 1889. In 1900 he was appointed professor of general chemistry at the Sorbonne and also director of the Institute of Applied Chemistry. One of the earliest achievements that brought him fame was the isolation of the element fluorine in the free state—a problem which had attracted the attention of many chemists before him, though with little success. This he accomplished in 1886 by electrolyzing a solution of potassium fluoride in anhydrous hydrofluoric acid at a temperature 23 deg. below zero Centigrade. Having obtained the element, he carried out an exhaustive study of its properties and those of its compounds, and his results were collected in a book on "Le Fluor et ses Composes," which he published in 1900.

Among other things, he thought it might be possible to utilize its extraordinary active powers of reaction for the production of carbon in the crystalline form—or, in other words, diamond—and attempted to gain this end by means of two gaseous fluorides of carbon which he found he could readily prepare; but the decomposition of these compounds only yielded lampblack instead of the hoped for diamond. His experiments, however, led him to take up the methodical study of carbon in its three varieties and to investigate the condition under which they are transformed one into the other. He thus came to recognize that high pressure is necessarily for the preparation of the crystalline variety, and to obtain this pressure he took advantage of the property possessed by molten iron of increasing in volume as it passes from the liquid to the solid state. He also took advantage of another property of molten iron, that of dissolving a large quantity of carbon; this carbon, at ordinary pressures, is deposited from the solidifying iron as graphite, but he hoped that by the aid of high pressure he would obtain it as diamond.

To melt his iron and carbon, however, he required a very high temperature, and as a convenient means of obtaining this he was led to the development of the electric furnace, with which also his name is specially associated. He melted iron and sugar-charcoal in a carbon crucible at a temperature of some 4000 deg. C., and then suddenly plunged the crucible in cold water. The result was that the outer solidifying skin of iron formed a rigid envelope, and that enormous pressure was set up in the interior as the inner liquid became solid. The carbon, as he expected, separated from the iron in the crystalline form, and thus he was enabled to produce real diamonds—exceedingly small, it is true, but still possessing the density and other characterictics of the natural products of Brazil or Kimberley.

He was further able to use the electric furnace—on which he published a book, "Le Four Electrique," in 1897—for a large extension of our knowledge of chemical action at high temperatures. Thus he succeeded in melting a great number of substances which had previously been regarded as infusible, and in reducing with carbon refractory oxides such as lime and silica to their elementary state.

He was also able to prepare many new compounds, especially carbides, silicides and borides, including calcium carbide, which was obtained almost simultaneously by him and by Willson in America in [illegible] England. He gave a lecture on the isolation of fluorine at the Royal Institution in 1897, and the day afterward that substance was reduced to the liquid state by him and Sir James Dewar in the Royal Institution laboratories, where, also, some years later it was obtained as a solid and shown to react violently in that condition with liquid hydrogen. In 1905 he was elected a foreign member of the Royal Society, and last year he again gave a lecture at the Royal Institution demonstrating the volatilization of gold and other metals by the aid of the electric furnace. It was only last year, too, that the fifth and last volume appeared of an exhaustive "Traité de Chimie Minérale," which was brought out under his direction and which was intended at once to [illegible]

KING EDWARD MINE AND SOUTH DEEP, ROSLIN, [illegible]

* From the *London Times*.

knowledge of inorganic chemistry and to point out the gaps that remain to be filled by future investigation.

Steel Production in Germany

The output of the German Steel Syndicate during 1906, according to the *Iron and Steel Trades Review*, amounted to 11,079,000 tons of finished and semi-finished products, being an increase of 2,127,048 tons over 1905. The production of tubes advanced 45 per cent.; forgings, railway axles, etc., 31 per cent.; bars, 29 per cent.; plates, sheets, shapes, and semi finished steel, each 22 per cent.; rolled rods and wire, 21 per cent., and railway material, 19 per cent.

Although the number of workmen in the Broken Hill district, New South Wales, is larger than at any previous period, it is still considerably below existing requirements, and operations are thereby impeded at several of the mines.

The Tavener Process for Gold Slimes

The Cost of Producing Gold Bullion from a Clean-up on the Rand by this Smelting Process is Less Than 4d per Fine Ounce

BY L. A. E. SWINNEY

The following notes on the smelting of [illegible] slime to the ultimate production of the gold bullion were compiled at one of the largest mines on the Rand, and represent the actual smelting of a "clean up" from start to finish. The figures pertaining to a specified smelt are given, which are taken as representing the average.

Drying of the Gold Slime

The filter press was at first held at a pressure of 80 lb. during the pumping in of the slime, and at half-cock and 40-lb. pressure during the second press, so that the slime should not be forced too far into the meshes of the filter cloths, and could be distributed evenly from the sides inward. One press and a half were obtained, and the cakes were duly detached from the frames into barrows resting on the tray underneath, and then taken into the smelting-house.

The cakes of slime were placed in cast iron trays 3x2 ft.x5½ in., and dried in the drying furnace (Fig. 1). The slime was dried at a uniform heat until it was slightly caked on the surface and all available moisture had been expelled. A slight crust of Zn SO_4 and Ca SO_4 was, as usual, found on the surface of the dried slime, which was shoveled from the trays into zinc pans, in which it was weighed when sufficiently cool, and then dumped into a conical heap on the cement floor. A sample of the slime was taken from the heap, and run down in pots to determine approximately the quantity of gold which might be expected from the smelt.

Assay of Sample

The sample weighed 14.58; and the following flux was used: PbO, 29 oz. + 2 oz. cover = 31 oz. PbO = 28.52 oz. Pb; C (on the PbO), 2.9 oz.; Na_2CO_3, 2.175 oz.; $H_3B_2O_3$, 5.0 oz.; SiO_2, 3.625 oz.; MnO_2, 4.35 oz.; Fe (on the PbO), 2.90 oz.

The lead bullion obtained weighed 34 oz., and, after granulation, was sent up to the assay office for assay, the return giving 0.523 per cent. Au. This was at the rate of 15 per cent. Au in the slime taken. A mean of two assays averaged 15.5 per cent. fine gold in the slime.

The heap of dried slime was then thoroughly mixed with the fluxes by continual shoveling and forming into cones.

The total weight of dried slime obtained called for 3150 oz. Au (3200 oz. approx.). Now the lead bullion obtained from the smelting should contain about 10 per cent. Au for successful cupellation in this process, and also to secure a good pour, therefore the weight of Pb bullion required = 32,000 oz. Pb. It being near enough to assume PbO the same as Pb, 20,000 oz. PbO are required, 3000 oz. PbO being used as a cover. Approximately, therefore, 120 per cent. PbO is required [illegible].

The weight of slime obtained from the 1st press was 12,975 oz., and the quantity of flux needed was calculated on this amount, and was as follows: PbO, 15,570 oz.; C, 1557 oz. (10 per cent. on the PbO); first press 55 per cent. assay slag, 7136 oz.; Fe, 1946 oz.; SiO_2, 3243 oz.

The carbon used was in the form of coal, the iron as tin-plate scrap and old tins cut up into small pieces, the SiO_2 as clean sand from the tailings dump, and the slag as common green slag from the assay office. The total weight of slime from the second press was 10,021 oz.; of this total 2741 oz. were smelted with the first press charge given above. The flux necessary for this extra amount was then calculated, and weighed as follows: PbO, 2741 oz.; C, 274 oz.; part of second press 55 per cent. slag, 1507 oz.; Fe, 356 oz.; SiO_2, 685 oz.; 3000 oz. PbO cover.

The double charge was smelted in the large pan furnace. The remainder of the second press, 7280 oz. (10,021—2741) was mixed with the requisite flux and smelted in the small pan furnace. The following weights were used: PbO, 7280 oz.; C, 728 oz.; part of second press 55 per cent. slag, 4004 oz.; Fe, 946 oz.; SiO_2, 2820 oz.; 2000 oz. PbO cover.

Smelting Flux and Slime

The mixed flux and slime was thrown upon the pan of the furnace, where previously the lead bullion obtained from the preceding by-product smelt had been placed. In one instance this bullion weighed 7483 oz., and contained 28.73 oz. fine gold. The fire was then lighted, and the reduction commenced. Only 5 per cent. of the iron was added with the original flux as a rule, the remaining 8 per cent. being added when the reactions were practically at an end. The cover of litharge was used to prevent any escape of the fine charge up the flue.

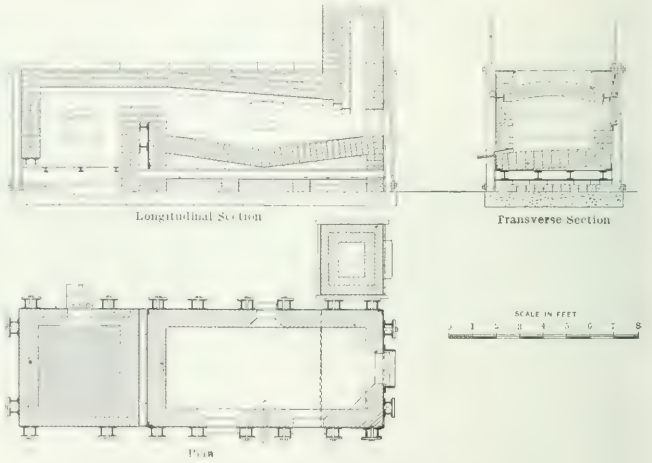


FIG. 1. PAN FURNACE FOR DRYING SLIME CAKES.

When the surface of the molten mass was fairly quiet the iron was added in two charges, one closely following the other. From this point (4:30 p.m.) onward, the temperature was maintained fairly high and constant. The slag was rabbled from time to time to ascertain the progress of the reactions and the fluidity of the charge, and at 7 p.m. the tap-hole door was raised, coal thrown on to the fire, and the slag rabbled off into slag pots of 240 lb. capacity. From time to time during the skimming, the door was closed, to raise the temperature, and prevent the slag from becoming too pasty.

Four pots of slag were obtained which

were too rich to throw away, since they contained a fair proportion of small lead metallics, and were therefore retained for the next smelt. Slag which assayed under 1 oz. was sent to the slag dump. Samples of the slag were assayed after each smelt.

A sample of the lead bullion was taken in a long-handled ladle, just before tapping, and granulated before being sent to the assay office. The furnace was cooled down toward the end to make the slag pasty and render the last portion capable of being easily rabbled off.

The tap hole was opened at 8:30, and the lead bullion tapped into a small pot fixed on a movable pivot with a long spout resting on wheels, so that the issuing lead could be directed into the molds in front of the spout. These molds were arranged in sets of five, and the lead was allowed to run into a ladle first, before directing it into the next set, to avoid loss by spilling.

Samples were taken on a shovel as the slag fell into the slag pot, and thrown into a bucket of water to granulate it. The last three pots of slag were generally retained for the by-products smelt, and were not sampled.

When the tapping was finished, a plug of wood was inserted into the tap-hole, followed by a plug of clay. These plugs were opened with hot irons at the commencement of the tap.

Results of the Smelt

(a) Large Pan Furnace—

Started 2 a.m.; tapped 3:30 p.m.; 14 cwt. of coke used; three pots of slag sampled, 17 bars of lead bullion cast from which was obtained 19,682 oz. lead bullion, assaying 9.225 per cent. fine gold = 1895 oz. gold.

(b) Small Pan Furnace—

Started 6 a.m., tapped 5 p.m.; 2 pots of slag sampled, 9 bars cast, from which was obtained 8522 oz. Pb bullion, assaying 14.918 per cent. fine gold = 1271.3 oz. gold.

As a rule about 1100 lb. of slag were obtained from a charge smelted in the large furnace. The bars of lead bullion were put aside for treatment in the cupellation process, any matte obtained at the end of the cast being broken up and treated in the by-products smelt.

Cupellation

The cupels should be made so that the bone ash scarcely binds when compressed in the hand. The bone ash is bought ready screened in 80 and 40 mesh sizes. Water and caustic potash are added and the bone ash screened through a 64 mesh screen, the cupel being made from the sieve product.

About 3000 oz. of bone ash are used for making a cupel, mixed with 14 lb. KOH and about 9 per cent. of water. The cupel is made on an iron slab laid perfectly level on a masonry foundation. The bone ash is rammed securely round the base of the "test" as it rests on the slab, and also underneath the crossbars on the bottom as much as possible.

The bottom of the "test" is well covered and trampled in by Kafirs. Next the ash is put in to half fill the "test," and is tamped down until quite hard, this being repeated until the whole of the "test" is full. The well of the cupel is then chiseled out at 3 in. from the edge, 14 in. from the breast end, and 4.5 in. deep.

A slope of about 75 deg. at the breast end is made and 4 tapping holes are drilled through in the breast at any convenient distance from the end and from each other. A carefully made cupel should last during two cuppellations.

Fire in the furnace was started and when the cupel was hot enough, the bars of lead were fed in from the channel at the back until it was almost on a level with the top of the breast. The "gate" was cut down to the level of the lead and leading to No. 1 taphole, and the blast was turned on from the tuyere at the back, and the litharge driven off into the slag pot underneath.

A plug of bone ash was inserted into the gate, and a ladle full of flux thrown on the surface of the gold, the flux being composed of 10 parts borax, 5 parts sodium carbonate, and 3 parts silica. The plug was removed, the blast turned on, and the molten slag fell into the pot. Directly the slag ceased to come away, the blast was turned off, the "gate" plugged up, and the doors were closed.

After a short interval the still plastic gold was broken up with bars, and the pieces were thrown into empty slag pots where they were broken up small enough to go into the Cornish crucibles in the small pot furnaces, where the gold was melted up.

Melting the Gold

A little flux was put on the bottom of the hot crucibles, and the broken pieces were placed on top until the pot was full. When the gold was thoroughly fused, and at a high temperature, the top slag was thickened by throwing in a little bone ash, stirring with a skimming rod, and knocking off the pasty mass into a bucket of water. All the slag was removed in this manner, and a second addition of about half a scoopful of flux was made.

When the slag became thoroughly molten, the pot was poured into a rectangular mold. When cool the mold was plunged into water and the bar detached, the slag which was knocked off the bar, together with the rest of the slag, going into the slags or by-products smelt. The gold bar was then cleaned by boiling in dilute HNO_3, dried, stamped with the name of the mine and its number, and taken up to the assay office to be sampled.

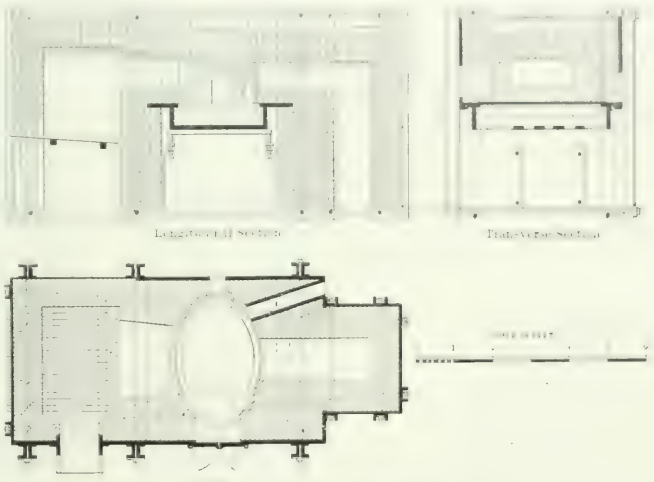


FIG. 2.—CUPELLING FURNACE.

ANALYSIS OF THE SMELT.

Material	Oz. or Per Cent.
SLIME.	
Weight	[illegible] oz.
Assay Value	[illegible] per cent.
Fine gold contents	[illegible] oz.
LITHARGE.	
Weight used	[illegible]
Weight recovered	[illegible]
Weight lost	[illegible]
Weight Pb reduced	[illegible]
LEAD BULLION.	
Weight received	[illegible]
Assay value	[illegible] per cent.
Fine gold contents	[illegible] oz.

Battery Number	Average Bullion Weights Before Smelting	Average Bullion Weights After Smelting	Fine Contents of Gold.	Fine Gold
	Oz.	Oz.		Oz.
[illegible]	[illegible]	[illegible]	862.5	[illegible]
[illegible]	925	[illegible]	801.5	798.196
[illegible]	1,007	[illegible]	858.0	860.841
91	995	974.179	857.5	835.358
Totals..	[illegible]	[illegible]	[illegible]	[illegible]

By-Products Smelt

residues, slag, etc., from the operations already described; in fact, everything suspected to contain gold was included in the charge. A characteristic charge follows: One barrow full of matte, old slag, part of a cupel (studded with gold beads) from previous cupellations, sweepings from the extractor house, gold metallics from the cupels, assay office, etc. (amounting to 678 oz.), 10 per cent. carbon (coal dust), 3042 oz. clean lead from stock, 3000 oz. of litharge.

The furnace was filled as full as possible, the fire started, and the charge run down. A shovelful of old tins was added with the first part of the charge which was run down, and with each succeeding part. The slag was skimmed off from the surface of each charge when the reactions were finished and the next charge added. The furnace was started at 6:30 a.m. Jan. 11, and was tapped at 10:30 a.m., Jan. 12, 1906. Twenty-four sacks of coal were used, and 15 pots of slag were sampled before sending to the dump. This slag assayed 6 dwt. per ton.; 9504 oz. lead bullion were obtained, assaying .562 per cent. fine gold = 53.41 oz. fine gold.

Smelting Costs

The following table represents the total cost of clean-up and smelting, and includes the labor. The costs were worked out on the basis of ounces produced.

[illegible] per month.

[illegible] per fine oz.

Electrical Equipment for Port Henry Iron Mines

The new power plant, designed by H. C. Pelton, consulting engineer, New York, which Witherbee, Sherman & Co. is erecting on the Lake Champlain shore at Port Henry, New York, furnishes an interesting example of the application of electricity in mining. Owing to the fact that the principal shafts of the mines are scattered over a considerable area, electricity has been found to be the most flexible form of power transmission. Power for this purpose is generated at present both by water and steam.

The new power house which is being built at Port Henry is about six miles from the mines, and will be interconnected with the other sources to supply the increasing demand for power. The station is to be built of monolithic reinforced concrete. The stack will also be constructed of this material. Portland cement will be used, mixed with tailings from the mines.

[illegible]

boilers is 107x51 ft., while the turbine-generator room measures 39x56 ft. and extends at right angles from the center of the main structure. By making use of the Curtis turbine much floor space is saved and the building is very compactly constructed.

Steam will be generated by four 500-h.p. Babcock & Wilcox boilers, arranged in pairs on either side of a 175-ft. stack, which occupies about the center of the powerhouse. There is space for two more boilers of the same capacity, one at the side of each pair.

The boilers are hand fired, and coal is conveyed to each by a car on a track running the length of the building. This car is filled from an overhead hopper through a hinged chute. The hopper is filled by a vertical bucket conveyor which carries the coal from a pit filled directly from cars outside the building.

The generating equipment comprises an 800-kw. Curtis steam-turbine generator which will deliver current directly to the line at a potential of 6600 volts and 25 cycles. The compactness of the vertical unit has permitted a remarkably economical disposition of machinery in the generating room. Space is left for the installation of a second turbine which will probably be installed at once.

The switchboard is located in a gallery with a reinforced-concrete floor. On this floor is placed also the motor-driven exciter sets, and space is available for two frequency changer lighting sets. A supplementary exciting unit is provided by a 25-kw. horizontal Curtis steam-turbine generator. The entire electrical equipment for this power house will be furnished by the General Electric Company.

The Cement Industry in 1906

The following statement, issued by the United States Geological Survey, shows the approximate production of hydraulic cements in the United States for the calendar year 1906.

This statement is exact within a small fraction of one per cent. and is issued in advance of the annual report on the production of cement which is now being prepared in that Bureau. The returns on which it is based are complete with the exception of those from four small plants.

The total production of all kinds of hydraulic cement in 1906, including portland, natural-rock and Puzzolan cements, was 50,027,321 barrels, valued at $54,015,713.

Of the above total amount of cement manufactured in the United States in 1906, 45,610,822 barrels were portland cement, with a value of $51,240,652; 3,935,275 barrels were natural-rock cement, with a value of $2,362,140; and 481,224 barrels were Puzzolan cement, valued at $412,921.

Prices were good in 1906, and showed an advance over those of 1905. The total production of cement in 1905 was 40,894,308 barrels, valued at $36,012,189. Comparison of totals for 1905 and 1906 shows an increase in 1906 of 9,133,013 in production and $18,003,524 in value.

The Quincy Mining Company

The report of the Quincy Mining Company for 1906 states that the board of directors authorized an increase in capital amounting to 50,000 shares, par value $25. From the sale of 10,000 shares at $70 each, 800 acres of land were bought from the Arcadian Copper Company for $750,000.

The workmen received two increases of 5 per cent. each, the latter being given voluntarily by the company.

The financial report follows:

Jan. 1 to Sept. 30.	Total.	Per Lb.
Sales of copper (11,237,716 lb.)	$2,097,409	18.66c.
Mining expense	1,176,689	10.47
Smelting, transportation, etc.	79,868	0.71
Oct. 1 to Dec. 31.		
Sales of copper (4,957,122 lb.)	$1,061,602	21.42c.
Mining expenses	485,831	9.80
Smelting, transportation, etc.	34,700	0.70
Total sales of copper (16,194,888 lb.)	$3,159,011	19.51c.
Interest and real estate	27,411	.....
Increase in capital stock, 10,000 shares @ $70	700,000	.
Total receipts	$4,886,422	23.99c.
Mining expenses	$1,662,520	10.265c.
Smelting, transportation, etc.	114,568	0.707
Taxes in Michigan	47,388	.....
Construction at mine	110,000	0.679
Construction at smelting wks.	28,560	0.114
Deferred interest	15,046	.....
Purchase of Arcadian land	750,000	.....
Total expenses	$2,728,482	16.84c.
Net income	1,157,939	7.15
Balance Jan. 1, 1906	$1,312,592	
Total surplus	$2,470,531	
Less dividends paid	1,250,000	
Carried forward	$1,220,531	

Mining was interrupted early in February and during March by underground disturbances or so-called "air-blasts" which caused levels to be distorted, tracks to be torn up and pipe lines, wiring and electric haulage systems to be badly injured. The disturbances came from a combined hanging- and foot-wall movement causing shafts Nos. 7, 2 and 6 to be crushed so that skips could not be operated at the time.

Equipment at No. 8 shaft, including the new steel rock-house was completed May 10. The whole surface equipment was overhauled and put in repair. New pipe-lines, mill and smelter equipment, including two 16x32-in. Sturtevant crushing rolls at No. 2 mill, mine buildings and other improvements have been added.

The total mineral smelted for the year was 28,794,724 lb., an increase of 2,288,356 lb. over 1905. Dividends amounted to $1,250,000 and the payments were made quarterly instead of semi-annually as heretofore.

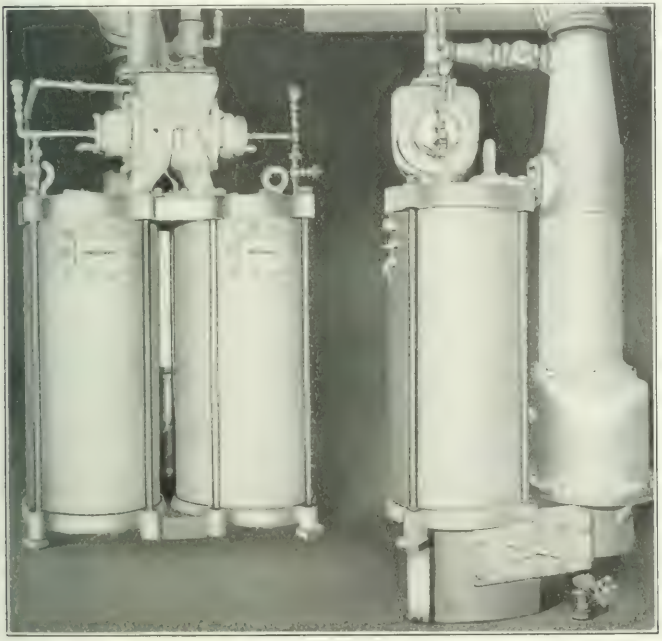
Recent prospecting in the northwest part of India has, according to a United States consular report, disclosed a number of veins of asbestos.

The Starrett Air-lift Pump

The Starrett pump shown in the accompanying photographs, Figs. 1 and 2, has been in operation for some time in the Ward shaft on the Comstock Lode, Nevada, at the 2350-ft. level. This is the first use of this pump for mining purposes. Receiving compressed air through a 2-in. valve at a pressure of 50 lb. per sq.in. it pumps 300 gal. of water per minute to a hight of 250 ft. The water pumped has a temperature of 169 deg. F. and carries fine gravel which, it is said, does not injure the pump in the least.

The Starrett pump employs a new principle, or rather an interesting combination of two old principles. It lifts the water by the direct pressure of compressed air, and when a head of water equal in weight [illegible] of the water in the discharge pipe at *c* is less than at *b* by the difference between *b* and *c*. The jet of air forces or lifts the column of water to the overflow.

The moment there is an overflow from the discharge pipe, the weight on the check valve *b* is reduced, and the exact amount of water that will counterbalance the overflow is admitted. Thus the pump can never overload itself, but the flow of water into the discharge pipe is automatically regulated by the air pressure. The 20 lb. of pressure lifts but 40 ft. of water, consequently, instead of a solid column, there is but 40 ft. of water in the discharge pipe, the remaining space being taken up by the air rushing upward at increased speed expanding in its course in accordance with Marriotte's law.



FIGS. 1 AND 2. STARRETT PUMP, FRONT AND SIDE VIEW.

to the air pressure has been created in the discharge pipe, air entering the lower part of the column reduces the weight and causes a second upward flow by the well known principle of air-bubble expansion.

Method of Operation

The working of the pump is simple and highly ingenious. A reference to the illustrations will show the principles involved.

Take a pressure of air of 20 lb. per sq.in. Referring to Fig. 3, 20 lb. of air pressure at *a* will force 40 ft. of water through the lower check valve *b*, causing an equilibrium. The 20 lb. of air pressure then

Instead of carrying a heavy load slowly the pump lifts several light loads in rapid succession, the amount of water discharged depending upon the pressure and quantity of air used.

With a double pump, one having two pump chambers or cylinders, the water is made to flow in a continuous stream by means of a device, called a shifter, which automatically turns the air from one cylinder into the other, there being no apparent break in the discharged column of water. The pump proper consists of two chambers or cylinders, top and bottom castings, and inlet and outlet check valves. The pump cylinders can be made of No. 18 steel hydraulic riveted pipe, which is guaranteed to stand a pressure of 150 lb. per sq.in., for it would not be necessary to carry a higher pressure than that even for a 1000-ft. lift.

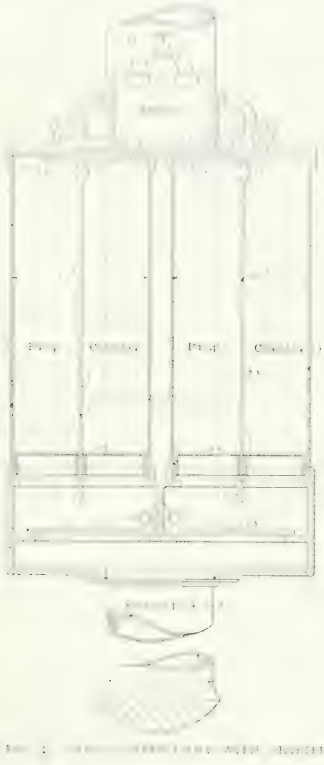
Fig. 4 represents a two-cylinder Starrett pump, having a discharge pipe nearly equal in size to the pump-cylinders. Its

FIG. 4. [illegible]

operation is as follows: While the air from the compression stroke of the compressor is entering pump chamber 3 through air inlet 1, into the shifter and through the air passage 2, forcing the

water through the discharge valve 10 into the discharge pipe 11, a partial vacuum is produced in pump chamber 3a, which causes the water to enter through suction pipe 6 and inlet valve 5a. At the same time air is forced into the discharge pipe 11 through the air-jet pipe 12 and adjustable check valve 9. It is by check valve 9 that the air pressure and also the amount of water admitted into the discharge pipe are regulated and controlled.

When the water is nearly all forced out of cylinder 3, an open float 4 settles upon a nut 13 adjusted on the rod 8, opening the check valve 7 and admitting air into shifter through the passage 14a, permitting the pressure to throw the piston in



the shifter to the right. The shifter piston has a movement of only one inch.

Hans C. Behr, in Bulletin No. 9, of the California State Mining Bureau, gives the efficiency of the Starrett system as 50 per cent. at the compressor, and a net efficiency of 35 per cent. The cost for repairs and replacements is small, for there are no rings, packing, lining, piston or rods. It requires no lubrication and demands little attention. There is no vibration and it requires no foundations. It works effectively when suspended by chains immersed in water.

The pump is manufactured by the W.

Treating Cobalt Ores

Special Correspondence

A report just issued by Dr. Eugene Haanel, Dominion superintendent of mines, on the "Present and Prospective Output of the Cobalt District," embodies the results of an investigation by Dr. Haanel, involving a visit to all the important shipping mines for the obtaining of information. The shipments of ore during 1906, as compiled from returns furnished by the Timiskaming & Northern Ontario Railway, are given at 738.46 tons; but this does not include many of the December shipments. A summary of ore shipped, as obtained from managers of mines, gives a total of 4584.84 tons, but this includes in some cases all shipments made since the beginning of operations. The approximate value is given at $4,283,369. The prospective shipments for 1907, according to information furnished by 16 mines, are 12,003 tons of an approximate value of $12,530,152. This output, says the writer, will be materially increased by the shipment from some of the mines now under development, and the removal of embargo on mines now under litigation.

The ore from the Cobalt district was shipped for treatment to three firms—the American Smelting and Refining Company, which has works at Perth Amboy, N. J.; the Balbach Smelting and Refining Company, at Newark, N. J., and the Orford Copper Company, at Copper Cliff, Ont. The two former have no process for saving the cobalt, nickel or arsenic contents of the ore. They are both extensive lead smelters and the process employed for saving the silver contents is to use lead ores as a collector. No detailed description of the process was available, nor could anything be learned by Dr. Haanel as to the costs of extraction.

The American Smelting and Refining company charges $10 per ton dry weight for treatment, and pays for 94 per cent. of the silver contents, at New York quotations, as given on date of assay. The Balbach Smelting and Refining Company receives silver ore if not too high in arsenic, the charges for smelting being arranged on a sliding scale, graded from $6 per ton on ore running 400 oz. per ton, to $2 per ton on ore above 700 oz. to 800 oz. per ton. On higher grade than this there is no smelting charge. The company pays for 93 per cent. of the silver contents at New York market price. Both companies accept the sampling of Ledoux & Co. as a basis of settlement.

The Orford Copper Company pays both for silver and cobalt, but not for nickel or arsenic contents. The company was unwilling to give any description of the process of treatment. The smelting is done at Copper Cliff, Ont., resulting in a partial silver recovery together with a high silver-bearing speiss which is shipped to Camden, N. J., for further treatment. The payment for silver is on a graduated scale from 94 per cent. of the New York official rate on the silver content of ore carrying 4000 oz. per ton or over, to 80 per cent. on ore of between 150 and 300 oz. to the ton. Cobalt is paid for on a similar plan, the rate being $30 per ton of ore containing 12 per cent. cobalt and over; $20 per ton of ore containing 8 per cent. cobalt and over; and $10 per ton of ore containing 6 per cent. cobalt and over.

The Anglo-French Nickel Company, of Swansea, Wales, has made application for Cobalt ores for the purpose of making an experimental investigation with a view of saving full values of their contents. The net return of all the metallic contents, after deducting cost of extraction, will be given to the senders.

The large smelter for the treatment of Cobalt and other ores now being erected by the Montreal Reduction and Smelting Company, at Trout Lake, near North Bay, Ont., is progressing toward completion. Six buildings have been put up, comprising over 43,000 ft. of floor space, and a battery of boilers of 600 h.p. installed. In the largest of the buildings there will be four smelting furnaces, each of 250 tons capacity. These it is hoped to have in operation within two months. A reverberatory of 500 tons capacity is also being installed, which will suffice for present needs. From time to time other furnaces will be added. The smelter will be fully equipped with machinery. The heavy engines and boilers were furnished by the Jenckes Machine Company, of Sherbrooke, P. Q., being constructed after special designs by J. H. Brown, the manager and principal promoter of the smelter. The machinery already installed has cost $350,000, and the total cost will be over $1,000,000. There are two dynamos, one for lighting and the other for special concentration work, the latter weighing 60,000 lb., and containing 480 miles of wire. The concentrator machines for the treatment of low-grade ores are of 250 tons capacity. A dust chamber or large tunnel 500 ft. long and 5½x7 ft. in section, built from the extreme end of one of the buildings, will retain and purify the poisonous gases and utilize the by-products in the form of chemicals. Slag will be made into pressed brick, and the silicate produced from some ores into silicate brick. The smelter is on the direct line of the Timiskaming & Northern Ontario Railway, and about 100 miles from Cobalt. The coke and coal used will be brought from West Virginia. Three metallurgical experts: G. A. Duckworth, of Swansea, Wales; Martin Peschel, of Freiburg, Germany, and A. Alonzo, of Spain, have been engaged. From 75 to 100 men will be employed and the capacity will be 3000 tons of ore per day.

Roasting for Magnetic Concentration of Zinc Ores

A Comparison of Work of Cylindrical Furnace Commonly Used in Southwestern Wisconsin with That of a New Circular Table Roaster

BY FRANK H. TREGO*

Attempts at the separation of the iron sulphide from the blende of the Wisconsin ores met with no commercial success until 1901. Before this, Blake's work at the Helena is the only one deserving of mention. Blake's process, by which the FeS_2 was desulphurized, changed the physical properties of the marcasite so that its subsequent separation by gravity became possible.

Upon beginning operations, the writer decided to erect a mill and roasting plant for a complete concentration of the zinc ores. This plant was located at Meekers Grove, Wisconsin, and was completed in the spring of 1902. The plant was made up of the following equipment: A three jig concentrating mill of the Joplin type, containing 17 cells, on which no ore was cleaned coarser than 3/16-in. mesh. The concentrates were drawn from the cleaner jig at 3/16 to ⅛ in., and from the sand jig at ⅛ in. to dust. These two groups were delivered into separate bins so that they could be handled separately in the roasting department.

The Original Plant

The roasting and separating plant contained one cylindrical furnace of the type shown in Fig. 1, 19 ft. long by 6 ft. in diameter, riding upon small rollers, 20 in. in diameter, which by means of the friction against the riding rings of the kiln, turned the shell at any desired speed. Gear wheels and belt were used to drive the rollers.

The cylinder had a pitch of about 8 in. in 20 ft. toward the fire-box end, and was revolved at a speed of forty revolutions per hour. The stack was at the high end, and the ore was fed in at this end by means of a helicoid conveyer working in an iron pipe. The ends of the cylinder were reduced in size, thus causing the ore to remain about 14 in. deep at the lower or discharge end.

Air was forced through a conduit 4x4 in. in the bridge wall of the fire box, and during its passage was heated by the high temperature of the fire brick comprising the wall. This hot air was conducted into the furnace over the ore and under the flames from the fire box, in order that it might be fairly pure when coming into contact with the ore in process of roasting, so that the maximum amount of oxygen might be made use of in oxidizing the FeS_2 for the purpose of producing a magnetic oxide.

The ore was delivered in a constant stream from the lower end of the furnace into another helicoid conveyer and transported to an elevator which delivered it to a bin lined with fire brick; whence it was fed to the magnetic separator, where the magnetic oxide was picked out by the electromagnets and the clean blende delivered to the bins.

Previous to the addition of the air blast, the furnace could not be made to give anything like satisfactory results. However, when the oxygen control was introduced, fairly satisfactory results were obtained by check assays and careful supervision. The following results were obtained in 1903 after the problem had been worked over for nearly a year. The average assay of the concentrates for nine months showed 27.7 per cent. Zn and 23.8 per cent. Fe; that of finished material, 58.7 per cent. Zn and 2.9 per cent. Fe; the average run per 24 hours during the same period was 28.3 tons. The plant consumed 12 h.p. and the apparatus was cumbersome, heavy and costly.

The plant equipped with a furnace of the cylindrical type was found to have an efficiency of from 65 to 75 per cent., the 25 to 35 per cent. loss being distributed between the tailings and the stack dust. The dust was worthless, having been drawn out of the kiln before receiving enough heat to oxidize the iron. It contained from 20 to 25 per cent. zinc; the tailings from 4 to 7 per cent. zinc; and the middlings from 9 to 13 per cent. zinc.

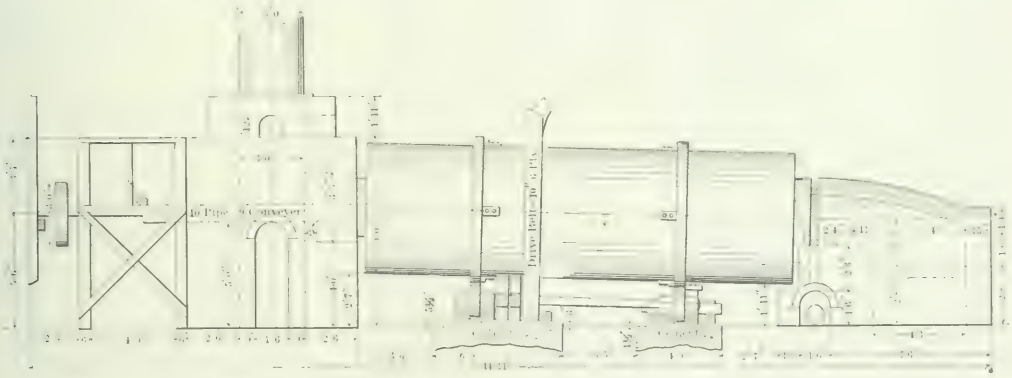


FIG. 1. SIDE ELEVATION OF CYLINDRICAL FURNACE

Introduction of Table Roaster

After the abandonment of Mine No. 1, I patented a furnace which was evolved from the study of the good points as well as the shortcomings of the old cylindrical type. With the new furnace, the efficiency was found, by repeated tests, to be from 70 to 90 per cent., the increase being due entirely to the kiln improvements. It was also found that the stack dust was of high grade in zinc and was sufficiently roasted to be passed through the magnetic separator and finished with the regular run of ore. The common practice is to re-mill the middlings, and allow them to be roasted again in company with fresh concentrates.

A brief description of this roasting furnace is as follows: Referring to Fig 2, the fire is built upon the grate bars *a*

*Consulting engineer, Platteville Wis.

and the gases pass over the bridge wall *b* into the space under the hood which covers the hearth. The hearth *c* is covered with one thickness of fire brick *d*, and is supported by a 20-lb. steel rail *g* fastened in a circle to the lugs underneath the table *c*. This rail travels in the grooved trolleys *e*, which are supported by the concrete pillars *f*, and which are propelled by the shafting and beveled gearing *i*. By the friction of the trolleys against the rail, the table is caused to revolve around the central pillar of fire brick which rises through the hole in the center.

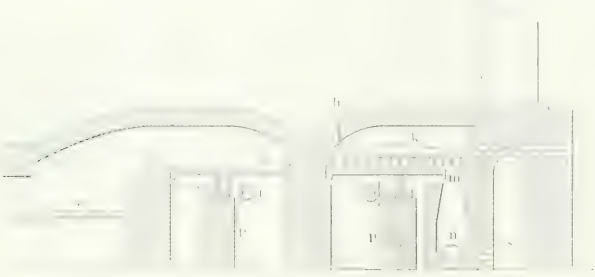


FIG. 2. SECTION, TREGO FURNACE

The gases from the fire in striking the arched hood, and also the central fire-brick pillar, are deflected downward and also divided so that they spread, covering the entire surface of the hearth, and pass out of the port on each side of the beam *k* into the smoke stack.

The ore to be roasted is fed into the hopper *h* in a steady stream. It falls before one of the plows *m* attached to the beam *k* and is thus moved away from the center the distance of the first plow from the second. As the table revolves, the furrow of ore is carried around until it meets the second plow, and is again turned over. This operation is repeated 12 or 13 times, or until the last plow scrapes the ore off the edge of the table, when it falls into the conveyer *N* to be carried away and cooled.

The hood over the table is built of fire brick covered with common brick. Air ports are cut into the hood just above the level of the table for the admission of oxygen to the heated ore. It is important that this oxygen enter above the heated ore but underneath the fuel gases, for thus it escapes the reducing action of the products of combustion, and comes in contact with the roasting ore at a temperature sufficient for the replacement of the sulphur.

These air ports have a double advantage. Not only can the admission of air be controlled, but the ore can also be watched constantly, so that the man in charge can make any change in his furnace temperature which may be required. After making a change in fire or feed, it is necessary to wait three or four minutes before the fluctuation of the temperature becomes appreciable. The entire roast is under absolute control at all times. In regulating the temperature of a cylindrical furnace the results cannot be seen for a considerable time. With the revolving hearth, the entire roast occupies from eight to nine minutes, and if the operator is not satisfied with the appearance of the ore inside of the furnace, he can see his final results without a serious delay.

The furnace is built high enough from the floor to admit of access underneath for oiling, and also for free circulation of air which keeps the table from becoming overheated.

Fine ore or dust carried into the smoke-stack is largely collected in the dust chamber *s* and is removed through the door shown in Fig. 2. The plows *M* are hung directly behind the central pillar, so that the burning gases, in passing out of the chimney ports on each side of the plows *M*, do not come into sufficient contact with them to warp them. It has not been found necessary to use water-cooled plows. The plows are constructed of steel angles, supported by a specially designed T-beam *k*.

None of the parts above the table is in motion. All of the brickwork is stationary and subjected only to the ordinary stresses incident to the masonry of furnace structures. The opening from the fire box into the hood is the entire width of the grate surface and 18 in. high. It is not contracted and the flames are not retarded.

Fig. 2 is a cross section through the fire box and smoke-stack. Fig. 3 is a plan and partial section of the level of the table. A 30-ton furnace requires only 0.7 h.p. to drive the mechanism. Several entire roasting and electromagnetic separating plants using this furnace have been built, the entire plant, including furnace, separator, elevators, conveyers, shafting, etc., requiring only 4 h.p. for operation. A 12-foot circular hearth handles 30 tons of sulphide concentrates, assaying 25 per cent. Fe in 24 hours.

Besides the cheap operating expense there are many advantages in regard to construction costs. The castings are much lighter and simpler than in the old style. In the cylindrical type the moving parts weigh 40,000 lb., while with the new machine the figure is reduced to 8000 lb. Erection is only a matter of a short time,

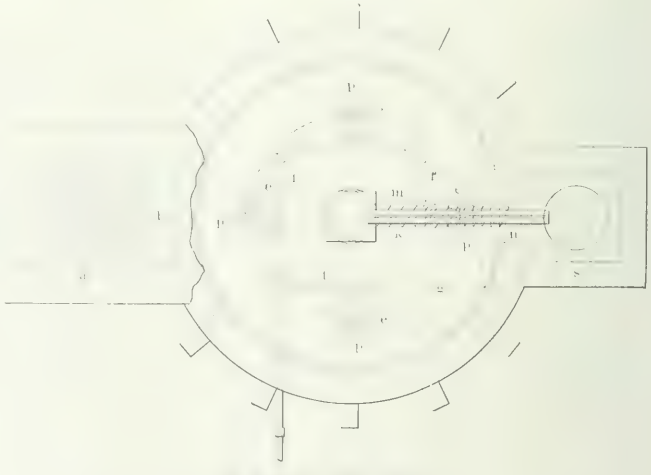


FIG. 3. PLAN, TREGO FURNACE

while the transportation question presents no difficulty in the roughest country, owing to the small bulk of the iron parts. The difference in the initial cost is close to $2000 in favor of the new furnace.

The following account covers all expense of operating the table furnace for 24 hours, the feed for that period being 30 tons:

[illegible] at $3.25	$6.50
[illegible] feeders at $2.00	4.00
2 tons coal at $4.00	8.00
[illegible]	.50
Repairs	1.00
[illegible] at 3 cts. per kilowatt power hour	2.90
	$22.90 = 73.3 per ton

The following table shows the character of the ore treated and the efficiency of the new roaster:

Assays	Raw	Roasted	Tailings and Middlings	Finished
Zn	41.7	44.1	11.7	60.6
Fe	15.6	16.8	44.2	3.1
Pb	1.4	1.5	0.8	2.7
$CaCO_3$	2.1			
CaO		1.8	2.1	2.2
S	37.9	31.9	30.8	31.8
Zn/Fe	1.3.26		7.7	

Coal consumption, 133 lb. per ton of raw ore.

In three tests of different ores treated in quantity the average loss of zinc was 30.9 per cent. and the recovery 69.1. The loss due to the furnace alone averages 12 per cent.

Comparing the expense accounts of the two furnaces, it appears that the cost of operating the cylindrical roaster is from $1.50 to $1.90 per ton, while with the new design 70c. covers all expenses.

Cost of operating cylindrical type, capacity, 25 tons per 24 hours:

2 [illegible] @ $2.25	$6.50
2 feeders @ $2.00	4.00
2.5 tons of coal @ $4.00	10.00
13 hp. @ 30c. per horse-power-hour	9.75
Oil	.50
Repairs, per 24 hours, approximated	5.00
	$35.75

1.43 per ton.

The cost per ton runs all the way from this up to $2.50 per ton according to efficiency of the men and character of the plant. In many installations of this type the breakdowns are frequent enough to cause the cost per ton to run very high.

The cost of the table furnace alone, erected in Wisconsin, not including the building, machinery nor separator, should run about $2400, whereas the cylindrical type will cost in the neighborhood of $4200. Owing to the smaller space required by the table furnace, there is also a difference of about $400 in the building where both structures are along the same lines in class of material, etc. The value of the separator as generally used is from $1300 to $1800 installed.

One of the mines here recently purchased a cylindrical kiln and plant complete at a cost of $9000. This would give us the itemized cost about as follows: kiln complete $3200; separator $1800; building (iron in this case) $1000; miscellaneous machinery, etc., $500; and profit $2500.

The table furnace with plant complete, I have built for the following cost: kiln complete $1900; separator $1800; miscellaneous machinery, $400; building $900; and profit $1500. The plant was completed and ready to operate within 28 days from signing of contract.

NO. 2. TEST OF PLATTE ORES

	Raw	Roasted.	Tailings and Middlings.	Finished
Zn	30.0	50.5	7.8	59.5
Fe	20.8	19.8	47.1	3.0
Pb	1.3	1.4	0.8	2.5
$CaCO_3$	2.4			
CaO		1.8	2.0	
Zn/Fe	9.3		7.9	
S	39.4	32.9	31.6	32.7

The coal consumption was 125 lb. per ton of raw ore.

In the ore tested in Nos. 1 and 2, it was found that $ZnCO_3$ (dry one) was present in considerable quantities, and under a magnifying glass it showed the usual spongy texture, the cavities containing FeS_2. This FeS_2, being oxidized in the furnace, was picked out by the electromagnets and carried into the tailings and the zinc oxide with it.

Another cause of considerable zinc in the tailings was the "chatty" condition of the raw ore (zinc and iron in physical combination) which condition was due entirely to faulty milling. The ore was not sufficiently ground to separate the two minerals, and the zinc was picked out by the magnets with the piece of iron to which it was attached.

NO. 3. TEST. COARSE ORE FROM HOSKIN MINE.

	Raw	Roasted.	Tailings and Middlings.	Finished.
Zn	36.1	40.6	11.8	59.9
Fe.	19.8	18.7	42.5	3.6
CaO	2.9			2.5

The coal consumption was 121 lb. per ton of raw ore.

NO. 4. TEST. FINE ORE FROM HOSKIN MINE.

	Raw	Roasted.	Tailings and Middlings.	Finished.
Zn	31.3	34.8	10.4	55.2
Fe	21.8	21.8	45.4	3.8
$CaCO_3$	4.4			
CaO				4.2

The consumption of coal was 136 lb. per ton of raw ore.

NO. 5. TEST. STANDARD LEAD AND ZINC SMELTING AND MINING COMPANY.

	Raw.	Roasted.	Tailings and Middlings.	Finished.
Zn	23.5		8.3	53.9
Fe	22.7			3.4
$CaCO_3$	12.5			
CaO				10.0

This ore was entirely unsized.

It will be observed that, regardless of the percentage of iron in the raw material, the process removed in each case a sufficient amount to produce a finished ore of a 3.5 per cent. Fe grade, showing an efficient separation of the pyrites and marcasite from the blende. Its excellence is apparent when one considers that the blende often contains as high as 2.8 per cent. Fe. The percentage of CaO in the finished product of necessity affected the percentage of Zn and was found materially to affect the coal consumption.

The efficiency of the process may be seen from the following table, giving the weights involved in tests Nos. 1, 2 and 3.

COMPARISON OF THREE TESTS

Test 1.	Raw	Fine Dust	Finished	Loss in Zinc	Loss Vol. of Zinc
Assays	41.7 Zn	2.1 Zn	[illegible] Zn		
Weights	1000	185	[illegible]		
Test 2.					
Assays	[illegible]	Zn	Zn		
Weights	[illegible]	[illegible]	[illegible]		
Test 3.					
Assays	[illegible]	Zn	Zn		
Weights	[illegible]	[illegible]	[illegible]		
			Average		

This table covers the entire process. Large losses are sometimes due to the electrical separator adjustment, or ignorance as to its proper management. The losses due to roasting alone are shown below:

Weights	3270	2495	11.8%	88.2%

In all of these tests the iron tailings and middlings were considered as lost, whereas it is the practice at some of the smelters, where they are using this preliminary treatment, to make a further recovery of zinc by treating the middlings.

It is now evident that the production of volatile matter can be greatly augmented by the method of firing; and, in addition to this, there should be some attention given to the quality of coal used. It has been found, after several trials, that a satisfactory fuel is "Indiana Block," the analysis of which is as follows:

Fixed carbon	[illegible] per cent.
Ash	7.8 per cent.
Volatile matter	45.8 per cent.
Moisture	0.7 per cent.

This coal is relatively low in percentage of fixed carbon, but where its advantage at once becomes evident is in its large quantity of volatile matter. In addition to these facts we find that the calorific value of this coal is approximately 14,000 B.t.u., which compares favorably with that of the more expensive grades, so that there are combined here a fair heat-giving capacity with a high percentage of volatile matter.

As before stated, the coal is not relied upon alone for heat, the other factor in the roast being a variable dependent on the percentage of replaceable sulphur in the ore. A direct comparison was made of iron of different grades, in which the replaceable sulphur of the iron ranges from 15.8 to 27.7 per cent., with a corresponding lowering in coal required.

Iron	Coal per Ton of Ore
15.8 per cent.	133 lb.
20.5 "	125 "
27.7 "	107 "

The iron percentage is not, however, at all times the absolute criterion of the heat production of the ore, from the fact that the consumption is somewhat affected by the quantity of gangue present in the ore, and by the proper sizing of the raw material.

From an engineering aspect, the rate of combustion in the fire chamber is quite satisfactory. Aside from the losses of heat due to the improper supply of air at all times incident to roasting or firing, there enters the important factor of radiation. It is considered the best practice in this respect to obtain a rate of from 8 to 10 lb. of coal per sq.ft. of grate area per hour, and with this rate one can expect as satisfactory temperatures as with a much more rapid combustion. The actual con-

sumption on the grates falls within this limit.

Approximately the kiln temperatures are 500 deg. C. and 800 deg. C. respectively, the cylindrical kiln being 300 deg. C. above that of the table hearth.

Few mills in this district recover more than 60 per cent. of the zinc values unless the mine run is very rich (over 10 per cent.), and few roasting plants reach 75 per cent. efficiency; therefore the final re- [illegible] at the zinc values in the mine run. Very few of the mine owners take the trouble to ascertain what sort of work their plants are doing, and it never occurs to them that they are not saving in the neighborhood of 90 per cent. of the zinc.

The United Copper Company

A circular recently issued to stockholders gives the net earnings for the 13 months ending Jan. 31, 1907, at $6,050,473. Dividends paid were $4,237,500, leaving a balance of $1,812,973. Adding the balance brought forward from 1906, made a total surplus of $5,640,132 on Jan. 31. The property owned by the company includes all the capital stock of the Montana Ore Purchasing Company; 95 per cent. of the stocks of the Nipper Consolidated, the Minnie Healey, the Corra-Rock Island, and the Belmont copper companies; 10 per cent. of the stock of the Butte Coalition Company. There are also smaller investments in other companies, including the Ohio Copper, the Stewart, the Bingham Consolidated, the Lexington, and the Davis-Daly Estates.

It is stated that the Italian railway authorities intend to substitute petroleum for coal on all the lines, and that consequently the Government will reduce the [illegible] duty on petroleum.

Erosion Lines in Snow

By Robert N. Bell*

The accompanying interesting photographs of snow corrugations were taken at South mountain, Owyhee county, Idaho. The condition shown is unusual, at least in this region. The views were taken by Henry Kehoe, superintendent of the Bagdad Chase Mining company, which is developing an extensive silver-lead-zinc property at this point.

RESULT OF QUIET RAIN ON FOUR FEET OF SOFT SNOW OVERLYING THREE FEET OF OLD SNOW

[illegible] PRODUCED BY RAIN IN SOFT [illegible]

The snow condition illustrated was induced by 24 hours of heavy rain immediately succeeding a continuous snowfall, unaccompanied with wind, that lasted three days, and during which 4 ft. of snow fell upon 3 ft. of well packed old snow.

While the corrugation lines, which developed in a day on a smooth surface, in general conform to the natural drainage declivities of the mountain, they deflect materially at some points and were probably in a measure induced by the rough wind-blown surface of the underlying old snow.

[illegible]

Mining in Manchuria

The following summary of a report on the mines of Manchuria made by a representative of a Tokio newspaper is furnished by Consul-General Straight:

The northern part of Manchuria abounds in minerals, principally gold, both quartz and placer, silver, copper, lead and iron. Thus far the average annual output has amounted to $10,000,000, some of the mines being operated by the Chinese officials, but most of them by native companies and small capitalists. A large part of the deposits has not yet been touched.

The territory drained by the Huifaho and to the north of that river is rich in gold, both quartz and placer, silver, lead, copper and coal. This is true also of the district to the east of the Tunghuachiang (Sungari river). This mineral wealth is made accessible by the Yalu, Tunghuachiang (Sungari), Nenchiang, Hailungchiang and Liao rivers and their tributaries. The construction of the Changchun-Kirin Railway will also greatly facilitate the development. The operation of the mine at Tienpaosan was about to be undertaken by Americans, but the project was abandoned on account of the Russo-Japanese war. The viceroy of Kirin then canceled their claim and the mine is now being operated by the bureau of mines of Hungchung with Chinese capital. The same is true of the gold mine at Chiapikou, which was originally operated by the Russian government, 20,000 coolies being employed, but is now in the hands of the Chinese.

The Extraordinary Faulting at the Berlin Mine

The Berlin Gold Quartz Mine, Nevada, Shows the Result of Remarkable Movements after the Formation of the Vein

BY ELLSWORTH DAGGETT

The Berlin Gold Quartz Mine is situated in Nye county, Nevada, on the west flank of the Shoshone range, about 40 miles south and 30 miles west from the town of Austin, the county-seat of Lander county. The distance from Austin is about 60 miles by stage-road.

The outcrop of the vein, at the top of the incline-shaft, is situated just at the base of the mountain proper, almost exactly at the intersection of the mountain-side with the gravelly bench that slopes for about three-quarters of a mile to the flatter sage-brush plain, or desert valley, below.

compact, seldom showing the friable, fissured, or shelly structure often to be found in quartz veins.

Original Condition of the Vein

Comparatively little evidence of relative motion of one wall of the vein upon the other is to be found—a fact indicating that during the formation of the vein, and prior to the extensive movements herein described, little disturbance had taken place. No evidence whatever of metasomatic origin has been observed. On the other hand, occasional occurrences of comby structure, in which the

The course of the vein is northeast and southwest, and its average dip about 45 deg. to the southeast.

The Berlin vein, prior to the extensive faulting described in this paper, was tolerably uniform in size, course and dip, and perhaps, on the whole, rather more regular than the average of gold-quartz veins.

It appears to have been a fissure filled with quartz, and may be said to have originally been in shape, structure and origin, a typical "old-fashioned" fissure-vein of the books.

Throughout the entire field covered by the underground works of the Berlin

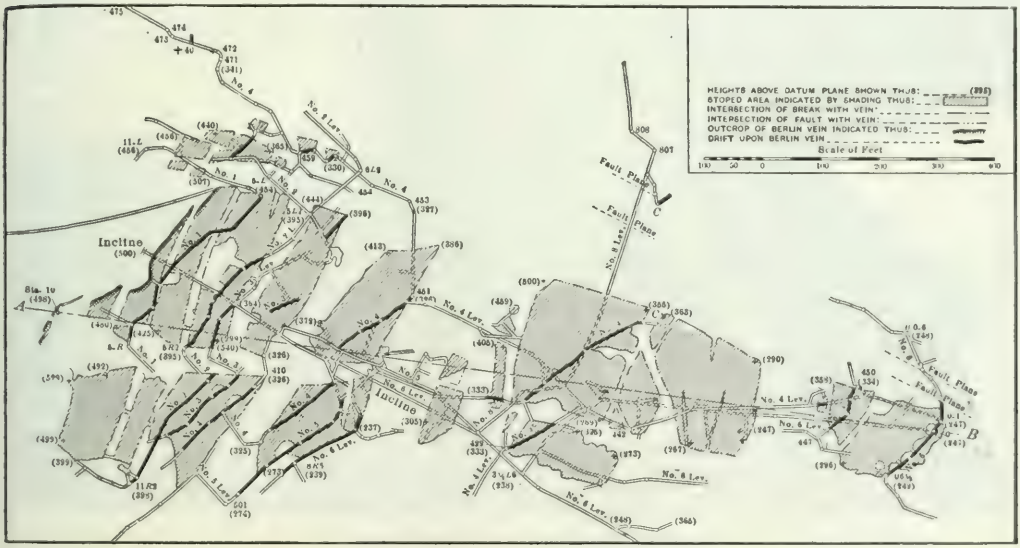


FIG. 1. PLAN OF UNDERGROUND WORKING OF THE BERLIN MINE.

The vein itself consists almost entirely of quartz, with perhaps 2 per cent. of sulphide of iron, copper, lead, zinc and antimony, and perhaps a trace of some of the compounds of tellurium with gold and silver, although none of the latter have been as yet positively identified.

The relative proportion, by weight, of silver and gold in the ores, varies in different parts of the vein, from 12 silver for 1 of gold, to 7 silver for 1 of gold.

The quartz vein-filling is usually frozen fast to the walls, and is very hard and

axes of the quartz crystals are at right angles to the plane of the vein, rather indicate deposition from solution in a pre-existing fissure.

Spurs, or branches, and small parallel veins, while not entirely absent, are not thus far numerous, and not extensive enough to possess any marked practical importance.

The thickness of the Berlin vein varies from a few inches to 8 ft., but, over far the greater portion of the explored area, is tolerably uniform at from 2 to 3 ft., measured normal to its plane. The average thickness of quartz thus far stoped, as determined by all available measurements, is a little less than 2.5 feet.

mine, the rock is andesite, which is, however, in places, locally so altered by compression or movement as to change considerably its appearance and structure. Some very limited chemical changes may also have occurred in places, by reason of which the above-given classification might, to a small degree, fall short of completeness.

The Workings

The underground workings, including the stopes, of the Berlin mine, as existing July 1, 1906, are shown in plan in Fig. 1, which is a reduced copy of the working-plan of the mine, from which, for the sake of plainness, most of the survey-

Note.—Paper to be presented at the New York meeting of the American Institute of Mining Engineers, April, 1907.

*Mining engineer, Salt Lake City.

the datum-plane have been omitted.

The stopes, shown by the shaded areas, have in general the form of a more or less irregular parallelogram, suggesting at a glance the extensive faulting in two directions, to which the vein has apparently been subjected.

The orebodies, properly enough called segments, are usually terminated on all sides by fault-planes. Those on the east and west sides, though just as truely fault-planes, have been locally called breaks, which term will be retained in this paper for the sake of identification.

The lines bounding the segments, as projected on the plane of Fig. 1, are mainly lines of intersection of the faults and breaks with the vein, and their projections do not at all represent the true course of either the fault-planes, the break-planes, or the vein.

Figs. 1 and 2 show the heights above the datum-plane.

The plane of this section was carefully chosen so as to avoid the faults, and Fig. 2, considered by itself, shows only the disturbances apparently due to the breaks.

Dislocated Segments

The light dotted line passing out through the surface-line may be considered as an elevation, showing the minimum hights which the segments could have occupied prior to the faulting herein considered. The actual hight from which the present segments have dropped to their present position may have been several times as great, as shown by the dotted lines.

Nor is it yet certain whether the movement was due to the subsidence of the northwest or to the elevation of the southeast portion.

shown in Fig. 3, which, moreover, represents that portion of the fissure system which may be regarded as best known from the present developments.

If we imagine that, in the field covered by Fig. 3, the accidents of erosion had left the surface about at the plane of the No. 4 level, then the heavy black lines would represent the actual surveyed outcrop of a single vein that, before the faulting here described, was probably as regular, as uniform in strike and dip, as nearly in a true plane, and generally as free from eccentricities as the average quartz vein.

So far as my observation goes, this situation is without parallel in quartz mining.

The Mode of Faulting

It was at first supposed that the north and south fissures or breaks, dipping

NOTE: THE HANGING WALLS OF THE FAULTS, BREAKS AND VEIN ARE SUPPOSED TO BE REMOVED ABOVE THE INTERSECTIONS SHOWN.
FOOT WALL OF VEIN (STOPED)
FOOT WALL OF VEIN (UNSTOPED)
FOOT WALL OF FAULT PLANES
FOOT WALL OF BREAK PLANES
INTERSECTION OF BREAK WITH VEIN:
INTERSECTION OF FAULT WITH VEIN:

FIG. 1A. STRATIGRAPHY OF THE BERLIN MINE

In Fig. 1, the hights shown in brackets refer to a datum-plane 500 ft. below the top of the Berlin incline-shaft. The hight of No. 8 level at the shaft is 137 ft. Figures not inclosed in brackets represent survey stations. The stopes, where limited by full lines, are not cut by faulting fissures, but end on account of poor or thin ore, or some similar reason.

Fig. 2 is a vertical section along line *A B* of Fig. 1 through Station 10, on the surface at the outcrop of the vein, and Station 0, on the No. 6 level, as shown in Fig. 1. In this section those portions of the Berlin vein actually stoped out are shown as a solid black line, while the probable position of the unstoped vein is indicated by two parallel lines. The mar-

Among many sections made in studying the Berlin underground work, there is one nearly parallel to section *A-B*, but further north, which shows it possible to drive a flat, incline-shaft, straight in line and grade, that would cut the vein no less than eight times.

Fig. 3 is a horizontal section, showing the intersection of the Berlin vein and of the break- and fault-fissures with the average plane of the No. 4 level, the average hight of which is about 165 ft. below the top of the incline-shaft, or 335 ft. above the datum-plane. The true course of the vein—viz., northeast and southwest; of the breaks, nearly always north and south: and of the faults, about north 60 deg. west., is therefore correctly

about 45 deg. west, had first been formed and had faulted the pre-existing vein, and that subsequently a pair of fissures had occurred, each with one or more branches having a general course about north 67 deg. west, and a dip of 63 deg. north 22 deg. east, cutting and faulting both the vein and the breaks. But as developments progressed, and additional intersections of the breaks and faults were found, or indicated, it was observed that in several instances the faults were cut and faulted by the breaks.

In the case of the so-called north fault, shown in Fig. 1, the segments of the Berlin vein, from its outcrop for a distance easterly of about 1300 ft., have been cut off. It was for a time believed that the

south branch of this fissure was a continuous fissure, cut by the No. 4 level at its east end, near survey station 450, and in the north branch of the No. 4 level, near station 459, and again near station 454. But a consideration of the position of the surveyed and known lines of intersection of the fault with the vein forming the north boundaries of the stopes, shows that these intersecting lines were very far from being in the same plane, and that a single fissure, to have contained them all, would have had to be extremely —in fact, impossibly—crooked and irregular.

The conclusion was therefore forced that some of the larger breaks had faulted also the north fault, as well as the vein, and that, instead of one continuous fissure, with a course north 67 deg. west, there were several fissures with an average course of about north 60 deg. west, and a dip north 30 deg. east, of about 63 deg. from the horizontal.

If we assume that the [illegible] break-fissures were in fact parallel to each other, and that the same was true of the fault-planes; that every fissure of each system has been cut and faulted by at least one fissure of the other system, and that the material fissured was rigid, incompressible and inelastic, it would appear that the line of any movement produced by gravity, or by an uplift from any cause, would necessarily be in both planes, and therefore in the line of the intersection of the two planes.

Now, in fact, the planes of neither the breaks nor the faults are exactly parallel. It is not known that every plane of each system has been cut or faulted by one or more planes of the other system. Moreover, andesite is far from rigid, being compressible, and capable of great distortion. Just so far, however, as the conditions existing in the Berlin field approach the hypothetical conditions outlined above, might we expect the direction of the movement to conform more or less closely to the direction of the intersection of the average fault- and break-planes.

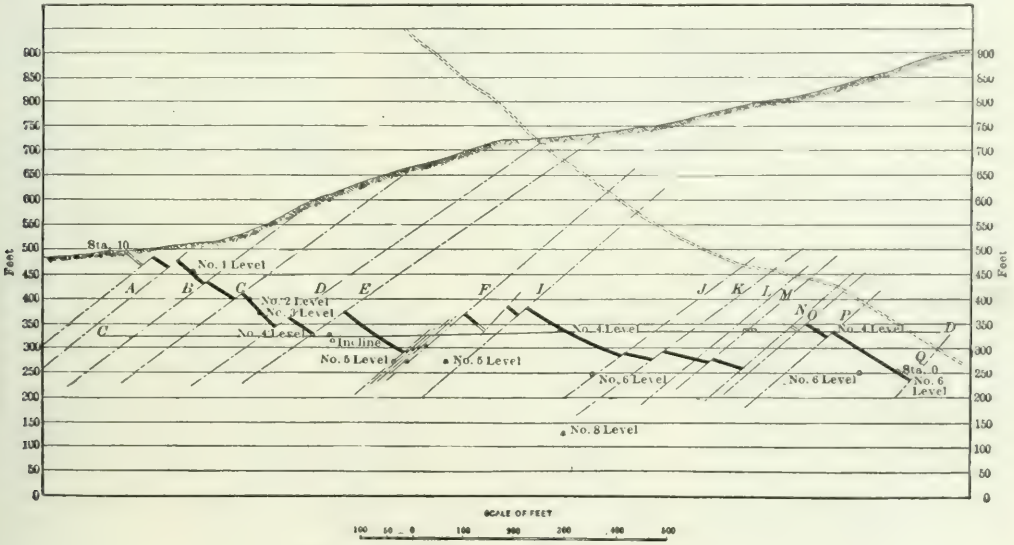


FIG. 2. VERTICAL SECTION ALONG LINE *A B* OF FIG. 1

In practical mining the main object is, of course, to find and extract the ore as cheaply as possible. It is not often that exposures interesting stratigraphically are incidentally made, or that special work for such a purpose is warranted. In the present case, while in many, perhaps in a majority of instances, the faults do cut and fault the breaks, there is no such uniformity as would enable us to establish the relative age of the two fissure systems. In fact, there are enough instances actually exposed, or undoubtedly indicated, of the breaks cutting and faulting the faults, to make it tolerably certain that the fissures of both systems originated at the same time, and in all probability from a single force.

Movement Upon Two Planes

Fig. 4 represents a very interesting occurrence, having a significant bearing on this point, which was recently uncovered by the accidental scaling-off of some slabs of clay and gouge in the northwest corner of the second large stope from the east end of the mine. The ore was stoped up to break *J*, but in the north corner, not quite to the fault-plane—perhaps to within 4 or 5 ft. of it. At point *C*, 12 or 13 ft. along the break southwesterly from the little corner of remaining quartz, there was plainly exposed in the hanging wall of the break the edge of a strong, faulting fissure, striking about north 60 deg. west, and dipping 60 deg. northerly. In this fissure, with some coarser material, was a layer of about 1 ft. of stiff blue clay, evidently the product of attrition. This layer of clay, without any parting whatever, and about uniform in thickness, was continuous around the sharp angle into the break, and up in the break to the quartz remnant, precisely as a layer of lubricant might be found in the V-groove of a planer. It no doubt continues up to the fault-plane on the north, and there turns down into it. Just southeast of point *C* a careful examination of the roof and the floor of the stope showed that no sign of fissure existed in the foot-wall of the break. The fault-fissure at *C* is nearly enough in the plane of the fault, which cuts off on the north the next westerly stope, practically to identify it. On the hanging wall of the break, within a few inches of the sharp intersection of the fault and break, are lines of motion parallel to the fault-plane.

The above conditions indicate that the movement of the north country was one movement, upon both planes at the same time, and therefore in the direction of the line of intersection of the two planes.

Intersections

In Fig. 1A are shown the intersections, known and assumed, of the faults and breaks with the vein and with each other, and the entire hanging-country above these intersections is supposed to have been removed.

Figs. 1 and 1A were made about the middle of 1906, and represent the works and known or assumed intersections as

of that date. One exception to this latter statement is, that the raise from the No. 8 level encountering ore at point *C* was begun and completed subsequent to the introduction of the lines of intersection.

Intersections of faults and breaks, where not surveyed and known, were then supposed to have the direction north 45 deg. west; and the average angle of the intersections of the vein with the breaks was taken as north 20 deg. east.

Some careful estimates, made since the preparation of Figs. 1 and 1A, and involving all of the principal vein and fault intersections, including both north and south faults, show these intersections to have an average direction of north 81 deg. west.

A revised consideration of the breaks shows that the more important breaks other of 92 deg. and 88 deg., the upper angle being 92 deg. The line bisecting the obtuse angle between these planes runs south 12.5 deg. east, and dips in that direction 57 deg. from the horizontal. If these calculations be correct, this is the theoretical direction of the pressure or force which produced the two systems of fissures, here called breaks and faults. The existence, before erosion, of a rock-mass, known to be several hundred, possibly several thousand, feet in thickness would, through the weight of such a mass, supplemented by some lateral pressure, easily account for the fissuring; and gravity alone might be sufficient to explain the movement.

Practical Considerations

The miner, however, is more interested in the direction and extent of the movefault, but that the total movement has been upon two or more nearly parallel fissures, with a slab, or several slabs, of rock, and a segment, or several segments, of vein between them. Moreover, the vein as a rule, though not always, is uniform in direction and size; hence the identification of the opposite ends of a fault crossing any particular portion is not generally to be expected.

Three occurrences of the Berlin vein, beyond the most northerly known branch of the north faulting fissures, are known.

At a point 800 ft. north and 900 ft. west of the top of the incline, but not shown in the drawings, is a segment of the vein, developed by a short tunnel and a shallow incline. This segment is cut off by an abnormal fault, striking north 48 deg. east, and dipping about 80 deg. southeasterly, developed by the innermost 100

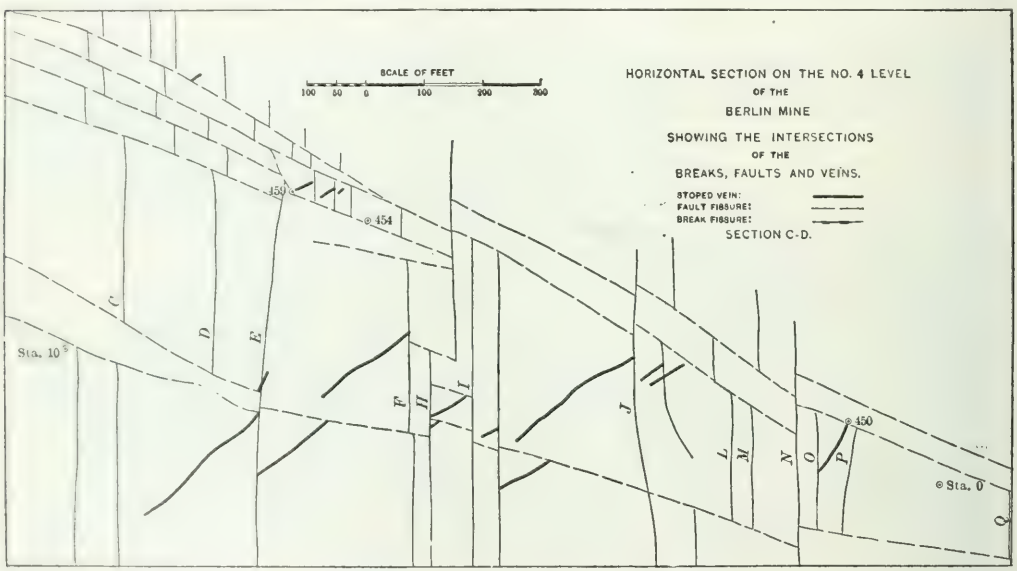


FIG. 3. HORIZONTAL SECTION OF NO. 4 LEVEL.

have an average dip of 40 deg. west with a strike, as near as may be north and south.

Taking the average course of the vein as north 45 deg. east, and its average dip at 45 deg. southeast, we may, with the average surveyed and known intersections given above, and the known dip of the faults—viz., 63 deg. from the horizontal—determine the average strike of the faults. This has been thus found to be north 59 deg. west.

The intersection of these planes of the average fault and break, as given above, strikes north 43 deg. west, instead of 45 deg. as shown in Fig. 1, and dips in that direction 29.5 deg. from the horizontal. The planes of the average fault and break, as given above, make angles with each ment, than in the question, just how it was produced.

In prospecting for the continuation of the Berlin vein, north of the north fault, the problem is complicated by the fact that the break-fissures found in either wall of any of the faults, do not necessarily correspond in their relation to each other with those in the other wall.

The same is also true of the faults. Thus, in the slab of andesite between the breaks *F* and *I* (see Fig. 2) are two known faults, and, in all probability, a third fault. At least two of these, if continuous, should be shown in the large open stopes on either side, but they are not to be found there.

It is also true that the north fault is probably nowhere in this field a single ft. of the lower tunnel, which is driven upon it. The movement here has been in the opposite direction from other faulting movements shown, and the vein from which the segment at the surface has been cut off has not been found, but is still below the bottom of the lower tunnel.

There is also at the same place an abnorthwesterly course, and a dip of about 45 deg. northeast. This may be the southern edge of a series of reverse faults, with a reverse displacement of the vein.

Some work on the No. 8 level, east of point *C*, done since the preparation of Fig. 1, also indicates one or more faults with reverse displacement; but these are as yet not well enough defined to be described here.

Position of the Ore

On No. 4 level, at a point marked (+ 40) in Fig. 1, is the south edge of a segment of ore which has been followed northeasterly, and upward for a few feet. The total movement of the north country, which has here been upon three, possibly upon four, presumably parallel fissures, indicated by this occurrence, is, as nearly as can be determined, about 400 ft. in the direction north 45 deg. west, at an angle of about 30 deg. from the horizontal. The total vertical component of the above movement is about 200 feet.

The vein at point (+ 40) was found by drifting along the most northerly branch of the north fault and breaking into its hanging-wall.

The third ore-occurrence, sought for by raise at *C*, and found since the intersection lines in Fig. 1A were outlined, is at Station *C*, in the raise from No. 8 level, at which point the intersection of the vein with a break was found 55 ft. above the level. Here also a normal segment starts off. Although it has been temporarily interrupted further north, by a reversed fault, it is without doubt a continuation of the vein from the northwest corner of the most easterly segment of the mine.

Opposite this point is doubtless a double fault with an intervening segment, as shown in Fig. 1A

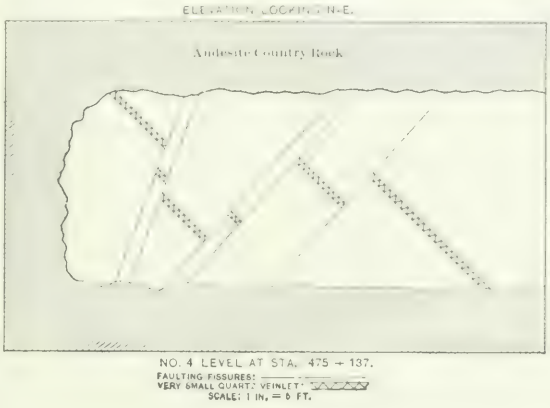


FIG. 5

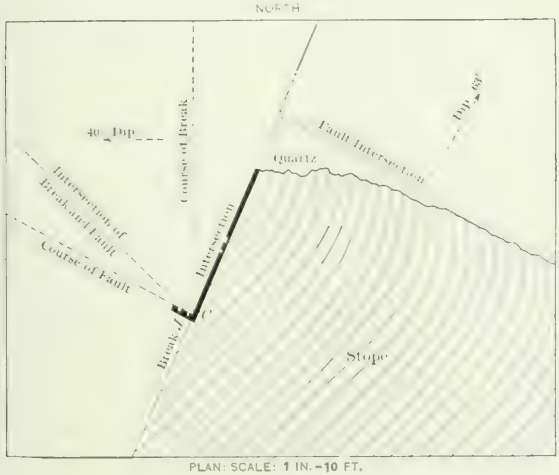


FIG. 4

This ore-occurrence indicates a total movement of the northwest country north 45 deg. west, and at an angle of depression of 33 deg., of 420 ft., and a total vertical drop of about 220 feet.

The position of the ore at point *C* was therefore 20 ft. further in the line of the movement and had 20 ft. more vertical displacement than is indicated at the ore-occurrence at (+ 40) on the No. 4 level. It was, however, the probable extent of the movement, as indicated by the ore found at No. 4 level, that suggested the raise from No. 8 level by which the vein was recovered.

There are exposed in the stopes of the Berlin mine many instances of breaks and faults which fade or run out to nothing, one of which, not shown in the drawings, but clearly enough in evidence in the mine, is found in the southwest corner of the second stope from the east end of the field. In this case the break, normal in its planes, intersections and in all other respects, begins with a mere seam in the foot-wall of the stope, increases for 20 ft. or so to a point where the vein displacement is about 4 ft., then decreases for 20 ft. to a feather edge, leaving no noticeable fissure beyond its ends in the roof or floor of the stope.

One is here impressed with the fact that fissuring and faulting is the habit of the rock mass. In this connection is perhaps worthy of illustration an observation, shown by sketch in Fig. 5, of the freshly uncovered side of the No. 4 level then being driven. A quartz veinlet, about 1 in. in thickness, was in a few feet faulted normally three times, and by reverse faulting twice, between the roof and the floor of the level.

The bright, white quartz against the dark andesite told its story as though just from the press.

In Figs. 1 and 1A an attempt is made to show pictorially the underground works and stopes, and in the two together the relations of the works on the Berlin vein and the breaks and faults which have disturbed it. In this illustration all that is really known of the matter has been found in the underground works shown in Fig. 1. The structure remote from the underground works is entirely assumption, based, as far as possible, upon the known ground as it existed in the middle of 1906.

From a practical standpoint the extraordinarily disturbed condition of the rocks in the Berlin mine is very unfortunate. Without attempting to give details, it is evident that the prospecting and development of the vein in such a broken country must be unusually troublesome and expensive.

Capacity of the Washoe Smelting Works

An illustrated pamphlet prepared by members of the Anaconda Copper Mining Company staff gives a series of totals showing the magnitude of the operations at that plant. The following are the requirements for a period of 24 hours: Ore treated, 10,000 tons; lime rock from quarries, 2300 tons; coke used, 650 tons; coal for reverberatories, 500 tons; coal for power, 500 tons; water, per minute, 35,000 gal.; men employed in and around Anaconda, 3000; monthly payroll, about $[illegible]

Effects of Acceleration on Winding Torques

A Test of the Tarbrax Electric Winding Plant Showed a Variation from 15 to 45 Kw. in Power Taken and 48 1-4 Per Cent. Efficiency

BY GEORGE NESS

The force required to produce any given acceleration being designated F, the acceleration by a, the mass moved by M, and its weight by W, and the acceleration produced by gravitation g, then:

$$F = Ma \qquad W = Mg \qquad \frac{a}{g}$$

and

$$F = \frac{Wa}{g}. \qquad (1)$$

Let u be the velocity at the beginning of any second of time; v, the velocity at the end of that time; and S, the space passed through in the time under consideration; then:

$$v^2 = u^2 + 2aS; \quad \text{or} \quad v^2 - u^2 = 2aS;$$

and

$$\frac{v^2 - u^2}{2} = aS.$$

Multiplying both sides by the mass, $\frac{W}{g}$, then:

$$\frac{W(v^2 - u^2)}{2g} = \frac{WaS}{g}.$$

And from equation (1) it follows that:

$$\frac{W(v^2 - u^2)}{2g} = FS. \qquad (2)$$

FS represents the pull, F in pounds (to produce the given acceleration throughout the seconds of time in question), multiplied by the space S passed through in feet, giving an acceleration-torque FS, in foot-pounds. To obtain the total energy in foot-pounds developed in this time, the static torque w (weight in pounds to be lifted) multiplied by S, the space passed through, has to be added. And therefore:

$$\frac{(F + w)S}{550} = \text{h.p.}$$

Allowing 80 per cent. for the efficiency of conversion, then:

$$\frac{(F + w)S \times 100}{550 \times 80} = \text{h.p.}$$

to be developed by the winding-engine.

The left side of the equation (2) is the more suitable for use in connection with electrical winding, and gives the energy exerted in producing acceleration during any second of time in terms of the initial and final velocities.

Let W be the weight in pounds of the masses to be accelerated; w the weight in pounds or unbalanced load to be raised; u the initial velocity in feet per second; v the terminal velocity in feet per second; a the acceleration in feet per second; and g, 32.2. The total torque T is equal to the sum of the acceleration-torque and the static torque, that is:

$$T = \frac{W(v^2 - u^2)}{2g} + wS$$

$$= \frac{W(v^2 - u^2)}{2g} + \frac{w(v^2 - u^2)}{2a};$$

$$= \frac{W a + w g)(v^2 - u^2)}{2ag}. \qquad (3)$$

A correction will have to be made for the weight of the rope wound on and paid out during the interval, if the rope be unbalanced.

To illustrate the resultant acceleration-torque at the peak-load, assume any mass, M, to be uniformly accelerated to a constant maximum speed of 25 ft. per second, then the results recorded in Table I will illustrate the relative energy necessary during the last second of the acceleration-period dependent upon the time employed in attaining the maximum speed. The curve (Fig. 1) illustrates these results as recorded in Table I.

From Table I will be seen the great increase of energy required to produce rapid acceleration, the peak-load being reached at the end of the acceleration period. From this instant only the static torque requires to be dealt with; and this is constant until the beginning of the retardation period, neglecting the difference in pull due to unbalanced ropes.

TABLE I RELATIVE ENERGY REQUIRED DURING THE LAST SECOND OF THE ACCELERATION-PERIOD

Acceleration Period.	Acceleration per Second.	Velocity at Beginning of Last Second.	Velocity at End of Last Second.	$v^2 - u^2$	Relative Energy to Produce Acceleration.
	(a)	(u)	(v)		
Seconds.	Feet.	Feet.	Feet.		
25	1.00	24.00	25	625 — 576.00	49.00
20	1.25	23.75	25	625 — 564.06	60.94
15	1.62	23.38	25	625 — 546.62	78.38
10	2.50	22.50	25	625 — 506.25	118.75
5	5.00	20.00	25	625 — 400.00	225.00
1	25.00	0.00	25	625 — 0.00	625.00

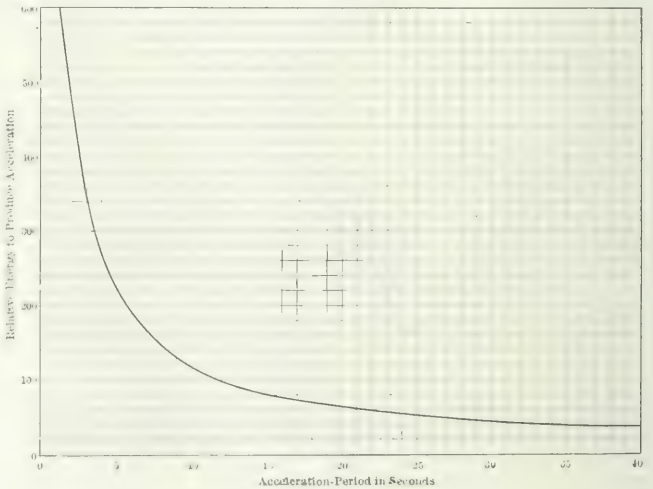


FIG. 1

Electrical Winding

There is no class of work which presents more obstacles to electrical application than that of winding from mines. The erratic nature of the load, the variations in speed, and the frequency of starting, stopping and reversal, combined with the necessity for absolute control, constitute a grouping of conditions which, in the earlier days of electrical science, would have been declared insurmountable. Apart altogether from the difficulties of winding, the question of the power factor is

one that has to be considered very carefully from the point of view of efficiency.

In the case of the plant of the Tarbrax Oil Company, Ltd., at Tarbrax, when it is worked to its maximum, there will be a torque varying from zero to about 280 h.p. thrown on and off every half minute or so. It is only by some such steadying or balancing system as has been introduced that a steady voltage could be maintained in the main circuit, from which both power and lighting are taken.

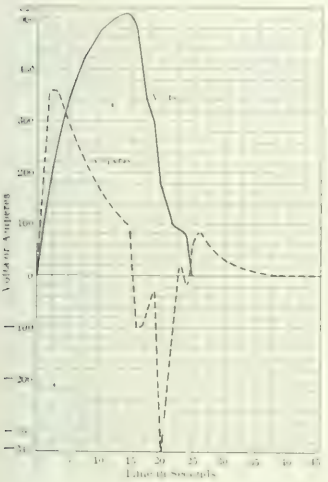


FIG. 2.

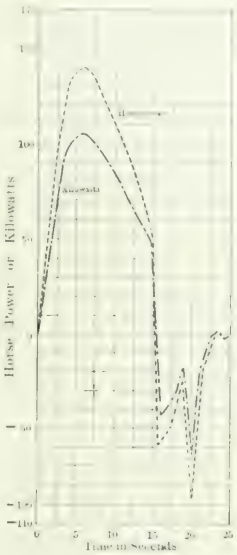


FIG. 3.

TABLE 2. TESTS OF ELECTRIC WINDING-PLANT

Time.	Wattmeter Readings.	Power-consumption.	Time.	No. of Winds.	Power-consumption.		Average No. of Winds per Minute.
					Per Minute.	Per Wind.	
A. M.	Units	Units.	Minutes.		Units.	Units.	
10 40	[illegible]	..	..	..	..	..	..
11 00½	00916.6	9.6	20	20	0.474	0.480	0.987
11 20	00924.9	8.3	19½	15	0.420	0.554	0.759
11 40	00936.4	11.5	20	19	0.575	0.605	0.950
12 00	00944.1	7.7	20	14	0.385	0.549	0.700
P. M.							
12 20	00953.9	9.8	20	18	0.490	0.545	0.900
12 45	00961.8	7.9	25	15	0.313	0.526	0.600
1.00	00970.4	8.6	15	16	0.573	0.537	0.941
Totals and averages.		63.4	140	117	0.455	0.541	0.840

Records of a Test

In the beginning of July, 1906, R. D. Munroe carried out a series of tests with a view to ascertaining the efficiency of the plant under working conditions, and I was enabled to make close observations as to the working of the plant. Representatives were also present on behalf of the Tarbrax Oil Company, Ltd., and of the contractors who laid down the plant.

Previous to the test, all the instruments to be used were carefully calibrated.

On the three-phase line at the switchboard, an integrating wattmeter of the Ferranti type, No. 95,743, was inserted, and connected up to the neutral point. By this means, the total units delivered to the winding system during the test were recorded. A [illegible] wattmeter was also inserted into one of the phases. By means of these instruments, the whole power absorbed by the main fly-wheel motor dynamo, including the power for excitation, was measured over the time occupied by the test.

Instantaneous readings were occasionally taken from the Thomson wattmeter, showing the power that was being absorbed at any particular period, thus enabling the power factor to be arrived at, by comparison with the readings on the volt-meter and ampere-meter at the same moment. In the circuit between the fly-wheel dynamo and the winding motor, continuous recording ampere-meters and volt-meters of the Nalder-Thomson type with center zero position were inserted, and a complete register of the current direction and potential during the different winds was obtained.

The test was started at 10:40 a.m., and continued until 1 p.m., and readings were taken at intervals from the different instruments.

During each wind about 12½ cwt. of shale were raised, the winding plant being operated at about half the normal output for which it was designed. Table 2 records the readings of the Ferranti integrating wattmeter. These results show that throughout the tests the average power consumption was 0.541 unit per wind; and, allowing 12½ cwt. for each wind, this shows a power consumption of 0.866 unit per ton of shale raised during the test.

The diagrams obtained from the recording instruments in the continuous-current circuit between the fly-wheel dynamo and the winding motor are more or less similar in character. For the purpose of calculation, diagrams of the volt and ampere records have been selected (Fig. 2). From these, a combined diagram (Fig. 3) was prepared, which showed the total power given out during the wind to be 1,140,412.5 watts, while from the winding motor when acting as a dynamo, 203,000 watts were returned to the fly-wheel motor, giving a total consumption of 937,412.5 watts, and this is equal to 0.2603 unit per wind, representing an efficiency of 48¼ per cent.

Current Taken

The winding-motor torque attained the maximum in 5½ sec. after the start of the wind, when the output was 104 kw. or 140 h.p. At the end of 15 sec., no further power is taken from the fly-wheel motor; reversal of the current direction occurs at the end of 15½ sec.; and, at the twentieth second, there is a maximum of 646 kw. or 86.6 h.p. being returned by the winding motor to the source of supply. At the end of the twenty-fourth second, the current rises in a positive direction and at the end of the twenty-sixth second, it has reached a maximum of 85 amperes, gradually dying away until at the end of 42 sec. it has reached a zero value. The voltage, however, has become zero at the end of the twenty-fifth second, so that there is no loss of power (Fig. 2). This rise of the ampere curve is probably due to residual magnetism, and it is merely referred to, as previous to making an analysis of the ampere diagram, it gave the impression that a loss of power was occurring.

The power taken to run the fly-wheel motor generator from the three-phase mains varied from 15 to 45 kw. This shows greater unsteadiness than was anticipated, but it is explained by the automatic slip-resistance having been designed for the absorption of a greater maximum power, in the raising of two cars from the mine, instead of one as at present. Owing to the load being small, the power factor is also adversely affected, varying from 0.67 to 0.84, and having an average of about 0.7. The low power factor necessarily lowers the efficiency of the plant, but with a power factor of 0.9 the efficiency would be relatively high.

With reference to the working of the winder, it ran smoothly and so quietly that it was practically impossible to tell whether the winding drum and motor were at rest or in motion, unless the eye [illegible]. The manipulators in charge show complete confidence, and there is no hint of nervousness in the handling of the machine, which is under the most perfect control.

The fly-wheel motor generator produced no undue vibration at any alteration of velocity and the bearings were cool. The entire electrical plant was satisfactory, and the commutation was sparkless during the whole course of the trial.

TABLE 3. ESTIMATED COST OF AN ELECTRICAL WINDING-PLANT

Generators, including stand-by set, switchboard, buildings, boilers, brickwork, chimney and cabling		£8,500
One-third of this amount is charged against the winding-plant		£2,833
Winding-plant, foundations, and buildings		2,800
Total capital charges		£5,633
Depreciation and interest on capital, £5,633 at 10 per cent. per annum		£563
Do., per week of 11 shifts of 8 hours each		£10 16s. 6½ d.
Do., per shift of 8 hours		£ 0 19s. 8.2d.
Do., taking rated output of 640 tons in 8 hours, per ton		0.368d.
Oil and waste, including power-station charges, per week	£0 15 0	
Wages of winders, per week	3 0 0	
Proportion of power-station wages chargeable against winding, per week	1 0 0	
Total	£4 15 0	
Do., per ton		0.260d.
Coal, 4 pounds per unit, at 6s. 8d. per ton		0.140d.
Total cost of shale raised, per ton		0.768d.

The question of the cost of winding by electrical means is most important. In the present instance we have arrived at the exact consumption in Board-of-Trade units to wind a ton of material at a certain speed, with an efficiency which must improve as the output is increased to a nearer approximation of the rated tonnage per shift.

In regard to the commercial aspect, there are no figures available, but table 3 contains an estimate of the cost of an installation of similar power which will serve as a guide and can be used as a basis for the consideration of each individual case.

This estimate includes the cost of 3000 ft. of cabling, all the necessary spare parts and also a stand-by set. This last item, for ordinary purposes, might be considered unnecessary when spare parts are kept, as the best makers will undertake to deliver duplicate parts within 24 hours. If the standing charges of a stand-by set are deducted from the above estimate, with a corresponding reduction of the capital charges of the power station and switchboard, a deduction of $5000 might be made in the proportionate and therefore total charges against the winding plant [illegible] per annum [illegible] per ton, thus reducing the total cost to 1.396c. per ton. [illegible] from a depth of 320 ft., with a total output of 640 tons per shift of 8 hours. The efficiency, however, at the rated output must necessarily be somewhat higher than the assumed, which is based on the records obtained during the test, but this will only lower the fuel cost per ton, the standing charges remaining constant.

A System of Coal-mine Accounting

By F. A. Hill*

It is within the province of an engineer to know thoroughly a mine-accounting system, and not depend upon accountants or auditors for methods that will give the engineer the absolute knowledge needed in operating a mine. He should know that careful check is kept upon employees, as well as upon supplies going into the mine.

The following system for checking employment of labor and its distribution into the various mining accounts has been evolved by the writer, and is now in use in two mining properties.

The proper distribution of accounts cannot be laid down by hard and fast rules for any given property. Each property is a rule in itself, as regards the particular knowledge that the engineer or manager should have of his costs.

The following distribution is in use in one mine and has proved satisfactory. In another property, a much more extensive distribution has been followed, which has also proved satisfactory.

DISTRIBUTION OF MINE ACCOUNTS

RENTON MINE

MINING

1. Miners' car price.
2. Laborers in breasts.
3. Timber in breasts.
4. Sharpening tools.

TRANSPORTATION

6. A Drivers, pushers, riders.
6. B Motormen and hoistmen.
6. C Miscellaneous.
7. Stable expense of all kinds.
8. A Power station wages.
8. B Fuel.
8. C Lubricants and waste.

DEADWORK

10. A Labor driving gangways, airways and timber for same.
10. B Labor maintaining gangways, airways and timber for same.
10. C Laying new track, ties, making frogs, switches and any extra work outside of maintenance.

PREPARING AND SHIPPING

11. A Labor engaged in handling coal and refuse at tipple.
11. B Washing coal.

MAINTENANCE OF EQUIPMENT

12. A Car repairs labor.
12. B Car repairs material.
13. Repairs to steam plant, boilers, etc.
14. Repairs to electric plant.
15. Repairs general machinery.

MAINTENANCE OF WAY AND BUILDINGS

16. Track repairs, labor and material.
17. Building repairs, labor and material.

GENERAL EXPENSE

18. Salaries of officers and clerks.
19. Salaries in general office.
20. Miscellaneous office expense.
21. Insurance and taxes.
22. Miscellaneous.

The above constitute the general operation and expense for cost of producing coal.

DEVELOPMENT AND PLANT

23. Development.
24. New machinery and cars.
25. New buildings.

NOTE—A charge of 5c. per ton for plant account and 2½c. per ton for development account is made each month and included in miscellaneous under general expense. This is a fixed charge and will be continued until those accounts are closed.

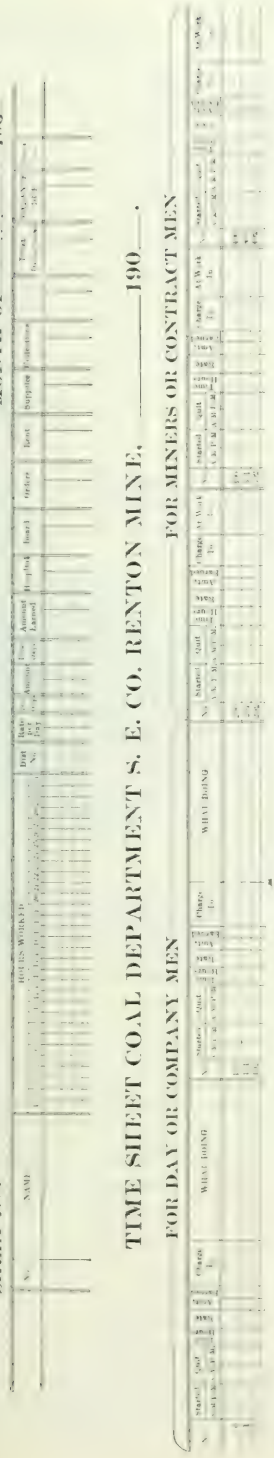
CHECK BOARD

A ⅝-inch cut-steel check with the numbers from 1 to 500 are first prepared. Then a board large enough to be properly spaced with nails driven in at equal distances, so that the numbers can hang in rotation, then the check clerk can, at a glance, take off any check from the board. Oftentimes, the superintendent desires to know how many men have gone into the mine. He goes to the check office, looks over the board, and if his day employees are grouped in lot numbers and his miners in another lot of numbers, he tells at a glance how many men are in, and can very closely figure how many tons of coal he will probably produce for the day's run.

Another check is that it is an absolute certainty that no men are left in the mine. Men may be at work in dangerous places and not show up at the proper hour. This causes everyone connected with the operation to wonder whether anything is wrong in that portion of the mine where the men have been at work If the missing men are miners, it is almost certain that some accident has happened, and they have not been able to reach their comrades. Assistance can be rendered, or the men can be traced at once. If company men, the probabilities are that the over-man will have the knowledge that the workmen have been detained on some over-time work.

In an explosion, or where any large number of men are engaged in any portion of the mine which may be cut off for some unknown cause, it is an absolute certainty, when the check board is examined, who the men are and where they have usually been employed; for, with this system, each employee soon knows its value to him—knows that if he does not report off from his work and deliver his check to the clerk, he has no time marked up for him for that day; hence, all are prompt in calling at the check office when coming from or going to their work. Again, it is not necessary for anyone to remember that John Jones worked 26 days, and has only 25 marked on the sheet.

*Consulting engineer, Seattle, Washington.


PAY ROLL CANADIAN AMERICAN COAL AND COKE COMPANY, LIMITED

SHEET NO. MONTH OF 190

TIME SHEET COAL DEPARTMENT S. E. CO. RENTON MINE. 190

FOR DAY OR COMPANY MEN FOR MINES OR CONTRACT MEN

Each day sheet stands for itself, and if he neither reported in or out for the day, it is an absolute certainty, after this check system has been in vogue for two months, that he was not at work.

THE DAILY TIME SHEET

The foundation of all labor and salaries connected with the mining operation is the time sheet, which is in use at two different properties. The sheet is ruled with 100 lines, and divided into 5 parts, 100 numbers in each part, making 499 numbers, which represent 499 names of employees.

The method employed is to have each employee go to the check office when he reports for work, ask for and receive his check, a 5/8-in. cut washer, with his number upon it; the time is put on the sheet when the check is given out. When the check is returned, the time is again put down and the kind of work upon which he was employed for that day. The following day, the check clerk works up the hours employed and amount due, together with the distribution number of the work at which the man was employed. When completed, he takes off of the sheet and tabulates the amount in dollars and cents after each distribution, totaling the whole, adds to it the number of tons of coal extracted, and such other information as the manager, engineer or superintendent may desire, from which the manager can tell exactly in dollars and cents the cost per ton of the labor for that day.

The time sheet then goes into the office, the pay-roll clerk enters the time on his pay-roll sheet, the five small lines for each number representing different distribution that the employee may be engaged upon. Hence the pay-roll sheet is a daily time-book of the mine employee, no matter on what work engaged. At the end of the month, the total time for each distribution is carried out on its proper line and column, and the pay roll must balance for the various distributions, and a perfect system is then had of the cost of the operation for all labor for the month. In practice, the daily report handed the manager will nearly balance the totals for the month.

If carefully and accurately worked up, it will, of course, absolutely check. This method keeps the time of the contract miner, as well as the day employee, and the mine foreman's book, in the distribution of his labor for the various contractors, must tally with this time sheet.

All coal-mine managers are familiar with the various methods of keeping miners' or contractors' time, and many of them know that when they depend upon the foreman's book for the distribution of the work among the miners, many errors are made. This time can be taken from the time sheet and put into the mine foreman's time-book for his miners at the various places or breasts, pillars, gangways, entries, or any specified contract place where the particular number or man may be at work during any day of the month; hence it will be seen that the distribution for each contract place is perfectly kept, and the office accountant can work this up without fear of error.

At the end of the month a report is made of the contract work in each particular place, regardless of the contractor; the total number of cars from a specified place, if a car price; the total number of tons, if a ton price from that particular place is recorded. The pay roll must then balance with the total contract work, and the total day's work of company men, making a check on the pay roll itself, or of its distribution. John Jones may have 26 days' work. It may apear in five different lines on the pay roll, or in five different distributions; yet his total time appears at so much per hour or day, and his total time, plus the total contract time, no matter how many men may have been engaged upon the contract work, will equal the total pay roll.

The general mine accounting is to be kept by the voucher system, and the pay roll is vouchered the same as for any supplies purchased, or for any supplies given out.

The method used for supplies is to use a blotter for each month in the storeroom. Pages are headed by the various accounts to which supplies may be charged out. On a requisition from the superintendent to the storekeeper, is the number of the account to which the supplies or stores must be charged. The supply clerk then puts on the blotter the requisition number, and the goods delivered under the head of the distribution number to which the account goes. At the end of the month, this is added and charged up by a voucher, crediting supplies and debiting the various mine accounts. The accompanying illustration shows the style of pay roll and time sheet used.

Anthracite Waste, and the Philadelphia Water Supply

Anthracite coal operators claim, in connection with the report of the Philadelphia water commission, that the dumping of coal dirt into the head waters of the Schuylkill river is not a menace to the city of Philadelphia, which derives its water supply from the river. They declare that elaborate precautions are now being taken to prevent the dirt from being washed from the culm banks into the river, and that in another year, there will be no cause of complaint from this source. They also contend that the sulphurous water from the mines is absolute death to the countless disease germs, which would otherwise be washed down the river from the sewage of the many towns and cities.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

On slope haulage when cars run down by gravity, the outside rail of any curve should be raised at the foot of the slope; an elevation of 2 to 3 in. works well at this point, while with rope and motor haulage, the maximum elevation is 4½ in.

In the installation of steam engines the nearer the engines are to the boilers the better, as the condensation losses will be less, and there is also the economy in first cost arising from fewness of pipes and in maintenance due to the smaller number of joints.

A 1-in. wire rope generally lasts long enough to raise 1,000,000 tons of coal up a 10 per cent. plane and about ½ mile long. The ordinary life of a wire rope is from 1½ to 4 years, according to the amount of work and improvements connected with the use of the rope.

When the angle of drive is greater than 60 deg., much trouble is likely to ensue. Vertical drives should always be avoided, as the belts or ropes tend to fall away from the lower pulley, and slipping becomes serious. If a vertical drive is absolutely necessary, a tightening arrangement must be provided.

In one instance it was found that moist sand occupied more space and weighed less per cubic foot than dry sand. A moist sample was taken from a bank 12 hours after a shower and weighed only 84.5 lb. per cu.ft., while a dry sample from the same bank weighed 107 lb. This fact must be taken into account when proportioning cement.

The pitch of anthracite coal chutes which are lined with sheet iron, should be as follows: For egg or broken, 2½ in. per ft.; for stove and chestnut, 3½ in. per ft.; for pea, 4½ in. per ft.; for buckwheat, 6 in. per ft.; for rice, 7 in. per ft.; and culm, 8 in. per ft. The angle of coal chutes should be from 35 to 45 deg. for the run-of-mine of bituminous coals; if the coal is wet, the angle should always be greater. Coarse coal will slide on a less incline than slack or culm.

According to Luke Grant in the *Industrial World* (March 16, p. 9) the number of deaths in Illinois due to shot explosions in the last 18 months is greater than before the enactment of the shot-firers law, and the miners themselves admit that some amendments to the law are necessary. Twenty-seven men have met death in firing shots since this law was enacted, and most of these deaths were due to bad shots placed by miners who knew that they were taking no chances themselves, as another man would have to fire them.

In respect to the relative cost of iron and wooden wagons for coal haulage, J. Gerrard states (*Min. Eng.*, London, Vol. XI) that iron cars cost somewhat more than wooden cars of the same size, but that the annual cost of repairs for the iron cars is much less than for the wooden ones. The figures are as follows: Wooden cars cost £2 apiece, whereas iron cars cost £2 7s. 6d. Annual repairs for iron cars are figured at 3s. 9d., while the cost of repairing wooden cars is put at 5s. 7d.

In proportioning lime to cement the method of measurement should be clearly understood. The volume of ordinary lime or quicklime increases in slacking to about 2½ times its volume measured loose in the lime cask; the exact increment depends upon the chemical composition, and the purity of the lime. The weight of lime paste is about 2½ times the weight of the same lime before slacking. Hydrated lime powder occupies more space than the quicklime from which it is made.

The most important thing to remember in firing a boiler is the regulation of drafts and the thickness of fire. An insufficient air supply causes imperfect combustion, and an excessive air supply results in too great dilution of the gases of combustion; in either case it tends to cool the furnace. The hottest fire that can be made is one in which the supply of air is enough in excess to insure perfect combustion and no more. When the gases of combustion contain 4 to 8 per cent. of free oxygen the hottest fire is obtained.

The proper elevation of an engine is one of the important points to consider, when determining its location. It is well to remember that if the condenser is to properly receive its supply, the injection should never be more than about 15 ft. above the lowest water level. This means that the vacuum in the condenser must be about 7 lb. per sq.in., before the water will enter the condenser. In order to get the condenser low enough, it is sometimes necessary to place the air pump far below the engine-house floor, and to have a long connecting rod to the air-pump rod.

The flushing of culm in anthracite mining practice permits most of the pillars to be robbed and at the same time prevents the roof from coming down. The pipes used to carry the water and culm are from 4 to 6 in. in diameter and are generally made of wrought iron. The life of the pipe depends on the nature of the water used and the material treated; with fresh water and very fine culm, a pipe will last nearly 2 years; when the culm ranges in sizes all the way to chestnut, a pipe will last about 10 months, while if ashes are mixed with the culm, 6 months will be the average life of the pipe.

In building a concrete dam in a mine where the water contains acid, it must be remembered that the acid will attack the cement and natural disintegration will surely follow. If the dam is to be for standing water, a partial wall of limestones built inside the dam, will lengthen the life of the stopping, as the acid will attack the limestones, and thus weaken the chemical activity of the acid in the water. That cement richest in lime decomposes most easily in the acid water. Sand containing a large proportion of fine grains should never be used in concrete or mortar for acid water constructions.

Ropes with 19 wires per strand are the most pliable and best adapted for hoisting. The others are stiffer and better adapted for guys, etc. For the safe working load, take one-fifth to one-seventh of the breaking load, according to speed. Hemp-center rope is more pliable than wire-center. Wire rope must not be coiled or uncoiled as hemp rope. Avoid untwisting and short bends. In order to preserve wire rope, use raw linseed oil, which may be mixed with an equal volume of Spanish brown or lamp black. For underground and wet places, use a mixture of one bushel of fresh slacked lime and some sawdust to one barrel of tar; boil the mixture and apply it to the rope while it is hot.

In view of the recent frightful accident from an explosion of gas in one of the coal mines at Reden, near Saarbrücken, Germany, which killed 150 miners, it is interesting to learn what progress has been made during the past 25 years in securing the lives of men employed in Prussian coal mines against the dangers from such explosions. The Prussian authorities have so improved the appliances needed in coal mining and have adoped so many precautionary measures to protect the lives of miners that while on the average 571 miners out of every million annually lost their lives during the decade 1881—1890, this record has been steadily reduced until in 1905 only 29 perished from explosion by fire damp. This shows what intelligent, systematic and persistent effort can and does accomplish in saving human lives from danger and accident.

Placer Claims above Minidoka Dam

A report on placer [illegible] above the Minidoka dam was recently made at the request of the Reclamation Service by L. C. Gillett and W. L. Walker, under the direction of Dr. David T. Day, of the United States Geological Survey, and is now on file in the office of the Reclamation Service, in Washington. The investigation of this ground was undertaken in order to ascertain its mineral value before it became submerged by the backwater of the Minidoka dam. A plan to dredge this ground has lately received considerable attention from promoters, and already one company has been organized and several claims near the lower end of the backwater have been purchased with a view to the installation of a dredge.

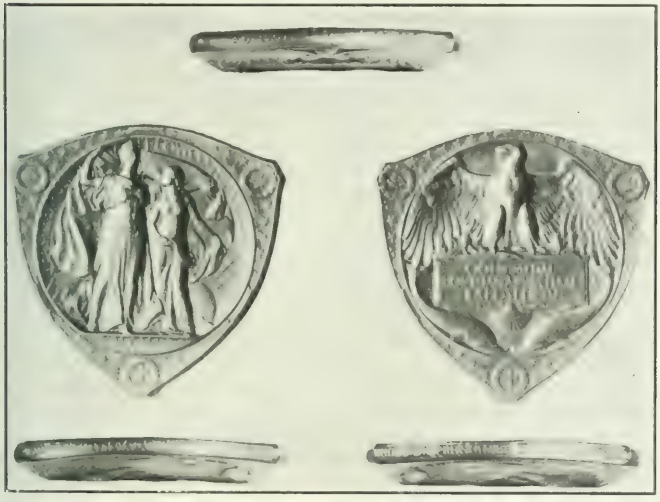
The claims prospected were those designated by D. W. Ross, supervising engineer of the Reclamation Service, and were situate along the Snake river, above the Minidoka dam, which is six miles south of the station of Minidoka, Idaho.

The prospecting was accomplished by means of test pits, panning, and sampling, the samples taken being shipped to Portland, Ore., for treatment and assay. The number of test pits dug was 129. It was found that in general the values were concentrated in the bottom of the loam and the upper portion of the underlying gravel. This surface soil or sandy loam ranges in thickness from 2 to 12 ft. The gold was everywhere of such fine flour-like particles that a large percentage of it passed through a 150-mesh screen. Occasionally, the values for individual pits averaged for the entire pit as high as $2.31 a cu.yd., but the more common values ranged from 5 to 20c. a cu.yd., while very few pits were absolutely barren of values. No other minerals of any commercial importance save gold were found.

Gold Medal for Mining Exhibit of Nevada County, Cal.

Through the courtesy of James D. Hague we are enabled to publish the accompanying illustration of the beautiful gold medal awarded for the mining exhibit of Nevada county, Cal., at the Louisiana Purchase Exposition in St. Louis.

The medal weighs 9 oz. and was made of bullion which is the usual product of one of the oldest mines in Nevada county, the North Star. The bullion is 849 fine in gold, and 139 fine in silver. The medal was struck at the United States mint at Philadelphia. The chasing and lettering of the rim was applied in New York before the interesting award was sent to its final destination.



MEDAL AWARDED FOR NEVADA COUNTY MINING EXHIBIT

Metal Production of Colorado

The metal production of Colorado for the year 1906 is reported as follows by E. L. White, commissioner of mines:

	Quantities.	Values.	Per Ct.
Gold, oz.	1,[illegible]	$22,[illegible]	[illegible]
Silver, oz.	12,[illegible]	8,[illegible]	[illegible]
Lead, lb.	[illegible]	[illegible]	[illegible]
Copper, lb.	9,565,319	1,844,002	4.2
Zinc, lb.	[illegible]	[illegible]	[illegible]
Total values		$44,[illegible]	[illegible]

Values are based on the average market prices of the different metals during the year. The zinc production is figured on the actual spelter recovered. By counties the four larger gold producers in order were Teller (Cripple Creek), San Miguel, Gilpin and Lake. Teller county reports [illegible] total. The chief silver producers were Lake, Pitkin, San Miguel and Mineral counties. The same counties were the chief lead producers. In copper, Lake and San Juan led; while in zinc, Lake county furnished 82 per cent. of the total. In total values, Teller county (Cripple Creek) stood first with $13,976,069, almost entirely in gold; while Lake county (Leadville), with a more diversified production, reports a total of $11,737,875. San Miguel was third, with $3,066,182; Pitkin fourth, with $2,646,869; while Ouray, with $2,030,627, was fifth in order.

Copper Production of the World

Statistics of production of copper in the world for the past three years have been compiled by A. Hirsch & Son, Halberstadt, Germany. Included in the circular, which we have received through the courtesy of L. Vogelstein & Co., are also statistics relative to consumption, exports and imports of the principal copper-consuming countries with special reference to the trade in the raw or partly manufactured metal in Germany. The following table shows the annual production of the world in metric tons:

COPPER PRODUCTION OF THE WORLD

	1904.	1905.	1906.
United States	[illegible]	397,545	417,411
Spain and Portugal	50,000	[illegible]	51,000
Mexico	[illegible]	60,000	[illegible]
Chile	[illegible]	33,000	30,000
Japan	32,000	31,400	37,000
Germany	[illegible]	[illegible]	[illegible]
Canada	21,500	[illegible]	24,000
Australia	[illegible]	35,000	[illegible]
Peru	7,000	8,000	11,500
Russia	10,700	[illegible]	10,000
Cape Colony	7,250	9,000	[illegible]
Norway and Sweden	6,000	6,000	[illegible]
Italy	3,250	[illegible]	3,100
New Zealand	2,000	2,200	2,500
Bolivia	2,000	2,000	2,000
Austria-Hungary, Turkey, Servia and Bosnia	1,500	1,500	1,500
Turkey	1,500	1,400	1,000
Other countries	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

There was an increase in the total production in 1906, of 5.6 per cent. over the previous year, the United States leading with 19,866 tons or 51.1 per cent. of the whole; Australia followed with 20.5 per cent. increase, and Japan was third with 14.4 per cent.

UNITED STATES

Year.	Total Copper Production and Imports	Exports of Copper	Mexico	[illegible]	Lake	[illegible]
1904	[illegible]	20,143	[illegible]	[illegible]	78,000	[illegible]
1905	491,756	14,953	[illegible]	[illegible]	85,000	356,753
1906	521,875	[illegible]	534	40,000	[illegible]	383,352

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The circulation of THE ENGINEERING AND MINING JOURNAL is regularly audited and averaged 462,500 copies per six months, or 8896 per issue. Of this number 5000 copies are printed. None sent regularly free. No back numbers beyond current year.

The Commercial Situation

As we reported last week there has been a weakness in copper, which was even then distinctly manifest. This has continued during the week just closing, and there has been a panicky condition in the general stock market. Liquidation in the stock market appears to have been overdone. The bear movement, inaugurated for manipulative purposes, has evidently gone further than its promoters contemplated, and many standard stocks are now selling at prices on which their dividends make a comparatively large return. From present indications there is no reason to anticipate reductions in the dividends.

With respect to copper, the slight decline is due to normal conditions. Producers have covered the largest part of their requirements for April, May and June, and temporarily no one appears to want to buy copper. But there are some producers who want to sell, wherefore there are lower offerings to tempt consumers. However, some of the largest producing interests profess, and we believe hold sincerely, the utmost confidence in the situation, and stand firm at their asking price of 25¼c. delivered 30 days, which is equivalent to about 25c. cash, and so long as they maintain that position the market cannot go off very far, and the London market for standard copper, which has only a reflex, sentimental effect on New York, must rise again.

It is probably true that there has been some slackening in the industrial activity of this country, but so far as that has been manifest it is merely a relief from the high tension at which we have been working, and will be a beneficial result rather than otherwise. It will be a good thing all around if we can get down somewhat from the dangerously high level at which we have been during the last few months. Because there has been a little recession in the price of copper, it does not mean that there is to be a slump in that metal, and the marking down in the prices of the stocks of the copper-mining companies has been absurd. When the price of copper rose above 18c., the prices of the stocks rose little or none, but now when there has been a little recession from the price of 25c., the value of the stocks has gone off in large slices. When people have got over their fright, a little calm reflection will show the irrationality of the situation. We have confidence in the soundness of the general business conditions, and in particular as to the position of copper.

The Labor Troubles at Goldfield, Nevada

Late reports from Goldfield, Nevada, promise an early cessation of hostilities in the new labor trouble which has brought the camp to the verge of civil war. The odd feature of the difficulty is that the ancient and perennial question of labor versus capital has nothing to do with it. It is a war of labor against labor, and the capitalists and employers occupy the unenviable position of non-combatants between the two belligerent armies.

Wages are high in Goldfield, and hours of labor satisfactory; the employers are willing to arbitrate or to do anything reasonable to get their work done, and are doing their best to promote peace between the warring factions. The trouble is one between rival labor organizations, the American Federation of Labor and the Industrial Workers of the World. The miners, it seems, are mostly members of the latter organization and are trying to induce workmen in other lines of skilled labor to join their own union. Things came to such a pass last week that everyone went armed, every office and store was guarded, and mines prepared to suspend operations.

The business and industrial interests of Goldfield are in harmony in desiring peace. Considering the extraordinary prosperity of the camp it would be strange if they were not. The men who pay the wages can exert a powerful influence, and it seems probable that their efforts to arbitrate between the unions will succeed.

Pennsylvania Coal

The State of Pennsylvania last year produced a little over 49 per cent. of the total output of the United States. In previous years it has furnished over one-half of the total, but the advance of mining in West Virginia and in some of the Western States has been on a scale which slightly reduced Pennsylvania's proportion, though the State made a moderate gain. The production of the State is divided into two great branches, largely

distinct in their character and the demand they meet—the anthracite from the eastern portion, and the bituminous coal from the central and western sections. While the final report for 1906 has not yet been issued, we have now the reports from all the mine inspection districts, the totals of which give the actual output for the year.

In 1905 the total anthracite mined was 70,220,554 long tons; equal to 78,647,020 of the short tons generally used in the coal reports. In 1906 there was a loss in the output, the causes of which have been heretofore explained; briefly put, they were the difference between miners and operators early in the year, and the carrying over of large stocks accumulated in anticipation of trouble. The quantity mined in 1905 was 64,410,327 long tons, or 72,139,566 short tons; a decrease of 6,507,454 short tons, or 8.3 per cent. For the reason already given, it is probable that the actual consumption in 1906 varied little from that of the previous year.

In bituminous coal, on the other hand, there was an important gain. The total for 1905 was 119,361,514 tons; while for 1906 the inspectors' reports give a total of 129,532,991 tons, showing an increase of 10,171,477 tons, or 8.5 per cent. Labor troubles affected the bituminous mines, but for a short time only; and the brief cessation caused was followed by increased production, in response to an active demand. It may be mentioned here that our estimate of the bituminous output, published in the JOURNAL of Jan. 5 last was 129,500,000 tons; this estimate differing from the actual figures by only 32,991 tons, or 0.025 per cent.

The total output of the State therefore, notwithstanding the loss in anthracite, advanced from 198,008,594 short tons, in 1905, to 201,672,557 tons in 1906; a gain of 3,663,963 tons, or 1.9 per cent. This approaches nearly to the coal production of Germany, and exceeds largely the total reported by any other country in the world, except Great Britain.

The Canadian Ministry of Mines

Formal notice has been given of the introduction in the Dominion Parliament, at Ottawa, of the bill to establish a department of mines, under a responsible minister, which has been for some time under consideration. The bill provides for the transfer to the new department of the Geological Survey, and also of the Mines Branch, formerly under the ministry of the interior, but recently transferred to the ministry of inland revenue. The new minister will have control of all matters relating to the mining industry. The department will comprise two main branches, the geological and the mines branch, each of which will be under the control of a director with a deputy minister over both.

While in the older provinces of the Dominion the mining lands are under the control of the provincial governments, which regulate all matters pertaining to mining, in the newer provinces of Manitoba, Saskatchewan and Alberta, and in the territories, the Dominion owns the public lands and has full jurisdiction. The creation of the new department, it is urged in favor of the bill, is demanded by the expansion of the mining industry, and the result will be to increase the amount of educational and supervisory work, and extend the scope of the present branches having it in charge. It is understood that Hon. William Templeman, who represents British Columbia in the Cabinet, and is at present the head of the inland revenue department, will be the first Minister of Mines.

The Reclamation Service

The Reclamation Service has been entirely separated from the Geological Survey, a separation which we are glad to record, for we have long advocated this division, which we believe necessary for the good of the Geological Survey. Frederick H. Newell, chief engineer of the Reclamation Service, has been appointed director of the service, an appointment which we are also pleased to record, for our criticisms of the service as a part of the Geological Survey have never referred to Mr. Newell's work, which has always been of a high value and character.

The new director is a native of Pennsylvania, and a graduate from the engineering department of the Massachusetts Institute of Technology, being a member of the class of 1885. He later took a postgraduate course in hydraulic engineering, and upon the completion of his studies entered practical service connected with the problems of irrigation in Colorado. He joined the Irrigation Survey in 1888, as hydraulic engineer, and when the Reclamation Service was established, in 1902, [illegible] pointed chief engineer.

The appointment will receive the approval of everyone who has been associated with Mr. Newell, and of everyone who knows the character of his services. He brings to his new duties a wide grasp of practical details and the trained, analytic mind of a thorough man of science.

The Mining Index

Our readers will notice this week the resumption of the usual list of the patents relating to mining and metallurgy. Hereafter notes of the new patents bearing upon this industry will be published once a month in a form under which they can be properly classified as to subject, which will assist in reference. However, brief abstracts of the more important patents will be published from time to time in the main part of the paper.

The index to the literature of mining and metallurgy, published monthly in the JOURNAL, has met with general appreciation, if we may judge from the number of orders for papers referred to therein and the requests that the index be reprinted on single sheets, so that sections may easily be cut out for filing in note-books, etc. For the latter purpose we sugggest an extra subscription, which will make available both sides of the pages, and will be cheaper than the price at which reprints could be supplied. This index contains monthly upward of 250 references, and makes our readers conversant with the appearance of almost everything in the technical press that is of importance in connection with geology, mining, metallurgy, chemical engineering, etc.

IF CONTRIBUTORS WILL kindly mail their photographs in flat packages, either mounted or between cardboards, they will eliminate a source of frequent annoyance, trouble and loss. Photographic views deserve considerate treatment. The sun gives a truthful picture without bias or preference; a single view often gives more real information than could be compressed into a page of type. Photographs, like all things precious, are perishable. Then why fold them or roll them up roughly and consign them to the mercy of the mail bag without protection or support?

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Ungava District Not in British Columbia

Permit me to call your attention to an error on page 190 of the JOURNAL of Jan. 26, 1907. In the article entitled, "A Notable Exhibit of Rare Minerals," line 15 from the bottom reads "probably some from as far as Ungava district, in British Columbia." Ungava district happens to be the northeast part of the Dominion, and incidently of the main land of the continent, while British Columbia is the extreme southwest province of the Dominion. Of course, the words "in British Columbia" should not appear at all. The collection of specimens which Dr. Kunz sent to this country for examination contained no specimens that were considered to have come from there, unless he sent more than one collection.

ALFRED W. G. WILSON.

Montreal, Feb. 26.

The account of the exhibit of minerals was published on the authority of the secretary of the institution in which the collection was shown. It was a stenographic error which placed Ungava district in British Columbia and not Dr. Kunz.

Genesis of Ores of the Cobalt District

In the discussion of his paper on the genesis of the ores of the Cobalt district, presented at the Toronto meeting of the Canadian Mining Institute, Prof. Van Hise said that the metallic silver was due to secondary enrichment.

His argument was based on the general principle that all veins have a zone of secondary enrichment, and when this zone is passed the ore becomes poorer. This is true of veins occurring in countries where there has not been a great amount of glaciation. In Ontario and particularly in the Cobalt district, glaciation has removed several hundred and possibly thousands of feet of the surface, and the veins as they outcrop at present are but the remains of larger ones that have been glaciated [illegible]

[illegible] PERIOD

There has been very little oxidation or secondary enrichment since the glacial period as evidenced by the metallic silver at the outcrop presenting glacial striæ just as plainly as the rocks in which it is [illegible] was inclosed. Mr. Timmins, of the La Rose mine, and I were shown a vein of metallic silver 2 to 6 in. wide outcropping on the hill back of the mine. The clay loam had been stripped off and for a distance of 200 ft. the metallic silver presented all the glacial markings as plainly as the inclosing Huronian rocks.

This is conclusive proof that the silver was there at the close of the glacial period and it is very unlikely that it could have been formed from secondary enrichment during the glacial period.

In the sulphide deposits of the Sudbury region, the zone of secondary enrichment is entirely absent, having been cut off during the glacial period, and sufficient time not having elapsed since that period to produce another. The sulphides are at the surface only covered by a few inches of gossan. As the same general conditions prevailed at the Cobalt district during the glacial period it is reasonable to assume that whatever zones of secondary enrichment have existed in the veins that they have been removed, and that the ores as mined a few feet below the surface are in the same condition in which they were deposited.

THE REDUCING AGENT

It therfore becomes necessary to account for the deposition of metallic silver from ascending hot solutions in order to explain the presence of the metallic silver in these ores. Its presence requires an explanation that is sound from a chemical standpoint and not subject to the accidental introduction of reducing matter from the surface.

The writer opposed the explanation by secondary enrichment and suggested the presence of graphitic deposits along with the ore due to the decomposition of hydrocarbon gases associated with the mineralizing solutions at the time the ore was deposited. These hydrocarbons would act as powerful reducing agents on the silver salts and precipitate metallic silver during the time of mineralization. Professor Miller stated that such carbonaceous or graphitic deposits were present, and were associated with the ores; some of this material being piled on the dumps at the mines.

This evidence was further strengthened by the information furnished by Messrs. Coste and Ingall that in the Silver Islet mine, near Port Arthur, hydrocarbon gases were encountered in the lower levels in sufficient quantity to burn under rock pressure. It was also stated that metallic silver was found in the bottom of the mine at a depth of 600 ft. As the glaciation was fully as great in that region as in the Sudbury district it seems improbable that secondary enrichment could account for the metallic silver in the Silver Islet mine.

The ores of that mine and of the Cobalt district are said to be practically the same in character, and the conditions in each case point to the deposition of metallic silver contemporaneously with the other minerals. It is therefore probable that metallic silver will be found associated with the other minerals to the greatest depth to which the mines may be worked. I pointed out that chloride is the form in which silver is usually found when it has been deposited by secondary enrichment. Professor Beck objected to this on the ground that in many cases metallic silver has been found where all the conditions pointed to its being deposited as a result of secondary enrichment as it was not found below that zone.

While this may be true it does not disprove the contention, and it is probable that in the veins in which the metallic silver terminated with the zone of secondary enrichment, that there were no hydrocarbon gases associated with the mineralizing solutions at the time of deposition.

I offer the suggestion that the presence of graphitic deposits on the walls of a vein together with carbonaceous material in the vein associated with the ore in evidence that at the time of mineralization hydrocarbon gases were associated with the solutions. It is also possible that this same principle of reduction during the deposition may account for the metallic copper in the Lake Superior region.

It would be interesting to know if such graphitic stains and carbonaceous deposits are associated with the Lake Superior copper ores.

HIRAM W. HIXON.

Victoria Mines, Ontario, March 13, '07.

Electric Smelting of Lead Ore

Will you kindly inform me if the electrical smelting of lead ore has been successfully accomplished on a commercial scale. R. P. F.

Pictou, Nova Scotia, March 14, 1907.

So far as we are aware, the electrothermic smelting of lead ore is nowhere practiced on a commercial scale.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ALUMINUM HYDROXIDE—Production of Aluminum Hydroxide. Chemische Fabrik Griesheim Electron. Frankfort, Germany. (Brit. No. 13,970 of 1906; Feb. 16, 1907.) Extracting hydroxide of aluminum from bauxite by caustic alkali at atmospheric pressure and at a temperature ranging from 180 to 500 deg. C.

CEMENT

KILN—Dry Kiln. La Fayette Moore, Jacksonville, Fla., assignor to L. Moore Dry Kiln Co., Jacksonville, Fla. (U. S. No. 846,044; March 5, 1907.)

KILN—Rotary Cement Kiln and Fuel Feeder therefor. Charles A. Matcham, Allentown, Pa. (U. S. No. 847,257; March 12, 1907.)

KILN—Rotary Kiln. William R. Warren, New York, N. Y. (U. S. No. 847,859; Mar. 19, 1907.)

COAL AND COKE

COAL AND ORE HANDLING—Means for Loading and Unloading Coal and Other Minerals. Cuthbert Burnett, Durham, England. (U. S. No. 845,217; Feb. 26, 1907.)

COAL SCREENING and Grading Apparatus. Joseph Rapp, Collinsville, Ill., assignor of one-fourth to Louis F. Lumaghi, Collinsville, Ill., and one-fourth to Joseph D. Lumaghi, St. Louis, Mo. (U. S. No. 846,140; March 5, 1907.)

COAL WASHER. Joseph Rapp, Collinsville, Ill., assignor of one-fourth to Louis F. Lumaghi, Collinsville, Ill., and one-fourth to Joseph D. Lumaghi, St. Louis, Mo. (U. S. No. 846,141; March 5, 1907.)

COAL WASHER — An Improved Coal Washer of the Type on which a Vibrating Pan is Used. Heyl & Patterson, Pittsburg, Pa. (Brit. Nos. 1936 and 1942 of 1906; Feb. 23, 1907.)

COKE Process of Coking Coal. Samuel B. Sheldon, Buffalo, N. Y. (U. S. No. 846,958; March 12, 1907.)

COKE-FURNACE. Samuel B. Sheldon, Buffalo, N. Y. (U. S. No. 847,614; Mar. 19, 1907.)

COKE MANUFACTURE—Process for Utilizing Close-burning Coal Dust for Making Metallurgical Coke or Other Kinds of Coke. Gaston de Velna, Paris, France, assignor to Arthur Stanley Riggs, East Orange, N. J. (U. S. No. 847,134; March 12, 1907.)

COKE OVENS—Apparatus for Charging Coke Ovens. Frederic W. C. Schniewind, Everett, Mass., assignor to United Coke and Gas Co., Charleston, W. Va., and Philadelphia, Pa., a corporation of West Virginia. (U. S. No. 845,719; Feb. 26, 1907.)

COKING OVEN. Louis J. Hirt, Brookline, Mass. (U. S. No. 847,001; March 12, 1907.)

PEAT—Process for Charring or Carbonizing Peat. Martin Ekenberg, Stockholm, Sweden. (U. S. No. 847,748; Mar. 19, 1907.)

PEAT DRIER. Benjamin F. Lambert, Anderson, Ind. (U. S. No. 846,574; March 12, 1907.)

SAFETY LAMP — Miners' Safety Lamp. Emil Piepenbring, Dortmund, Germany. (U. S. No. 846,050; March 5, 1907.)

SAFETY LAMPS—An Improved Friction Device for Igniting Miners' Safety Lamps. P. Wolf, Zwickau, Saxony. (Brit. No. 5374 of 1906; Feb. 23, 1907.)

COPPER

ALLOY. F. Dannert, Berlin, Germany. Obtaining an alloy of copper and lead by introducing into molten copper a mixture of a lead oxide and powdered glass. (Brit. No. 8894 of 1906; Feb. 16, 1907.)

COPPER-REFINING FURNACE. Ralph Baggaley, Pittsburg, Pa. (U. S. No. 846,891; March 12, 1907.)

EXTRACTION OF COPPER Process of Extracting Copper. Oscar Fröllich, Berlin, Germany. (U. S. No. 846,657; March 12, 1907.)

SILICATE OF COPPER—Process for the Treatment of Silicate of Copper. George H. Waterbury, Denver, Colo., assignor to Los Angeles Metals Extraction Company, Los Angeles, Cal. (U. S. No. 847,448; Mar. 19, 1907.)

GOLD AND SILVER

AMALGAMATION—Amalgamator and Concentrator. Julius A. Jean, Denver, Colo., assignor of one-half to George A. Moors, Denver, Colo. (U. S. No. 847,077; March 12, 1907.)

AMALGAMATION—An Improved Method of Circulating Gold-bearing Pulp over Amalgamating Plates Arranged in a Tank. B. G. Jayne and C. M. Knight, New York. (Brit. No. 17,699 of 1906; Feb. 23, 1907.)

CYANIDE PROCESS—Machine for Cleaning Covered Filters. Hiram W. Blaisdell, Los Angeles, Cal. (U. S. No. 845,746; March 5, 1907.)

CYANIDE PROCESS—Machine for Cleansing Filter Beds. Hiram W. Blaisdell, Los Angeles, Cal. (U. S. No. 845,744; March 5, 1907.)

DREDGES — Upper Tumbler for Dredges and the Like. Samuel L. G. Knox, Milwaukee, Wis., assignor to The Bucyrus Company, South Milwaukee, Wis., a corporation of Wisconsin. (U. S. No. 845,795; March 5, 1907.)

EXTRACTION OF GOLD. James W. Worsey, St. Helens, and Edwin Hoal, Liverpool, England. (U. S. No. 846,768; March 12, 1907.)

HYDRAULIC MINING — Gold-saving Apparatus. James H. Leggett, Oroville, Cal. (U. S. No. 846,483; March 12, 1907.)

PARTING GOLD—Process of Separating Gold from Silver and Other Metals. Donald Clark, Bairnsdale, Victoria, Australia. (U. S. No. 845,853; March 5, 1907.)

PRECIPITATION—Zinc Shavings Device. T. Meyer, Zurich, Switzerland. Improved apparatus for producing zinc shavings. Brit. No. 1066 of 1906; Feb. 16, 1907.)

IRON AND STEEL

ALLOY — Self-hardening Alloy of Steel. James Churchward, New York, N. Y. (U. S. No. 845,757; March 5, 1907.)

ALLOY—Steel Alloy and its Manufacture. James Churchward, New York, N. Y. An alloy consisting of steel, nickel, manganese and titanium, in substantially the proportions specified. (U. S. No. 846,979; March 12, 1907.)

APPARATUS for Transferring Metal Blooms, etc. Edwin E. Slick, Pittsburg, Penn. (U. S. No. 12,620, reissue; March 19, 1907.)

BLAST FURNACE—Charging Apparatus. Thomas F. Witherbee and John G. Witherbee, Port Henry, N. Y. (U. S. No. 845,601; Feb. 26, 1907.)

CASE-HARDENING. Adolph W. Machlet, Elizabeth, N. J. (U. S. No. 847,588; Mar. 19, 1907.)

CONVERTION OF IRON—Process of Converting Iron Castings into Steel or Malleable Iron. Mary A. Hunter, Philadelphia, Pa. (U. S. No. 846,031; March 5, 1907.)

CORROSION — Preventing Iron Surfaces from Rust by Treating Them with Dilute Solution of Phosphoric Acid. T. W. Cosiett, Birmingham. (Brit. No. 8667 of 1906; Feb. 23, 1907.)

CUPOLA FURNACE. Benjamin D. McCormick, Akron, Ohio. (U. S. No. 847,097; March 12, 1907.)

DRY AIR BLAST—Air-blast Drier. John Beernink, Milwaukee, Wis. (U. S. No. 845,047; Feb. 26, 1907.)

DRY AIR BLAST Process of Drying Air for Blast Furnaces. Nathaniel T. Bacon, Peacedale, R. I. (U. S. No. 847,273; March 12, 1907.)

DRY-AIR BLAST APPARATUS. L. Block, New York, N. Y. Improved apparatus for removing moisture from air used in metallurgical operations. (Brit. No. 800 of 1906; Feb. 16, 1907.)

DRY-AIR BLAST APPARATUS. W. H. Webb, W. G. Brettell and A. J. Adamson, Liverpool. Improved cooling apparatus for removing moisture from air used in metallurgical operations. (Brit. No. 960 of 1906; Feb. 16, 1907.)

FURNACE GASES—Apparatus for Removing Impurities from Furnace Gases. Ralph Baggaley, Pittsburg, Pa. (U. S. No. 846,815; March 12, 1907.)

OPEN-HEARTH FURNACES—Improved Pouring Spout. J. A. Drain, Pittsburg, Pa. An improved pouring spout for open-hearth furnaces, so that a big charge can be poured into more than one ladle. (Brit. No. 19,616 of 1906; Feb. 16, 1907.)

ROLLING MILL—Mill for Rolling Annular Articles. Casimir von Philp, Bethlehem, Pa., assignor to Bethlehem Steel Co., South Bethlehem, Pa., a corporation of Pennsylvania. (U. S. No. 846,942; March 12, 1907.)

ROLLING MILL—Universal Rolling Mill. Victor Chartener, Pittsburg, Pa. (U. S. No. 846,825; March 12, 1907.)

ROLLING MILLS—Hotbed for Rolling Mills. Edwin E. Slick, Pittsburg, Pa. (U. S. No. 846,761; March 12, 1907.)

TEMPERING BATH for Steel. James Churchward, New York, N. Y. (U. S. No. 845,755; March 5, 1907.)

WIRE — Incandescent Lamp Attachment. S. O. Cowper Coles, London. A wire intended as a substitute for platinum for use in electric incandescent lamps, consisting of pure iron, first tinned and then covered with aluminum. (Brit. No. 10,622 of 1906; Feb. 16, 1907.)

LEAD

LEAD PRODUCT. John W. Bailey, New York, N. Y., assignor, by mesne assignments, to United Lead Company, a corporation of New Jersey. (U. S. No. 846,384; March 5, 1907.)

MICA

MICA SHEETS—Process of Making Artificial Mica Sheets. Edward Cooper, Newton Lower Falls, Mass. (U. S. No. 847,910; Mar. 19, 1907.)

NICKEL

ORE TREATMENT—Process of Treating Nickel Ores, etc. Ralph W. E. MacIvor, London, England, assignor to Metals Extraction Corporation, Limited, London, England, a corporation. (U. S. No. 846,492; March 12, 1907.)

PETROLEUM

DRILLING—Well-drilling Machine. Geo. N. Thomas, Pacific, Mo. (U. S. No. 846,165; March 5, 1907.)

OIL WELLS—Rope-grab for Oil or Other Drilled Wells. Lawrence Stephens, Macksburg, Ohio. (U. S. No. 846,157; March 5, 1907.)

REFINING—Separating Low-boiling Products from the Burning Oil Distillate of Petroleum to Raise the Fire Test Thereof. Herman Frasch, New York, N. Y., assignor to Standard Oil Co., Bayonne, N. J., a corporation of New Jersey. (U. S. No. 845,456; Feb. 26, 1907.)

REFINING — Steam Still for Petroleum. Herman Frasch, New York, N. Y., assignor to Standard Oil Co., Bayonne, N. J., a corporation of New Jersey. (U. S. No. 845,735; Feb. 26, 1907.)

QUICKSILVER

MERCURY - CONDENSER. Conrad F. Brown, San Jose, Cal. (U. S. No. 847,547; Mar. 19, 1907.)

MERCURY RETORT AND FURNACE. Conrad F. Brown, San Jose, Cal. (U. S. No. 847,399; Mar. 19, 1907.)

SMELTING—Furnace for Reducing Cinnabar Ore. Charles F. Burgess, Yreka, Cal. (U. S. No. 845,690; Feb. 26, 1907.)

RARE METALS

METALLIC LAMP FILAMENTS. J. Lux, Vienna, Austria. Method of forming exceedingly thin filaments of molybdenum or tung-

SULPHUR

SULPHUR ... Apparatus ... (U. S. No. ...

METALLURGY GENERAL

ALLOY ... Arthur E. Hobson, Meriden, Conn., assignor to International Silver Co., a corporation of New Jersey. (U. S. No. 846,851; March 12, 1907.)

FLUE DUST.—Method of Recovering Values from Flue Dust. Ralph Baggaley, Pittsburg, Pa. (U. S. No. 846,818; March 12, 1907.)

METALLIC OXIDES. Process of Making Metallic Oxides. John W. Bailey, Jersey City, N. J., assignor, by mesne assignments, to United Lead Co., a corporation of New Jersey. (U. S. No. 846,444; March 12, 1907.)

METALLIC SULPHIDES—Process of Reducing Metallic Sulphides. Edward L. Anderson, St Louis, Mo., assignor, by direct and mesne assignments, of one-half to himself and Hosea Anderson, St Louis, Mo.; and one-half to John H. Miller and Chalon G. Cloud, McLeansboro, Ill. (U. S. No. 846,642; March 12, 1907.)

ORE TREATMENT — Method of Treating Ores. William Kemp, Tucson, Ariz. (U. S. No. 846,216; March 5, 1907.)

SULPHIDE ORES — Process of Smelting Sulphide Ores. Corydon W. Munson, Toledo, Ohio. (U. S. No. 846,498; March 12, 1907.)

SULPHIDE ORES — Process of Treating Sulphide Ores. Otokar Fronek, Cleveland, O., assignor to the General Laboratory Co., a corporation of Ohio. (U. S. No. 845,868; March 5, 1907.)

WASTE HEAT OF SLAG—Method of Generating Steam from Waste Heat of Slag. Ralph Baggaley, Pittsburg, Pa. (U. S. No. 846,817; March 12, 1907.)

MINING MACHINERY AND APPARATUS

BORE-HOLE SURVEYING INSTRUMENT. Instrument for Surveying Bore-holes. Percy E. Lewis, Johannesburg, Transvaal, assignor of one-fourth to Luther Cyril Franck, Johannesburg, Transvaal. (U. S. No. 845,875; March 5, 1907.)

CENTRIFUGAL PUMP — Centripetal-Centrifugal Pump and Condenser. Roscoe S. Prindle, New York, N. Y., assignor of one-half to Charles H. Tompkins and Vincent C. Tompkins, New York, N. Y. (U. S. No. 845,816; March 5, 1907.)

CONVEYER. John F. Doehle, Plainfield, N. J. (U. S. No. 846,402; March 5, 1907.)

CONVEYER APRON. Emil Schaffner, Wimbledon, N. D. (U. S. No. 845,269; Feb. 26, 1907.)

CONVEYERS—Tripper or Deliverer for Conveyers. Clarence K. Baldwin and Lincoln Moss, New York, N. Y. (U. S. No. 847,309; Mar. 19, 1907.)

DRIER—Sand and Mineral Drier. Marguerite Schaeffer, Indianapolis, Ind. (U. S. No. 847,513; Mar. 19, 1907.)

DRILL—Mining Drill. Jasper N. Rickles, Altoona, Ala. (U. S. No. 845,898; March 5, 1907.)

DUMPING BUCKET. Louis A. Lehmann, New York, N. Y. (U. S. No. 846,800; March 12, 1907.)

HOISTING AND CONVEYING APPARATUS. Thomas S. Miller, South Orange, and Joseph H. Dickinson, Montclair, N. J. (U. S. No. 846,042; March 5, 1907.)

HOISTING APPARATUS—Safety Arrangement for Hoisting Apparatus. Wm Thornton, Johannesburg, Transvaal. (U. S. No. 846,807; March 12, 1907.)

MINE CAGES. An Improved Grip for Suspending Mine Cages on Guide Ropes in Case the Hauling Rope Breaks. F. Pratt, Glamorgan. (Brit. No. 14,011 of 1906; Feb. 23, 1907.)

MINE ... Rope for Mine Cages. A. Braunig and G. Schmidt, Gorlitz, Germany. Providing a second drum and winding rope for mining cages in case of emergency, should the usual hauling rope break. (Brit. No. 9013 of 1906; Feb. 16, 1907.)

MINE CAGES Safety-clutch for Mine ... (U. S. No. ... May 14, 1907.)

MINE ELEVATORS—Detaching Cone for ... George Kilian, Scranton, Pa. (U. S. No. 845,177; Feb. 26, 1907.)

MINE ELEVATORS — Safety Device for Elevators. George R. Layman, Lincoln, Ill. (U. S. No. ... March 12, 1907.)

PICK. Andrew C. Pitman, Gary, W. Va. (U. S. No. 845,574; Feb. 26, 1907.)

PICK. Thomas A. Lutz, Winburne, Pa. (U. S. No. 845,427; Feb. 26, 1907.)

ROCK DRILLING MACHINES. An Improved Standard for Supporting Rock drilling Machines. The Hardy Patent Pick Co. and W. Bleans, Sheffield. (Brit. No. 7235 of 1906; Feb. 23, 1907.)

ROCK-DRILLING MACHINES—Drill or Bit Rotating Mechanism for Rock drilling Machines or Engines. Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. (U. S. No. 845,952; March 5, 1907.)

ROCK DRILLS — Apparatus for Making and Sharpening Rock Drills. Gilbert Glossop, Leeds, England, assignor of one-half to Thos. Henry Bradbury, Leeds, England, and one-half to Andrew Makie Niven, Robert Niven and John Wylie Craig Niven, Johannesburg, Transvaal. (U. S. No. 12,614; March 5, 1907.)

ROCK DRILLS. Means for Circulating a Cooling Medium in Gas-actuated Rock Drills. Otho C. Duryea, Los Angeles, Cal., assignor to National Gas Drill Co., Los Angeles, Cal., a corporation of California. (U. S. No. 846,407; March 5, 1907.)

ROCK DRILLS. Valve for Percussive Rock Drills. Albert W. Daw and Zacharias W. Daw, London, England. (U. S. No. 847,739; Mar. 19, 1907.)

SHAFT SINKING—Apparatus for Sinking Shafts. Ralph Baggaley, Pittsburg, Pa. (U. S. No. 846,816; March 12, 1907.)

SURVEYING INSTRUMENT. Philip Ferber, Hoboken, N. J., assignor to the Keuffel & Esser Co., Hoboken, N. J., a corporation of New Jersey. (U. S. No. 846,989; March 12, 1907.)

METALLURGICAL MACHINERY AND APPARATUS

BLOWER. William W. Green, Niles, Mich., assignor to Garden City Fan Co., Chicago, Ill., a corporation of Illinois. (U. S. No. 846,844; March 12, 1907.)

BRIQUET MACHINES—Feeder for Briquet Machines. Karl P. Hangi, New York, N. Y. (U. S. No. 845,299; Feb. 26, 1907.)

GAS PRODUCER. Henry K. Cowen, Chicago, Ill., assignor to International Harvester Co., a corporation of New Jersey. (U. S. No. 845,163; Feb. 26, 1907.)

PRODUCER-GAS APPARATUS. Harry F. Smith, Lexington, Ohio. (U. S. No. 846,357; March 5, 1907.)

PRODUCER-GAS PLANT. Peter Eyermann, Beloit, Wis. (U. S. No. 847,054; March 12, 1907.)

FURNACES

ELECTRIC FURNACE. Basilius von Ischewsky, Kiew, Russia. (U. S. No. 847,003; March 12, 1907.)

ELECTRIC FURNACE. Le Roy W. Stevens, Syracuse, N. Y., assignor to Advance Furnace Co. of America, Utica, N. Y. (U. S. No. 846,521; March 12, 1907.)

HEATING FURNACE—Continuous Heating Furnace. Harry Farrock, Youngstown, and Willis McKee, Elyria, Ohio; said Parrock assignor to said McKee. (U. S. No. 846,506; March 12, 1907.

MELTING AND CONVERTING FURNACE—Improved Form of Portable Melting and Converting Furnace for Steel and Other Metals. L. Rousseau, Paris. (Brit. No. 12,729 of 1906; Feb. 23, 1907.)

ORE FURNACE—Apparatus for Treating Materials. Charile E. Mark, Chicago, Ill. (U. S. No. 846,588; Mar. 12, 1907.)

ORE-ROASTING FURNACE. George H. Franklin, Boulder, Colo. (U. S. No. 847,756; Mar. 19, 1907.)

ORE SMELTING FURNACE. Harrison B. Meech, New York, N. Y. (U. S. No. 847,962; Mar. 19, 1907.)

PYROMETER. John F. Hammond, Brewster, N. Y., assignor to S. S. White Dental Manufacturing Co., Philadelphia, Pa. (U. S. No. 846,998. Mar. 12, 1907.)

REVERBERATORY FURNACE. An Improved Reverberatory Furnace for use in Connection with Gaseous Fuel. F. Cotton, Hornsby, New South Wales. (Brit. No. 1770 of 1906; Feb. 23, 1907.)

ROASTING FURNACES—Improvements in Roasting Furnaces. A. Ducco, Turin, Italy. In rotating ore roasting furnaces, means for preventing the access of air when the ore enters. (Brit. No. 5997 of 1906; Feb. 16, 1907.)

ORE DRESSING MACHINERY

CRUSHING—Ore Crushing and Grinding Mill. Augustus L. Engelbach, Denver, Colo. (U. S. No. 845,067; Feb. 26, 1907.)

CRUSHING MORTAR AND SEPARATOR. Hugh R. Logan, Carson, Nev. (U. S. No. 847,016; Mar. 12, 1907.)

CRUSHING ROLLS, IMPROVED. C. C. Lane, Los Angeles, Cal. A crushing machine in which the crushing roll frame is made up of sections and the plane of each crushing roll is adjustable relatively to the tread upon which they travel; the improvement consisting in making the sections composing the frame with toothed outer edges so as to form a composite gear wheel, and in distributing the traveling crushing rolls in balanced banks; also on making the rolls to travel over steel rings and embedding their foundations in concrete. (Brit. No. 19,946 of 1906; Feb. 16, 1907.)

CRUSHING ROLLS—Improved Methods of Fixing Hardened Steel Rollers on Rolls for Crushing Ore and Stone. C. H. Darbishire, Penmaenmawe. (Brit. No. 22,078 of 1906; Feb. 23, 1907.)

DISTRIBUTING DEVICE for Ores. Joseph E. Kennedy, New York, N. Y., and Francis J. Hobson, Guanajuato, Mexico. (U. S. No. 846,792; Mar. 12, 1907.)

MILLING—Feeding Device for Ball-Mills. Max F. Abbé, New York, N. Y. (U. S. No. 845,992; Mar. 5, 1907.)

ORE CLASSIFIER and Feeder. Michael Christmann, Leadville, Colo. (U. S. No. 845,395; Feb. 26, 1907.)

ORE-CONCENTRATOR. Alonzo C. Campbell, Asheville, N. C. (U. S. No. 847,236; Mar. 12, 1907.)

ORE-CONCENTRATOR. Michael Christmann, Leadville, Colo. (U. S. No. 845,396; Feb. 26, 1907.)

ORE REDUCTION—Apparatus for Disintegrating Soft Middlings. John M. Case, Louisville, Ky., assignor to J. M. Case Mill Mfg. Co., Louisville, Ky.; a corporation of Kentucky. (U. S. No. 845,851; Mar. 5, 1907.)

PULP SCREEN ROLL. Alfred M. Meincke, Winchester, Mass. (U. S. No. 847,352; Mar. 19, 1907.)

SETTLING-TANK. John M. Callow, Salt Lake City, Utah. (U. S. No. 845,520; Feb. 26, 1907.)

STAMP-MILL STAMP-HEAD. Martin P. Boss, San Francisco, Cal. (U. S. No. 847,397; Mar. 19, 1907.)

INDUSTRIAL CHEMISTRY

ALUMINA MANUFACTURE—Process for Removing Silica from Aluminate of Soda in the Manufacture of Alumina. Compagnie des Produits Chimiques d'Alais, Salindres, France. (Brit. No. 27,290 of 1906; Feb. 23, 1907.)

CALCIUM PEROXIDE—Process of Making Calcium Peroxide. Otto Liebknecht, Frankfort-on-the-Main, Germany, assignor to The Roessler & Hasslacher Chemical Company, New York, N. Y., a Corporation of New York. (U. S. No. 847,670; Mar. 19, 1907.)

CARBON BISULPHITE—Apparatus for Making Bisulphite Liquor. John C. Murray, Bangor, Me., assignor of one-third to George C. Crafts, Bangor, Me., and one-third to George W. Fortier, Orono, Me. (U. S. No. 846,499; Mar. 12, 1907.)

FERTILIZER and Process of Making Same. Carleton Ellis, White Plains, N. Y. (U. S. No. 847,749; Mar. 19, 1907.)

PHOSPHATES—The Manufacture of Mono-Calcium Meta-Phosphate from Tribasic Phosphate of Lime by Roasting with Carbonaceous Matter. M. Walkey, London. (Brit. No. 13,882 of 1906; Feb. 23, 1907.)

PIGMENTS—Apparatus for the Production of Pigments. Clinton P. Townsend, Washington, D. C., assignor to Elmer A. Sperry, Cleveland, Ohio. (U. S. No. 846,526; Mar. 12, 1907.)

PIGMENTS—Process for the Production of Pigments. Clinton P. Townsend, Washington, D. C., assignor to Elmer A. Sperry, Cleveland, Ohio. (U. S. No. 847,032; Mar. 12, 1907.)

SULPHUR—Manufacture of Alumina and Alkali Compounds of Sulphur. Adolf Clemm, Mannheim, Germany. (U. S. No. 845,854; Mar. 5, 1907.)

SULPHURIC ACID—A Concentrator for Sulphuric Acid, in which the Acid, in the Form of a Fine Spray, Meets an Upward Current of Hot Gases. A. Gaillard, Barcelona, Spain. (Brit. No. 12,538 of 1906; Feb. 23, 1907.)

SULPHURIC ACID. Apparatus for Desulphurizing and Agglomerating Pyrites-Cinder, etc. Rowland F. Hill, New York, N. Y., assignor to General Chemical Company, New York, N. Y., a corporation of New York. (U. S. No. 847,410; Mar. 19, 1907.)

SULPHURIC ACID—Purification of Sulphuric Acid. Vero C. Driffield and Frederick W. Wright, Liverpool, England, assignors to United Alkali Co., Limited, Liverpool, England. (U. S. No. 846,288; Mar. 5, 1907.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

I. R. Miller, of Denver, is at present in New York.

James E. Kulyn, of Reno, Nev., has gone to Chicago on mining business.

B. C. Austin is superintendent of the Santa Ysabel mine at Quartz, California.

I. W. Lukins has resigned as general manager of the Illinois Collieries Company.

E. W. Sebben, of Denver, has gone to Utah where he has some examinations to make.

Godfrey D. Doveton has returned to Denver from a four months' engagement in Mexico.

Joseph Porter is superintendent of the Bonanza King mine, at Trinity Center, California.

Clarence K. McCornick has been elected president of the Balaklala Copper Company, of California.

We shall be obliged if A. N. Palmer, who recently favored us with a contribution, will communicate his address.

Frank A. Maxwell, United States deputy mine surveyor, of Georgetown, Colo., is in Denver on important business.

R. B. Brinsmade left St. Louis, March 19, for the Southwest, to examine mines in northern New Mexico and Arizona.

C. S. Pierce is now superintendent of the Soulsby mine, at Soulsbyville, Cal., for the Bagdad-Chase Mining Company.

Frank H. Probert has returned to Los Angeles, Cal., from Montana, where he has been making some mine examinations.

A. E. Keables, president of the Security Investment and Mines Company, of Denver, is in the East on important business.

S. F. Shaw is now superintendent of the concentrator for the Granadeña Mining Company, of Santa Barbara, Chihuahua, Mexico.

Francis L. Robbins, formerly president of the Pittsburg Coal Company, will become president of the Illinois Collieries Company on April 1.

William R. Boggs, Jr., manager at Matehuala for W.B. A. Dingwall, of Matehuala, San Louis Potosi, Mexico, is in the United States on a short vacation trip.

J. de F. Junkin, Jr., of Coalgate, I. T., general manager of the Coalgate Company, is spending several weeks in New York, on business.

David H. Lawrance, of Denver, has just returned home from a month's trip to Nevada, where he visited some of the principal camps of the State.

John Knox has been appointed underground mining superintendent for the Calumet & Hecla. He is a graduate of the Michigan College of Mines.

George G. Matchett, secretary of the Dominion State Mines Corporation, of Farmville, Va., will be in Philadelphia from April 1 to April 6, inclusive.

Edward J. Porteous, late of Los Angeles, Cal., is now engineer in charge of the Rogue River and Development Company's mines, at Marial, Curry county, Oregon.

E. M. McIlvain, formerly president of the Bethlehem Steel Company, has been elected president and general manager of the Robins Conveying Belt Company, New York.

O. E. Jager has left Humboldt, Ariz., temporarily, taking a three months' engagement with the Garretson-Sahuaripa Company at La Calera, district de Sahuaripa, Sonora, Mexico.

Walter Fitch, of Salt Lake City, Utah, formerly general superintendent of the United States Mining Company, has been appointed superintendent of the mines of the Calumet & Hecla.

Walter F. Lineberger, of the firm of Lineberger & Rone, Torreón, Cohuila, Mexico, spent some time recently, examining properties in the new zinc district at Musquiz, Coahuila, Mexico.

T. H. Drummond, of the Newhouse engineering staff, has been appointed assistant superintendent of the Nipissing mines at Cobalt, Ont. W. H. Linney remains in charge of the mining operations.

Carl Scholz, president of the Rock Island Coal Company, has been going over the Chicago, Rock Island & Pacific lines in the Indian Territory, with officers of the road, arranging to provide for storage of coal for next winter.

John L. Gans, of Uniontown, Pa., has been appointed general manager of the Pittsburg Coal Company, and will have charge of the new proposed extensive coke operations of the company with headquarters at Brownville, Pennsylvania.

Obituary

Nikolas Sokolov, one of the most eminent of Russian geologists, died in St. Petersburg, Feb. 2—15. He was chief of the Geological Committee of Russia and a prominent member of the Imperial Academy of Sciences.

The recent death of E. E. Burlingame, the leading assayer of Denver for more than 30 years, was a shock to his many friends. He had for a long period enjoyed the thorough confidence of the mining community by his skill and accuracy in metallurgical experiments. As far back as 1868 he was territorial assayer.

Henry M. Chamberlayne, superintendent of the Selova mines of the Crescent Coal Company, at Warrior, Ala., was shot and killed in a fight at that place, March 18. His assailant was also killed. Mr. Chamberlayne was 40 years old; he was born in Richmond, Va., but had been in the Birmingham district, engaged in coal mining, for 16 years past.

Spaulding K. Wallace died at his home in Steubenville, O., March 15, from pneumonia. Mr. Wallace was born in Pittsburg in 1845 and removed to Wheeling, W. Va., when a boy, engaging in the iron business in a minor capacity, but advanced rapidly and for some years was president of the Jefferson Iron Works, Steubenville, O. He was a man of high mental endowments and was recognized for many years as one of the leaders in the iron industries of the Ohio valley. He retired from active business several years ago.

Industrial

The Allis-Chalmers Company, Milwaukee, Wis., has opened a new branch office in New Orleans in the Godchaux building.

Zenith furnace at Duluth, Minn., was blown out on the last day of the month, and will be out for a short time in order to make repairs.

The Michaelsen Mineral Concentrator Company, Howe, Neb., has been organized with an authorized capital of $250,000 to manufacture concentraters and mining machinery. The incorporators are L. Coeur, J. W. Mayer and J. T. Cox.

Victor M. Braschi & Co., of the City of Mexico, announce that, to handle their increasing business in the north of the republic in power, electrical, mining and metallurgical machinery, they have opened a branch in Torreon, Coahuila, in charge of Charles F. Parker, as manager.

The Buffalo Copper and Brass Rolling Company, Buffalo, N. Y., has been incorporated with a capital stock of $800,000 by Robert L. Fryer, George A. Ray, Franklin D. Looke, William K. McFarlin, Edwin H. Thomas, Robert S. Cox and Albert E. Jones. A rolling mill for the manufacture of sheet copper will be erected; also a wire mill.

The Columbia Engineering Works, Portland, Oregon, having discontinued the engineering and machine-shop departments and having specialized on the manufacture of steel castings and steel logging blocks and tools, has adopted the more appropriate name of the Columbia Steel Company. It has also enlarged capacity and facilities for making all grades of steel castings.

The Ashland Fire Brick Company, Ashland, Ky., has booked a number of large orders recently, including several open-hearth furnaces for Gary, Ind.; furnace linings for Goshen, Va.; Ashland, Ky.; Columbus, O.; Hanging Rock, O.; Jackson, O.; Big Stone Gap, Va.; Lowmoor, Va.; several stoves for South Chicago,

Hanging Rock, O.; cement kilns for Yankton, S. D., and Hildalgo, Mex., in addition to many smaller orders.

C. Tennant, Sons & Co., a new incorporation of an existing firm, have acquired the business of James Lee & Co., of New York, dealers in heavy chemicals. The last named firm has been dissolved, after a continuous existence of 82 years. The business will be continued at 76 William street, New York. The officers of the new company are Sir Edward P. Tennant, president; John E. Leech and William A. Tennant, vice-presidents.

J. J. McCabe, 14 Dey street, New York, N. Y., is manufacturing a double-spindle lathe which has met with the approval of many mining companies in the United States and Mexico. The lathe is supplied with a 26-in. and a 48-in. spindle which makes it possible to turn large or small work on the same lathe with little adjustment. It is not claimed that the "2 in 1" will take the place of a regular 48-in. lathe, but in repair shops it is very useful and one machine answers for two except for the heaviest work.

Societies and Technical Schools

Lexington State Miners' Association—This association, which comprises mining men and mining interests—capitalists, operators, engineers, prospectors, and miners—of the entire State, was formed in the summer of 1906, with the purpose of drawing outside capital to the mineral resources of the State; exposing wild-cats and stock-jobbers; fighting for the creation of an official State Mining Bureau, and the passage of better mining laws; distributing printed data and reports on mineral resources; and of securing aid for the prospector in need of financial co-operation for the development of meritorious prospects. An official monthly paper has just been started by the association, which will be sent to all Eastern parties desiring it. It will be purely a vehicle of information, the main purpose being a detailed exposition of the copper, gold, galena, antimony, silver, tungsten, iron and other resources of the State.

Worcester Polytechnic Institute—The New York alumni held a dinner in New York, March 15, which was well attended. At the close of the dinner Prof. William H. Bristol, of Stevens Institute, gave a demonstration of his recording pyrometer, tracing the heating and cooling curve of antimony and steel on a chart coated lightly with lamp black and co-ordinately arranged so that the temperatures may be instantly read. An interesting feature was the exhibit of a unique electric furnace, operated on an ordinary electric-lamp circuit. This furnace, small enough to fit in one's pocket and capable of operation on a desk, is constructed of quartz, which permits of rapid heating and cooling without danger of short-circuiting through the flaking away of the crucible, as sometimes occurs when ordinary clay is used. Following this demonstration, Dr. William Campbell, professor of metallurgy at Columbia University, gave an interesting talk on "The Microstructure of Steel," illustrated by lantern slides.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Hart-Parr Company, Charles City, Iowa. Gasolene Engines. Pp. 40, illustrated, paper, 6x9 in. 1907.

Joseph Dixon Crucible Company, Jersey City, N. J. The Horse. Pp. 30; illustrated; paper; 4x8½ in. 1907.

Ohio Brass Company, Mansfield, Ohio. Monthly Bulletin No. 7. Pp. 12; illustrated; paper; 6x9 in.; February, 1907.

Samson Manufacturing Company, Denver, Colo. Catalog No. 2. The Samson Crusher. Pp. 8, illustrated, paper, 6x9 in. 1907.

J. Beardshaw & Son, Ltd., Sheffield, Eng. Notes on High Speed Steel. Pp. 32, illustrated, paper, 3x5 in. January, 1907.

Niles-Bement-Pond Company, 111 Broadway, New York. No. 15. Progress Reporter. Pp. 20, illustrated, paper, 9x12 in. March, 1907.

Automatic Oil Cup Company, 155-159 Huron street, Milwaukee, Wis. Bangs Automatic Oil Cups. Pp. 11, illustrated, paper, 6x9 inches.

American Locomotive Company, New York City. Builders of Locomotives for All Classes of Service. Pp. 76, illustrated, paper, 6x9 in. 1907.

Word Brothers, 60 Castro street, San Francisco, Cal. Word Brothers Drill-Maker and Sharpener. Pp. 20, illustrated, paper, 4½x7 in. 1907.

Lane & Bodley Company, Cincinnati, O. Bulletin No. 101. Four Valve Shaft Governor Engine. Pp. 8, illustrated, paper, 6x9 in. January, 1907.

C. T. Carahan Manufacturing Company, 36th and Wazee streets, Denver, Colo. The Murphy Air Hammer Rock Drill. Pp. 35, illustrated, paper, 5x7½ inches.

Green Fuel Economizer Company, Matteawan, N. Y. Catalog 104. Green's Fans, Blowers and Exhausters. Pp. 96; illustrated; paper; 6x9 in. 1907.

H. W. Johns-Manville Company, 100 William street, New York. Catalog No. 302. "J-M" White-Top Asbestos Roofing. Pp. 70, illustrated, paper, 4½x7 in. 1907.

J. Geo. Leyner Engineering Works Company, Denver, Colo. Bulletin No. 510. Leyner Steam and Electric Geared Hoists. Pp. 56, illustrated, indexed, paper, 6x9 in. 1907.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1050. Alternating Current Generators, Water-Wheel Type. Pp. 20; illustrated; paper; 8x10½ in.; December, 1906.

Abenaque Machine Works, Westminster Station, Vermont. Abenaque Gas or Gasolene Driven Direct Connected Air Compressor Outfits. Pp. 8, illustrated, paper, 6x9 inches.

Byron Jackson Machine Works, 18 Telegraph avenue, Oakland, Cal. Bulletin No. 21. Jackson High Duty Centrifugal and Turbine Pumps. Pp. 20, illustrated, paper, 6x9 in. 1907.

American Concentrator Company, Joplin, Mo. Bulletin No. 10. N. C. Crushing and Screening Machinery. Pp. 16. Bulletin No. 13. N. C. Coal Washing Machinery. Pp. 24. All illustrated, paper, 7x10 inches.

Risdon Iron Works, San Francisco, Cal. Catalog No. 14. Johnston Concentrator. Pp. 36, illustrated, paper, 7x10 in.; 1905. Catalog No. 17. Gold Dredging Machinery. Pp. 60, illustrated, paper, 7x10 in.; 1907.

Jeffrey Manufacturing Company, Columbus, Ohio. Bulletin "B." Grab Bucket Systems for Power Houses. Pp. 12. Bulletin "C." Coal and Ashes Handling Machinery for Power Plants. Pp. 15. Both illustrated; paper; 6x9 in. 1907.

Allis-Chalmers Company, Milwaukee, Wis., Bulletin No. 1415. Allis-Chalmers Style "D" Gates Rock and Ore Breaker. Pp. 27, illustrated, paper, 8x10½ in.; July, 1906. Bulletin No. 1038. Allis-Chalmers Alternating Current Generators. Pp. 24, illustrated, paper, 8x10½ in.; November, 1906.

Construction News

Orient, Washington—An equipment of machinery is to be installed on the Tenderfoot mine. Wm. O'Brien is superintendent. His address is Orient, Ferry county, Washington.

Valley, Washington—The Copper Boy Consolidated Mining and Milling Company intends to install a concentrating mill with a capacity of 50 tons daily. Address at Valley, Stevens county, Washington.

Blount County, Tennessee—The Altoona Mining Company is preparing to develop coal lands, and will need mining machinery, cars, rails and power plant. T. F. Wood, Steiner Bank building, Nashville, Tenn., is president.

Dunellon, Florida—The Florida Phosphate Mining Corporation, a new company, is preparing to mine land-pebble phosphate and will need machinery. F. S. Royster, Norfolk, Va., is president, and Peter N. Gilchrist, Charlotte, N. C., is chief engineer.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francsico

March 21—Negotiations for a smelter site near San Pedro, Los Angeles county, have been successful. It is now understood that the smelter will be built shortly. The Goldfield mine operators who are interested not only have plenty of ready money to carry the plan through, but they control high-grade silicious ores in quantity sufficient to assure large regular supplies. The plant will at first be of 500 tons daily capacity, but this is to be doubled next year. There will also, it is understood, be a copper refinery. In connection with the smelter a sulphuric-acid plant will be installed, which will entirely obviate danger to vegetation from sulphur fumes. The acid produced will be used chiefly for manufacturing fertilizers. Instead of proving a menace to agriculture, the proposed plant will prove a benefit. The site selected is so situated, however, that smoke damage to tillable lands would be impossible, even without this adjunct.

At Engel Brothers' copper properties in Lights cañon, 12 miles from Taylorsville, Plumas county, a crosscut tunnel is being run into the base of Iron Cap mountain. This tunnel is designed to cut the ledge of the Superior mine. This mine gained considerable fame in the early days, because of its yield of massive bornite ore of high grade. Over $30,000 worth of copper was taken out of a "glory hole" on the surface on the side of the mountain, but the development was not continued on account of the distance to market, a long wagon and railroad haul being necessary to get the ore to the smelters; the transportation and smelting charges were too costly to permit of much profit. Engel Brothers secured the mine and have held on to it for nearly 30 years, earning their own backing to prosecute the development by manufacturing butter firkins for farmers of Honey Lake and Indian valleys. They succeeded in doing several thousand feet of development work, principally tunnels, on their two groups of claims, and have finally opened up a big property. Arrangements are now being perfected to secure Eastern capital to open up the mine on a larger scale, and a company has been formed, with headquarters in San Francisco, to incorporate the mine. The getting of the Engel copper mine on a producing basis will bring the Plumas copper zone to the front. With the completion of the Western Pacific, the prospectors see deliverance from unfavorable circumstances. The copper zone embraces the Indian Valley region, which includes [illegible] Meadows and Shoofly copper districts and embraces an area of mountainous country, drained by Indian creek, 60 miles long and 15 miles wide.

Salt Lake City

March 23 — The management of the Ohio Copper Company has let a contract to the Minneapolis Steel and Machinery Company, through G. W. Pope, the Salt Lake representative, for the construction of a concentrating mill which will start off with a capacity of 2000 tons per day. The Ohio is controlled by F. Augustus Heinze and associates. The plant is to be ready for commission by the end of the year.

The Bingham Argentine Copper Company, recently organized to operate in Bingham, is preparing for a campaign of development. The corporation owns ground in the vicinity of the Bingham-New Haven and the Utah Consolidated, The officers are: A. T. Wright, of Ogden, president; John Dern, vice-president; L. H. Farnsworth, treasurer; William Iglehart, of Salt Lake, secretary.

Dividends have been declared by several Tintic mines for payment this month. They are: Beck Tunnel Consolidated, $40,000; Grand Central, $15,000; Victoria, $3000.

The Columbus Consolidated Mining Company, operating at Alta, Utah, has posted its second quarterly dividend. The amount is 20c. a share, or $60,000. Payment is to be made April 6.

The first two sections of the Utah Copper Company's new Garfield mill will probably begin on ore next week. This is the first of the concentrating plants at Garfield to go into commission.

The Jennie Gold Mining Company, operating at Gold Springs, Utah, has won in a suit involving title to its property. The case has been pending in the courts for several years and the victory is complete for the mining company.

The management of the Newhouse Mines and Smelters Corporation, operating the Cactus copper mine in Beaver county, has decided to increase its working force by 60 or 70 men. This is in line with the policy outlined some time ago to increase the output of this mine. The mill is handling close to 1000 tons of ore daily.

The consolidation of the Bingham Standard and the Bingham Central mines in Bingham has been arranged. A new holding company, to be known as the Bingham Central Standard Copper Company, is to be formed with a capital stock of $5,000,000, divided into shares of $5 each. Of this, 200,000 shares are to go into the treasury and the remaining 800,000 shares are to be divided equally among the original companies. Shareholders of the Bingham Central are to receive share for share in exchange, while the Bingham Standard shareholders will get one share in the new company for two in the old one. The Bingham Central will settle its own indebtedness of $250,000, while the Standard's indebtedness of $125,000 will be met by the sale of 250 bonds of $500 each. Samuel Newhouse will be president of the new holding company.

On account of the washouts on the San Pedro, Los Angeles & Salt Lake Railroad in southern Nevada the Bamberger Delamer mines at Delamar, Nev., have been closed. The company is unable to get coal to keep its power plant in operation.

Butte parties have closed a deal for the purchase of the properties of the Bingham Copper Hill and the Midland Mining Company in the camp of Bingham, and a new corporation, to be known as the Bingham-Butte Copper Company, will be organized. The two groups comprise about 250 acres, there being 14 patented claims. The new owners will undertake the development of the ground without delay.

A special meeting of shareholders of the Silver King Mining Company has been called for April 10, at which time a proposition to effect a consolidation with the Keith-Kearns Company will come up for consideration. Both corporations are operating at Park City, and it is proposed to organize the Silver King Amalgamated Mines Company, with 1,250,000 shares of the par value of $5 each. The 150,000 shares of the original Silver King Company will go into the new company on the basis of $25 each. The Keith-Kearns Company will be allotted 1,500,000 shares of the capital stock, which is on the basis of $7.50 a share for the original stock. To meet the deferred payments on the McGregor properties acquired by the Silver King some time ago, as a means of settling litigation, 100,000 shares of the new stock are to be sold at par. The Addenda group of claims owned by former Senator Thomas Kearns, according to the proposed plans, will be turned into the combination in consideration of the issue of 15,000 shares. With the distribution of stock completed, there would be left in the treasury 61,000 shares. The com-

1165 acres.

The Utah Copper Company has filed an amendment to its articles of incorporation raising the capital stock from $6,000,000 to $6,600,000.

Denver

March 26—Judge Lewis, of the United States District Court at Pueblo, has refused the Carnegie Steel Company permission to amend its complaint in the famous suit against the Colorado Fuel and Iron Company for infringement on the so called Jones mixer patent.

It is reported from reliable sources that Jacob B. McKennan, who has for some time past been general manager of the Minnequa steel plant, may be the late Frank J. Hearne's successor as president of the Colorado Fuel and Iron Company. Mr. McKennan had large experience in Illinois, before being appointed to his present position.

At a depth of about 750 ft., a large deposit of coal has been discovered only nine miles northwest of Denver. It is probably an extension of the coal measures at Leyden, where the deposit was thick at 680 ft. depth.

The entire force of the Denver mint is employed at present with the coinage of 6,200,000 half-dollar pieces for Mexico; the dollar pieces are coined at New Orleans.

In the Southwestern part of the State several snowslides have lately done more or less damage. A couple of days ago, near Ophir, on the Rio Grande Southern, two loaded freight cars of a train, coming down the mountain, were struck by an avalanche and carried down a steep gulch. The balance of the train remained in the track.

The labor situation at Goldfield, Nevada, has during the past week become so serious that C. E. Mahoney, acting president of the Western Federation of Miners, has left Denver to take personal charge of the interests of the Federation at that point.

After being idle for several months the plant of the Western Iron Mills, Denver, will start up again; a reorganization of the company owning the same has been effected under the management of M. T. Whitehead, formerly connected with the Carnegie works, and F. S. Rutherford, formerly with the Youngstown Steel and Tool Company. The Western Iron and Steel Company has been organized for the purpose of leasing the plant. About 100 men will be employed and the capacity will be about 200 tons a day.

One of the largest orders ever placed in Denver for metallurgical machinery was booked by the Colorado Iron Works for a corporation in New Zealand, within the past few days. It is a contract for a 200-ton copper-smelting plant and the estimated cost will be about $125,000. It will take about five months to manufacture the machinery.

After a long argument on the motion for a change of venue in Moyer-Haywood case in Boise, Idaho, the case was concluded yesterday and Judge Wood announced that he would render his decision on March 25 next.

Scranton

March 26—The 32 collieries of the Philadelphia & Reading Coal and Iron Company were closed during the past week, for the purpose of restricting the output.

Three hundred employees of No. 8 colliery of the Lehigh Coal and Navigation Company, in Panther creek, went on strike on Saturday. The reason assigned was that the company refused to discharge a non-union man.

The Coaldale co-operative store, established under the direction of John Mitchell by the United Mine Workers, has proved to be a money maker. It has more than 500 regular customers, and sells the goods cheaper than the competing merchants, yet has declared dividends averaging 12 per cent. since the store was opened.

While strenuous efforts are being made by the bituminous operators to defeat the bill in the State legislature for a tax of 3c. on anthracite coal and 2c. on bituminous coal, the anthracite operators are diffident, stating that if the tax is imposed it will simply result in the price of coal being raised.

Because the Kingston Coal Company installed some labor-saving machinery at its No. 2 breaker at Plymouth, there are 3500 miners and laborers on strike. About 1500 men employed at No. 2 colliery first left work, and since then the men employed at the other two collieries went out on a sympathy strike.

For the first time since 1902 the Lehigh Coal and Navigation Company is storing marketable sizes of coal at its yards at Hauto, along the Tamaqua branch of the Central Railroad of New Jersey. The reasons given are a poor market and scarcity of cars.

In the Schuylkill-Dauphin district, according to the mine inspector's report, one life was lost for every million tons of coal mined. The production was 2,205,192 tons, while the fatalities were 16 and the non-fatal accidents were 60 in number.

Representative Dempsey, of Lackawanna county, has introduced a bill in the State legislature, providing damages for death of men employed in the coal mines. The basis of compensation is the number of children who may be solely dependent upon the workman at the time of his death from injuries, and it fixes the amount at from $750 to not more than $1500. This will apply in the event that a brother is the sole support of the family.

Representative Garner has introduced a bill to increase the number of mine inspectors from 20 to 30. They are to be divided as follows: First district, 9; Second district, 7; Third district, 1; Fourth district, 7; Fifth district, 4; Sixth and Seventh, 1 each.

Complaining that the company was violating the award of the anthracite commission by compelling them to do extra work without actual compensation, 100 miners went on strike at the No. 6 colliery Lansford, of the Lehigh Coal and Navigation Company.

London

March 19—Tin interests everybody, and in addition to new developments in Cornwall and the East, attention is being paid to some of the Spanish deposits. A group named the Sultana, situated in the Province of Orense, have been acquired by a syndicate of London, Paris and Manchester men and floated as the Arnoya Mining Company Ltd. According to Mr. Wickersheimer, a French Government engineer, the lodes are extensive, and considerable work has been done on them already. The tin occurs as oxide, in conjunction with arsenical pyrites, but it is stated that the amount of arsenic is relatively small. The estimates of the extent and richness of the orebodies are somewhat general in character. One lode is said to contain 300,000 tons averaging 5 per cent. of tin oxide, which in itself should yield a fortune to somebody. It is stated also that the coarse granite and quartz forming the vein matter are very friable, and can be mined without explosives. I can only say that I hope the sanguine expectations of the directors will be realized.

The Oroville Dredging Company, Ltd., is a corporation formed under the laws of Maine, but the shares are largely held here, the company having been floated under the auspices of the Venture Corporation in 1905. The company was a consolidation of four local dredging companies working on the Feather river near Sacramento. The capital is $3,500,000. The shares were all issued as fully paid, and have stood steadily at or about par, $5. So far five dividends at the rate of 2½ per cent. have been paid, and a sixth will be distributed next month. Complete reports are given by Mr. Hammon relatively to the work done and profits earned, but as these are considerably behindhand in publication, they are not of much current interest. I may note, however, that the total cost of working per cubic yard is 6.21c. and the returns 14.75c., leaving a profit of 8.54c. per cubic yard. During the year ended June 30, 1906, the ground dredged was nearly 5,000,000 cu.yd. or nearly 100 acres, to a depth of 30 ft.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

GILA COUNTY

Dripping Springs Mines and Smelters—This new company is capitalized for $5,000,000, comprising 500,000 shares of the par value of $10 each, and its officers are: C. E. Finney, president; F. L. Wright, vice-president; E. W. Brooks, treasurer; Robert K. Porter, secretary and assistant treasurer; R. D. O. Johnson, manager of mines. The above, with Judge R. E. Sloan and Paul Burks, constitute the board of directors.

The properties of the company are located in the Banner mining district, about 25 miles south of Globe, 10 miles from Kelvin, and adjoining the mines and smelters of the Saddle Mountain Mining Company. The nearest railroad station and post-office now is Winkelman, about 7½ miles distant. The property is 3 miles from the railroad and the Gila river. The smelter site is about 2½ miles from the mines. The country is open and lends itself to the installation of a wire tramway from the mines to the smelter. The smelter site is located close to the railroad and the Gila river, affording transportation and water for smelting operations. The company controls what has been known as the O'Carrol property, consisting of 60 claims, with a total area of 1200 acres, and has located 300 acres of Government land on the railroad and the Gila river, to be used for the smelter site. Such invesigations as have been made indicate the existence of a large body of ore, running from 2 to 10 per cent. copper. The ore carries enough silica, lime and iron to make it self-fluxing and can, it is believed, be so mined as to send to the smelter a product averaging 5 per cent. copper. The property has been divided into five sections, or units, and the company is now doing preliminary work necessary to the running of two tunnels on the orebodies in the western unit. Each tunnel is to be about 2000 ft. in length with a shaft to a depth of 600 ft. About $30,000 will be expended on mine equipment, such as compressor and drill plants, hoists, etc., so the work of opening up and blocking out ore will progress as rapidly as possible. The machinery plants will be enlarged as work progresses. A wire tram is projected from the mines to the smelter, to be installed while the smelting plant is under construction. A modern smelting plant of 500 tons daily capacity is also projected, to be built as soon as ores have been blocked out in quantities sufficient to provide 500 tons of ore daily for a period of one year or more. The smelting plant will be planned for 1000 tons daily capacity, so that an extension can be made to take care of this tonnage of ore as soon as it is blocked out.

Arkansas

BOONE COUNTY

Arkansas Zinc and Lead Company—This company has been organized, to operate the old Denison mine and mill, near Harrison.

California

NEVADA COUNTY

Walcott—This gravel claim, near Nevada City, has been sold at sheriff's sale to Albert Matteson.

English Mountain—This mine, between Graniteville and Meadow lake, formerly a producer, is to be re-opened under new management.

Rogue Copper Mines—Thos. A. Varden has started men at work on these mines, near Spenceville, under superintendence of M. Dougherty. The 1800-ft. tunnel is to be extended.

Norambagua—This mine, at Grass Valley, has been sold by G. H. Root and Geo. Campbell to Philip Knapp, representing Pittsburg men.

PLUMAS COUNTY

Nevada Development Company—This company is about to conduct extensive operations on the Minerva Bar and Horse Shoe Bend placers on the middle fork of Feather river, below Nelson Point. A. M. Tong is superintendent. The company is composed of Arizona men.

SHASTA COUNTY

Brunswick—The new 10-stamp mill of this mine, near French gulch, has been started up. The mine is owned by W. D. Lacy, of New York, who will employ 40 men. Electrical power is used.

Washington—On Webb ledge on this property at French gulch high-grade ore has been struck. The mine is now owned by E. E. Egley and A. S. Mitchel.

White Oak—This mine, in Lower Springs district, has been sold to F. H. Griffith, representing an English company.

SISKIYOU COUNTY

Oregon Water Power and Mining Company—This company, whose property is near Happy Camp, intends putting in a higher ditch, as the present system of ditches is too low to cover much of the available ground.

TRINITY COUNTY

La Grange—This company has bonded the Hammer property on South fork of Trinity river. It is a hydraulic proposition.

Bonanza King—The mill has been re-opened and will start up at once on this mine at Trinity Center. Jos. Porter, superintendent.

TUOLUMNE COUNTY

App—A very rich strike has been made in this well-known property, over $25,000 having been taken out in two days. The mine is owned by W. A. Nevills.

Bagdad-Chase Mining Company—This company is re-opening the old Soulsby mine, at Soulsbyville, with C. S. Pierce in charge.

Santa Ysabel—This company is re-opening the mine of the same name at Quartz, with B. C. Austin as superintendent.

Lyon Gold—This company is working the Ida Klein mine at Stent, with J. N. Lynn as superintendent.

Colorado

LAKE COUNTY—LEADVILLE

Buckeye—In this mine, Fryer hill, the lessees are upraising in the body of iron to catch the carbonate shoot that is supposed to lie on top of the iron, and also driving the north drift ahead. The Deer Lodge, east of the Buckeye, has resumed work and the shaft will be sunk deeper.

Bug Gold—Another car was recently shipped to Denver from the mass of low-grade material in this property, English gulch, to determine the advisability of erecting a mill. The returns give $20 per ton; another car will be shipped soon, and if the values are near the first, the company will erect a mill in the spring. The property is owned by Milwaukee people.

Cleveland—A tunnel is being driven on this claim, California gulch, to open a known body of zinc; a few days ago a body of copper ore was unexpectedly opened; the tunnel will be driven to the zinc shoot and when that is cut the copper channel will be prospected.

Eclipse—This claim, Empire gulch, cuts into the Arizona placer, and from time to time [illegible] without results. A few months ago Pres-

ton Rawson and associates secured a shaft; after going down 38 ft. a body of ore 6 ft. thick and 14 ft. high, was opened, which netted $20 per ton. The gangue matter is a carbonate of lime which is a desirable smelting product. On account of the condition of the roads it is impossible to ship the ore. The sudden death of Rawson last week has temporarily closed the property.

Garbut—This property, Breece hill, has resumed operations. The shaft is down 700 ft., and in the lower levels there is a good body of copper sulphides.

Helen Gould—In this group, East Tennessee park district, the late strike gives numerous fine samples. No ore will be shipped until the spring on account of depth of the snow.

Hopkins Tunnel—Shanahan and partners are driving a tunnel on Mount Sheridan, located above timber line, and have opened a 3-ft. vein of galena. On account of the state of the roads the ore is being stacked on the dump until spring opens. Mt. Sheridan is the dividing line between Lake and Park counties. The ore was caught on the Lake county side.

Little Evelyn—This company has secured 63 acres of ground in South Evans gulch, including the Boulder shaft, and is under the management of Timothy Kyle. A new plant of machinery is being installed.

Lord Byron—On this property, Iowa gulch, operated by the Foxy Grandpa Mining Company, a new shaft was started and after going down 30 ft. a body of mineral was encountered carrying silver, zinc and copper. The peculiar part of the strike is the copper, as this mineral has never been found before in the section in paying quantities.

Moyer—This mine, property of the Iron Silver Mining Company, Iron hill, is producing 9000 tons per month of lead, copper and zinc sulphides. From development work on the Tucson, the extension of the Moyer shoot, 50 tons daily are being shipped from drifts and upraises.

Umatilla—This company owns a group of five claims adjoining the Continental Chief, at the head of Iowa gulch, and during the week a meeting of the stockholders was held in Leadville to plan for the resumption of work.

Weston Pass—The southern extremity of the Leadville formation has been overlooked during the past few years, but work is likely to be resumed this spring. The Ruby, the largest developed claim in the section, was last worked by John Walsh, in 1898, when he took out 1500 tons of an excellent grade of galena ore. During the following winter the heavy snows demolished the buildings, and when the snow melted the incline shaft was filled with water; Walsh's associates did not care to go to the expense of rebuilding and taking the water out, and it has remained idle. F. J. McNair has secured an option on the ground and will commence work when the snow disappears.

TELLER COUNTY—CRIPPLE CREEK

Cripple Creek Drainage and Tunnel Company—This is the name of the corporation formed to build the new drainage tunnel. The directors are all mine owners, with E. D. Marr, of Colorado Springs, as secretary. The company is now asking for bids to build 15,000 ft. of tunnel, from the portal to a point near El Paso mine. This will lower the water-level about 750 ft. in the district. An extension of 11,000 ft. to the Vindicator mine, is also proposed.

Georgia

DADE COUNTY

New England Company—This company, owning iron lands in Dade county, has been placed in the hands of a receiver on the suit of holders of $80,000 of its bonds. The company was organized in 1890 and has done no work for several years past.

Indian Territory

CHOCTAW NATION

McAlester Coal and Mining Company—This company, after keeping its mine No. 6 closed for 30 days, on account of a fire, opened the shaft recently. The mine was found to be still on fire, and it was necessary to close the shaft again.

Michigan

KEWEENAW COUNTY COPPER

Miskwabik—The sale of the Miskwabik property, in Keweenaw county to the Cole-Ryan interests has just been completed. Included in the transfer is an option on 200 acres, adjoining the original property, held by A. A. Guck, Charles Smith, Joseph Busch and others. The shareholders of Miskwabik stock will receive $1.27 per share when the final payments are made April 15. The Kearsarge lode has been found on the property and considerable exploration has been done.

Montana

MISSOULA COUNTY

Monitor—Work has been carried on at this mine, near Saltese, all winter, and development has been considerably extended. Recently a body of copper-gold ore was encountered on the 380-ft. level, the extent of which has not yet been determined. At present the ore has to be hauled five miles to the railroad. A tunnel is to be run in 2000 ft. to tap the ore-body.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Red King—Bonanza ore has been cut by the Little Florence Mining Company. The find was made at a point about 600 ft. south of the boundary of the Florence mine in an area known as the Milltown section. Several carloads of ore have been sacked for shipment and some very rich specimens are being obtained. There are a large number of claims in course of development in the vicinity of the Red King and new strikes may be reported at any minute.

St. Ives—The St. Ives leasing company has picked up a new ore-shoot in a drift from the 100-ft. level which assays upward of $1150 per ton. Rich specimen ore is being sacked in three separate portions of the workings.

Combination-Fraction—The Moreton & Beesley Leasing Company has raised 200 tons of high-garde ore for shipment. A new hoist has been installed and a spur to the railroad has been built to facilitate shipment of the ore to the Salt Lake smelters. Regular shipments will be commenced in a few days. A large body of shipping ore has been developed in the mine.

Mohawk-Consolidated—A new strike of great value has been made in No. 1 claim, which lies N.N.W. of the rich ground from which Hayes & Monnette obtained such great wealth recently. The orebody has been penetrated 12 ft. without striking the hanging wall.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments of ore over the Tonopah Railroad from Tonopah for the week ending March 14 were: Tonopah Company, 1225 tons; Belmont, 465; Tonopah Extension, 305; Midway, 70; Montana Tonopah, 175; total, 2240 tons. Additional shipments from Goldfield were 112 tons, making a total of 2352 tons.

West End Consolidated—The new shaft has been sunk to a depth of 40 feet and will be continued with all speed. Owing to the difficulty in securing cars little ore is going forward at present, but the usual quantity of shipping ore is being raised weekly and stored at the surface. Development work is confined to the drift from the 400-ft. level, which is opening up a large orebody of milling grade.

Midway—High-grade ore is being extracted from the 433-ft. level, where the vein averages 10 ft. in width. Operations continue to be hampered by bad railroad facilities and lack of fuel supplies.

Monarch-Pittsburg — The shaft has reached a depth of 750 ft. and will be continued to 1000 ft. before crosscutting is undertaken. The Red Rock Extension Company action, which was commenced against this company in the local court recently, involves a fraction of one of the claims.

Copper Mining—The copper deposits in the vicinity of Sodaville and Mina are at present attracting a considerable amount of attention locally. In the Pilot range, east of Sodaville, the Dunlap mine is being developed by the Brock syndicate, of Philadelphia, and the Stewart property, only a short distance from it, was recently sold to New York capitalists.

West of Mina the Blue Light is rapidly developing, the orebody being 40 ft. wide.

There is news of a copper strike near Acme, a station on the Carson & Colorado Railroad, between Luning and Thorne, and several hundred prospectors have already left to secure locations. The new discovery is in a section of the Walker Lake Reservation, which has attracted a large proportion of the prospectors who entered the territory when it was thrown open last fall.

Pennsylvania

Anthracite Coal

Delaware & Hudson—This company owns and operates its property in the anthracite coal region directly, without the intervention of a subsidiary company. The statement of the coal department for the year 1906 is as follows:

	Total.	Per Ton.
Coal sales	$18,571,342	$4.45
Interest, etc.	1,047,864	0.20
Total receipts	$19,619,206	$4.65
Mining and preparing coal	$11,423,416	$2.12
Transportation	5,636,557	1.05
Handling & general expenses	462,971	0.09
Total expenses	$17,521,844	$3.26
Net earnings	$ 2,097,362	$0.34

The averages are computed on the tons sold. The coal sales are made up as follows: At mines, $160,816; to railroad department, $1,178,823; general sales, $16,795,674; coal added to stock, $436,029. Included in mining and preparing coal is $558,821 for coal purchased from tenants and others.

The coal statement for the year is as follows, in long tons:

	1905.	1906.	Changes.
Coal on hand, Jan. 1	208,176	113,061	D. 90,115
Coal mined	5,695,493	5,401,389	D. 294,104
Total	5,899,669	5,514,450	D. 384,219
Coal sold	5,785,608	5,377,586	D. 408,022
On hand, Dec. 31	114,061	136,864	I. 22,803

The total coal of all kinds carried on the company's railroads last year was 8,690,000 tons. The account of the estimated coal reserves is as follows: Owned and controlled at beginning of year, 213,168,843 tons; acquired during the year, 34,510; total, 213,203,353; mined during the year, 5,401,389; reserves at close of year, 207,801,964 tons.

Expenditures on improvements in the coal department were $608,810, of which a total of $280,280 was for new breakers and washeries.

Lehigh Valley Coal Company—This company has awarded a contract to Daniel Levan, of Wilkes-Barre, for a new breaker at Jeansville. It has been popularly supposed that all the coal has been worked out of the Jeansville basin, but this company is evidently of opinion that there is sufficient left to justify a large expenditure. This company will also open a large coal operation at Newtown. It owns four miles of the basin from the Swatara tract, near Tremont, eastward to the Star branch, near Branchdale. It is considered one of the best coal properties in the Pottsville basin. The company has already had a trial slope sunk on an overlying red-ash vein at Feger Ridge, about one mile west of Branchdale. This slope penetrated a depth of about 1500 ft., presumably to the basin. It developed a rich seam of coal and by trial made of other seams of coal it is expected that the other measures will prove equally rich. A line for a railroad has been surveyed from the Lehigh Valley, a distance of about two miles. A modern breaker will be built and 40 blocks of houses built. This company will build a washery with a capacity of 500 tons at the Prospect colliery. This culm dump is one of the oldest and largest in the Wyoming valley.

McTurk Coal Company—This company has awarded a contract to George M. Christ, of Ashland, for a new breaker at Girardville, at a cost of $75,000. It will have a capacity of 1000 tons a day and more than 50,000 ft. of lumber will be used in construction. The breaker was designed by Architect Cool, of Scranton, and the machinery will clean all the coal classified separately, the cube coal going through one process and the flat coal going through another. The arrangement of the machinery will save a great deal of labor.

Coke

H. C. Frick Coke Company—This company has planned the erection of four large coke plants during the present year. At York Run the Collier plant is projected with 400 ovens. At Prospect, on the Monongahela Railroad, another plant of 250 ovens will be constructed. The Phillips plant, at Thaw, on the Pennsylvania Railroad, will have 400 ovens instead of 250 as at first planned. At Roncoe, where coal has been mined for some time, 350 ovens will be erected. The company has purchased the surface of the J. Seaton Collier farm of 100 acres in Georges township, Fayette county, and will build the Collier plant, with 500 ovens and 250 houses. The reported price paid for the farm was $100 an acre. The company owned the coal under the land. The company will this summer change many of the oven fronts at its various plants for the purpose of installing coke-drawing machinery. The labor situation has been so acute for several months that the company has decided that the best way to provide against it is to use the patent coke drawer. Large orders for brick and material to change the oven fronts have been placed.

South Dakota

Saginaw—This company has been reorganized with I. N. Herber as the new manager. Sufficient capital has been secured to erect a mill. The mine is well developed showing strong gold-bearing veins at 400 ft. depth.

Black Hills Porcelain, Clay, and Marble Company—This company is now patenting its two groups of claims, lying east and west of Custer. This includes the ground upon which valuable deposits of lithograph stone have been found, and also mica deposits.

Lawrence County

Globe—This company has purchased 52 acres of ground adjoining its property. The phonolite vein, one of the company's chief assets, runs through this new ground. A force of men is at work installing machinery as fast as it arrives.

Homestake—A despatch from Deadwood, dated March 26, states that for 24 hours the Homestake mine has been on fire near the 500-ft. level and so far no appreciable gain has been made. In a few hours 200 men were carried out of the mine unconscious, overcome by gas and smoke.

It is impossible to determine the extent of the fire, as at no time have the men got near enough even to tell its exact location. It is feared that it may get into the bulkhead on the 500-ft. level, where there is an immense amount of timber, which would carry the flames to other levels.

Utah

Iron County

Reuben Gold Mines—This company has been formed by a Salt Lake syndicate to develop the Reuben group of five claims. A shaft has been sunk 50 ft. A recent sampling gave returns of better than $30 to the ton. Only the foot-wall is exposed and the width of the orebody has not been determined. Will J. Dooly, of Salt Lake, is president.

Ophir—This property, which is owned by Michigan people, is likely to become active again.

Burro—Leasers are endeavoring to get hold of this property, which was the first mine from which ore was shipped from the Stateline district.

Uvada—An orebody has been encountered in this property which, it is said, bears every evidence of being as important as those opened in the Jenny mine not long ago.

Juab County

Utah Mine—This Fish Springs property is reported to be in excellent physical

condition and is a regular shipper of silver-lead ore.

Carisa Gold and Copper—A new orebody has been opened on the 300 level, the management reporting values running from 9 to 15 per cent copper.

[illegible] running from 30 to 40 oz. in silver and 40 per cent. lead has been encountered on the 800-ft. level. There are 4 or 5 ft. of second-class ore showing on this level.

SALT LAKE COUNTY

Utah Apex—This Bingham company is installing a larger hoist at the top of the incline shaft with the view of exploring the ore deposits at greater depth. The Parvenue tunnel adit is in about 2500 ft. and the exploitation of the Leonard fissure, recently cut by this adit, is giving encouraging results.

Phoenix—The lower tunnel adit in this Bingham mine has been completed to 2000 ft., with the face showing strong mineralization. It is expected that an orebody will be encountered within the next 50 ft., when a raise will be made to connect with the upper tunnel. The company contemplates the erection of a new mill this year. Andrew Gebhardt, of Salt Lake, is president of the company.

Tintic Mining and Development—This company has revived the matter of installing an aërial tramway system. The management has experienced so much annoyance during the past year on account of poor ore deliveries to the smelter over the Copper Belt railroad, that it has decided to install its own facilities for transportation.

Virginia

ALLEGHANY COUNTY

[illegible] Company – This company has been organized to acquire and develop a large limestone property near Clifton Forge. It is proposed to quarry limestone for flux; also a crushing plant to furnish road metal and ballast, and kilns for making lime. E. W. Church, of Norfolk, Va., is president.

Wisconsin

ZINC-LEAD DISTRICT

Gritty Six Mining Company—The financial difficulties of this company, at Cuba City, have been straightened out. The recent fire which destroyed the entire plant, excepting the roaster and separator-plant building, which is of iron, increased the difficulty somewhat. At a stockholders' meeting, held March 20, an option was given to parties who agree to take in all the old stockholders on a pro-rata basis; an amount of money is to be paid in which will satisfy all creditors. This plan should be satisfactory to all, as it will give all stockholders, who are widely scattered, and who expressed a willingness at a previous meeting to come in on a reorganization, an opportunity to pay in on or before April 9, next. The capitalization is to be cut down and it is proposed to erect a new concentrating plant at the earliest possible moment. A thorough examination of the Gritty Six just previous to the fire showed good development.

West Virginia

RALEIGH COUNTY

Pemberton Colliery Company—This company has been organized to develop a tract of 1800 acres of coal lands in the Shady Springs district. J. E. Summerfield and A. A. Lilly, of Beckley, W. Va., are among the incorporators.

Wyoming

CARBON COUNTY

Penn-Wyoming Copper Company—This company owns the Ferris-Haggerty mine, at Encampment, and was formerly a producer of blister copper. Early in 1906 its smelting works were destroyed by fire and the company made no production in 1906. The works are being rebuilt and it is expected that they will soon be ready for operation again. The present company is the successor of the North American Copper Company, which went into the hands of a receiver.

Canada

ONTARIO—COBALT DISTRICT

March 25—The official statement of ore shipments from Cobalt over the Timiskaming & Northern Ontario Railway for the week ending March 16 is as follows: Buffalo, 101,400 lb.; Nipissing, 319,230; O'Brien, 64,170; Red Rock, 40,000; total, 524,800 pounds.

Buffalo—Three shafts are being worked day and night and development work steadily carried on. No. 6, the main shaft, down 135 ft., has been connected by drifting at the 85-ft. level with shaft No. 5, 360 ft. distant. The latter shaft is put down on two veins which are both yielding well, the wall rock being richer than the ore, being shot with native silver in leaf form. Drifting in several directions from shaft 5 is being done. No. 4 shaft is down 60 ft., silver values at the bottom being high. Machinery for melting metallics and reducing to bullion, which will melt 600 lb. per day, is on the ground ready for installation.

Cobalt Concentrators, Ltd.—A contract has been closed for machinery for the concentration plant, to be erected at some central point in the Cobalt area. The cost of the machinery, which is to operate on the dry process, will be $35,000, and it is claimed that over 90 per cent. of the silver values in low-grade ores can be recovered and a larger percentage of the cobalt.

Temagami Silver—On this company's silver property at Cross lake, in the Temagami forest reserve, development work has been in progress several months. Machinery is being forwarded, comprising a 60-h.p. boiler, six-drill compressor, hoist, and drills. These are being teamed over the ice to the mine.

McKinley-Darragh-Savage — Beginning with June the disbursements will be changed from monthly to quarterly dividends. No dividend will be paid April 1 for that reason. The new machinery is being installed at the property on the lake, the old machinery being removed to the Savage lot.

ONTARIO—EAGLE LAKE AREA

Golden Park—This company is developing a property near the Redeemer mine, Alexander McPhail being in charge of operations. There is a vein of highly mineralized quartz which shows some free gold and is impregnated with copper pyrites.

Africa

CONGO FREE STATE

Despatches from Brussels, Belgium, report that the International Forestry Company, in which American capital is interested, is organizing an expedition to prospect the goldfields believed to exist in the Congo Free State. R. D. Mohun, formerly American consul at Boma, is to have charge.

RHODESIA

Gold production reported in February was 40,482 oz. bullion, being 6566 oz. less than in January, but 2107 oz. more than in February, 1907. For the two months ending Feb. 28, the total was 81,728 oz. bullion in 1906, and 87,530 oz. in 1907; an increase of 5802 oz. The bullion reported this year was equal to 77,902 oz. fine gold, or $1,610,234 in value.

Other production reported this year was 107 tons lead, an increase of 32 tons; 17 tons copper; 1 ton wolframite; 50 tons antimony ore; 1141 tons chrome ore; 17,441 tons coal, a decrease of 3934 tons.

TRANSVAAL

The gold production in February was 493,542 oz. fine, being 44,096 oz. less than in January, but 85,874 oz. more than in February, 1906. For the two months ending Feb. 28, the total was 836,306 oz. in 1906, and 1,031,180 oz. in 1907; an increase of 194,874 oz. Of the total this year 995,874 oz. were from the Witwatersrand, and 35,306 oz. from the outside districts.

WEST AFRICA

Gold production in February was 22,448 oz. For the two months ending Feb. 28, the gold output was 35,854 oz. in 1906, and 47,747 oz. in 1907; an increase of 11,893 oz. this year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, *March 27*—The coal trade in the West has been chiefly moved by the discussion of the railroad-rate question. The agitation started by the Indiana operators, aided by the State Railroad Commission, has resulted in the withdrawal of the order for a 10c. increase on Indiana coal to Chicago. Other questions are still unsettled, including the season rate on coal for shipment up the lakes. With the coming of spring, the railroad transportation conditions are improving, though many complaints are still heard of short supply of cars, and slow movement of coal.

In the East the usual season conditions prevail. The contracting season in the seaboard bituminous trade is on, and is chiefly affected by the advanced railroad rates. The anthracite companies have made the usual 50c. discount on spring trade, to take effect on April 1. The demand for steam coal continues good throughout the Eastern territory.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to March 16 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	1,078,692	1,076,228	D. 2,464
Bituminous	7,903,748	7,624,212	D. 279,536
Coke	2,650,697	2,837,112	I. 186,715
Total	11,633,137	11,537,552	D. 95,285

The total decrease shown this year is 0.8 per cent.

The coal and coke tonnage of the Baltimore & Ohio Railroad in January was as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	98,488	108,636	I. 10,148
Bituminous	2,244,691	2,210,206	D. 34,485
Coke	586,963	497,962	D. 89,001
Total	2,877,142	2,816,804	D. 60,338

The total decrease this year was 2.1 per cent.

Coal and coke tonnage of the Norfolk & Western Railway in January was as follows, in short tons:

	Coal.	Coke.	Total.
To Lines points	780,686	200,122	980,808
To Tidewater	147,344	14,618	159,961
Total	927,030	214,740	1,140,769
Total, 1906	960,835	220,654	1,181,489

This shows a total decrease of 40,720 tons, or 3.4 per cent., this year.

The Southwestern Interstate Coal Operators' Association gives out the following statement of coal production in January, in short tons:

	1906.	1907.	Changes.
Missouri	42,148	40,[illegible]	D. 2,[illegible]
Kansas	911,814	867,440	D. 44,374
Arkansas	191,682	216,296	I. 24,614
Indian Territory	31,425	29,[illegible]	D. 1,[illegible]
Total	1,177,068	1,153,[illegible]	D. [illegible]

The total decrease was 6.5 per cent. this year.

Shipments of coal over the railroads in the Ohio Coal Traffic Association in January were, in short tons:

	1906.	1907.
Hocking Valley	1,[illegible]	[illegible]
Toledo & Ohio Central	1[illegible]	161,[illegible]
Baltimore & Ohio	1[illegible]	18[illegible]
Wheeling & Lake Erie	290,956	305,745
Cleveland, Lorain & Wheeling	243,646	226,483
Zanesville & Western	106,331	123,098
Toledo Division, Penna. Co.	260,662	260,071
Lake Erie, Alliance & Wheeling	109,[illegible]	109,[illegible]
Marietta, C. L. & Clev.	[illegible]	1,485
Total, net tons	1,669,318	1,721,326

The total increase this year was 52,008 tons, or 3.1 per cent.

Coal receipts at St. Louis in January were 739,456 short tons in 1906, and 786,280 in 1907; an increase of 46,824 tons, or 6.3 per cent.

Receipts and shipments of coal at Chicago in January are reported as follows, the balance representing approximately the city consumption:

	Received.	Shipments.	Balance.
Anthracite	145,200	88,046	57,154
Bituminous	1,556,118	618,719	937,399
Coke	28,974	27,669	1,305
Total	1,730,292	734,434	995,858
Total, 1906	1,197,626	412,782	784,844

The receipts of bituminous coal this year were from Pennsylvania, 108,648; Ohio, 94,808; West Virginia, 80,925; Indiana, 344,091; Illinois, 927,646 tons.

Coastwise shipments of coal from the principal Atlantic ports in January were as follows:

	Anthracite.	Bituminous.	Total.
New York	1,418,151	1,015,766	2,433,917
Philadelphia	187 506	384,359	571,865
Baltimore	21,251	298,551	319,802
Newport News	.....	145,285	145,285
Norfolk	.....	99,441	99,441
Total	1,626,908	1,943,302	3,570,210
Total, 1906	1,321,061	1,938,592	3,259,653

The total shipments show an increase of 310,557 tons, or 9.5 per cent., this year.

New York

Anthracite

March 26—The hard-coal market has shown considerable activity, especially during the early part of the week, but during the last few days there has been a larger supply, it is reported, of small steam sizes. There has been a number of contracts taken up on the new schedule of prices, and it is expected that beginning with April 1, there will be the usual heavy business for at least three months. It is the general opinion that the supply of small steam sizes will remain short for some length of time, and that the demand will become stronger than ever. This is due principally to the number of isolated power plants in this vicinity which depend upon the smaller sizes for steam generation. The new schedule of prices is as follows: Broken, $4.25; egg, stove and chestnut, $4.50; buckwheat No. 1, $2.50; pea, $3; rice, $1.85; barley, $1.50. The small steam sizes are quoted nominally, and dealers have not so far issued circulars; sales of these sizes are reported to have been made at an advance over the figures given above.

Bituminous

The Atlantic Seaboard soft-coal trade shows considerable activity, and is reported to be moving all the coal that it can acquire before the new schedule takes effect. The car supply is reported to have improved considerably during the past week, with the exception of the B. & O. One producer reports that no manifest has been received for six days.

Trade in the far East is taking care of all the coal that can be secured. Trade along the Sound has fallen off materially during the past three days, due to vessel scarcity.

New York harbor trade was very active during the early part of the week, but the last few days has seen a decided falling off in activity. Prices are quoted at $2.65 @2.70 f.o.b. New York harbor shipping ports for fair grades of steam coal. There seems to be no reason for the present drop in prices, except that the higher prices ruling during the previous two weeks attracted a large quantity of steam coal, both soft and hard, to this market. Transportation from mines to tide is fairly regular, and car supply has improved. There is nothing new to report in the coastwise vessel market. We quote freight rates from Philadelphia on large vessels at $1.10, and discharge to Boston, Salem and Portland. The rate from New York to the same points is 95c. and discharge for small vessels. In both cases the loading and discharging clause is included.

Birmingham

March 25—With a better railroad service the coal production in Alabama is on the increase. The coal producers are yet loud in their complaints as to the transportation facilities throughout this

and all depends on the facilities for hand-

greatly in the past four weeks, several batches of foreign laborers being brought into the district. The Pratt Consolidated Coal Company is beginning to get coal out of new mines in the western part of Jefferson county, as the new extension of the Louisville & Nashville railroad puts on a regular train service. The Alabama Fuel Company, H. F. DeBardeleben, vice-president and general manager, is opening four mines in various parts of the State, with two openings in St Clair county already in daily operation. Several extensive deals in coal properties were reported during the past week. Messrs. Adlers, of Birmingham, are reported to have purchased several thousand acres of coal lands from the State University. Friedman & Rosenau, of Tuskaloosa, are said to have sold something like 600 acres of coal lands in Tuskaloosa county, the price being $10 per acre. Daniel Pierson and associates have changed the name of their corporation to the Pratt Southern Coal Company and have increased the capital stock to provide for extensive development.

Chicago

March 26—The depression in the coal market is being slowly removed, through the restriction of shipments and the clearing of demurrage coal from tracks. With the spring season now practically in full swing, there is a general readjustment of conditions. At the same time it is recognized by the trade that production is above consumption though the prosperity of the country has by no means abated.

Lump and egg are in light demand, of western coals, and sell for $1.85@3; run-of-mine is $1.65@2 and screenings bring $1.25@1.60. The tendency now is, as usual in the spring, toward the greater use of finer coals and the discontinuance of sales of lump and egg.

Eastern coals are in firmer condition than western. Hocking Valley is especially firm, owing to the small supply, which is attributed to transportation difficulties in the mining district. The price of Hocking lump is about $3, some coal from the district selling for 25c. less. Smokeless coals are at $3.35 for run-of-mine, with supplies and sales reported very good. Youghiogheny brings $3.20 for ¾-in. and is in rather light demand. Pittsburg No. 8 is worth $2.75 for ¾-in. and run-of-mine, with the demand light but the market steady.

Anthracite business is very light.

Cleveland

March 26—The coal markets are quiet just now, awaiting the opening of the lake trade. Railways are well stacked up with coal in Cleveland yards and dealers are sacrificing in order to avoid demurrage fees. Pittsburg No. 8 slack has dropped to 75c., against 80@85c. last week, and prospects are for still lower prices for the rest of the week and next. In hard coals there is a strong market, owing to the fact that cars are very scarce. Steel mills are getting all the gondola cars to ship steel, and coal contracts are thus being held up.

There is plenty of coke in the market, especially for spot shipment, at steady prices. Deliveries up to the close of the first half are selling at $3@3.15 and last-half contracts are around $3.20. Floods have had little effect on Connellsville shipments, and local ovens are well supplied. Foundry coke sells at $3.50 to $3.75.

Indianapolis

March 23—Word has been received at the office of the Indiana Railroad Commission that the order for an advance of 10c. a ton in coal rates from Indiana and a part of the Illinois coalfield into Chicago and the Northwest territory, which was to have become effective April 1, has been rescinded. The official notification states that no advance will be made during the coal year from April 1, 1907, to April 1, 1908.

E. J. Knickerbocker, the coal-traffic manager of the Chicago & Eastern Illinois, signed the notification, and also advised J. C. Kolsom, of Terre Haute, president of the Indiana Operators' Association that there would be no advance. The result of the agitation is important to the coal men, as applying to the Chicago and Northwestern territory shipments, and also indirectly affects the coal rate all over the State, especially to the gas belt, for the understanding was that the proposed 10c. advance to Chicago was to be the forerunner of a general advance in the middle West, and the rate to the gas belt was to be boosted next.

Much credit is being given the Indiana Railroad Commission since the action of the railroads is supposed to have resulted directly from the visit of members of the commission, and a few of the Indiana coal operators, to Washington where the delegation conferred with President Roosevelt and the Interstate Commerce Commission.

The gas belt coal rate was the subject of much concern some months ago, when the numerous manufacturers in that territory declared that if the coal rates were increased the manufacturing industries of that part of the State would be practically ruined. The withdrawal of the proposed advance into Chicago is taken to mean that there will be no further steps looking to other advances. In consequence there is great rejoicing in the gas belt.

It is said that the block-coal men are to have their chance next. Four of the prominent block-coal men of the Brazil and Terre Haute district appeared before the Indiana commission this week and asked that the commission use its good offices in an attempt to remove the differential of 10c. a ton in the rate on block coal. The rate on bituminous coal is now 10c. a ton less to Chicago than the rate on block coal. In compliance the commission has sent notices to the general freight agents of the roads directly involved asking them to come to the office of the commission next Tuesday, to meet a committee of the block-coal operators and discuss the subject with a view of adjusting the matter amicably.

Col. W. H. Zimmerman, of Terre Haute, said to the Indiana Commission that the annual consumption of Indiana block coal had fallen from 1,000,000 tons a few years ago, to about 500,000 tons in 1906. Incidents were cited where two mines within 400 yards of each other, one a block-coal mine, and the other a regular bituminous mine, and the rate on the block coal was 10c. higher on the ton than the rate on the bituminous. The object of the conference is to correct this unjust differential.

Pittsburg

March 26—There is a good supply of railroad cars and most of the mines in the district are in full operation. The new local freight rates become effective on Monday, April 1, a reduction of 5c. a ton having been made by the Pennsylvania and the Baltimore & Ohio railroads, and the concession to operators owning individual cars withdrawn. The rate from the mines to Pittsburg will be 33c. on the Baltimore & Ohio and 38c. over the Pennsylvania lines. There was a good boating stage on the rivers and from 3,000,000 to 4,000,000 bush. of coal went to lower ports on Sunday and yesterday. The Monongahela River Consolidated Coal and Coke Company has closed a number of additional large contracts for deliveries extending to April 1, 1908. Among them was 150,000 tons for the Texas & Pacific Railway for delivery at New Orleans. Prices remain firm on a basis of $1.15@1.25 a ton for mine-run coal at the mine. It is expected that the lake shipping season will open about April 15 this year.

Connellsville Coke—Coke prices for prompt shipment have declined and furnace coke is quoted this week at $2.75@3, but for shipment during the last half $3 is the minimum price. Foundry coke for spot shipment is quoted at $3.50@3.75. The *Courier* gives the production in the Connellsville region for both fields for the week ending March 23 at 415,123 tons. The shipments aggregated 14,260 cars, distributed as follows: To Pittsburg, 5432 cars; to points west of Connellsville, 8180 cars; to points east of Connellsville, 648 cars.

Foreign Coal Trade

March 27—The quantity of coal bunkered or supplied to steamships in the for-

eign trade at United States ports in January was 455,939 tons. Adding this to the exports, previously reported, makes 1,217,309 tons of coal sold for consumption beyond the limits of the United States during the month.

Exports of fuel from Great Britain, with coal shipped for the use of steamers in foreign trade, for the two months ending Feb. 28, are reported as follows, in long tons:

	1906.	1907.	Changes.
Coal	7,920,148	9,026,070	I. 1,105,922
Coke	121,390	159,921	I. 38,531
Briquets	228,002	217,520	D. 10,482
Total export	8,272,540	9,402,911	I. 1,130,371
Steamer coal	3,030,350	2,921,425	D. 109,027
Total	11,302,890	12,324,244	I. 1,021,344

The total increase was 9 per cent. The shipments of coal to the United States for the two months were as follows:

	1906.	1907.	Changes.
Atlantic ports	13,570	6,226	D. 7,344
Pacific ports	...	6,005	I. 6,005
Total	13,570	12,231	I. 1,339

These shipments were light in both years.

The official report of production, just published, gives the total coal mined in the United Kingdom, in mines worked under the coal-mines act, at 236,111,050 long tons in 1905, and 251,050,809 tons in 1906; an increase of 14,939,759 tons, or 6.3 per cent. Some coal operations come under the quarries act as open workings, but the quantity thus obtained is only a few thousand tons. The gain last year was a good one, showing an excellent condition of trade

Iron Trade Review

New York, March 27—The disturbed condition of the stock exchanges has had some effect on the iron and steel markets, so far as new business is concerned. There is rather a halt in orders, and buyers seem disposed to wait a little before calling for new material. The specifications on contracts, however, continue to come in, and there is no cessation of work at mills and furnaces. The flood damages in the Pittsburg district are being pretty well cleared up, and seem to be rather less than first reports indicated.

The pig-iron buying has not been heavy, being confined largely to small lots wanted to make up deficiencies. In finished material there has also been a halt, which seems to be rather temporary in its character.

Preparations are being made for the opening of the navigation season, and the shipment of ore from the Lake Superior district. Season contracts so far made indicate a very heavy tonnage; in fact, it is expected to exceed even the heavy total of last year.

Production does not keep quite up to the highest level. Many furnaces are feeling the strain of the past year of heavy work, and repairs are needed.

Birmingham

March 25—Many manufacturers have been besieged lately to furnish every ton of spot iron they could possibly scrape together, but this kind of iron is extremely scarce and many orders, notwithstanding the high premium offered, had to be declined. A well-known iron broker had commissions recently to get several orders of small lots of spot iron and he found the work most difficult. April, May and June iron can be purchased but once in a great while now, and is considered by the manufacturers as spot iron. Every indication in this territory points to advancing quotations for iron during the latter part of the year, No. 2 foundry for delivery during the fourth quarter of the year is being quoted at $18.50@19 per ton and the sales are quite numerous. The stock exchange excitement in the East has had no effect. The manufacturers are working hard to get the railroads to handle the product and to keep up production. During the past fortnight two furnaces have failed, one at Woodward being out entirely for repairs, while one of the Alabama Consolidated Coal and Iron Company's furnaces at Gadsden needed some immediate repairs on the top and had to lose several days time. The make in this territory is off considerably.

The railroad situation in this district is not improved and the outward movement of iron shows but little change. Inquiries are being received in the Birmingham district as to requirements during the latter part of the year which show that there will be a large quantity of iron needed.

No change in conditions in the steel market in this section are reported. There is room for improvement in production. Rolling mills, foundries and machine shops, cast-iron pipe works and other plants continue to do well. At a meeting of the Southern Stove Makers' Association, an advance of 5 per cent. was voted, to go into effect immediately.

Baltimore

March 26—Imports of spiegeleisen for the week were 1010 tons; of ferromanganese, 554 tons. Arrivals of iron ore were three cargoes, 10,074 tons, from Beni-saf, Algeria. One cargo of manganese ore, 5300 tons, was received from Brazil.

Chicago

March 26—Sluggishness marks the iron market. There is little disposition of sellers or buyers to force different conditions than have existed for the last two or three weeks. Small purchases for delivery in the next three months are the rule, only a few lots going to 1000 tons. It appears to be a waiting market for both melters and furnace agents. Yet firmness is apparent; there are no breaks and no hints of breaks in the prices, and both sides profess confidence in the future.

Southern No. 2 for second-half deliveries sells for $18@18.50, with apparently less available than formerly. Northern remains at about $23.50 for similar shipments. For quick delivery iron Southern brings $25.85@26.35, and Northern $25.50 @26. There has been no effect practically on the market from the stock disturbances in New York.

Foundry supplies of pig iron are known to be short and it seems only a question of a short time until the market will turn again to heavy buying for the future.

Coke is strong, though some stacks have shut down for repairs, causing the supply to be ample. Connellsville 72-hour brings $6.65 for quick deliveries, and $6.40 on contracts.

Cleveland

March 26—Conditions are pointing to the largest lake shipping business this season in the history of the trade. Shippers are practically all contracted up to the last half and independent vesselmen are only making short-time shipping obligations in anticipation of higher rates later on.

Pig Iron—The iron market is reported quiet, with no change in values. A number of furnaces are out of blast and a lightened production will be the temporary outcome. Spot delivery No. 1 foundry is bringing $26 at furnace. Bessemer is quoted at $21.50.

Philadelphia

March 27—The crude-iron market has not presented any sensational features for a week, or, in fact, any interesting points deserving of special comment. Our local consumers are showing some degree of indifference and the furnace men are equally indifferent as to whether they sell any iron at present. Reports from quite a number of furnace centers throughout middle and eastern Pennsylvania show the usual oversold condition and some difficulty in making shipments on time. Forge iron continues strong and the bar mills are all busy, filling orders with comparative promptness. The concessions reported in Southern iron, from 25 to 50c. per ton, are regarded here as exceptional and temporary, and our best informed dealers and makers consider that the strong quotations prevailing for months past will continue. Small lots of spot iron are bobbing up unexpectedly and are commanding very strong prices. Quotations are rather variable and in a way misleading. Standard forge for early delivery has been selling at $23.50, basic $25 and Middlesboro at $22. For delivery in midsummer iron is offered at $22.50@23, for forge, and basic quotations are held as high as $24.50. For early winter delivery No. 2 foundry has been quoted and

cided news concerning the steel market. Agents have the same stereotyped report to make as to demand and prices. The conditions are practically the same as they have been for months past.

Bars—Premium prices prevail for steel bars for early and late deliveries. Manufacturers are paying no attention to the rumors in the market as to weaker prices. Common iron is moving with a little more freedom and some car-builders have been sneaking around the market trying to obtain better terms than have been offered.

Sheets—The presentations of specifications, for light sheets especially, is a feature of the market just at present. Small lots are selling freely at the usual advance.

Pipes and Tubes—The tube market is exceptionally strong and mills are simply deluged with orders. The damage done by the recent floods in western Pennsylvania has interfered somewhat with the output.

Merchant Steel—Within the past few days the agents of merchant-steel mills report quite an improvement among the small buyers, who appear to be insistent upon early deliveries, regardless of prices.

Plates—The suspension of production in some of the Western plate mills has had its effect upon output and prices, especially where early deliveries are desired. The situation in plates is rather uncertain, as there are large buyers in the market who are insistent that their orders be given preference.

Structural Material—The came conditions exist to a certain extent in regard to structural material. Deliveries are somewhat delayed, but construction has not been interfered with. Premium prices do not appear to help some of our smaller buyers out.

Steel Rails—Some business has been done in steel rails, but they were largely in trolley material and in light rails, which bring $33@34 for weights ranging from 20 to 40 pounds.

Scrap—The scrap market is better supplied with certain lines of scrap than a month ago and the dealers are scouring the country without having to pay higher prices. The special demand at present is for machinery scrap, which is held at $22.50; railroad scrap, which has sold at $21.50, and for No. 1 steel scrap, which is worth about $19. Quotations for steel axles are $22.50, old iron rails $27.50, wrought turnings $17 per ton.

Pittsburg

March 26—The wild break in prices of stocks in Wall street yesterday is not likely to affect the iron and steel trade, but may keep some buyers out of the market for a short time. Business in all finished lines is better than it has been for several months, and the mills are sold up for the first half and, in a number of lines, through the third quarter. Unless there are heavy cancelations of orders, which is not regarded as at all probable, there can be no decline in prices before the fourth quarter. The Carnegie Steel Company during the week booked orders for 25,000 tons of standard steel rails, which brings the total tonnage sold by that company for delivery in 1907 to about 800,000 tons, or considerably more than were sold at this time last year. The tonnage now on the books is divided about as follows: Standard sections for steam roads, 550,000 tons; traction lines, 75,000 tons; for export, 135,000 tons, and light rails, 40,000 tons. The Carnegie company expects to make about 1,100,000 tons of rails this year, or over 100,000 tons more than last year. The books have not yet been opened for deliveries in 1908, but it seems to be pretty well settled that the price will be continued at $28 for bessemer steel rails, and that railroads may make reservations for next year's delivery if they desire.

There was no new buying of finished steel products of any consequence during the week, but specifications continue heavy and the mills are well filled up with business for several months. All the mills in this district have fully recovered from the effects of the flood, and are running again to capacity, but the idleness has thrown them further behind in deliveries. The committee of agricultural implement makers appointed to endeavor to secure concessions from the steel bar mills visited the leading interests in this district during the week, but failed in their mission. The bar mills are booked for months ahead at the established price of 1.60c., and last week a 10,000-ton contract was received for third-quarter delivery at that price.

The American Sheet and Tin Plate Company announces that it will make no change in tin-plate prices for third-quarter delivery, but so far it has not booked any orders for shipment beyond July 1. It will likely begin taking on business before the close of the week. This action on price taken by the leading interest will probably make inoperative the rate of $4 a box made by independent producers on large orders booked for the third quarter. The established price of $3.90 a box will continue, although for prompt delivery premiums are paid.

Pig Iron—The heavy buying last week has greatly strengthened the bessemer pig-iron market, and the expected decline for second-half delivery may not materialize. Sales of bessemer for second quarter, including those mentioned last week, and an option on 14,000 tons for May taken by the United States Steel Corporation, aggregate 61,000 tons. The corporation bought altogether 11,000 tons for April delivery, and the Cambria Steel Company took 36,000 tons for equal monthly deliveries through the second quarter. The price was uniform at $22 f.o.b. Valley furnaces. Unless there is a general buying movement for last half it is believed that $22 will continue as the price for third quarter, which will insure a strong pig-iron market for the rest of the year. The market for foundry iron is a trifle stronger this week, sales for prompt having been made at $24.50, and for second quarter at $23.50. The market for the second half is firm at $21.50@22, Valley furnaces. Gray forge is not in demand and is quoted nominally at $21.85, Pittsburg.

Steel—The Carnegie Steel Company has bought 5000 tons of open-hearth steel billets in addition to the 10,000 tons recently purchased from the New York State Steel Company. This tonnage will be applied to outside steel contracts and enable the company to operate its finishing mills fully. Bessemer billets remain nominally at $29.50, and open-hearth at $32. Plates remain at 1.70c., and steel bars at 1.60c.

Sheets—The mills are still from eight to ten weeks behind in deliveries on black sheets, and fully three months behind on galvanized sheets. The prices remain firm at 2.60c. for black, and 3.75c. for galvanized No. 28 gage.

Ferro-Manganese—There is no change in prices, and for prompt delivery quotations are $75@76 per ton.

London

March 15—Exports of iron and steel, and of machinery, from Great Britain for the two months ended Feb. 28 are valued by the Board of Trade returns as follows:

	1906.	1907.	Changes.
Iron and Steel..	£ 5,979,012	£ 7,345,336	I. £1,366,324
Machinery.....	4,031,869	4,409,746	I. 377,877
New Ships.....	1,018,503	1,409,437	I. 390,934
Total.....	£11,029,384	£13,164,519	I. £2,135,135

The total increase was 19.4 per cent. The leading items of the iron and steel exports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	171,783	315,655	I. 143,872
Wrought iron.....	29,620	33,460	I. 3,840
Rails	75,593	61,420	D. 14,173
Plates.....	35,025	57,642	I. 22,617
Sheets.....	83,444	81,024	D. 2,420
Steel shapes, etc	37,964	49,038	I. 11,074
Tin-plates.....	61,544	68,392	I. 6,848

The total quantities of iron and steel were 651,474 tons in 1906, and 826,854 tons in 1907; an increase of 175,380 tons, or 26.9 per cent. Exports of pig iron to the United States this year were 177,036 tons, an increase of 78,654 tons; of tin-plate, 11,292 tons, an increase of 4032 tons.

Imports of iron and steel, and of machinery into Great Britain for the two months were valued as follows:

	1906.	1907.	Changes.
Iron and steel...	£1,713,915	£1,080,307	D. £633,608
Machinery.....	751,373	758,075	I. 6,702
Total.....	£2,465,288	£1,838,382	D. £ 626,906

The total decrease was 25.4 per cent. The chief items of the imports were, in long tons:

	1906.	1907.	Changes.
Pig iron	14,718	13,764	I. 954
Wrought iron	25,852	11,488	D. 14,364
Steel billets, etc.	113,605	47,201	D. 66,404
Bars and shapes	12,964	1,820	D. 11,144
Structural steel	22,807	8,035	D. 14,772

The total quantities of iron and steel were 269,112 tons in 1906 and 141,262 tons in 1907; a decrease of 127,850 tons, or 47.5 per cent.

Imports of iron ores into Great Britain for the two months were as follows, in metric tons:

	1906.	1907.	Changes.
Manganiferous ores.	77,744	67,544	D. 9,859
Iron ores	1,264,826	1,420,431	I. 155,605
Total	1,442,570	1,488,175	I. 45,646

Of the imports this year 49,544 tons manganiferous ores and 1,055,481 tons iron ores came from Spain.

Dusseldorf, Germany

March 4. Owing to changes in classification in the German tariff, reports of imports and exports of metals for the full year have not been published. For the 10 months, March-December, these imports and exports were as follows, in metric tons:

	Imports.	Exports.	Balance.
Copper	104,710	5,807	Imp. 98,903
Tin	11,523	4,183	Imp. 7,340
Lead	58,495	20,015	Imp. 38,480
Zinc	41,189	53,094	Exp. 21,905
Nickel	2,908	751	Imp. 2,157

The output of the German blast furnaces in January, is reported by the German Iron and Steel Union as follows, in metric tons:

	Tons.	Per Ct.	Tons.	Per Ct.
Foundry iron	165,014	16.2	177,543	16.7
Forge iron	54,186	5.3	60,504	6.6
Steel pig	81,820	8.0	87,493	8.2
Bessemer pig	41,191	4.0	40,712	3.8
Thomas pig	656,430	64.5	686,901	64.7
Total	1,018,161	100.0	1,062,152	100.0

There were increases of 12,529 tons in foundry iron; 5673 tons in steel pig, and 30,571 tons in Thomas, or basic pig. There were decreases of 389 tons in bessemer and 4693 tons in forge. The total gain was 43,691 tons, or 4.3 per cent.

Metal Market

NEW YORK, March 27.

Gold and Silver Exports and Imports

At all United States Ports in February and year

Metal.	Exports.	Imports.	Excess.
Gold:			
Feb. 1907	$1,027,058	$ 3,275,933	Imp. $2,248,875
" 1906	8,486,430	2,079,983	Exp. 6,406,647
Year 1907	3,477,130	6,746,108	Imp. 3,269,008
" 1906	14,225,096	4,685,392	Exp. 9,542,603
Silver:			
Feb. 1907	4,223,970	3,693,061	Exp. 530,909
" 1906	6,435,129	4,480,449	" 1,954,680
Year 1907	8,990,935	7,350,102	" 1,640,833
" 1906	13,951,797	9,167,160	" 4,784,637

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Mar. 23 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 200	$1,222,801	$1,487,148	$ 16,024
1907	1,717,426	2,909,617	8,781,916	506,021
1906	3,027,379	1,399,487	17,331,030	446,210
1905	31,207,071	3,104,550	8,877,541	629,936

The gold exported to the week went to Haiti; the silver to London. Gold imports for the week were from Europe; silver from Mexico and the West Indies.

The joint statement of all the banks in the New York Clearing House for the week ending March 23 shows loans $1,049,989,600, a decrease of $3,587,000; deposits, $1,002,044,000, a decrease of $1,-829,800, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie	$182,424,500	$184,974,400
Legal tenders	77,207,100	70,271,200
Total	$259,631,600	$255,245,600
Surplus	$6,363,575	$1,709,150

The surplus over legal requirements shows an increase of $1,676,350, as compared with the previous week.

Special holdings of the leading banks of the world, March 23, are reported as below, in dollars:

	Gold.	Silver.	Total.
Asset New York	.....	.....	$181,954,400
England	$180,669,280	.....	180,669,280
France	522,088,415	$196,110,895	718,199,310
Germany	169,765,000	56,590,000	226,355,000
Spain	77,150,000	124,185,000	201,335,000
Netherlands	26,320,000	28,562,000	54,882,000
Belgium	16,333,333	8,166,665	24,500,000
Italy	162,305,000	24,925,000	187,230,000
Russia	596,370,000	28,765,000	625,135,000
Aust.-Hungary	231,590,000	61,830,000	293,420,000
Sweden	20,805,000	.....	20,805,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to March 14:

	1905.	1906.	Changes.
India	£ 4,514,010	£3,173,210	D. £ 1,341,800
China	.....	.....	.....
Straits	.....	85,050	I. 85,050
Total	£ 4,514,010	£3,257,260	D. £ 1,256,750

Imports for the week were £8000 from Chile; £317,000 in bars and £45,000 in Mexican dollars from New York; a total of £370,000. Exports were £61,500 in coin to the Straits, and £342,000 in bars to India; £403,500 in all.

Indian exchange has been slightly easier, the Council bills offered in London having been taken at an average of 16.06d. per rupee. Buying of silver for India has been light.

Imports of gold and silver at San Francisco for the two months ending Feb. 28 were as follows:

	Gold.	Bullion.	Total.
Gold	$743,821	$416,559	$1,150,380
Silver	85,757	1,443	87,200

The receipts of gold were largely from Australia; of silver from Mexico. Exports for the two months were as follows:

	Coin.	Bullion.	Total.
Gold	.....	.....	.....
Silver	.....	$2,111	.....

Exports of silver, chiefly to China and Japan, have been light this year.

The movement of gold and silver in France in January is reported as follows:

	1906.	1907.
Gold:		
Imports	Fr. 59,174,000	Fr. 13,120,000
Exports	4,188,000	600,000
Excess	I. Fr. 54,986,000	I. Fr. 13,516,000
Silver:		
Imports	11,742,000	12,698,000
Exports	7,779,000	6,590,000
Excess, imports	Fr. 3,963,000	Fr. 6,108,000

Imports of copper and nickel coins were 9000 fr. in 1906, and 3000 fr. in 1907; exports were 26,000 fr. in 1906, and 5000 fr. this year.

The movement of gold and silver in Great Britain for the two months ending Feb. 28 is reported as follows:

	1906.	1907.
Gold:		
Imports	£ 7,977,615	£8,301,912
Exports	4,878,901	6,717,744
Excess, imports	£ 3,098,714	£ 1,584,168
Silver:		
Imports	£ 4,172,862	£3,816,377
Exports	4,087,748	3,388,157
Excess, imports	£ 85,114	£ 428,220

Of the silver imported this year £2,017,-623, or 52.8 per cent. of the total, came from the United States.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.51½	$0.53½
Peruvian soles and Chilean	0.484	0.51
Victoria sovereigns	4.854	4.87
Twenty francs	3.86	3.89
Spanish 25 pesetas	4.78	4.80

STERLING AND SILVER EXCHANGE

March.	Sterling Exchange.	Silver. New York.	Silver. London.	March.	Sterling Exchange.	Silver. New York.	Silver. London.
21	4.8310	66⅛	30⅛	25	4.8365	66	30 7/16
22	4.8345	66⅛	30⅜	26	4.8295	65⅞	30⅛
23	4.8360	66	30⅛	27	4.8345	66	30⅜

New York quotations are for fine silver per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

March.	Copper. Lake.	Copper. Electrolytic.	Copper. Lake, London.	Tin.	Lead.	Spelter.
21	25 @ 25¼	24 @ 25	107½	45	6.00	6.80 @ 6.85
22	25 @ 25¼	24½ @ 25	107½	45	6.00	6.80 @ 6.85
23	25 @ 25¼	24 @ 25	107½	45	6.00	6.80 @ 6.85
25	25 @ 25¼	24 @ 25	107½	45	6.00	6.75 @ 6.80
26	25 @ 25¼	24 @ 25	107½	45	6.00	6.75 @ 6.80
27	25 @ 25¼	24 @ 25	107½	45	6.00	6.80 @ 6.85

quotations for electrolytic copper are for

cathodes is 0.125c. below that of electrolytic.

ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—The enormous decline in values on the stock exchange has not failed of its effect on all metals. Buyers have become most cautious and prefer to await developments before entering into any new commitments. Quotations at the close are entirely nominal at 25@25½c. for Lake copper; 24½@25c. for electrolytic in cakes, wire bars or ingots; and 24@24¼c. for casting.

Realizations of bull holdings, aided by bear sales, brought about a most substantial decline in the speculative kinds which are dealt in on the London exchange. The low level reached for standard on March 26 was £93 10s. for spot, and £97 10s. for three months. From this there has been a fair recovery, which, however, was not fully maintained. The market closes at £98 15s. for spot, and £100 12s. 6d. for three months'.

Refined and manufactured sorts we quote: English tough, £105@106; best selected, £107@108; strong sheets, £116@ —.

The National Copper Bank expects to begin business May 1, with a capital of $2,000,000, in New York.

Exports of copper from New York for the week were 2496 long tons. Our special correspondent reports the exports from Baltimore for the week at 89 long tons copper.

The average price received by the Franklin Mining Company for its output of 4,571,570 lb. of copper, in 1906 was 18.603c. This low average is explained by the fact that the copper was sold largely in September and November for delivery in January and February. The Isle Royale reports an average of 18.81c. on 2,937,098 lb. The Mohawk average for the year 1906 was 19.60c. on sales of 12,723,515 lb. copper.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—In sympathy with the standard market, tin suffered a severe decline, and a new low level was established, the market in London at one time touching £180 10s. for spot, and £178 10s. for futures. It rallied, however, and the close is cabled as £184 for spot, and £182 for futures.

In this market no business of consequence has been done, values ranging from 30½c. the low point reached, to 30½c. at the close.

Shipments of tin from the Straits for the first half of March were: United States, 695 long tons; Great Britain, 1626; European continent, 215; total, 2536 tons.

Arrivals of Bolivian tin concentrates in Europe for the two months ended Feb. 28, reduced to fine tin, were 2572 tons; a decrease of 125 tons from last year.

Lead—There is no change in the quotation of 6c., New York; 5.92½., St. Louis.

London reports a weaker market, and the quotation there is cabled as £19 5s. for Spanish and £19 7s. 6d. for English lead.

The American Metal Company, of New York, has bought a controlling interest in the Ohio & Colorado Smelting Company, which has its works at Salida, Colorado.

The movement of foreign lead in the United States in January is reported as follows, in short tons:

In bond, Jan. 1	2,691
Imports	4,724
Total supplies	10,415
Re-exports	2,073
In bond, Jan. 31	5,208
Total deductions	7,281
Balance	3,134

The balance has, presumably, entered into consumption in this country.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull and slightly lower. The latest sales are on a basis of 6.02½@6.05c. for Missouri brands.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 9, that the price of lead is 91 reales per quintal; silver, 14 reales per ounce; exchange, 27.56 pesetas to £1. The price of lead, on current exchange, is equal to £18 9s. 8d. per long ton, f.o.b. shipping port. Exports for the week were 1583 tons argentiferous and 320 tons desilverized lead to Great Britain; 501 tons argentiferous and 66 tons desilverized to Marseilles; a total of 2470 tons.

Spelter—Entire absence of demand has had a weakening effect on prices and quotations are entirely nominal at 6.75@6.80, New York, and 6.60@6.65c., St. Louis.

The London market has had a serious decline, and is reported as weak, at £25 5s. for good ordinaries, and £25 10s. for specials.

It is stated that E. V. Lanyon has bought the old W. & J. Lanyon smelter, at Pittsburg, Kan., including 13 acres of land and old buildings. He proposes to tear down the old buildings, put up a substantial new structure, and install new machinery throughout. The old smelter was a two-block plant, but the new one will be larger. Gas furnaces will be used, run with producer gas.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds. The base price was advanced 10c. on March 27.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 9, that the market is quiet. Exports for the week were 1800 tons blende to Stettin.

Antimony—The market is lifeless. Quotations are unchanged, but are merely nominal, as follows: Ordinaries, 22¾@23½c.; Hallett's, 23½@24c.; Cookson's, 24½@25½c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—Demand continues strong and prices high. Unmanufactured platinum is quoted at $38 per oz. for ordinary and $41 per oz. for hard. For good scrap $31.50@32 is paid.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities, and $42 for smaller orders. San Francisco prices are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Aluminum—Prices are steady and demand good. Prices for ton lots, or over, are: No. 1, over 99 per cent. pure metal, 40c. per lb.; No. 2, over 90 per cent., 38c. Small lots are 1 to 3c. higher, according to size. The Pittsburg Reduction Company—now the Aluminum Company of America—no longer gives out monthly price lists.

Missouri Ore Market

Joplin, Mo., March 23—The highest price for zinc ore was $53.50 per ton for one lot of three tons, the general high price being $52.50; the assay basis price $48@51, and the average price $48.02, over a dollar decline in prices.

The highest price paid for lead was $85 per ton, medium grades, $80@83; the average price, $82.60 per ton.

Zinc purchasing has lightened the past two weeks, while the output has increased. Instead of continuing to advance on the ore as produced the smelters seem determined to ship the ore they own, and buy as little as necessary in the meantime, until the reserve stock is changed from their ownership to that of the producers. The output is now averaging around 6000 tons per week, climbing as high as 6800 tons last week.

The lead buyers have been enabled the past two weeks to ship a large part of their previously purchased stock, and this

spirited market today.

Following are the shipments of the district for the week ending March 23:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	2,905,860	1,562,240	$107,460
Joplin	2,602,180	457,700	82,915
Alba-Neck City	1,298,850		33,770
Duenweg	1,049,860	178,110	33,292
Galena-Empire	897,380	256,420	32,712
Badger	780,620		20,514
Prosperity	470,950	142,740	15,674
Spurgeon	452,530	94,700	12,006
Oronogo	436,510	18,480	10,865
Granby	384,150	95,880	10,070
Aurora	301,580	6,820	8,679
Springfield	62,160	114,280	6,250
Baxter Springs		70,400	2,921
Stott City	90,940		2,352
Cave Springs	70,730		1,768
Reeds	70,000		1,710
Carthage	63,990		1,665
Wentworth	59,440		1,466
Sherwood	39,240	3,490	1,045
Zincite	34,300		789
Totals	12,289,710	2,983,750	$418,370
Twelve weeks	143,267,140	21,584,000	$4,288,570

Zinc value, the week, $295,112; 12 weeks, $3,385,922
Lead value, the week, 123,258; 12 weeks, 902,448

Average prices for ores in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	.....	March	73.73	....
April	44.63	.....	April	75.13	....
May	40.51	.....	May	78.40	....
June	43.83	.....	June	80.96	....
July	43.25	.....	July	74.31	....
August	43.56	.....	August	75.36	....
September	42.58	.....	September	79.64	....
October	41.55	.....	October	79.84	....
November	44.13	.....	November	81.98	....
December	43.68	.....	December	81.89	....
Year	43.24	.....	Year	77.40	....

Wisconsin Ore Market

Platteville, Wis., March 23—The demand for all grades of zinc ore continued strong, nearly all the ore was sold on a $51 basis for 60 per cent. ore. There were no unusual circumstances affecting the selling market and owing to the early spring and quick drying up of the roads, the output should increase materially within the next 45 days, as a number of new mills will be put in operation and the ore that has been piling up at a few of the large producers can now be hauled. Dry bone, lead and sulphur suffered no material change. Owing to the continued shortage of cars the buyers were unable to get all ores loaded. This accounts for an apparent shortage.

The camps of the district loaded ore for the week ending March 23, as follows:

Camps.	Zinc lbs.	Lead lbs.	Sulphur lbs.
Platteville	284,980		
Highland	177,000	54,500	
Linden	152,000	41,760	
Mineral Point	124,500		46,080
Cuba City	70,000		
Benton	70,000		
Darlington	52,000		
Total for week	952,480	92,760	46,080
Year to Mar. 23	13,078,294	896,180	143,160

Owing to the condition of the wires it was impossible to get the ore report from Hazel Green and Buncombe.

Chemicals

New York, March 27—The chemical markets are generally strong, with good demand for nearly all sorts of material.

Copper Sulphate—The demand continues strong, and supplies are readily taken by consumers. Prices remain unchanged. For carload lots and over, we quote $7.50 per 100 lb., while smaller parcels bring $7.75 per 100 lb. in the local market. Supplies are quite large, but hardly equal to current demand.

Nitrate of Soda—Spot supplies are still scarce and the market is strong. Quotations are unchanged, 95 per cent. for 1907 delivery, all positions, commanding $2.45 @2.47½ per 100 lb., and 96 per cent. $2.50 @2.52½. For 1908 delivery quotations are $2.42½ and $2.47½, respectively.

British Chemical Trade—Exports of chemicals from Great Britain for the two months ended Feb. 28 were as follows, in cwt. of 112 lb. each:

	1906.	1907.	Changes.
Bleaching powder	175,167	191,247	I. 16,080
Muriate of ammonia	18,687	27,386	I. 8,699
Soda ash	214,770	330,886	I. 116,116
Bicarbonate of soda	45,653	66,496	I. 21,143
Caustic soda	230,076	253,260	I. 22,584
Soda crystals	26,067	18,885	D. 7,182
Soda sulphate	119,818	133,834	I. 14,016
Sulphuric acid	15,989	11,310	D. 4,629

Exports of copper sulphate for the two months were 7213 tons in 1906, and 8902 tons in 1907; an increase of 1689 tons.

Imports of chemicals and raw materials into Great Britain for the two months ended Feb. 28 were, in long tons:

	1906.	1907.	Changes.
Nitrate of potash	1,709	1,997	I. 288
Nitrate of soda	17,570	15,957	D. 1,613
Phosphates	79,463	92,547	I. 13,084
Sulphur	2,597	2,759	D. 838
Pyrites	129,445	135,179	I. 5,734

Estimating sulphur contents of pyrites at the usual figure, the total sulphur imported was 55,375 tons in 1906, and 56,831 tons in 1907; an increase of 1456 tons.

Mining Stocks

New York, March 26—The market has been raided the last three days and prices have declined rapidly. Stocks that have been hitherto strong and steady have depreciated from 10 to 30 per cent.

Amalgamated touched a new low point for the year when it fell off to $78½ today. It closed at $83¾. American Smelting common sold down to $105, but recovered and closed at $114⅛. U. S. Steel, Anaconda, Utah Copper, and all other mining stocks on the Exchange were very weak, and the general tone of the market continued panicky. All efforts to strengthen the situation have so far failed.

The curb has followed the lead of the Exchange and the outside securities have suffered losses all through the list. The coppers have lost heavily, some of the closing prices being as follows: British Columbia, $63¼; Cumberland Ely, $9; Davis-Daly, $12⅝; Greene Copper, $22; firmer, but losses were recorded. Nipissing closed at $11¼ after selling down

Boston

March 26—Mining shares have continued on the toboggan slide the past week, and are selling at a level which certainly looks inviting to the man with means. Prices have been slaughtered and they are without rhyme or reason to the layman. Many stocks sold at panic prices today. Recoveries were sharp although stocks are from $3 to $65 below prices of a week back, the latter being in the case of Calumet & Hecla. The whole financial structure has been weakened by the events of the past few weeks, but who dare say that things may not be worse?

Amalgamated Copper from a closing at $92 a week ago touched $79.50 in this market today, recovering to $85.50 at the close. For a day or two last week the market mended, but it was only temporary and stocks have been dumped over regardless. The sharp break in the New York list has caused the break in metal shares, yet without hurting anyone seriously to date, so far as known. New York and the West are the largest owners of copper shares dealt in on this market and this is really the main trouble, as these people have been extended in the railroad and industrial shares and have had to sacrifice copper shares in their effort to save themselves. North Butte, which closed at $91.50 a week ago, rallied to $92.50, but broke wide open with sales $2 apart in cases, until it touched $72 today, recovering to $84.50 in a short time.

Butte Coalition also went by the board, breaking $10 to $20.50, with recovery to $23.87½. Bingham sought a low level at $14.50, rallying to $17.25, which is $3.75 net lower than a week ago. Boston Consolidated broke $5.50 to $20.50, recovering to $22; Copper Range $11.50, to $72, recovering to $76.25; Isle Royale $8.25 to $13.75, recovering to $17.50; Mohawk $15 to $68, recovering to $75; Old Dominion $11.25 to $38, recovering to $46.50; Osceola $25 to $115, recovering to $124.50; Parrot $3.75 to $19.75; Quincy $10 to $108, recovering to $113; Shannon $4.25 to $14.75, recovering to $17; Tamarack $15 to $100, recovering $10 of it, Trinity $9.12½ to $14.87½, recovering to $18; United Copper $13.75 to $53, Utah $7.50 to $53, recovering to $57.50; United States Smelting $5.50 to $50, recovering to $51.50; Wolverine $6 to $155; Calumet & Hecla $65 to $8.20; and Calumet & Arizona $14 to $149, recovering to $150.

Allouez Mining fell $10 to $50; Centennial $7.25 to $20.25; Arcadian $2 to $6; Atlantic $3.25 to $13; Franklin $3.75 to $16.25; Greene $3.75 to $20.62½; Michigan $3 to $13; Rhode Island $1.50 to $6;

and La Salle $3, to $15.75. Recoveries followed these extreme prices. Annual reports of mining companies tell the same favorable story for 1906 operations. The curb also suffered declines but not to the same extent as on the board.

Colorado Springs

The local stock market has been dull and inactive this entire week. Gold Sovereign, Isabella and Work are about the only stocks that have received any attention. Good reports are coming from the mines in the Cripple Creek district, but the brokers and investing public seem to be turning their attention to the Nevada stocks. It is thought, however, that this will be of short duration.

STOCK QUOTATIONS

NEW YORK Mar. 26	
Name of Comp.	Clg.
Alaska Mine	1⅝
Am. Nev. M. & P. Co	5¢
Amalgamated	81
Anaconda	58½
Balaklala	9
British Col. Cop.	6¾
Buffalo Cobalt	2
Butte & London	2¢
Butte Coalition*	24
Butte Copper & Zinc	53¼
Cobalt Contact	
Colonial Silver	2⅝
Cum. Ely Mining	
Davis Daly	1⅝
Dominion Cop.	5
El Kay	2
Foster Cobalt	1¾
Furnace Creek	1⅝
Giroux Mine	5¼
Gold Hill	2
Greene Gold	1¾
Greene-C. & S.	1¾
Greene-T. & D. Val.	1
Guanajuato	4
Guggen. Exp.	2⅝
Hancock	¾
Mines Co. of Am.	1¾
Mitchell Mining	1
Mont. Shoshone	1¾
New Utah M. & S.	4
Nipissing Mines	11
Old Hundred	4
Silver Queen	1
Stewart	2¼
Tennessee Copper	17
Union Copper	1
Utah Apex	2
West End Consol.	12

N. Y. INDUSTRIAL	
Am. Agri. Chem.	5
Am. Smelt. & Ref.	124
Am. Sm. & Ref., pf.	102
Brooklyn Union Gas	114
Colo. Fuel & Iron	6
Federal M. & S. pf.	5
Inter. Salt	6
National Lead	5
National Lead, pf.	96
Pittsburg Coal	5
Republic I. & S.	8
Republic I. & S., pf.	9
Sloss-Sheffield	5
Standard Oil	5
Texas Co.	1
U. S. Steel	3
U. S. Steel, pf.	9
Va.-Car. Chem.	7
Va. I. Coal & Coke	5

ST. LOUIS Mar.		
Name of Com.	High.	Low.
Adams	10	7
Am. Nettie	28	8
Comb. Coal	3 4	3
Cent. C. & C.	65 00	63
C. C. & C. pd.	80.00	78
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Con. Coal	29.00	27
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

BOSTON Mar. 26	
Name of Comp.	Clg.
Adventure	4
Allouez	50
Am. Zinc	38
Arcadian	6¾
Atlantic	14
Bingham	38
Boston Con.	22
Calumet & Ariz.*	136
Calumet & Hecla*	820
Centennial	31
Com. Mercur	38
Copper Range	76½
Daly-West	15½
Franklin	17
Granby, New	125
Greene Con.*	22½
Isle Royal	17¼
La Salle	16
Mass.	5¾
Michigan	14
Mohawk	74
Mont. C. & C. (new)	1⅝
Nevada	14
North Butte	85½
Old Colony	1
Old Dominion	46
Osceola	121
Parrot	20
Phoenix	1¾
Quincy*	111
Rhode Island	¾
Santa Fe	6¾
Shannon	10
Tamarack	110
Trinity	18
United Cop.	44
U. S. Oil	¾
U. S. Smg. & Ref.	51¾
U.S.Sm.& Re.,pd.*	4
Utah Copper	57½
Victoria	7¼
Washington	2
Wilmot	5
Winthrop	1
Wyandotte	1

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Ahmeek	
Ariz. Com.	2¾
Black Mt.	6
Cananea Cent.	20
East Butte	11¾
Hancock Con.	
Keweenaw	2
Majestic	3
Raven	2
Shawmut	17
Superior	10
Superior & Pitts.	2¾
Trinity Mar.	2¾

LONDON Mar. 27	
Name of Com.	Clg.
Anglo-Arg.	£1 12s
Camp. Sulphide	0 1
Camp. Bird	1 1
Copperopolis	2 1
Esperanza	1 1
Lake View	1 1
Mason & Barry	1 1
Mexican	1 1
Oriental	1 1
Rio Tinto	1 1
Tharsis	1 1
Tincroft	1 1
Tom Reed	1 1
Utah Apex	1 1
Ariz. Cop. pfd.	3 15 0
Ariz. Cop. def.	5 12 6

Cabled through Hayden, Stone & Co., N. Y.

S. FRANCISCO Mar. 19	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.55
Best & Belcher	1.40
Caledonia	.41
Challar	.11
Con. Cal. & Va.	1.00
Crown Point	.27
Exchequer	.80
Gould & Curry	.27
Hale & Belcher	.68
Mexican	.73
Ophir	2.30
Overman	.15
Potosi	.11
Savage	.76
Sierra Nevada	.71
Union	.65
Utah	.05
Yellow Jacket	.90
TONOPAH STOCKS	
Golden Anchor	.25
McNamara	.47
Montana-Pitts. ex.	.21
North Star	.27
Rescue	.14
GOLDFI'D STOCKS	
Black Ants	.08
Blue Bull	.37
Columbia Mt.	.76
Comb. Frac.	3.77
Conqueror	.19
Daisy	2.00
Florence	3.15
Frances-Mohawk	1.10
Goldfield Con.	7.50
Grandma	.22
Great Bend	.85
Red Hills	.20
St. Ives	1.42
BULLFROG STOCKS	
Amethyst	.38
Bonnie Claire	.38
Mayflower Con.	.38
Montgomery Mt.	.21
Original	.17
MANHAT'N STOCKS	
Gold Wedge	.12
Manhattan Mg.	.12
Pine Nut	.18
Ruby Wonder	.25
Stray Dog	
Yellow Horse	.07

NEVADA Mar. 27 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	16.00
Tonopah Exten.	3.62½
Montana Tonop'h	3.50
Belmont	4.25
Tonopah Midway	1.85
West End Con.	1.37
Jim Butler	1.19
GOLDFI'D STOCKS	
Sandstorm	.57
Kendall	.40
Red Top	4.00
Jumbo	4.00
Goldfield Mining	1.40
Diamfield B. B. C.	.59
Atlanta	.72
Mohawk	16.50
Silver Pick	1.24
Laguna	1.50
BULLFROG STOCKS	
Mont. Shoshone C.	10.50
Tramps Con.	1.23
Gold Bar	1.15
Bullfrog Mining	.29
Bullfrog Nat. B.	.42
Homestake Con.	1.20
MANHAT'N STOCKS	
Manhattan Con.	.72
Manhat'n Dexter	.26
Jumping Jack	.16
Stray Dog	.33
Indian Camp	.17

COLO. SPRINGS Mar. 23	
Name of Comp.	Clg.
Acacia	
Black Bell	
C. C. Con.	5½
Dante	5¼
Doctor Jack Pot	
Elkton	57
El Paso	41¼
Findley	68½
Gold Dollar	6⅞
Gold Sovereign	6¾
Isabella	23½
Jumbo	
Jennie Sample	7
Jerry Johnson	
Mary McKinney	60
Pharmacist	6½
Portland	1.15½
Un. Gold Mines	
Vindicator	
Work	17¾

New Dividends

Company.	Payables.	Rate.	Amt.
Am. Agri. Chemical, pfd.	Apr. 1	$3.00	$544,590
Am. Smg. & Ref., com.	Apr. 15	1 75	875,000
Am. Smg. & Ref., pfd.	Apr. 1	1.75	875,000
Buffalo, Ont.	Apr. 1	0.03	27,000
Central Coal & Coke	Apr. 15	1.50	76,875
Central Coal & Coke, pfd.	Apr. 15	1.25	23,438
Columbus Con., Utah	Apr. 6	0 20	60,000
Daly Judge, Utah	Apr. 12	0.37½	112,500
Esperanza, Mex.	Apr. 22	1 32	600,600
General Chemical, pfd.	Apr. 1	1 50	165,000
Guggs. Exp. Co.	Apr. 1	2.50	262,500
Inter. Nickel, pfd.	Apr. 1	1 50	131,123
Iron Silver, Colo.	Apr. 1	0 20	100,000
New Idria, Cal.	Apr. 1	0 20	20,000
Nova Scotia Steel & Coal	Apr. 15	1.50	74,555
Philadelphia Co.	May 1	0 75	434,296
Quartette Mg.	Mar. 30	0.01¼	15,000
Tenn. Coal, Iron & R.R.	May 1	1.00	225,536
Tenn. C. I. & R.R., pfd.	May 1	2.00	4,960
Tezuitlan	Apr. 1	2.00	20,000
Tonopah Belmont	Apr. 1	0 10	125,901
U. S. Red. & Ref., com.	Apr. 15	0.87½	656,250
U. S. Red. & Ref., pfd.	Apr. 15	0.87½	656,250
Utah Con.	Apr. 15	1.50	450,000
Va.-Carolina Chem., pf.	Apr. 15	2.00	360,000
Work	Apr. 1	0.01	15,000

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Apr.	Apr. 24	$0.05
Arizona Prince, Cal.	Mar. 25	Apr. 20	0.01
California, Cal.	Apr. 3	Apr. 20	0.05
Con. Cal. & Va., Nev.	Mar. 21	Apr. 11	0.25
Etna-King, Cal.	Mar. 19	Apr. 3	0.01½
Halo & Norcross, N.	Apr. 4	Apr. 30	0.15
Herkimer Gravel, C.	Mar. 29	Apr. 15	0 01
Lucky U. Utah	Mar. 15	Apr. 1	0.02
Lucky Nev.		Apr. 4	0 03
Lloyd-Searchlig't, N.	Mar. 29	Apr. 18	0.01
Mountain Nev.	Apr. 3	Apr. 25	0.15
Oro Blanco, Cal.	Feb. 25	Apr. 22	0.03
Posey Canon, Cal.	Apr. 1	Apr. 15	0.01
Quincy, Jr., Idaho			0.10
Savage, Nev.	Mar. 14	Apr. 3	0.10
St. Ives, Utah	Mar. 28	Apr. 16	0.02
Wabash, Utah	Mar. 12	Apr. 3	0.05

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.852
March	64.597		29.854	
April	64.765		29.984	
May	66.976		30.968	
June	65.394		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.927		31.483	
October	69.523		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361		18.641		81.111	
April	18.375		18.688		84.793	
May	18.475		18.724		84.867	
June	18.442		18.719		84.397	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.606	
March	36.662		September	40.516	
April	38.900		October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year.	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350		15.922	
April	5.404		15.959	
May	5.695		16.725	
June	5.750		16.813	
July	5.750		16.525	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209		6.056		24.563	
April	6.078		5.931		25.781	
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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Cyanide Plant for Treating Guanajuato Ores

The Guanajuato Reduction and Mines Company Transports Pulp from the Mill to the Tanks by Means of a Pipe Line a Mile Long

BY CARLOS W. VAN LAW

The plant illustrated in the accompanying photographs exemplifies the superior practice developed in the cyaniding of silver ores in the Guanajuato district mines. It was installed by the Guanajuato Reduction and Mines Company, and started running on March 1, 1906, with 80 stamps. The operation of the plant has been so successful during the last year that on Nov. 1, 1906, the installation of a duplicate unit was begun, which is expected to be in operation in the fall of the present year.

The Guanajuato Reduction and Mines Company, in Nov., 1903, acquired possession of two miles upon the mother vein, including the famous old Valenciana, Cata, Rayas and Mellado properties, thus embracing all of the old producers of this vein, with the exception of the Sirena, which is held by the Guanajuato Consolidated Company. An extensive unwatering program was immediately inaugurated and mine development was begun.

Ancient Dumps

The past workings on these properties, from the year 1547, have produced an enormous quantity of dumps, aggregating by actual survey nearly 2,000,000 tons and more than an equal quantity of stope fillings, both of which from preliminary sampling and actual milling returns, have been demonstrated capable of yielding a good profit. This assured product, aside from the returns of the mine development, warranted plans for a large plant, which is to be brought as rapidly as possible to a capacity of 1000 tons a day. The present 80 stamps are milling something over 7500 tons per month.

Fig. 1 is a general view of the present 80-stamp mill, with the Cata mine in the immediate background, the $1,000,000 church and the stacks of the Valenciana mine showing on the sky line. The view is taken from about the middle

*General manager, Guanajuato Reduction and Mines Company, Guanajuato, Mex.

FIG. 1.—GENERAL VIEW OF MILL, GUANAJUATO REDUCTION AND MINES COMPANY.

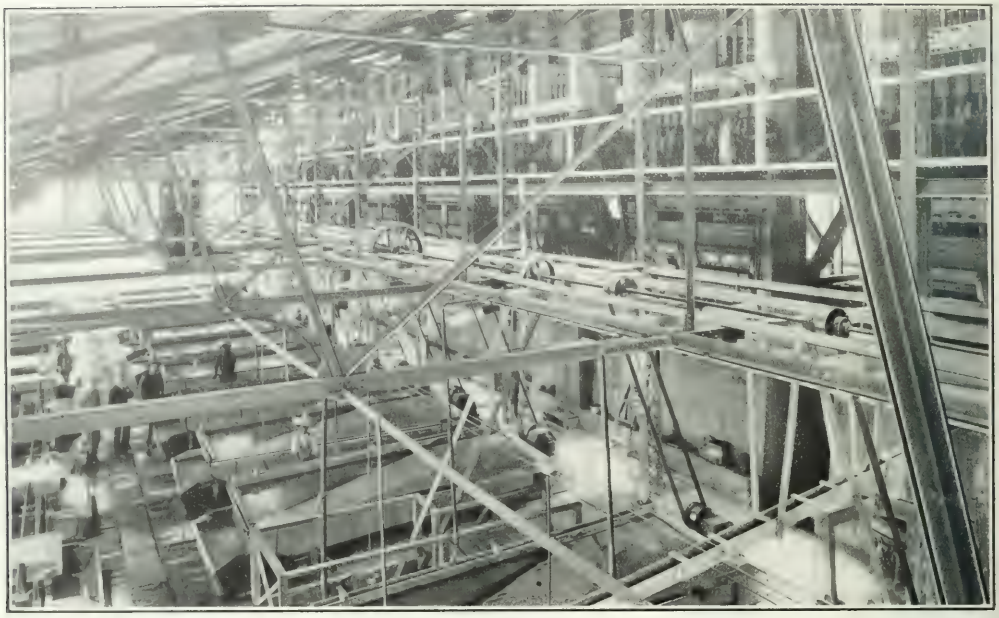


FIG. 2.—INTERIOR OF STAMP MILL, GUANAJUATO REDUCTION AND MINES COMPANY.

FIG. 3.—TRESTLES FOR PIPE LINE CARRYING PULP TO TANKS.

Ore is brought from the Cata mine and from the dumps of the Mellado over the railroad grade shown in the photograph, in four-ton gable-bottomed mine cars, to a bin above the crushing plant, in which plant the ore is double crushed to 1½-inch ring by gyratory crushers, the sorting likewise taking place on the sorting belt.

The Mill.

The crushed ore is conveyed and elevated by a traveling belt and distributed into the steel bin of the mill structure, which bin has a capacity of 2500 tons of crushed ore. The ore is then passed through Challenge feeders to the eighty 1050-lb. stamps, Allis-Chalmers pattern, making one hundred 7½-in. drops per minute. The mortar is of extra heavy "El Oro" type, weighing 9000 lb., with extra broad base directly bolted to heavy concrete piers.

Battery crushing is through 26-mesh, 28-wire steel screen, the pulp being classified into coarse and fine product in spitzkasten, the entire tailings of the Wilfley tables taking the coarse product being reground in an Abbé tube mill, the reground product being again concentrated over Johnson vanners; the Wilfley tables taking the fine spitzkasten product discharge directly into the tailings launder of the mill without regrinding.

The overflows from the spitzkasten are elevated to a central spitzkasten of large size, whose bottom product is treated over Johnson vanners, the overflow going to the cyanide plant. The combined tailings of all tables are carried in a concrete launder through a tunnel under the patio to a cone house outside the grounds, where in two steel [illegible] 1000-ton plant and also for the discharge of tailings into the main river.

To effect this transferal, an 8-in. cast-iron bell and spigot pipe line joins the cone house above mentioned with the cyanide plant, being laid with extreme care upon a uniform grade of 2¼ per cent., except for the first 800 ft., which has a grade of 3½ per cent. to give an entry head into the line. To support the grade, two steel viaducts were installed, one of which is shown in Fig. 3.

At the cyanide plant a classification into sands and slimes is effected by a double-[illegible]

FIG. 4. ARRANGEMENT OF TANKS, FIRST CYANIDE PLANT, CANANEA.

eter, about one-half of the water is removed and returned for mill use.

The Cyanide Plant.

The mines being located upon a small branch arroyo, in which there was neither room for a large plant nor for the discharge of tailings, it became necessary to separate the crushing and concentrating plant from the cyanide plant, which it was desired to place upon the main stream of the district, a mile away, where sufficient room could be obtained for the ultimate

through Butters' distributers into either of two receiving tanks and, after draining, discharged through six bottom-discharge gates in each tank upon conveyer belts, which elevate and convey the sands over the top of a line of 40x8-ft. leach tanks, into which the sand is showered by special distributing tripper and handled by ordinary leaching process with 15-day leach time.

[illegible] Treatment.

The overflows from all classifying cones pass over a trap to eliminate any sands

which may have escaped, the slimes being conducted to 36x12-ft. agitating tanks and treatment is effected by agitation and decantation. The agitation is by 6-in. Meese-Gottfried centrifugal pumps supplemented by mechanical arms. After the final wash in the slime tanks, the slimes are pumped into high settling tanks, where a final settling and decantation takes place before discharge. All decanted solutions pass through sand-filter tanks before entering the zinc room.

The zinc room contains 15 steel zinc boxes of 6 compartments each, each compartment being 4x4x3 ft. At clean-up the precipitate is flushed through the copper bottom of each compartment into steel launders to a central sump, being thence pumped through a Johnson filter press. No acid treatment is given, as nothing which will not pass a 60-mesh screen is sent into the filter press, all coarser than this being returned to the zinc boxes.

The filter-press product is dried by compressed air in the press, mixed with fluxes, and melted directly into bars without briquetting. After mixing with the fluxes the cake still retains sufficient moisture to prevent any dusting and no difficulty or loss has been had with this handling.

The zinc-box capacity was installed with the view to the double unit now being put in, there being ample zinc-box capacity for 500 tons a day of ore treated.

Efficiency of the Plant

It is interesting to note, as an indication of the mechanical perfection of the plant, that during the period from April 1, 1906, to Jan. 1, 1907, eliminating the few shut-downs of electric power, for which the company is not responsible, the total loss of possible stamp hours during the entire period constituted 83/100 of 1 per cent., and included in this are all routine stoppages of stamps for changing shoes and dies, replacements, screens and all other routine operations of whatever nature.

The transportation of 75,000 tons of ore over a distance of 5440 ft., separating the cyanide plant from the mill, during the last ten months of 1906, was effected through the pipe line above mentioned, without the least evidence of a tendency to clog or without any appreciable wear whatever upon the material of the pipe. During the ten months there was a charge of $3.57 (Mex.) for paint, which constitutes the total cost of upkeep and maintenance of the entire transportation system for the 75,000 tons.

The pulp runs in the bottom of the line freely and without pressure, the line being filled to a depth of only 1¾ in. at a capacity of 250 tons per day, running therefore as in an open launder. Many doubts were expressed as to the possibility of conveying fairly coarse pulp at the extremely small grade mentioned, of 2¼ per cent., but no difficulty whatsoever has been encountered from this cause, although, as has been said, about one-half of the water normal in ordinary concentration is eliminated before the pulp enters the line, in which it has a consistency of 4 of water to 1 of dried pulp.

Fig. 2 is an interior view of the milling plant and Fig. 4 a general view of the tankage and arrangement at the cyanide end. Fig. 3 shows one of the pipe-line viaducts.

Experience with a Cornwall Tin Mine

By Edward Walker

One of the larger mines in Cornwall that has not done so well as might have been expected is the Basset, which was converted into a limited company in 1896. For some time it has barely paid its way, and the amount carried forward to the debit of profit and loss was over £20,000 on Jan. 1, 1906. The operations during 1906 have been more profitable. The rise in the price of tin has been advantageous, and on the other hand the expenditure on wages, development, etc., has been slightly higher. The ore raised was 47,339 long tons and the extraction was 33 lb. of concentrates to the long ton. The total income was £68,000, and the expenses £54,900. After providing £3000 for depreciation, the profit of the year's work was about £10,000. Owing to the debit balance referred to, none of this profit is available for dividends. The shareholders have never received any dividend, and from time to time since the formation of the limited company, new shares have been issued. There is at present an accumulated dividend due on the preference shares amounting to over £26,000. There are also 20,000 special ordinary shares which have to receive twice their money back before the main bulk of ordinary shares receive any dividend. The outlook for these ordinary shares is therefore not very bright, but if tin remains at its present high price for a few years, their position will be much better. I refer to the Basset as one of the mines that might have been expected to do better than it has done. My reason for saying so is that the management is in the hands of Francis Oats and William James, who have had considerable experience in South Africa. It is commonly supposed (probably wrongly as I have pointed out in another place) that the Cornishman at home is out of date and ought to have his genius revived by contact with mining operations in other countries. Some people even go so far as to say that new blood entirely is wanted for the management of Cornish mines. At the Basset mines this infusion of new blood, or at any rate the infusion of new ideas gained abroad, has not done anything toward putting Cornish mining on a paying basis. This remark is not made in a captious humor, and is not intended as any reflection on the gentlemen named. It is to give a specific instance of the view I take of Cornish mining, that with tin at a low price not the greatest mining genius on earth would have produced any better results than have actually been obtained.

The Meaning of "Current Density"

By D. Tommasi*

The meaning of the words "current density" is not always well understood and the use of the expression gives rise to no little confusion. Current density plays an important part in electro-chemistry, because, by varying it, the physical and chemical properties of the substance set free by the decomposition of the electrolyte may be modified.

With a small current density the deposits are nearly always thick, very adherent and of crystalline form, while with a greater density the substances are ordinarily precipitated in the form of a powder and adhere but feebly to the cathode. Substances which are easily oxidized are deposited on the cathode in the oxidized state when the current density is small, and in the metallic state when it is large.

Ordinarily "current density" is understood to mean the quotient of the intensity divided by the surface which the current traverses; or, in other words, the number of amperes passing per unit of surface of electrode. The unit of surface adopted in electro-chemistry is generally the square decimeter; there is, however, a certain confusion as to the dimensions of the surface to which this unit is to be applied. Chemists should unite on terms convenient as a means of defining the density of the current. There are two factors, one of which, the intensity or strength of current, is to be measured, and the other, the surface, should have a common unit. How shall this last factor, the surface, be defined? Should it be applied to one cathode alone, to one anode alone, or to both electrodes together? Should it refer to one face of the electrode or to both faces?

To Smelt the Burra Copper Slag Dumps

The *Australian Mining Standard*, Feb. 13, 1907, reports the erection of a smelter at Kooringa, near the Burra copper mine. It is intended to treat about 90,000 tons of slag resulting from smelting Burra ores in by-gone days. It is stated that this slag contains from 2 to 2.5 per cent. copper.

*Electrical engineer, Avenue d'Italie, Paris.

The Mines of the Altar District, Sonora

A Stretch of Territory on the Borders of Arizona Which Has Produced Millions in Gold and Contains Rich Placers and Ledges

BY JOHN S. ALEXANDER

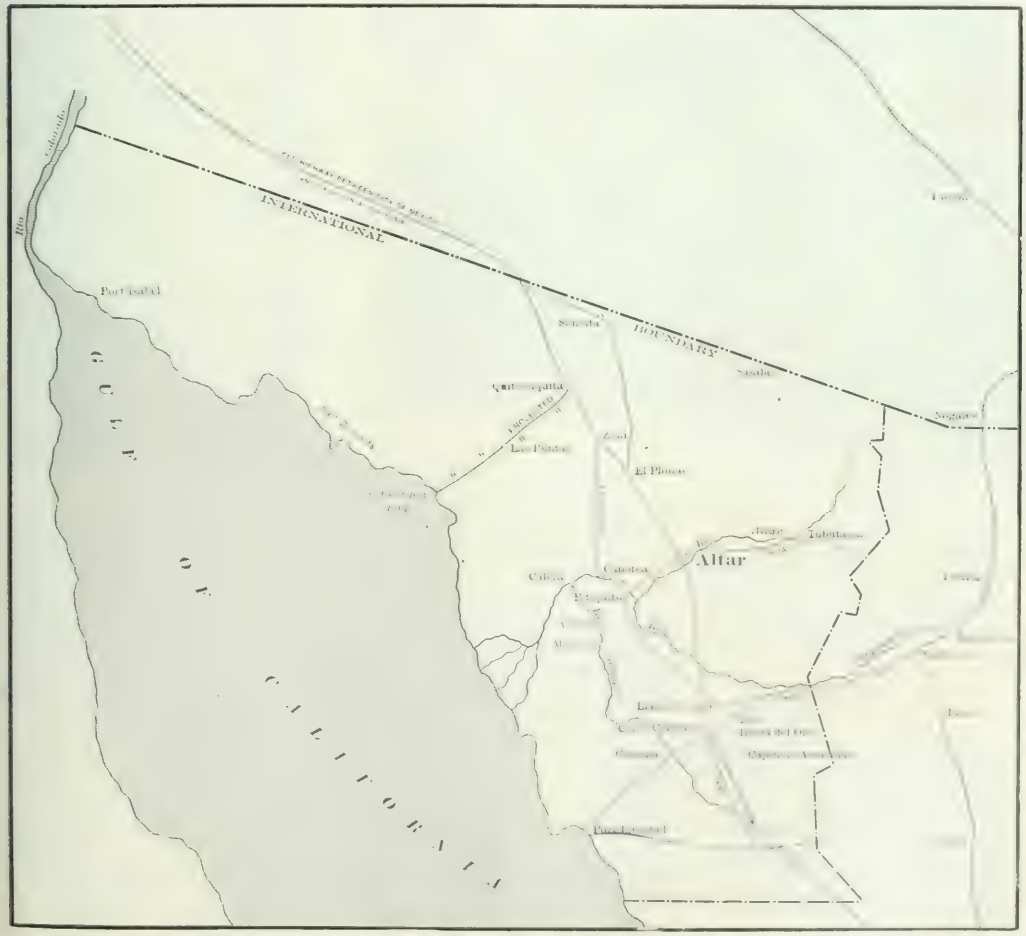
Directly south of Arizona and [illegible] on the west by the Gulf of California, lies the Mexican state of Sonora, and a line drawn from a point a little west of the familiar shallow angle in the international boundary, south 125 miles and thence westward to the gulf, marks off the district of Altar which thus comprises the extreme northwestern part of the Republic of Mexico, save a part of the peninsula of Lower California. The area of the district is 18,000 square miles, or about that of Vermont and New Hampshire combined.

Being a continuation of the great Colorado desert of Arizona, it presents many of the same general characteristics: a sandy plateau of 2000 ft. elevation, with a gradual fall to the gulf, and interspersed with isolated peaks and short, disconnected minor ranges of granite and other eruptives. The Sierra Madre and other associated high ranges lie to the eastward and entirely outside of the district.

[illegible]

Heading among the timbered slopes of a distant range, the important Magdalena river, by a series of long reaches and bends, carries its fertilizing waters nearly 150 miles through the otherwise arid central part of the district; until, sinking in the sand near the coast, it finds a subterranean outlet to the gulf. Cienega river, rising farther south in the same sierra, makes a long detour to the southwest and thence due north unites with the Magdalena. Another branch of the latter

*Mining engineer, 3 Broad street, New York.



MAP OF THE ALTAR DISTRICT, SONORA, MEXICO

is the Altar river, coming from the northeast. These three streams with their deep gravel beds serving as storage reservoirs, are the chief source of the water supply of the district. The great bends in their courses bring them so near to many mining districts that pipe lines of from 6 to 20 miles will effect a wide water distribution. In the north, Quitovac and Sonoita, near the Arizona line, both have good local water supplies.

It is a country of natural gravel wagon roads, almost uniformly level, so that all parts of the district can be easily reached, either from Santa Ana, on the Sonora branch of the Southern Pacific Railroad which connects the main line, at Benson, Arizona, with the port of Guaymas, or from the main line at Tucson or Gila Bend, Arizona. The competition, via Guaymas, with low water rates from all parts of the world, gives Santa Ana a much more favorable rail-freight rate, even from New York, than Arizona points.

Along the coast, beds of salt and soda deposits of value occur. A growth of unusually large mesquite trees, some miles wide and said to be 100 miles long, extends north and south, within and near the eastern edge of the district.

Geology and Mineralization

The Spanish archives and the Mexican mint records accord the large production of $98,000,000 of gold and silver to the Altar district. Copper is now being opened up in places; while many of the gold ledges yield copper as a by-product. Practically the whole district is within the mineralized belt, for hardly a corner of it is without its historic placer or mine.

The placers were naturally the first discovered and worked; they extend over almost the whole of the western half of the district. Undoubtedly the most important metallurgical center a century ago was Cienega, sometimes called Cieneguilla, on the river of that name. Within a short distance, was discovered, in 1799, the San Ildefonso de la Cieneguilla gold and silver mine; followed in 1803, by the neighboring San Francisco gold placer of great richness. Their chief owner was Don Francisco de Castro, who is said to have taken $2,000,000 from these properties in a very short time.

Castro's Mill

The ores from his ledge mines were brought to Cienega for smelting and treatment by amalgamation, where great slag heaps and dumps at the site of his works of a century ago are evidence of the magnitude of his operations. The primitive-looking barrel-amalgamating plant, with roasting furnace attached, shown in the photograph, is on one of these old dumps, which are still worked over for mixture with new ores.

CASTRO'S MILL AT CIENEGA, SONORA.

Castro also owned the remarkable Cerro Colorado, the Spanish Red Mountain, so named from the color of the oxidized surface ores, situated six or seven miles from Cienega. This is a mountain mass of soft, free milling gold ore, 550 ft. above its base; almost the entire mountain is a ledge of quartz porphyry, 2000 ft. wide. Some 900 ft. of it has been sampled and assayed averaging $4 per ton. Until quite recently, it had never been tested in depth; a shaft has been sunk 200 ft. near the base of the mountain, and a large body of $15 ore has been opened. The records of Castro's day say this was by far the greatest orebody of the locality, and that it was so wide and soft that a miner could break down 15 tons a day. It was extremely docile under treatment. In the words of the record:

"It was of a low grade, and as there was not sufficient water at the mine to treat it, and there being no facilities for transporting the ore to water (six miles) but by burros, it was seen that it could not be worked in Sonora to advantage; in some other land where it could be treated by water power arrastras, without doubt this one mine alone would be sufficient for a bonanza."

This writer of over a hundred years ago had never heard of a steam engine or dreamed that a power stamp mill, a steam force pump or spiral steel pipe would ever be possible in Sonora. However, not six miles from this Cerro Colorado mine, there is now being erected by the Llanos del Oro Mining Company, of California, a modern 100-stamp mill of the highest type of construction, obtaining its water supply, by a 14-mile pipe line, from the Magdalena river. The Llanos del Oro Company has opened, in one of the old placers, a comparatively deep lying, thick, blanket deposit of gold-bearing cemented gravel, sometimes finding several such deposits in vertical succession.

There are many other camps and mines in Altar, including Las Pintas, Quitovac, El Plomo, Caborca, El Tiro, Mina Yaqui, Reina del Oro, and Cajon de Amarillas, old records are also available describing the exodus of operators and miners from this, the nearest Mexican mining district, to California, in 1849, bringing with them Mexican methods, which became the foundation of our own mining practice and laws.

Railway Rates in Mexico

Consul J. A. LeRoy, of Durango, writes as follows concerning the Mexican railway law by which the Government has the power of regulating freight and passenger rates, as well as freight classifications, etc.

The various railway concessions have been made subject to this right of control. At intervals of four or five years revision of freight rates and classifications has been made. Freight rates have always been and still are high in almost all cases, in some very high. There has, however, been a tendency toward their gradual reduction. The revision of the present tariff has been under consideration for four or five months past. It perhaps would have been promulgated before now except for the recent operation by which the Mexican Central system was consolidated with the National Lines of Mexico, in which the Government has the majority of stock. Various interests have had their hearings in Mexico City in behalf of a reduction of freight tariffs. Some of these reductions, if granted, should exercise a direct influence upon importations from the United States.

Primitive Mexican Crushing and Dressing Plant

Simple and Inexpensive Appliances and Methods Devised Centuries Ago Are Still in Use in the Mountains of Chihuahua

BY FRANK H. PROBERT

A number of [illegible] methods of more or less historical interest have recently been published in the columns of the technical press. Some of these processes have long since ceased to be used, but there are many places, far removed from modern transportation facilities, where such primitive means are still employed to reduce simple ores. These descriptions are not only of general interest, but frequently will suggest an

FIG. 1. WOODEN STAMPS

idea which if carried out would be of material benefit to property holders unable to install a modern plant.

While traveling through the Sierra Madre Occidental of Chihuahua, Mexico, investigating certain properties in the Guadelupe y Calvo district, I saw sundry crude appliances in active operation which were yielding good returns.

Nature of the Country

Nestled in the deeply incised rocky cañons which characterize the breakdown of the Sierras toward the Gulf are a number of abandoned camps which many years ago were the scene of great activity. An occasional tunnel in the mountain side, almost hidden from view by a tangle of dense underbrush, ruins of arrastras and *planillas* bear testimony to the prosperous times of days gone by. It is seldom that one is fortunate enough to witness the operation of any of these primitive reduction works. At the camp of El Cuervo, some six days' ride on mule-back from the nearest railroad and about 30 miles from Guadalupe y Calvo, Mexicans are still extracting silver with the crudest of appliances.

The western slopes of the Sierra Madre which mark the breakdown of the Great Central Plateau of Mexico show a series of lava flows superimposed one above the other but by no means contemporaneous. It would seem that all the orebodies are confined to the andesite, which is the oldest of the igneous rock masses found. The vein systems follow definite lines of fracture in the andesites. The mineralized areas are marked wherever the andesite comes to the surface by outcrops of white quartz filling a fissure on one side of the prominent escarpments which characterize the *barranca* country.

Generally there has been marked silicification of the adjacent wall rocks of considerable lateral extent. The vein structure suggests that after the filling of the original fissures with gangue matter and accompanying silicification of wall rocks there was a later movement along the same plane, crushing the vein filling into fragments and that this breccia was later cemented. This possibly accounts for the local seggregation of the silver in bonanza streaks which are now being mined and treated by the rough methods about to be described. The silver occurs both as native silver and as sulphide (argentite) in an exceedingly fine state of division disseminated throughout the silicified andesites.

A Primitive Stamp Mill

Figs. 1 and 2 show the old wooden stamps which were driven by water power to reduce the ore to suitable size for the subsequent extraction in the *planillas*. The three wooden stems are made of 6x8 in. roughly hewn native timber. The shoes consist of ½-in. sheet metal bent to fit the stem and held on by a series of iron straps. The tappets consist of wooden plugs in the stems, which engage with a series of plugs on the shaft, and which take the place of cams in modern milling practice.

A tree trunk about 12 in. in diameter is attached to an exceedingly rough wheel made to revolve as an undershot water wheel. Round the periphery of this ill-provised shaft are a series of notches in [illegible] to lift the stamps and to afford a means of altering the drop. There is no mortar; that which corresponds to the dies of a stamp battery is a flat stone placed underneath the stamps on which the ore is shoveled and ground by the irregular dropping of the three stamps. The pulp is allowed to run into a reservoir.

I was unable to determine the capacity of this battery, but am told that it approximates about one ton per day per stamp. I think this estimate is high. At the time of visit the mill was out of com-

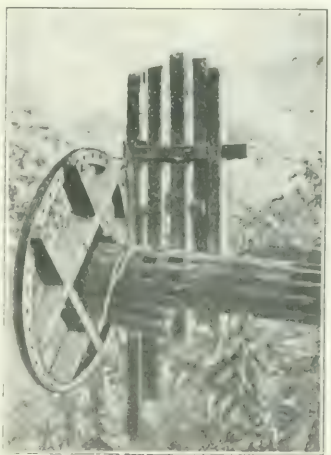


FIG. 2. STAMPS [illegible] MILL

mission and the ore was being reduced in a series of arrastras.

Construction of an Arrastra

Fig. 3 shows an arrastra in operation. An annulus 2 ft. deep and about 12 ft. in diameter is dug out, the walls supported by rough stonework and the bottom paved with flat-surfaced rocks. A tree trunk 10 in. in diameter is pivoted by an iron spike in the center and two radiating arms support the peripheral water wheel shown. A series of wooden vanes 12 in. apart, of the form shown in Fig. 4, are so arranged as to get the full force of the stream of water directed against them by the launder to one side. When once the arms are in motion, the water power is sufficient to keep the arms revolving, but to start it human power is often necessary. From the central axis two arms are attached to

*Mining engineer, Los Angeles, Cal.

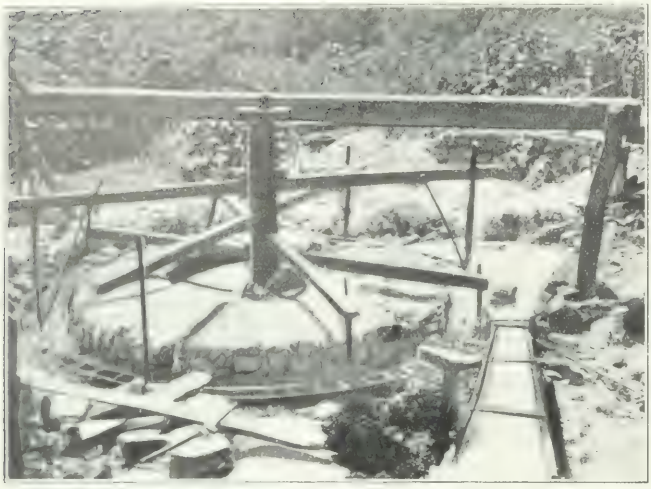


FIG. 3. ARRASTRA WITH WATER WHEEL DRIVE.

FIG. 4. BUCKETS OF HORIZONTAL WHEEL DRIVING ARRASTRA.

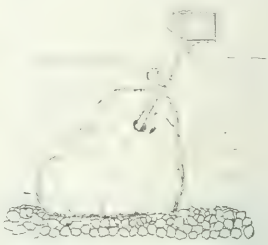


FIG. 5. MULLER OF ARRASTRA.

carry the mullers. Two suitable rocks, each weighing about 600 lb., and about 18x18 in. square, are placed in the pit, holes drilled in the upper surface, tough wooden spikes inserted and lashed by rawhide thongs to the arms. The method of attachment is shown in Fig. 5.

A rough frame work supports the central axis. Ore is shoveled into the pit, a little quicksilver fed on the bed and the material is slowly ground. About 10 *cargas* of 300 lb. each are crushed per day of 24 hours. The pulp is washed through a sluice gate and allowed to settle in a settling pond.

THE PLANILLA CONCENTRATOR

From the settling ponds the pulp is taken to one or other of two machines. The *planilla* is as crude an appliance for the concentration of metallic contents of an ore as can be imagined. It consists of a wooden floor about 6 ft. long by 4 ft. wide, having an inclination of about one in twelve. The sides and head piece are of rough boards.

The pulp from the arrastras is shoveled upon the upper end of the floor, and the *planillero* or operator, seated at the front end, facing the pulp, slowly washes out the values. He does this by throwing water from a small pool at his side by means of a horn spoon. There is some skill required even for this work: a peculiar wrist motion makes the water take a curved path across the table. The siliceous contents of the pulp flow off at the bottom of the floor with the water and the heavier metalliferous particles cling tenaciously to the upper end as concentrates. About 1200 lb. per day of twelve hours are treated and a concentration of 100 into 2½ is obtained. An analysis of the concentrates follows:

ANALYSIS OF CONCENTRATES FROM THE PLANILLA.

Silver	25.880	parts per 1000.
Gold	120	grams per kg.
Silica	48.2	per cent.
Iron	20.9	per cent.
Sulphur	22.0	per cent.

Another equally primitive concentrator is shown in Fig. 6. It resembles the old-fashioned Cornish buddle and no doubt this latter appliance was copied from it. It consists of a smooth rock bed, about 16 ft. in diameter, there being a drop of 6 in from the circumference to the center. A small cup-shaped well catches the tailings, from which they are carried off and allowed to run to waste. A wooden cylinder hollowed out from the Aliso tree, 2 ft. 6 in. in diameter, 3 ft. high and 2 in. thick, is supported on an iron pivot in the center, from the base of which a series of eight iron pipes 1 in. diameter, of unequal length, each fitted with a "rose" spray, distribute water over the bed. From a cross beam which revolves with the cylinder an ordinary gunnysack or strip of canvas is hung, which sweeps the pulp in a thin even stream over the floor. Human motive power is used. The concentrates are periodically cleaned up. A capacity of 40 cargas, or 12,000 lb. per day, is claimed, the concentration being about the same as in the *planilla*. The pulp from the arrastras is shoveled round the circumference of the bed, and the longest arm of the series of radiating pipes washes it upon the bed little by little.

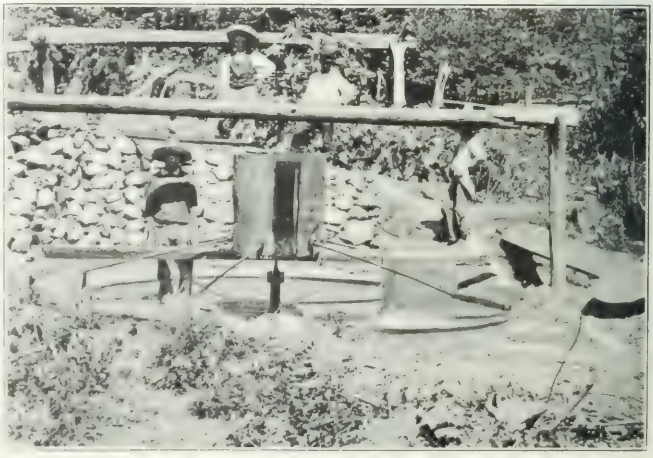


FIG. 6. ROUND TABLE CONCENTRATOR.

Heretical Vein Types in Sonora

BY F. L. H.*

Our neighboring State of Sonora is rich not only in mineralization, but also in the variety of its vein types. Many of its most important deposits depart so widely from the established rules which should be followed by well ordered veins that it may be helpful to the mining public to record some observations of the writer and the conclusions which he has formed.

While there are in Sonora many quartz veins carrying sulphide ores in what may be called a normal way, there are other types which are abundant and important and deserve full recognition.

One of the most important of these is the impregnated *shear zone*. Here we have a saturation of sheared or shattered rock in a zone of fracture and displacement, with metal-bearing solutions, without the normal accompaniment of quartz, calcite or other vein stone, such as is found in a normal vein carrying metallic ores. The writer has observed this feature in rocks of different types at many many places. Good examples may be seen at Planchas de Plata, in Magdalena, where the rock is a porphyry conglomerate and the impregnation, chloride of silver; at Las Animas, in Altar, where we have an impregnation of gold and copper in limestone, and at La Marina in the same district, where there is an impregnation of gold in sheared granite gneiss. I understand from Prof. S. F. Emmons that similar conditions occur in some of the orebodies at Cananea and Nacosari.

The subject is still new to investigation and more data are needed for a complete description, but it is clear that we have here a definite and important type which the writer proposes in the near future to make the subject of detailed study and discussion. The point of interest to the miner is that no vein stone is present and consequently no very conspicuous surface evidence of the deposit. As a rule also there are no walls to the vein.

The term shear zone, as here used, is applied to areas in which the country rock is traversed by minute parallel fault fissures, only a few inches apart and without any open crevices which would hold foreign vein matter in appreciable quantity. The rock in the zone of fracture is usually much decomposed and altered by saturation with metalliferous solution.

A second important type is the barren quartz vein with rich impregnations in the inclosing country rock. The writer has seen several cases where ore deposits of importance occurred in this way. There are many large barren veins in Sonora, but few prospectors have had the necessary "nerve" to explore the inclosing country and develop such treasures as lie concealed.

There has been, however, one recent occurence which deserves attention; the development of a large and rich body of copper ore by prospectors who had the courage to tunnel 225 ft. into a mountain side without surface indications to guide them.

*Economic geologist and mining engineer, New York.

Geographic Nomenclature

The following important decisions relating to geographic names and their application were made by the United States Geographic Board, Feb. 6, 1907:

Cordilleras; the entire western mountain system of North America.

Rocky Mountains; the ranges of Montana, Idaho, Wyoming, Colorado, New Mexico, and western Texas.

Plateau region; the plateaus of Colorado river and its branches, limited on the east by the Rocky Mountains, on the west by the Wasatch range, and extending from the southern end of the Wasatch southwestward, southeastward, and eastward to the eastern boundary of Arizona, following the escarpment of the Colorado plateau, and including on the north the Green river basin.

Sierra Nevada; limited on the north by the gap south of Lassen peak, and on the south by Tehachepi pass.

Cascade range; limited on the south by the gap south of Lassen peak and extending northward into British Columbia.

Coast ranges; extend northward into Canada and southward into Lower California, and include all mountains west of Puget Sound and the Willamette, Sacramento, and San Joaquin valleys, and southwest of Mohave desert.

San Juan Mountains; include all the mountains of southwest Colorado south of Gunnison river, west of San Luis Valley, and east of the Rio Grande Southern Railroad.

Sangre de Cristo range; extends from Poncha pass, Colorado, to the neighborhood of Santa Fe, N. M., thus including the southern portion, locally known as the Culebra range.

Front range; includes on the north the Laramie range as far as the crossing of the North Platte, and on the south includes the Pikes Peak group.

Appalachian system; includes all the eastern mountains of the United States from Alabama to northern Maine.

Copper Deposits at Sleemanabad, India

Deposits of copper and lead ore have been discovered and are being developed by Burn & Co. and P. C. Dutt in the Jubbulpore district, Central Provinces, India, 1.5 miles from the Sleemanabad station of the East India Railway, and 40 miles from Jubbulpore. The minChalcopyrite, tetrahedrite, galena, pyrite and barytes, with the usual oxidized gossan accompanying these minerals.

The country rock consists of dolomite with occurrences of silicious slate and limestone of probably the same geological age as the Dharwar schists of the Kolar goldfields. The series forms a belt, with a maximum width of 7 miles, and extends for 20 miles in a northeast-southwest direction. Within this belt are the deposits at Sleemanabad.

Results of Prospecting

Seven veins uncovered have been on the property having a general strike of north, 7 deg. west, and a dip to the west of 75 deg.

A 12x8-ft. shaft was sunk on No. 1 vein to a depth of 70 ft., at which depth a 19-ft. crosscut intersected the lode. Drifts were run north and south for 50 ft., disclosing an average of 4 ft. of copper and iron pyrites disseminated through the vein rocks.

Diamond-drill exploration has proved the deposit for 800 ft. along the surface and to a vertical depth of 400 ft. A second vein, 56 ft. west of No. 1, has been explored by shallow pits for a distance of 160 ft., showing an average width of 3 ft. of copper and iron pyrites.

No. 2 and No. 3 veins have simply been uncovered. No. 5 has been opened to a depth of 45 ft. by a brick-lined shaft. At the outcrop considerable barytes was found which gave way to a conglomerate of slate, quartz, dolomite and barytes cemented together with copper pyrites and gray sulphide copper ore.

A shaft is also being sunk on vein No. 7, but the other veins on the property have not been explored.

It is stated that native labor is obtainable at the rate of from 5 to 8c. per day of nine hours for men, 4 to 5c. for women, and 3c. for boys and girls.

Coke costs £1 sterling per ton, delivered at Sleemanabad.

Antimony in New South Wales

Antimony mining in the Hillgrove and Metz districts, New South Wales, has been prosperous, says the *Australian Mining Standard*, Feb. 13, 1907. Other branches of mining have felt the shortage of labor owing to so many men being engaged in antimony mining. Two additional furnaces are being built and a suggestion is being made for the erection of a co-operative smelter. As high as £34 has been paid locally for the metal. Scheelite also is commanding high prices, over £100 being obtained in one instance. At Bowraville, too, antimony mining is progressing rapidly, and it is stated that there is room for 1000 men in this district alone.

Lead Deposits in Northern Kentucky

By R. B. Brinsmade*

The lead-fluorspar region of southwestern Kentucky is well known to geologists, but less familiar is the occurrence of workable lead veins in Owen and Henry counties within 50 miles of Cincinnati.

The countryside is hilly. Domes of 200 to 500 ft. high, separated by narrow creek beds at their bases, form the prevailing topography. The hill slopes are moderate, seldom exceeding 20 deg., and are covered with oak brush and blue grass, which give way under cultivation to the tobacco plant, as the locality is within the famous Burley tobacco region of northern Kentucky and southern Ohio.

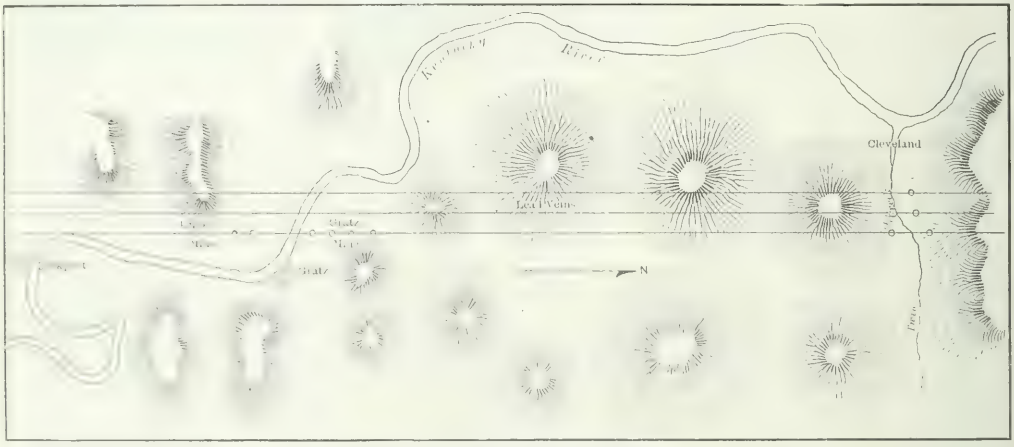


FIG. 1. MAP SHOWING POSITION OF LEAD MINES IN NORTHERN KENTUCKY

Geology of the District

The geological formation is the Cincinnati of the lower Silurian period and around the mines comprises a blue-gray limestone, horizontal and thinly bedded. There are three parallel veins 200 yards apart striking north and south at right angles to the Kentucky river about a mile below Gratz, in Owen county. The veins, indicated on the map, Fig. 1, have been traced to Lockport, 3 miles south and to Twin creek, 7 miles north, so that their known length is 10 miles, and their general character is the same, wherever explored.

The veins dip nearly vertically and vary in width from a few inches to as many feet at different points on the strike. At Lockport and Gratz only the most easterly vein has been worked, but at Twin creek there are openings on all three. The veins appear to be fissure cracks due to folding, and faulting, if it took place, must have been along the strike rather than along the dip. The filling is barite, calcite and galena; the first occurs in typical white or brownish orthorhombic prisms, the second in translucent white or yellow tablets, while the galena is in cubes, either in thin bands parallel to the walls or in isolated crystals often an inch in diameter.

The vein walls exhibit no slickensides or other signs of movement, but the filling is frozen to them as when first deposited. The absence of corrosion or other action peculiar to molten magmas and the well known solubility in hot aqueous solutions of barite, calcite and galena makes it unnecessary to go farther than water deposition as the source of the vein filling. The crystallized vein filling has few inclusions of wall rock, indicating that the fissure walls were firm at the time of deposition, but in places there are two or three mineral streaks in the limestone instead of the usual one.

The Workings

The vein outcrops at Lockport and Gratz were denuded by the Kentucky river and at their north ends by Twin creek and at these places, where mining has been done, the vein filling appears continuous along the strike, instead of in shoots as is common in this type of deposit. The showing varies, but is best in the Gratz mine on the first level, where the stoping is almost continuous for 500 ft. on a thickness varying from 6 in. to 6 ft. with an average of above 15 in. A 3 ft. width of stope, however, must be excavated for machine drilling and all the broken rock is run through the mill. Here on the 300-ft. level, the blue limestone rests on a fine-grained brown dolomite, and the vein is less regular, but sufficient depth has not yet been reached to determine what the permanent nature of the vein in the dolomite will be.

The Union was the first mine and was opened, during the high price of lead in the sixties, to a depth of 160 ft. With the rise of lead quotations 7 years ago prospecting was stimulated and the mines at Lockport and Twin creek started. The work at Lockport stopped when surface trenching to a depth of 15 ft. ceased to yield ore, but at Twin creek the Hoosier and other shafts were sunk and a small concentrater erected. As these failed to pay the machinery was sold and is now in use at the Union mill at Gratz. The part of the Gratz mine north of the Kentucky river was discovered by W. H. Miller and opened in 1900. A 325-ft. shaft has been sunk, a 100-ton concentrator has been erected. As the mill stands over the shaft, on a bluff about 200 ft. above the navigable Kentucky river, the transportation of coal, lumber and supplies, and the shipment of concentrates is cheaply effected. At the river is a duplex steam pump to lift water to the 12,000-gal. wood tank above the mill. A double-track surface tram, with independent steam hoist and balanced trucks, handles the freight from boat to mill.

Mining

The mine is opened by 3 levels, placed 100 ft. apart on the 5x8-ft. vertical shaft, that is only timbered through the surface soil. Hoisting is done by a steel bucket holding 800 lb. of ore, running without guides and detached from its ⅞-in. rope to rest on a truck for entering the drifts. The bucket is handled with a duplex 6x10-in. steam hoist and is dumped just in front of the mill crusher located at the shaft collar.

The power house for mine and mill comprises two 60-h.p. return-flue boilers of 44 in. diameter, which take their feed water from one side of a brick wall in a masonry cistern. The dirty river water enters the other side of this cistern, is filtered by the brick partition and then heated by the exhaust of the engines.

*Mining engineer, Socorro, N. M.

The mill engine is a 14x24-in. simple slide-valve engine of 120 h.p. The air compressor is a McGowan duplex of 8-drill capacity.

For drilling there are three 2¾-in. and one 2 in. Rand, a Little Jap and a 3¼ in. Ingersoll. The last is only used for shaft sinking from a tripod, the Little Jap for block-holing or squaring up, while the others are employed in drifting and stoping. The shaft sinking is by the usual center-cut and the drifting by the bottom-cut method, but the stoping system is unusual and is shown in section along the vein in Fig. 2.

Wooden chutes are placed at *a, b, c* and *d* from 40 to 50 ft. apart, and the stope bottom carried up hopper-shape, as shown, so as to leave pillars like *a b f* to protect the drift and to avoid the use of timber. These chute pillars can be finally recovered by underhand stoping. In order to save set-ups, the stope back is attacked by the sawtooth system. In stope 1—6 a

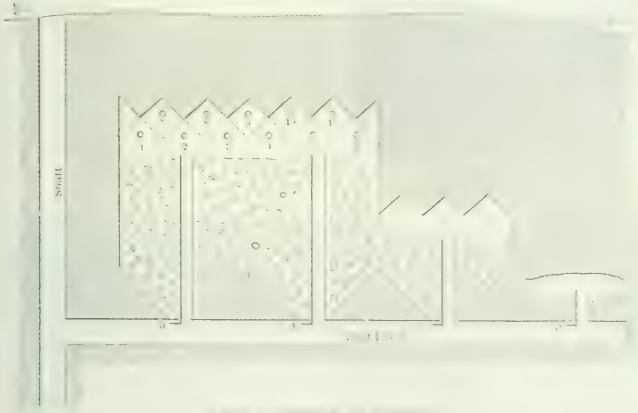


FIG. 2. METHOD OF STOPING.

3-ft. drill bar would be set up for a certain round only at points 1, 2 and 6, and the drill at 2 would bore two holes above and two holes below the bar in direction 2—7, and then four more in direction 2—8, or eight in all. Holes from points 3, 4, etc., would be put in similarly.

For the next upward round the bar would be set up at points 7, 8, 9, 10 and 11, with 8 holes to be bored from each. In this way all the holes are self-cleaning uppers and a 6-ft. depth can be reached without sticking. With the flat and down holes of usual overhand benches, the calcite cubes, chipped out, would tend to wedge the drill bit and cause delay.

Enough broken ore is left in the stope to support the men at the back, for whose ingress plank mainways *a-2, b-5*, etc., are carried up, with entrances next the chute gates. For stoping the 30 to 40 per cent. dynamite, used in development, has been replaced by 15 per cent., as the latter is slower and makes less galena fines for the mill. The mine only runs a 10-hour day shift and the drillmen only bore, all loading and firing being done by an extra gang at night.

Milling.

The mine ore without sorting is shoveled into a 14x24-in. Blake crusher, which discharges into 16x24-in. rolls. The latter feed a 12-in. rubber bucket-elevator, which lifts into an 8-ft. trommel with ⅜-in. round punched holes. The trommel oversize goes to a 5-ft. Huntington mill, but the undersize enters the roughing jig. This latter, like the finishing jig, has three 24x30-in. compartments fitted with cast-iron grate bars set crosswise and with slots ⅛ in. diameter at the top.

The tailing overflows the last compartment to waste, from which compartment only, is middling removed by side discharge into the Huntington mill. The hutch work descends to a 6-in. bucket-elevator to ascend to the finishing jig. On this latter the tails go to waste, but the hutchwork is concentrate with 78 per cent. lead, and is lifted by an 8-in. bucket elevator to a settling box for bagging and shipment.

The Huntington mill crushes through a 16-mesh screen and feeds 5 Woodbury Imperial tables on the floor below, without classification. These tables make only waste tailing and concentrate with 80 per cent. of lead. To run the mill at its capacity of 80 to 100 tons in 10 hrs. requires a hoisting engineer, a crusherman, a jigman (who also fires), and a roustabout. To mine enough ore for the mill shift takes about 25 men. The mill is crude and could undoubtedly be improved in capacity and saving by recrushing the first trommel oversize in rolls and by using classification before sending to the tables. As the barite is now in demand at a neighboring chemical works, it can be separated during milling by taking it off as middling on the jigs and tables.

The Union mill is a makeshift and the mine is only working a few men. The vein so far as opened is narrower than in the Gratz workings across the river, but like it the minimum vein thickness for profitable stoping will depend on prevailing economic conditions. The deposit as a whole will require careful supervision to be payable, even with lead at present prices.

Mining in Chihuahua

Vice-Consul C. M. Leonard reports that 1906 was a year of unusual prosperity in the Chihuahua district. Foreign capital principally from the United States, is flowing into the country in increasing amounts, large sums being invested in mines, timber lands, ranches, railroads, manufacturing and commercial enterprises, water-power schemes, etc.

Several zinc mines were opened during 1906, and are now producing regularly. Copper exists in great quantities in the western part of the State, and only awaits railroad transportation to make these mines available. Several new gold and silver mines have been discovered. Taxes on mining claims have been reduced to $6 silver per annum per claim of 2.47 acres up to 25 claims. All over that number are taxed at the rate of $3 each. A permanent mining exposition has been opened in Chihuahua, which is maintained by the State. It contains a great variety of specimen ores.

The Kansas City, Mexico & Orient Railroad, which is being built from the former city to Topolobampo, on the Pacific coast, passing through Chihuahua from east to west, is progressing satisfactorily. Recently 62 miles of road west of Minaca were completed and trains are now operated daily. Track is laid and trains run daily to a point 76 miles east of Chihuahua. This, with the Chihuahua & Pacific Railroad, which acts as a connecting link, gives the State a continuous railroad for a distace of 278 miles from east to west. The Kansas City, Mexico & Orient Railroad has also 62 miles of road completed and under operation from Topolobampo eastward. The road will pass through a mining district rich in gold, silver, and copper. From the terminus of the Guerrero valley extension of the Chihuahua & Pacific Railroad at Temosachic, the Cananea Consolidated Copper Company is building a narrow gage road to reach its timber district. This road will eventually be built through to connect with the Sierra Madre, Rio Grande & Pacific Railroad, giving that section a direct outlet to El Paso, Tex. A silver-lead smelter is being erected in Chihuahua which will have a capacity of 800 tons daily, and employ 500 men.

According to St. Petersburg journals, new goldfields have been discovered in the Troitsk district, on the Miassae river, also on the River Oke, about 46 versts from Okinsk.

Mathewson Furnaces at the Washoe Smelting Works

Anaconda Copper Mining Company, and

MATHEWSON FURNACE, WASHOE SMELTING WORKS

prepared by members of the staff, describes the blast furnaces of the Washoe plant. There are three furnaces, two of which are 51 ft. long and the other 87 ft. long, having a width of 56 in. at the tuyeres. The smaller furnaces have a capacity of 1600 tons, the larger 3000 tons of charge in 24 hours. The smaller furnace, here shown, is two jackets high and has water-jacketed crucibles. There are two points of discharge.

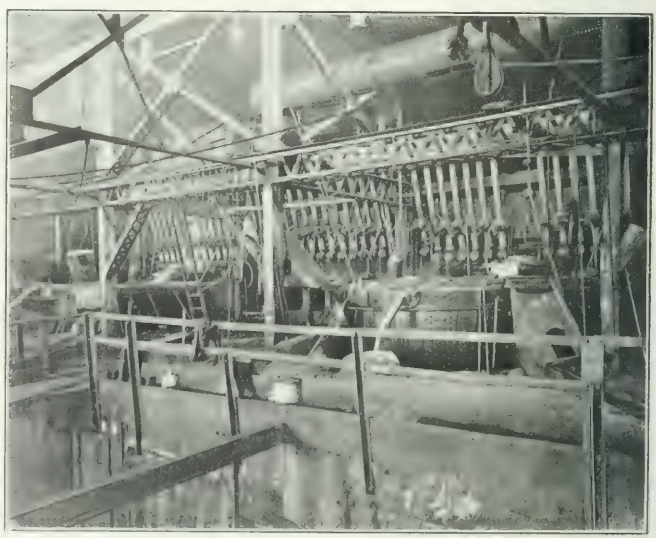
The bottom of the center of the furnace is of silica brick, laid on water-cooled cast-iron plates, mounted on cast-iron columns and has a gradual slope to each discharge spout. The 87-ft. furnace has three discharge spouts and three settlers, but is otherwise built in the same manner as the 51-ft. furnace. The 51-ft. furnace has eighty-eight 4-in. tuyeres, and the 87-ft. furnace, 150.

The type of furnace used is the Mathewson patent blast furnace. It has increased hearth area with but two ends to bind and hold the crusts. Any crusts forming on the sides can be readily removed by allowing the furnace to run down, the crust either dropping or being readily barred. It has smaller radiating surface for the same hearth area than the smaller furnaces, uses less coke, and makes a flexible unit. Any part of the furnace can be handled as the case demands, and is susceptible of repairs without shutting down the entire furnace. Leaking water jackets may be replaced without shutting down the furnace.

[illegible] from 6 to 8 hours to change a jacket. The procedure is to shut off the tuyeres on the jacket to be changed and the one opposite, allowing the water to circulate until all buckstays, tuyere pipes, etc., are removed, and the jacket ready to be pulled out; this chills a wall inside the jacket strong enough to hold the contents of the furnace. The new jacket is placed in position, all connections made and the blast turned on and smelting resumed. The entire end of one furnace has been shut down, jackets changed, furnace cleaned out and operations resumed, and during this time (from ten days to two weeks) the other half of the furnace was in operation.

The circulation of the water through the jackets is as follows: Each individual tier of jackets forms a complete set with two feed pipes and two discharge pipes. In the case of the tier at the crucible end, the feed enters the crucible jacket, the discharge from this going to the one immediately above, the discharge of this to the top jacket, from which it overflows to the waste pipe. The 51-ft. furnace has three 7-ft. 45-deg. unlined steel flues; the 87-ft. furnace has five. All the flues discharge into a large brick and steel dust chamber of the type adopted for the entire plant.

The furnaces are charged from both sides, the doors being raised by compressed air. A charge train consists of eighteen cars. The cars receive the weighed quantities of the various materials from storage bins placed in three rows and built of wood. Each row is 28 ft. wide, 786 ft. in length and 20 ft. deep, and is divided into a series of bins of various sizes as required by the volume of material handled. They serve to store first-class ore, coarse concentrates, lime rock, slum for briquetting, converter lining, etc., and are filled from tracks on top of the bins. All gates in bins used constantly are operated by compressed air.



FIFTY-ONE-FOOT BLAST FURNACE, WASHOE SMELTING WORKS

The charge train first takes its quota of slag, then ore, then coarse concentrates, then lime rock, then goes to the briquetting plant, where it receives its quota of briquets. Two charge cars constitute a charge, the weight of which varies from 8400 to 11,000 lb., according to its composition. The train when loaded is hauled

The slag and matte flow from the furnace through the discharge spouts into 16-ft. settlers. The settlers are circular and made of half-inch steel plates lined with 12-in. silica brick. The slag overflows and is granulated in water and carried in launders lined with cast iron to the dump. The matte is tapped from the settler into 10-ton, hot-metal ladles, and taken to the converter plant.

The Chicago Giant Rock Drill

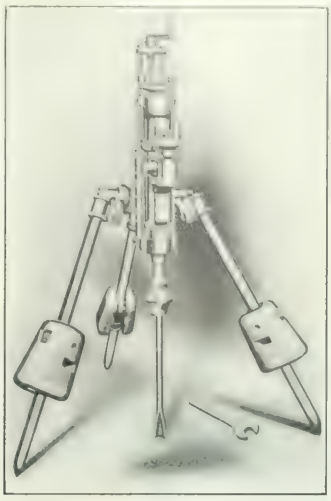
The Chicago Giant rock drill, manufactured by the Chicago Pneumatic Tool Company, has a shell of the adjustable type, constructed so as to provide for double side bearing for the cylinder. The shell caps are made to take up wear in two directions with one adjustment. A removable cylinder stop is also provided in the lower end of the shell, to prevent the cylinder from slipping out in case the feed screw should be run out of the feed nut. To remove the cylinder from the shell, all that is necessary is to remove the stop first, then by turning the feed screw to run the cylinder down in until the feed screw is out of the feed nut. This allows the cylinder to be slipped out of the shell without dismantling the machine.

The cylinder is cast from a special mixture, having a tensile strength of 35,000 to 38,000 lb. The upper end is extended to form a chamber for the rotating mechanism which is of the releasing type. Three parts are used, and the pawls are reversible. The ratchet is of one piece with the rotating or rifle bar, which is extended on its upper end to fit into a chamber or recess into the upper head; this provides for holding the rotating bar in a central position and relieves the rotating mechanism of side strains.

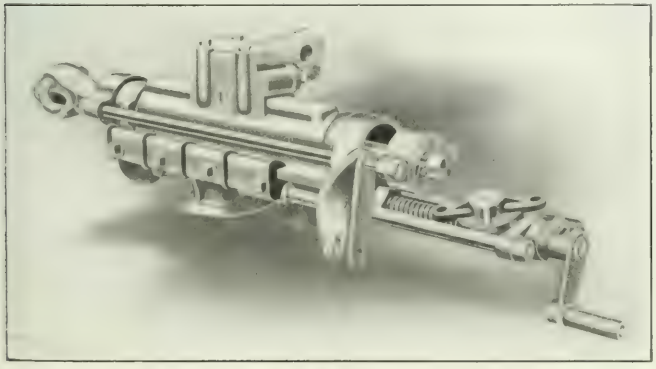
The valve motion is positive and is of the tappet or rocker type, modified to give a short stroke, the length of the stroke being at all times under the control of the operator. The supporting pin of the rocker works in renewable steel bushings and is completely inclosed, it being kept in place by caps easily removable but securely locked in place by the valve seat.

An oil-reservoir chamber is provided in the valve seat and communication is made between the oil reservoir and the interior of the valve chest. The oil is led through this channel into the chest where it mixes with the operating fluid and is carried by it into the interior of the machine. One filling of the oil reservoir lasts half a shift. In case the rotating mechanism should not receive sufficient lubrication from the interior, provision is made in the upper head for oiling.

The drill does its best and most economical work when operated by compressed air, but it is also a satisfactory machine when operated by steam.



CHICAGO GIANT ROCK DRILL.



CHICAGO GIANT ROCK DRILL UNMOUNTED.

Cost of Shaft Sinking at Bendigo

The cost of sinking the main shaft of the Victoria Quartz Company, at Bendigo, Queensland, from 4948 ft. vertical to 4300 ft., is published in the *London Mining Journal* as being £5 16s. per ft. W. Richard, the mine manager, reports: The cost per ft. is made up of the following items: Wages, 62s. 6d.; firewood, 25s.; timber, 13s. 3d.; explosives, 7s. 4d.; and sundries, 7s. 11d. The total cost of sinking 252 ft., £1461 15s. 2d. Two plats were cut at a cost of £81 4s. 2d. The great depths at which this work was carried out makes this statement of costs more than ordinarily interesting. The rock sunk through comprises hard slates and sandstones of Lower Silurian age. They are not so hard as the rocks in the unaltered zone at Kalgoorlie, but they do not blast so well as granites and rocks classed as greenstones. A comparison of their relative advantages is difficult to make, for even in the narrow limits of "The Golden Mile" at Kalgoorlie there are very great differences in the cost of mining in country on the eastern and on the western side of the belt, the advantage lying with those mines on the eastern side. In the Ballarat district, where the Lower Silurian series is uptitled at an angle of about 78 deg., such rocks blast very badly in shaft sinking and favorably in crosscutting.

Broken Hill Proprietary Company

Cable advices from Melbourne give particulars of the profits and progress of the Broken Hill Proprietary Company during the six months ended Nov. 30 last. The output was 2,413,066 oz. of silver, averaging 2s. 9.73d. per fine ounce, and 29,383 long tons of pig lead, averaging £16 5s. 5d. per ton. The net profit was £314,284. Developments on the 1200-ft. level are most satisfactory, the ore being equal in value to that found in the 1000-ft. level and the width of the body being greater. The ore reserves are estimated at 3,000,000 tons, which is a figure practically identical with that of two years and a half ago, when the last measurement was made. During that period 828,000 tons have been extracted. The amount raised during the last six months was 293,271 tons, which is an increase over the previous half year of 64,000 tons. The zinc concentration plant has worked satisfactorily and produced 32,181 tons of concentrates for the half-year. The erection of the spelter plant at Wanatah has been completed, but it is not yet in operation, as several modifications are required. The cabled report also refers to the results of the recent fire and combats the somewhat alarmist reports circulated. It is probable that a good deal of ground will still fall in the open cuts from this cause, but such falls will cause no inconvenience nor danger. Further than this no trouble is anticipated.

Peculiar Formations of the Mexican Arid Region

Water Is Not the Predominating Factor, and the Surface Geology Differs Widely from That of Humid Regions

BY ROBERT T. HILL

The two great American desert provinces of the Cordilleran region, which I have named the Chihuahua and the Sonora provinces, respectively, present many peculiar geologic formations. In fact the common, ordinary rocks appear so different in their surface aspects from those of the familiar humid region, that the traveler as well as the resident, is bewildered as to their names, their origin, and their classification.

The behavior of rocks under weathering in the arid regions, is, in general, entirely different from that observed in humid districts. A limestone, for instance, which in a semi-humid climate will slowly dissolve away under weathering, and leave its projecting fossils, in the arid region will crackle upon the surface into a breccia, weather into fantastic rain grooves called *karrenfelder,* become coated with travertine, or re-cement and re-crystallize, so that it appears as an entirely different material. Furthermore, rock waste is not carried to the sea, but is left upon the surface in new and puzzling formations.

In the present paper, a few of the more common of the aberrant formations of the desert regions will be described briefly, without going into extensive technical details.

Detrital Land-made Formations

While the marine sedimentaries and igneous rocks constitute the massive substructure of the Mexican plateau, superficial rocks occupy more extensive areas of outcrop. These materials, whether occurring as vast sheets of gravel, or gigantic sand-hills, like the Medanos of northern Chihuahua, or the flour dust of the Jiminez desert, or the reddish brown adobe clays of laguna sedimentation, or wind-blown *yeso,* are all derived from the decay of the mountains. Their extent and depth are surprising.

The deposits are sometimes consolidated and sometimes loose. They also include chemical incrustations and deposits of the type known as *caliche* and *tepetate.* These rocks as a class are the result of arid disintegration, oxidation and local transportation upon the surface, without reference to any common deposition level like the sea. They occupy all the vast stretches of desert plain between the mountains of the plateau, fill the ancient valleys, and even coat the surface of the lower slopes and valleys of the mountain rocks.

While some of these formations in Mexico are known by local names which to the inhabitants are sufficiently descriptive and recognizable, these names have not as yet been accepted by academic geologists.

Most of this material is the product of the atmospheric processes beginning with rock shattering from daily variations of the temperature followed by gravity, torrential transportation, and wind and chemical action from evaporation. The variation of temperature shatters the hardest rock, gravity, rain and wind move, grind, sort and redeposit it, while chemical action results in solution and redeposition.

The formations thus produced grade one into the other, and often extensive formations are found which are the product of all the processes mentioned.

Shatter Formations

In the arid regions, rock as well as water constantly seeks a lower level. Upon the summit and around the base of every mountain in arid Mexico, covering its slopes, may be seen great masses of angular, freshly-broken rock resembling in its angularity the freshly-cut macadam of the road-maker. Heated to intense temperatures by the midday sun, the massive rocks are likewise chilled by the cooling nights. As a result, the solid rocks are constantly being shattered into fragments.

Fragments of this kind remain in situ on the original surfaces until removed by torrents. When breaking from the edges and faces of the cliffs, the material in accordance with the laws of gravity rolls down the slopes and hills, and is sorted into different sizes.

The Wash

The torrential rains of Mexico, especially those which characterize the afternoons of the rainy season from June to December, falling upon a surface covered with shatter débris gathers up this material and carries it onward as gravel and sediment in great muddy sheet floods to lower levels. Some of the material is also dissolved and carried in solution by the waters. The angular breccia is still further broken, and partially rounded in its tempestuous travels before being redeposited. Upon reaching the plain, the ephemeral waters usually cease, through evaporation and imbibition.

Gravitational material thus gathered up and redeposited is known as "the wash." Where torrents run down a steep slope, dikes or ridges of waste are left on each side of the streamway, resembling the débris upon the banks of an artificial ditch. Great talus fans, or "deltas" of wash are also built up at the mouths of cañons.

The talus fans and ridges themselves are reattacked by cloudbursts and their material is removed over and over upon the lower plains. Thus the wash is being worked over and over by the desert atmosphere, and spread out in level sheets.

In its progress from the mountain cliff to the plain, the rock waste is being constantly reduced. Ultimately, much of it is ground into fine rock powder. Some of this is taken into solution, some is carried on to be redeposited as silt in lagoons, but much of it dries and is picked up by the wind, and retransported and redeposited as wind-made formations.

Laguna Formations

Some of the mountain torrents, instead of drying upon reaching a lower level, empty their muddy floods into shallow ephemeral lakes, known as *lagunas,* previously described in my geographical papers, and in which the fine rock powder is deposited in layers of silt. This silt is often laid down in great quantities, forming beds several feet in thickness in a single season. Upon the drying up of the temporary lakes in which it is deposited, this laguna material is subjected to the evaporation and transportation of the winds, and in most cases is picked up and redeposited. The Rio Grande, north of Presidio Del Norte was once a laguna stream, as is the Colorado of the West today. The old Laguna deposits are nearly 700 ft. thick near El Paso.

Aeolian or Wind-made Formations

The ultimate fate of all the projecting massive rocks which constitute the popularly supposed eternal mountains of Mexico is to be converted into fine adobe silt or sand, through the process of shattering, gravity and wash above described, filling up the valleys between the mountains, as the latter are degraded, and until ultimately the mountains are worn down to reach the common level of the plain.

The rock waste is constantly being ground into desert dust (rock powder) so well known to every traveler in the arid region. This dust travels extensively before finding a final abiding place. The strong winds constantly transport the finer rock material back and forth until it

of some desert vegetation, or friendly cliff.

In this manner, the materials filling the great valleys of the desert, ordinarily attributed to lacustral sedimentation, have been stratified until in some cases the bases of the adjacent mountains have been deeply buried. The individual wind formations are conspicuous and interesting phenomena, especially the mesquite mounds and the medanos.

The Mesquite Mounds

In traveling over the desert plains of

through the accumulation of sand by the branches, young bushes also spring up in miniature valleys between the hills, around which other hills are started. As a result, there is a general upward growth of the surface of the land by the wind-blown sand and dust collected around this

The Medanos

In northern Chihuahua, south of the city of El Paso, there is a vast area of sand hills resembling the dunes of Holland, and the New England and Virginia coasts. These sand hills rise, in

material is in the air, vast quantities of it have found lodgment in the adjacent plains of Coahuila and Zacatecas, constituting a rich soil exceedingly productive under irrigation.

Throughout Spanish America there are many popular terms used for important geological formations which, owing to their absence or inconspicuousness in European and North American countries, have received but little attention. Some of these names are of Indian origin and it is obviously impossible at present for the

LA BRISCA FORMATION, WESTERN CHIHUAHUA

new and old Mexico, extensive areas of low brown sand hills may be seen averaging in hight 4 or 5 ft., and seldom exceeding 30 ft. in diameter. From the tops and sides of these hills project the branches of the mesquite bush, while their sides are literally perforated with the holes of various burrowing animals. The switches which project at the top of these hills are the branches of the buried trees and are ever extending upward while the trunks (commonly miscalled roots) are constantly being buried and concealed by the sand.

While these hills

places, to hights of 200 ft. or more and are the most striking and conspicuous objects of the landscape. They represent the wind-brought débris from the vast stretches of plain to the south and west which finds lodgment against the mountains to the north and east.

Another interesting phase of the wind-made formations is the white soil of the "flour-dust" deserts in the vicinity of Torreon. Here the surrounding mountains are composed of almost pure limestone, which grinds into exceedingly white dust resembling flour. Although to the traveler, it seems that most of this

writer to enter into an etymological research as to their appropriateness.

Popular names as applied to rocks are based upon their physical qualities and not their mineral composition. As an illustration of this the word *dobe* (the American corruption of *adobe*) as shown in this article, is a name applied to any soft earth which has the power of cohesion upon drying, regardless of whether it is clay, lime or silica; just as the term marl is applied in the eastern States to the silicious glauconitic sand of New Jersey; while in Europe and the western United States it is used for calcareous or chalky

tate and many other names used in Spanish America for aberrant superficial materials are similarly confused by Spanish speaking people. Not only this but where Americans have invaded Spanish America they have still further confused these names and their application.

The local names of these substances are immaterial further than that it is always well to conform with local usage when possible. As I shall show, however, the names have been used to denominate a variety of the general phenomena.

Telpetate, *tepetate* and *tipetate* are va-

which is used in that city for mortar, cement and for building stone in the construction of buildings. In the present paper, in conformity with my previous usage, I shall continue to use the generic term *tepetate* for this class of deposit, although it may subsequently be found that it may be supplanted by a more specific one.

Formations of this general class become conspicuously notable as far north as the semi-humid plains of western Kansas. Throughout the western portion of the southern plain regions they form an extensive thickness of pan or subsoil, as

lime taken in solution from the hot mountain rocks is deposited upon the land instead of being carried to the ocean, as in humid regions, where precipitation is sufficient to carry the runoff and its solutions to the sea.

The results of the process in the arid regions are deposits of peculiar forms of carbonate of lime of a chalky color and various degrees of texture, from a loose marl to firm limestones and conglomerates.

Why *tepetate*, *'dobe*, and *caliche* assume the white, chalky texture, instead of being crystalline and translucent like travertine, stalactite and Mexican onyx, can-

EDGE OF TEPETATE OR CALICHE, EDGE OF RIO GRANDE VALLEY AND FRANKLIN MOUNTAINS

extensively for certain soft unconsolidated or semi-consolidated earths. In the volcanic regions of South and Central America, the name is applied to soft surface materials which are largely the oxidized soils and subsoils of volcanic ash, tuffs, lapilli, or even the decomposed residual material of massive ejecta. In fact, it is applied to nearly any material which has been transported or altered from its original place or condition.

I first encountered the word *tepetate* at Monterey, Mexico, where some twenty years ago I heard it applied to a type of the calcareous material herein described,

from Kansas, southwestward toward the Canadian river. They become increasingly conspicuous, and extensive as one travels southward through Mexico, until upon reaching the mountains and valleys of the southern part of the republic (notably around Irapuato, Chilpancingo and other places) their white and glaring colors constitute a most conspicuous feature of the landscape.

The whole story of the *tepetate-caliche* family of rocks, with the exception of the spring river *dobes*, is summed up by the fact that in the arid region of America, where precipitation is not sufficient to produce continuous runoff to the sea, the

not here be explained. Probably a solution of this query will be found in the conditions and rapidity of deposition relative to the air of the two groups of material. Stalactite, travertine and Mexican onyx are deposited very slowly in damp caverns, and hence their crystallization is more perfect. *Tepetate*, *caliche* and *'dobe* are rapid precipitates in the dryer arid atmosphere.

Caliche

Wherever one digs into the ground, or wherever the soil is removed by a railway at a drainage cut, throughout the southern extension of the great plains of Kan-

[illegible] desert plains of Arizona, one will observe a few feet below the surface a thick formation of white mortar-like lime, marl or limestone, very similar to the surface tepetate previously described, and which is commonly called *caliche* in northern Mexico and in Arizona.

Professor Blake defined caliche[1] as "a calcareous formation of considerable thickness and volume found a few inches or a few feet, below the surface-soil, upon the broad, dry gravelly plains and mesas of the arid region." He explains the origin of caliche "by the upward capillary flow of calcareous water induced by constant and rapid evaporation at the surface in a comparatively rainless region. Unlike ordinary travertine, it is the result not of descending but of ascending currents. The *caliche* is a fine example of the formation of an extension of calcareous strata in the midst of pre-existing beds, not by metasomatic processes, but by precipitation from sources below.

It is my belief that the *caliche* of this type described by Professor Blake, is deposited by descending as well as ascending solutions. In the arid region, the line of permanent saturation is very deep. The earth and rocks to a depth of several hundred feet are perfectly dry, pulverulent and porous. In such cases rainfall in proceeding downward merely wets the upper stratum of soil, and soon ceases by absorption and combination. At the lower line of visible saturation, calcium carbonate is given down as *caliche*.

CUTTING CANTERA, CHIHUAHUA

Tepetate of the Monterey Type

This form of limestone is the one which I have previously called *tepetate*, and its occurrence is so frequent and extensive in arid Mexico, as to constitute a conspicuous and noteworthy geological formation. It differs chiefly from *caliche* in the fact that there can be no doubt as to its superficial origin. In places this formation is a very thick and extensive, semi-indurated lime marl, coating the surface of the desert plains, especially around the margins of those Mexican deserts surrounded by limestone mountains. South of Saltillo, the constant accretion of this material around the margins of the desert is gradually encroaching upon the adobe soil from the mountains toward the centers of the valleys. The beds of this material thus deposited are conformable to the slight slopes of the margins and bottoms of the plains.

Many of the mountain masses of northern Mexico are composed of more or less pure Cretaceous limestones. These usually constitute the perimeters of great desert basins which themselves are of unconsolidated material. Besides the Cretaceous lime-rocks of the mountains, there are other lime-yielding formations.

The rainy season from July to October is marked by showers which usually fall upon the rock surfaces in the afternoon when they are hottest. The heat of the rocks undoubtedly favors solution which is likewise accelerated by the carbonic acid of the air and scant vegetation. As a result the runoff carries much carbonate of lime. Upon reaching the margin of the desert plains the runoff is usually dissipated through imbibition and evaporation and the accompanying carbonate of lime is redeposited in layers of white lime material on the surface, or in the interstices of the light loam soils and gravel, which become cemented by the lime matrix, frequently making fairly massive conglomerates, or upon flooding over sands, form grits with a calcareous matrix.

The tepetate of this type also frequently coats the edges of the strata occurring in cliffs so that they are so thoroughly calsomined that the stratification is often entirely concealed.

This is one of the factors which makes fossil finding so difficult in many excellent stratigraphic sections of the Mexican

[illegible] posited over the eroded slopes as blankets or sheets, especially in the form of deltas near the bases of mountains. At the copper mines near Jimulco, the whole lower face of the mountain is covered with this latter form of *tepetate*.

[illegible] the San Antonio Type

Still another type of the tepetate group are the spring river marls locally called *'dobe*, found along the Sabinas, in Mexico, and adjacent to the spring rivers of San Antonio, New Braunfels, Austin, and elsewhere, just east of the Balcones fault line, between the Colorado and the Rio Grande, in Texas.

These spring rivers are discharges of deep-seated underground waters, which have circulated sub-horizontally through many miles of limestone, and then vertically along fault planes through from 300 to 1000 ft. of limestone. They are heavily charged with bicarbonate of lime, and with carbonic acid gas. At the outlet of the springs, the water is of a beautiful azure hue, and the bottoms are covered with a dense mass of the most exquisite aquatic vegetation. A short distance below their origin, within a mile or so, the waters become cloudy and of increasing chalky color, and begin to deposit the contained lime.

The San Antonio river is one of the most conspicuous streams of this type. Its runoff in past times has migrated considerably as attested by the topography of its wide valley between outlying bluffs below San Antonio. Over the ancient flood plains is an extensive deposit of white or slightly cream-colored marl much indurated at the surface, but quite soft upon breaking through the crust.

This marl is mostly carbonate of lime with a slight mixture of clay and silica, constituting a white, chalk, marl-like material, which at Austin, San Marcus, New Braunfels, and San Antonio, is locally called *'dobe*, although in no manner similar to the clay adobes used for the making of unburnt brick. These deposits here attain a thickness of at least 25 feet.

It is dug down with pick and shovel, and is extensively used as a road material, possessing the peculiar quality of setting upon being moistened and rolled. Excellent highways and streets are constructed of this material.

An interesting phenomena accompanying the *'dobe* banks or quarries southeast of San Antonio along the outer margin of the river valley, are the so-called "gravel beds." This gravel averages about the size of a hen's egg, and is oval in shape. Instead of being rolled and water-worn stone, however, it consists of calcareous concretions composed of regular concentric layers of lime, which have developed *in situ* in the orignal marl, and which are constantly growing in size by the downward deposition of exterior layers from

[1] "The Caliche of Southern Arizona, an Example of Vadose Circulation," by Wm. P. Blake. E. & S. Trans. A. I. M. E., Richmond meeting.

the spasmodic circulation of water around them after each rainfall.

I have not yet had opportunity to make sufficient examination to determine the nature of the concretions further than the ascertainment of the fact that they are the gravel beds, so-called. At one place noted they were 10 to 12 ft. in thickness, and their resemblance to a bank water-worn gravel is at first very striking.

The quantity of *'dobe* thus deposited in the lower courses of the spring river of the San Antonio, is something enormous. At New Braunfels the divides of the Black Prairie, 80 ft. above the present runoff, and to a depth of 40 ft., are capped by this material, which extends for many miles down the river.

Mine Tepetate

Another interesting form of *tepetate* is that which often forms the gangue matter of the upper extension of some mineral veins. This, too, is usually a soft white earthen calcareous matter.

Not all of the precipitation which falls upon the hot mountain surfaces nor the lime taken in solution escapes as runoff, however, but much of it is disposed of by downward circulation through the cracks and fissures of the limestone, and is deposited at various depths therein. The wall rock and vein matter itself also decomposes into gouge called *jaboncilla*, and on drying developes a white efflorescent aspect. By these processes a *tepetate*-like material becomes the gangue of the upper extension of mineral veins, and is an important feature in mining, aiding the geologist to appreciate the extent of the zones of superficial leaching.

A simple illustration of the deposition of *tepetate* in fissures, joints and sedimentation and bedding planes is seen at the south end of Mt. Franklin in the suburbs of El Paso, Texas. Here the bed-rock consists of tilted Paleozoic limestones, which do not in themselves constitute good material for calcination. The cracks and fissures between them, however, are filled with *tepetate* which has been deposited by the circulation and evaporating waters and which is mined for its lime-making qualities.

The mine and fissure *tepetate* of this type are not to be confounded with the mine waste which is also called *tepetate* by the Mexican miners.

Jaboncilla

By far the most interesting and conspicuous of the altered rocks are the substances known as *jaboncilla* and *cantera*, both of which are alteration products of the great mantles of rhyolite and andesite so extensively found throughout the republic.

Jaboncilla, which is the Mexican word for soap-like, is applied by Mexican miners to the semi-decomposed condition of andesite or any other igneous rock which is encountered in the mine workings. The igneous rock is softened and decomposed *in situ* by ground moisture into a putty, or soap-like substance without losing the form of its original crystallization. Thus some of the rocks of this material which to the eye resemble porphyry can be as easily cut as cheese with ordinary tools. *Jaboncilla* has the property of indurating upon exposure to the air and moisture, as in the instance of the material known as *cantera*, next to be described.

Cantera

Throughout the mountains of Mexico, and especially in northern Chihuahua and Trans-Pecos, Texas, the western Sierras and Sonoran province, a peculiar material, which is known as *cantera*, is met. *Cantera* is a consolidated quartz-porphyry cinder or tuff, altered and softened (as noted by Kimball) by the influence of saturating ground waters, and which sets or consolidates on exposure to the air. It oxidizes brown upon the surface, but it is white before weathering. The city of Chihuahua is constructed of this material. In fact all of the beautiful florid architectural effects of Mexico, both of the aboriginal, the Spanish and the modern epochs are due to the ease with which *cantera* can be hewn when freshly quarried.

Agglomerate Formations of the La Brisca Type

Throughout the western Sierra Madre and the Sonoran province, there are vast superficial formations of volcanic agglomerate composed of a white material, clearly rhyolitic in nature, carrying slightly rounded pebbles and angular fragments of igneous rocks.

These formations weather into peculiar and striking forms, such as pinnacled cliffs, rounded domes, pillars, etc.

This formation occupies the outer margins of old valleys which it once filled, and below which the streams have since been cut to considerable depths. It is 500 ft. in thickness along the Aros and Tutuaca rivers of Chihuahua and the San Domingo river of Sonora. It belongs to a past, but recent, geologic period.

It is popularly supposed that the La Brisca represents ancient volcanic mud flows, but I, although my observations upon it have been extensive, must confess my inability, as yet, to explain it.

The California Mining Bureau

Special Correspondence

The Promotion Committee, of Nevada county, California, in advertising the mining resources of the county, intends placing a special exhibit of gold, ores, gravel, etc., in the museum of the State Mining Bureau, in the Union Ferry building, San Francisco. Thousands of people in search of information concerning mining visit the Mining bureau annually, and many go there who are not visitors to the interior counties. Since the earthquake of last April the Bureau museum and library have been completed, and the cases for specimens and books have been put in order, so that these places are again open. There is a very large collection of ores, etc., in the museum, all properly identified and labeled. This collection is arranged both by county and by character of ore. But special exhibits arranged by the respective counties, as proposed in the case of Nevada county, would add much to the value of the collection. Other counties could well follow the lead of Nevada in this direction.

State Geologists and Commissioners of Mines

In response to several requests, we print the following list of State geologists and commissioners of mines. In the cases of Arizona, Virginia, Washington and Wyoming, it is to be remarked that there are no appropriations from which the State geologists can obtain funds to carry on geological work. However, the commissioners of mines in Colorado, and the inspector of mines in Idaho have appropriations for the performance of the duties of their offices, while the State geologists of Arizona, Virginia and Wyoming are able to accomplish important geological work.

STATE.	NAME AND ADDRESS.
Alabama...	Eug. A. Smith, University, Ala.
Arizona...	Wm. P. Blake, Tucson
California *a*	Lewis E. Aubury, San Francisco
Connecticut	Wm. N. Rice, Middletown
Colorado. *b*	E. Lyman White, Denver
Georgia....	W. S. Yeates, Atlanta
Idaho.... *c*	Robert N. Bell, Boise
Illinois....	H. Foster Bain, Urbana
Indiana....	W. S. Blatchley, Indianapolis
Iowa.....	Samuel Calvin, Iowa City
Kentucky..	C. J. Norwood, Lexington
Kansas....	Erasmus Haworth, Lawrence
Louisiana..	G. D. Harris, Ithaca, N. Y. and Baton Rouge, La
Mississippi.	A. F. Crider, Jackson
Michigan...	Alfred C. Lane, Lansing
Nebraska..	E. H. Barbour, Lincoln
N. Carolina	Jos. Hyde Pratt, Chapel Hill
N. Dakota.	A. G. Leonard, Grand Forks
Maine.....	L. A. Lee, Brunswick
Maryland..	Wm. Bullock Clark, Baltimore
New Jersey	H. B. Kümmel, Trenton
New York..	John M. Clark, Albany
Missouri...	E. R. Buckley, Rolla
Ohio.....	J. A. Bownocker, Columbus
Oklahoma..	A. H. VanVleet, Norman
S. Carolina	Earle C. Sloan, Charleston
S. Dakota.	E. C. Perisho, Vermilion
Vermont...	G. H. Perkins, Burlington
Virginia...	Thos. L. Watson, Blacksburg
Washington	Henry Landes, Seattle
W. Virginia	I. C. White, Morgantown
Wisconsin..	E. A. Birge, Madison
Wyoming..	H. C. Beeler, Cheyenne

a State mineralogist; *b* commissioner of mines; *c* State inspector of mines.

Flux for Lead Dross

A flux for reducing lead dross in a crucible is given in *Metal Industry*, March, 1907. Soda ash and charcoal are mostly used on account of the small cost. A satisfactory flux consists of soda ash, 25 parts; pearl ash (carbonate of potash), 7 parts; finely ground charcoal, 2 parts. Mix thoroughly one part dross and two parts flux, and heat in good, bright fire till fusion becomes quiet.

The Mineralization of Mexico

By F. J. H. Merrill*

The results of nearly four centuries of gold and silver mining in Mexico show that its mineral zones are among the richest in the world, and that some of its silver veins have, for a time, exceeded all others in productivity. It is therefore of interest to review briefly the geologic conditions under which its mineral wealth occurs, and to determine what broad conclusions may be drawn concerning them.

Prospecting has been carried on industriously in Mexico ever since the conquest, and probably most existing veins have at some time been examined to some extent, though various circumstances have caused many comparatively rich deposits to be left untouched. We are therefore justified in assuming that the mineral deposits are sufficiently well known to permit us to generalize on their distribution, and to form some conclusions about the general conditions of their occurrence.

Distribution of Veins

Mineral veins are most abundant along the western range of the Sierra Madre, which is nearly parallel to the eastern range as far south as 20 deg. lat., where it changes its course to east-by-south and meets the eastern range in the region of Puebla, inclosing between its branches and the national boundary to the north an irregular trapezoid with a width from east to west of about 400 miles and a length of about 1000 miles.

While mineral veins are most numerous in the western mountain range, the largest and richest veins have been found in the plateau region between the two main ranges. This condition may be regarded as indicating that the general supply of ore-making material was nearly uniform, but that along the principal mountain axes the number of fissures was greater, so that the mineralizing forces were divided; while in the less disturbed zone between the main ranges the fissures were less frequent and possibly the country rock more favorable to the formation of large orebodies.

Observations on the geology of these deposits have been accumulating for about 100 years, from the time of Humboldt's visit in 1804, to the present day. The mineral veins occur (if we may credit the mass of testimony on record) always and exclusively in some association with volcanic rocks. The ore deposits are of various kinds, influenced by the rocks in which they have been formed.

Nature of the Rocks

The prevailing country rocks in Mexico are of three principal types: 1, old granites, gneisses and schists; 2, sedimentary limestones, sandstones and shales or slates; 3, volcanic rocks of several species regarded as mainly Tertiary. In all of these types true veins occur. In the limestones (owing to their solubility and greater susceptibility to mineralizing solutions), there are also large cave deposits which are in part replacements, and various contact deposits formed at the margin of igneous intrusions.

So far as my personal observation and access to literature have permitted me to form an opinion, there is no metalliferous deposit in Mexico without some relation to volcanic rocks. To make a perfect demonstration on this point, and to show that the existing relations in this connection are all causative and not accidental, involve an extensive campaign of observation, comparison and record. The needs of science and of commerce demand such a systematic study and render it of the utmost importance and value.

Eruptive Rocks and Ore Deposits

It would be out of place here to develop arguments on the origin of ore deposits, and to trace the possible, or probable, influences of volcanic action in stimulating circulation and deposition by atmospheric or magmatic waters. The field of argumentative discourse on this subject is still well occupied. Turning therefore from the question of the relation between ore deposits and eruptive rocks, we may consider the relation of the orebodies to the country rocks in which they occur.

Gold, when unaccompanied by silver, is found mainly in the crystalline gneisses and schists which outcrop in the low country toward the Pacific coast. Through Sonora, Sinaloa, Michoacan, Guerrero and Oaxaca, outward from the eruptive zone of the Sierra Madre and below the levels of outcrop of the Mesozoic rocks over which the great volcanic sheets have been spread, is uncovered an old series of schistose crystalline rocks in which are many rich veins of gold. Too little is known to permit one to generalize on the reasons for this concentration or to speculate on the origin of the gold which occurs in the veins of other terranes associated with silver or copper. A larger volume of facts is needed.

There is, however, one broad conclusion to be drawn concerning the distribution of mineralization, to which allusion has been already made, namely, that the *largest deposits* of the precious metals *are in the Mesozoic sediments* of the central plateau of Mexico; and, while an abundance of eruptive dikes and other small intrusions suggest the relation of volcanic influences, the very large orebodies are mainly in the Cretaceous limestones and shales or slates.

Limestones inclose the great silver deposits of Santa Eulalia, Sierra Mojada, Sombrerete, Fresnillo, Catorce and Zimapan. Shales and slates inclose the bonanzas of Guanajuato,† Zacatecas and Sultepec. The rich veins in andesite of Real del Monte show that not even a change of terrane could overcome the intense mineralizing force at work in this central plateau region. In the great eruptive zone of the western Sierra Madre, where the Mesozoic sediments are largely covered by Tertiary lava flows, the mineralization has penetrated the andesites, to be covered at many points by later flows of rhyolite. Who can say that far down beneath the volcanic mountain masses of these western ranges there may not be in the buried Cretaceous beds treasure caves and bonanzas wholly out of sight at present, but perhaps in store for a future generation?

*Economic geologist and mining engineer, New York City.

†The age of the slates [illegible] is undetermined through lack of fossils.

Bichromate Titration for Iron

L. Brandt states (*Zeit. anal. Chem.*, 1906, XLV, 95-99) that the determination of iron by titration with bichromate solution, diphenylcarbohydrazide has the advantage over other indicators of being used in the titrating vessel, and not outside it. The method is as follows: To about 1.5 liters of water in a capacious dish are added 60—80 c.c. of dilute hydrochloric acid (sp.gr. 1.12) and 100 c.c. of a solution containing 10 grams of manganese sulphate, 55 c.c. of dilute sulphuric acid, 1:3, and 5 c.c. of phosphoric acid of sp.gr. 1.7. The iron solution which should contain 0.2—0.5 gram of iron, and 5 c.c. of a 0.1 per cent. solution of the indicator are further added, and the titration with bichromate performed. There is, at first, a bright red-violet color which finally changes sharply to the green of chromic chloride. The indicator may also be employed in the determination of chromic acid, an excess of standard ferrous ammonium sulphate solution being added, and the process completed as above described. The solution of the indicator in acetic acid should be prepared fresh every few days.

Life of Wooden Pipe Lines

D. C. Henny reports in the *Engineering Record* (March 23, 1907) that a woodstave pipe line in Southern California, where it is exposed to atmospheric conditions more destructive than usual, required in ten or eleven years' service, the renewal of 11 per cent. of its staves and the reconstruction of 5½ per cent. of its total length. Wood pipes with earth covering laid in Butte, Mont., in 1892, subsequently have not required, according to Eugene Carroll, any replacing of staves except in one case where the earth covering was not compact.

Geology of the Buck Mountain Coal Bed

Different Degrees of Inclination Render It Necessary to Use All Methods of Anthracite Mining at the St. Clair Colliery

BY HARRY W. ALTHOUSE*

The St. Clair Coal Company operates the Buck Mountain coal bed lying at the top of the Pottsville series No. XII, of the Lykens coal measures, the basal member of the Lower Productive Coal series. The formation is a monocline for about three miles along the lowest levels of the Buck Mountain bed. Above this coal seam the north dip of the basin is inverted in the overlying coal measures comprising the Skidmore and Mammoth veins.

SURFACE PLANT, ST. CLAIR COLLIERY, ST. CLAIR, PENN.

The Coal Basins

The Mill Creek gap, cutting directly across the basin at right angles to the strike, equally divides the mine workings in the upper measures. This basin, locally, is a portion of the Mine Hill syncline extending along the southern base of a westward spur from the Broad Mountain. Along this slope the coal seams outcrop to the east. Westward some distance from the gap the Buck Mountain bed seeks cover, and arches within the mountain crest, rolling over and joining the New Castle-Heckersville basin lying to the northward. Farther westward, and in the lowest elevations of the coal bed, the seam almost merges with the Wadesville basin to the southward. East from this point, along the trend of inversion, the deposition of the Buck Mountain coal bed did not occur, as there is no continuity with the same bed directly to the southward in the Pine Forest—Wadesville basin, although the rocks show regularly the stratagraphic succession. This is probably owing to the lack of deposition occasioned by sea currents or tidal influences upon the sedimentation from the littoral deposits of a subsiding sea coast, or more likely from the deep-sea scouring resulting from the undertow across a submarine longitudinal elevation during a local subsidence of the sea floor on either side. This, however, did not affect the laying down of the Mammoth bed, 25 to 45 ft. in thickness, and geologically 275 ft. above the Buck Mountain, as by that time the influences had been sufficiently minimized or entirely removed, at any rate, so as not to have affected the continuation of the formation in some of its coal deposition, if not all of it.

Methods of Working

This basin in the coal bed worked, and particularly along the south dip, has much the shape of a canoe, while the other side, or north dip, is entirely missing.

*Mining engineer and geologist, Pottsville, Pa.

Beginning with an inclination of 25 deg., then increasing to 35, 45, 50, 60 and 75 deg., and still farther eastward to 90 deg., afterward inverting, then gradually decreasing in about the same manner, until finally a pitch of only 5 deg. is reached. Thus it will be observed that the basin becomes comparatively flat, so to speak, and presents all of the various methods that are employed for attacking the coal in the anthracite fields, consisting of slopes, shafts and drifts, and employing pitching or horizontal workings, using [illegible] car breasts as a means for winning the coal.

West of the Mine Hill Gap the mine workings load the coal by gravity from chute breasts on gangways. This is also the case to the eastward in the extreme upper levels, but elsewhere the coal is loaded by hand, the cars usually running into the breasts from lifts or entries opened at stated intervals as in the bituminous regions, excepting that these gangways follow a 1 per cent. contour in favor of haulage and drainage without the least regard to direction, and the breasts are driven diagonally across or square with the inclination of the seam as may best suit the purpose.

The mine workings at the Gap are operated by means of a single-track steam slope, about 1500 ft. long, having an inclination of 25 deg. across a pitch of 45 deg., and was sunk to the southeast. From the bottom of this main slope, a single-track inside slope, operated by electric hoist, nearly 1500 ft. in length, and on a pitch of about 14 deg., nearly square with the dip of the coal bed, reaches the extreme lowest limit of the Buck Mountain bed, thus making for the two slopes a combined lift of 780 ft. in vertical hight. From near the top of this underground slope, to the eastward, the formation is nearly flat, inclining 3 to 8 deg., and is worked by means of an inside plane operated by electricity.

The shaft workings, two miles east of the Mill Creek Gap, have not yet connected with the above slope workings, the coal being transported over the surface by steam locomotives on a continuous down grade of 3.2 per cent. The shaft is about 187 ft. in depth, and from near the bottom of it an inside single-track slope, 2000 ft. long, pitching about 8 deg., and in a westward direction, is operated by means of a rope hole to surface steam winding engines. From near the top of this inside slope a single-track inside plane, operated by electricity, was driven to the eastward, and about 1700 ft. long on a pitch of about 9 deg. From near this point, a water-level tunnel, 850 ft. long, was driven from both ends in order to relieve the shaft workings of all the coal above this tunnel level. From near this locality, another inside plane, single track, operated by electricity, has been driven eastward a distance of 1800 ft. on a pitch of nearly 6 deg. This plane may eventually attain a length of 3000 ft., which, with the present workings, makes a continuous system of planes and slopes of approximately 6700 feet.

SECTION, LOOKING EAST, ST. CLAIR COAL COMPANY, ST. CLAIR, PENN.

Lithology of the District

The rocks are entirely sedimentary in character and comprise arenaceous and argilaceous sandstones, with one exception, where in the Mammoth formation a trace of a calcareous deposit in the form of small shells and several concretionary masses were observed. These rocks consist of conglomerates, sandstones, shales, slates, fire-clays, and argillaceous sandstone, also as cited above, a calcareous deposit containing small shells, and many nodular concretions above the Mammoth bed, but not below it. The color varies from almost white, this with respect to the rocks, then to gray, and almost black below the Mammoth coal bed, but above this formation from light gray to almost black, buff, brown, yellow, brownish red, to nearly red and even pink.

In the very deep portions of the basin, and in the higher elevations to the eastward where the coal bed is more regular, and of greater thickness, the composition of the top is overlaid with a very hard black slate.

Higher up, where less regularity exists in the vein structure, the top is composed of an exceedingly hard, compact sandstone, which appears to show indications of metamorphism, while still higher the material forming the top of the Buck Mountain bed is very rough, coarse and uneven, and is composed mostly of conglomerate. At certain localities only, and where the sandstone and conglomerates end, and at the point where the slate formation begins, the roof material overlying the coal is found to contain many varieties of fossil remnants of ferns and plants. This feature is nowhere noticeable except at certain places where a slate top exists over the coal bed.

This is, perhaps, owing to the depths in the sea which occasioned the slate formation near the end of the deposition of this coal bed, and probably as the transporting power of the waves, currents, and wind or tides, etc., had ceased to further exert its influence in distributing portions of the ferns and plants from land areas, or low-lying shores, or a subsiding sea coast, where the waves lashed the sands as at present along our Atlantic shore line, and this probably occurred after the coal bed had been deposited from the microscopic vegetal organisms or particles which then undoubtedly grew at or near the surface of the sea, and not on its bottom.

Position of the Group

This formation lies entirely within the [illegible] adopted for that portion of the Pennsylvanian group, and corresponds to the Al-

legheny and Kanawha formations, while that below it, the Pottsville series No. XII, 1100 ft. in thickness, containing the Lykens coal horizons, corresponds to the Pocahontas-New River formations. In this way we may correlate the Sewell and Pocahontas No. 5 coal beds of southern West Virginia, with the Lykens coal beds Nos. 2 and 3 of the Pottsville series. In like manner, the Pocahontas No. 3 or Fire Creek seam of West Virginia may be correlated with the Lykens coal bed No. 5 as developed within the Pottsville series No. XII of the southern anthracite coalfield.

Specific Gravity of Coal as a Measure of Purity

By M. S. Hachita*

The specific gravity of coal is largely influenced by the quality of the fuel and the locality in which it is found. In some instances the coal will have a specific gravity of 0.5, while in other cases, as shown in Table I, the specific gravity will amount to 1.9. It is seldom possible to obtain satisfactory results when only a portion of the seam is taken, since this does not represent the whole vein unless the latter is entirely homogeneous. It is rarely the case that a coal bed is uniform in composition, for as a general rule, slate and bony partings occur with the coal measures.

TABLE I.

Name	Specific Gravity.
Lignite or brown coal	0.5 to 1.5
Intermediate or wax coal	0.9
Bituminous coal	1.2 to 1.35
Semi-bituminous coal	1.3 to 1.45
Semi-anthracite	1.4 to 1.50
Anthracite	1.45 to 1.70
Meta-anthracite	1.70 to 1.90

Sampling

In the process of sedimentation, the slate or mud was mixed with coal, resulting in the formation of bone. The amount of these impurities in a coal seam differs in various parts of a section, so that in determining the specific gravity, several samples must be taken at different points in the face. In accomplishing this result, the samples should be collected wherever there are physical irregularities in the appearance of the seam; each sample representing that portion of the vein which is homogeneous. As a consequence of this condition, the thickness of those parts which are represented by the samples must enter as the weight for the calculation of the specific gravity.

If we take the "C" vein in the Table II, where the samples are numbered 1, 2, 3, etc., in the second column is found the thickness of the samples; the succeeding columns show the measured strata, the specific gravity, and the products of the specific gravity, and the thickness of the stratum. The sum of the products divided by the total thickness of the "C" seam gives the mean specific gravity of the vein, Table III.

TABLE III. MEAN SPECIFIC GRAVITY OF 12 SAMPLES

1, C, with bone and slate	1.586
2, B, with bone and slate	1.759
3, A, with bone and slate	1.686
4, C, with bone only	1.541
5, B, with bone only	1.589
6, A, with bone only	1.686
7, C, without impurities	1.488
8, B, without impurities	1.510
9, A, without impurities	1.493
10, A, B and C, with slate and bone	1.681
11, A, B and C, with bone only	1.618
12, A, B and C, without impurities	1.495

To show the results in Table II graphically, I have plotted the specific gravity on the abscissa and the thickness on the ordinate, Fig. 1. From this diagram the extent and nature of the impurities in the different seams are readily evident.

TABLE II

Vein	No.	Thickness.	Strata.	Specific Gravity.	Specific Gravity Multiplied by Thickness.	Products Excluding Slate.	Products Excluding Slate and Bone.
	1		Sandstone.	2.829			
	2	0.2	Bone.	1.931	.3862	.3862	
	3	1.0	Coal.	1.482	1.4820	1.4820	1.4820
	4	0.4	Bone.	1.652	.6608	.6608	
	5	0.2	Slate.	2.372	.4744		
C Vein.	6	0.7	Coal.	1.496	1.0472	1.0472	1.0472
	7	0.3	Bone.	1.594	.4782	.4782	
	8	0.9	Coal.	1.487	1.3383	1.3383	1.3383.
	9	3.0	Slate.	2.625	5.8671	5.3927	3.8675
	10	50.0	Sandstone.	2.899			
	11	0.3	Coal.	1.542	.4626	.4626	.4626
	12	0.1	Slate.	2.454	.2454		
	13	0.3	Coal.	1.545	.4635	.4635	.4635
B Vein.	14	0.5½	Slate	2.700	1.4850		
	15	0.2½	Coal.	1.508	.3770	.3770	.3770
	16	1.1	Bone.	1.733	1.9930	1.9930	
	17	0.9	Coal.	1.500	1.4250	1.4250	1.4250
	18	0.2	Bone.	1.585	.3170	.3170	
	19	0.3	Coal.	1.477	.4431	.4431	.4431
	20	0.2	Slate.	2.800	7.2116	5.4812	3.1712
	21	0.2	Bone.	1.650			
	*22	2.5	Fire Clay.	2.661			
	23	3.0	Fire Clay.	2.601			
	24	0.9	Coal.	1.515	1.3625	1.3635	1.3635
	25	0.1	Bone.	1.849	.1849	.1849	
	26	0.2	Coal.	1.500	.3750	.3750	.3750
A Vein.	27	1.5	Bone.	1.970	3.0535	3.0535	
	28	1.2	Coal.	1.481	1.7772	1.7772	1.7772
	28	0.7	Coal.	1.484	1.0388	1.0388	1.0388
	28	0.5	Coal.	1.489	.7445	.7445	.7445
	29	0.5	Bone.	2.143	1.0715	1.0715	
	7.30		Sandstone.	2.713	9.6089	9.6089	5.2990

*150 ft. sand stone stratum between 22 and 23.

By consulting Table II, it will be noticed that there are many varieties of bone whose specific gravities vary from 1.585 as in No. 18 to 2.143 as in No. 29. The bone of No. 18 is more highly carbonized than that of the No. 29 class, therefore we cannot consider that No. 18 and No. 29 bones are of the same quality, nor can we afford to ignore this fact.

Practical Application

To find how much of No. 18 is combustible matter and how much ash is not an easy matter unless we make a chemical analysis. But if we want to know approximately how much of this is coal and how much ash, it becomes a simple matter providing we know the mean specific gravities of the seam and the earthy portions contained. In Table II, take No. 4 for an example; its specific gravity is 1.652, while the average of No. 1 and No. 9 is 2.728. Now let X equal weight of that portion of No. 4, which is coal. Then $(1-X)$ equals the remaining portion of No. 4, which is earthy matter. The sum of the products of the weight of coal in No. 4 times its specific gravity, which is 1.488, (see Table III), and the weight of the earthy matter in No. 4 times its specific gravity, which is 2.728, gives the specific gravity of sample No. 4, that is: $1.488\ X + (1-X)\ 2.728 = 1.652$. Solving the equation for X, we have

$$X \frac{1.076}{1.240} = 0.8677+,$$

or bone No. 4 contains 86.77 per cent. of coal and 13.23 per cent. of earthy matter. In the same way, it has been found that No. 29 contains 47.18 per cent. of coal, and 52.82 per cent. of earthy matter.

Tests with Small Sizes

From these results we can readily see that bone No. 4 is almost twice as rich in coal as the sample No. 29. In other words No. 4 is almost as good as coal. In this connection, I have made tests with small sizes of coal. A 20-lb. sample of pea, and 10-lb. sample each of buck, rice and barley, were treated; the results of calculations as above are shown in Table IV.

TABLE IV.

Sample.	Weight of Coal in Air, lb.	Weight of Coal in Water, lb.	Specific Gravity.	Earthy Matter Over Normal Per Cent. of Ash.
Pea	20	10 1/8	1.589	4.11
Buck	10	3 3/16	1.509	1.69
Rice	10	3 10 1/2 16	1.576	7.10
Barley	10	3 9 1/2 16	1.562	5.97

*District engineer, Lehigh Valley Coal Company, Wilkes-Barre, Penn.

This method of the physical analysis of small sizes of coal is valuable, as it gives quick results, and can be done anywhere with little or no expense for apparatus. The only necessary equipment consists of an ordinary spring balance, two dish pans and a tub of water large enough to hold the pan. Only a little skill is required in securing the results. A general arrangement of the apparatus is shown in Fig. 3.

The Jolly Balance

In determining the specific gravity of

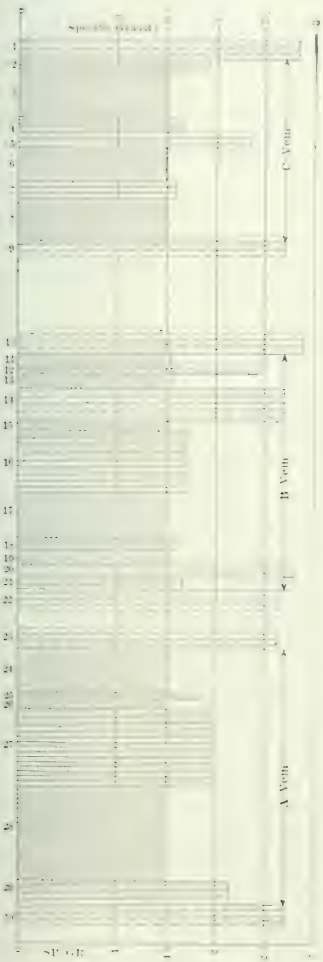


FIG. 1. GRAPHIC DIAGRAM OF RESULTS IN TABLE II

the samples selected, and securing the results shown in Table II, I used a Jolly's balance, as the size of the samples was small. This apparatus is not generally used in the coal fields. It consists of a mirrored meter-stick *c*, shown in Fig. 2; No. 20 double watch-glass pans *f*; tumbler *h*, and lengthening rod *a*; the meter-stick *c* is firmly fastened in the screw tripod, *eee*.

In manipulating the apparatus, it is necessary to adjust the screws *eee* so that the meter-stick *c* stands vertical; then hang the wire spring *d* so that the spring and the meter-stick are parallel. Hang the watch glasses *f*, having the lower one under the water in *h*; then unscrew *d* so that you can either raise or lower the rod *a*, until the index *b* is about 5 in. below the upper end of the meter-stick, by moving the platform *m*, which slides along *c*. Then take the initial reading at the index *d* on the meter-stick; the line of sight in reading the graduations must be normal to the meter-stick.

The initial reading equals say 27 mm. Then unscrew *d* and lower *m* about 15 in.; after this, place a sample (about the size of a bean) on *f*, the upper pan; then move *m* until the lower pan is the same depth under the water as before, then read the graduations, say 125 mm. Remove the

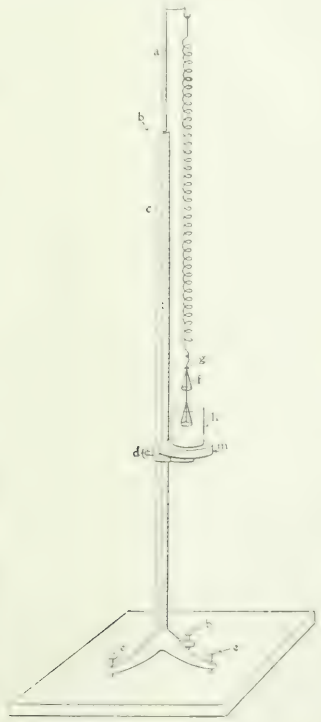


FIG. 2. THE JOLLY BALANCE

sample from the pan, and put it in the lower pan, which is in water; then raise *m* until the lower pan is submerged to the proper depth, and read the graduations as before, say 64 mm. The specific gravity of the sample may be calculated as follows:

$$Sp.\,Gr. = \frac{\text{weight in air}}{\text{loss of weight in water}}$$

$$\frac{125 - 27}{125 - 64} = \frac{98}{61} = 1.606$$

In determining the specific gravity of pea, buck, rice coals, etc., the samples taken are necessarily heavy and bulky, therefore we cannot satisfactorily use a Jolly's balance for this purpose. I would suggest for heavy samples the use of a spring balance and two pans as previously described.

The principles involved in the use of this apparatus are about the same as those

with the Jolly balance. The only difference is that resulting from the use of a spring balance instead of the wire spring, Fig. 2, and the reading on the balance is pounds instead of elongation. The calculation for specific gravity is identical whether we use elongation or pounds as the unit.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

The State of Arkansas produced 1,875,569 tons of coal in 1906, as compared with 1,071,144 tons in 1905.

The State of Pennsylvania has produced more than one-half the entire coal output of the United States during the past century.

The average temperature in the interior of [illegible] mines is about 57 deg. F., or practically the same as the average yearly temperature on the surface.

Careful observation seems to indicate that as a general rule, coal seams are thicker in the trough or depression, and thinner over the succeeding roll or hill.

One advantage that results from extracting the entire coal seam, and not generally considered, is that when the overlying strata breaks to the surface, any gases that may be contained in the measures are let out.

In rope haulage or hoisting it is always well to remember that when you double the speed you double the amount of wear on the rope; for this reason, where conditions will permit, it is better to increase the load than the speed.

In lighting coal mines it is found that [illegible] will produce about 180 c.p. with glow lamps and about 1000 c.p. with arc lamps. It is usual to allow ten to twelve 16-c.p. 60-watt glow lamps per i.h.p. at the engine of a generating set.

The mining laws of West Virginia, [illegible] have been revised, now make it [illegible] for any miner, after he has exploded 50 in. or more of powder in any one or more holes, to return to his room within 20 min. with a naked lamp.

In order to prevent the dangerous practice of stemming with coal dust, the various mine [illegible] have provided that in [illegible] where [illegible] for stemming cannot be secured, the operators be compelled to provide clay at [illegible]

At present, there are more than 50,000 mines in the United States; these mines of all kinds, use approximately $20,000,000 worth of timber each year. The timber used by the average bituminous coal mine each year costs $2170; the average expenditure for timber by each anthracite mine is $20,524.

In one of the large bituminous districts, during the past year, it is safe to say that several large companies have received a profit on their coal not exceeding 6c. per ton. Since this was a year of great [illegible] perity, it appears that the producing companies have not benefited in proportion to other similar industries.

Headgear pulleys should not be too heavy, or their tendency to continue revolving when the speed of the rope is being reduced will wear the rope. The usual diameter of a headgear pulley is 120 times the diameter of the rope. For underground haulage, a satisfactory figure for the minimum diameter is 50 times the diameter of the rope.

Firedamp explosions by shot firing in dangerous mines can be minimized by employing powerful detonators. The fulminating portion of the detonator should be properly inclosed, as only such caps as do not suffer leakage can be relied on. Another advantage gained by the employment of detonators is increased efficiency. It is estimated that the explosive force is increased as high as 10 per cent. by good detonation.

Wire ropes before use should be stored in a dry place, upon timbers, and oiled frequently. When not galvanized, protection should be applied in the form of a suitable grease free from ingredients which might cause corrosion. Any broken wires should be bent backward and forward until they break off at the point where they disappear into the rope; this is more satisfactory than to cut them off with a pair of pliers.

Recent experiments in England have shown that in order to lessen the smoke thrown off when domestic fires are first lighted it is only necessary to sprinkle powdered limestone from a small hand scoop on the surface of the fire. It is said that when this is done the diminution of smoke becomes instantly apparent, and in a few minutes the fire is clear and nearly smokeless, with a strong undercut. The powdered limestone can be obtained at trifling cost, and is quite clean in its application.

Approximately two thirds of all the accidents that occur in coal mines, result from falls of roof and sides. These figures show that accidents of this sort have largely increased during the past decade. This unfortunate condition seems to be largely the result of exploding heavy charges of powder, which often fractures the sides and roof of an entry or chamber, and from the use of mining machines which prevent proper timbering at the face, because when many posts are placed, it is difficult to move the machines about.

Practical experience shows that to generate the power for lighting a mine it is always best to have a separate dynamo and to use it for the purpose of lighting only. When the current for lighting purposes must be taken from power circuits, it should be remembered that about 250 volts is practically the highest with which any incandescent lamp will work successfully, and when a higher voltage is used, the lamps must either be run two or more in series or to employ a transformer. It should be remembered that when two or more lamps are run in series they cannot be lighted separately, but must be switched on or off all together.

That a careless engineman may ruin a wire rope by jerking when slack is present is practically and carefully demonstrated by recent dynamometer tests made in England by Cradock & Co., with the following results:

	Tons	Cwt.
Cage and 4 cars weighed by machine	5	1
Cage and 4 cars lifted gently.....	5	3
Cage and 4 cars lifted with 3-in. slack chain.....	3	10
Cage and 4 cars lifted with 6-in. slack chain.....	10	10
Cage and 4 cars lifted with 9-in. slack chain.....	12	10

One way to obviate the strain when starting to hoist is to mount the pulley pedestals upon springs similar to those of railway cars. One other method is to have a sleeve link, with a pin passing through it, placed between the cage and the cap; alternate layers of india rubber and sheet iron are threaded upon the pin and kept together by a double lock nut. The disks of rubber are compressed and the strain relieved when the load is lifted.

It is sometimes the custom to begin firing shots at the head of an entry and to continue lighting the shots against the air. When such shots are tamped on the fuse, which latter is cut different lengths, it is the common method to light many shots before any one explodes. Under these conditions, the shots may explode simultaneously or in rapid succession, which causes carbon-monoxide gas to accumulate rapidly in the mines, so that should any of the shots be misplaced and result in a blow-out or windy shot, the sheet of flame that results is likely to cause an explosion. For this reason the mining laws of the State of Indiana will likely be revised so that the maximum charge of powder will be limited to 6 lb., and the number of shots to be placed at any one time in any working place will not be allowed to exceed two. It is also recommended that the shots lighted in one room be exploded before shots are lighted in the adjoining room, and that no drill bits be used exceeding 2½ in. in diameter.

Metallics

A broken pick handle is generally due to carelessness or else to strong muscles and a weak head.

Several moils should be kept in each stope for a moil is a very handy tool. At many mines moils are made conspicuous only by their absence.

A turn-sheet is quicker than a turn-table. Turn-tables about mills and mines are generally in great need of overhauling. No good turn-table for underground work has as yet been seen by the writer.

At some mines the mouths of the chutes are made too small. It is inevitable that in breaking hard ore some of it will break in large boulders. It is far cheaper to have a good, large mouth to the chute and break the boulders in a breaker than to have a miner break them with a sledge.

A miner should have several weights of single-jack hammers to choose from. The common weight of single-jack used is from 3¾ to 4 lb., but some miners prefer a 3½-, a few even a 4½-lb. hammer. Some prefer a small handle, others a large handle. The tool should suit the miner, not the miner the tool.

Liquid ammonia reacts violently on solid nitrogen peroxide; if ammonia gas be slowly brought into contact with the peroxide, the reaction proceeds more smoothly. Nitrogen peroxide also acts on ammonium salts, though heating to 100 deg. Centigrade in sealed tubes is then necessary to complete the reaction.

A board or any other object should never be nailed in a shaft. The nails rust away or are eaten away by the mine water and the object held by the nails drops unexpectedly and a fatal accident may result. When it is absolutely necessary to use nails in a shaft, only copper nails should be used, for copper resists mine water better than iron.

A miner doing much picking should be given two picks, one light, one heavy. Each is suited to a certain kind of work; a heavy pick to prying and similar work, a light one to picking down the roof. In soft, talcy ground a pick with a chisel point is the best, for the picking consists rather in chopping out the ground than in picking proper.

A running board should be placed between the rails on all main tracks where men are used to tram the cars. This plank should be wide enough to so nearly fill the space between the rails that it is impossible for a person's foot to become caught between the rail and the plank. It is better to prevent than to cure an accident. Many accidents have resulted from men's feet getting caught between the rails and the running board.

An engine of the best design, working with superheated steam and run well, will give only 17 per cent. thermic yield, whereas numerous tests on gas engines show that 32 per cent. indicated and 27 per cent. effective can easily be obtained. These facts, having been fully established, should lead mining engineers to consider carefully the advantages of gas engines for operating central generating stations from which power for almost all purposes could be cheaply and efficiently transmitted to all works, whether surface or underground.

The use of chlorine under moderate pressures is possible only if the gas be perfectly dry, in which condition it does not attack any of the ordinary metals. For compressing the gas satisfactory results are obtained by the use of ordinary metal reciprocating pumps with displacement plungers and oil-seals. The chlorine can be dried by means of zinc chloride. For lubricating purposes and for the oil-seals, chlorine-proof whole oil is used, which is prepared in the following manner: Good sperm-whale oil is treated with chlorine until chemical action (indicated by rise of temperature) ceases, and is then treated with zinc oxide to neutralize acidity. Of many oils tried, the treated whale oil was the only one to prove quite satisfactory.

Even in so small a matter as driving a wedge when blocking timbers, there is a right and a wrong way of doing it. This applies to sawed wedges, and not to shaved wedges such as are used in some camps where there is no saw-mill at the mine. These wedges are sawed from scrap blocks left over from framing timbers. The grain of timber is generally approximately parallel to its length; so when one of the blocks from it is sawed into wedges, one cut must cross the grain more than the other. Therefore one side of the wedge is rougher than the other. When it is desired to draw the timber while driving the wedge the rougher side of the wedge should be against the timber; when it is desired not to draw the timber, the smoother side of the wedge should be next the timber.

The ores purchased by a zinc smelter will be of various kinds. Few will correspond exactly with the ore which it is aimed to charge into the furnaces. Some will be higher in zinc; others will be lower. Some will be too high in iron, others too high in lime. The very desirable ores can perhaps be purchased only at a small margin. The deficiency must then be made up from the price of the less desirable ore. Inasmuch as the various kinds of ore may not be bought contemporaneously, the smelter effects this balancing in price by arbitrary additions to the returning charge on certain kinds of ore, according to the percentage of objectionable impurities contained. It may be necessary under certain contingencies to put a less advantageous charge into his furnaces, when the cost of smelting will be directly increased and the percentage of metal extraction decreased, by greater destruction of retorts, higher zinc tenor of the residues, or some other factors which have a powerful influence on the ledger.

The most inefficient machine used in mining is the air compressor, considered together with its pipe lines, rock drills and air-driven pumps. The system of centralization of plant has in most cases almost everything to recommend it, but in the instance of air compressing plant the advantages of this principle are considered doubtful by some good engineers. The high losses due to cooling and forcing air along miles of piping, with the attendant innumerable little leaks, leave little but a poor result to be expected, and expectation in this particular is more than realized. Decentralization in air compressing and distribution is recommended by H. S. and G. A. Denny, who prefer in all instances small unit air compressors placed as near as possible to the machines they operate, and electrically driven. By adopting this scheme, use can be made of the heat created by the act of compression, and pipe losses are reduced to a minimum. The comparative efficiencies would be, roughly, the difference between the losses in conveying air through pipes to the working place, and that in conveying current through the connecting wires to the motors.

Many men are killed in mines by falling into chutes. This is easily avoided by placing a grizzly over the chute. This not only prevents such accidents, but it also prevents the dumping into the chute of boulders too large for the chute doors or too large for the ore crushers. When these grizzlies are used chutes seldom have to be blasted, and besides they hang up less frequently. In case the placing of the grizzly at the top of the chute interferes with dumping cars into it, the grizzly can be placed in timbered stopes on the set of timbers below the level, while, if the chute is a mill-hole, stulls can be put across the hole three or four feet below the top, and the grizzly placed on top of the stulls. A grizzly can be easily made by tightly wedging into place a series of 5x10-in. timbers separated from one another by 8-, 10-, or 12-in. blocks for spacers. These wedges should never be nailed, as owing to the timber's absorbing moisture and swelling it soon becomes somewhat difficult to knock out the wedges and remove the grizzly when it is desired to do so. Nails only make it still harder. It is not a bad scheme to use such a grizzly over the chutes in stopes where the ore breaks large. It effectually prevents the rolling into the chute of "round-heads." The chute is a serious temptation to a mucker who has been "pounding his brains out" on a round-head for a quarter of an hour. The grizzly described can be quickly taken out and put in another place.

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The Mining Industry of Mexico

The prominence of Mexico in the mining world and its importance as a field for American enterprise and investment are sufficient reason for the large share of our space which we devote this week to that country. The first mining boom to affect this continent concerned the deposits of Mexico and although mining has been carried on actively for nearly four centuries, and the production of silver exceeds that of the United States, it is believed that the development of the mineral resources of the Republic has been only begun.

The extension of railroad lines through the western part of the Republic is certain to prove a great stimulus to mining in the territory affected. The development of water power also promises to be of great benefit to the industry. Movements are on foot to supply several of the historic camps with electric current from power stations upon neighboring streams. Guanajuato is the first to secure the benefit of cheap electric power; Pachuca is now also to have current transmitted from a power station at no great distance, and a company recently formed has undertaken extensive work on the Durango river and will carry power to the city of Durango and to the mines of Sombrerete, and will have a reserve capacity for other purposes.

There is abundance of undeveloped water power along the slopes from the central plateau to the low country which borders the coasts, and the rainfall in the northern desert regions is sufficient to drive many mills if properly stored and utilized. Many of the large operations scattered throughout the Republic may and probably will be connected with sources of cheap power produced in this way.

With the substitution of cheap water power for imported fuel, the industry will be relieved of its greatest handicap. Mexico deserves all the attention which it is receiving from mining men, and will continue to be of especial interest for years to come.

Copper Placers

There is prospect of a new development in mining, which is of great interest both technically and commercially. This is the exploitation of alluvial deposits of native copper. In Alaska, at the head of White river, and at the head of Copper river, above Fairbanks, there are gravel deposits containing native copper in large nuggets, the latter comprising some huge masses. The amount of copper available in this form appears to be large, but the extent of the deposits has not yet been accurately determined. On Copper river these placers run up into the copper deposits in place. On White river, the sources of the placer copper appear to be covered by the glacial ice, and the erosion seems to be still going on from the flow of the glaciers.

It is expected that steps to work these copper placers will be taken in the near future. The working season will be rather short, but the means for working, either by dredging or by ordinary hydraulic mining, can be quickly installed, and upon the completion of the railway, which is planned to open the Copper river country, a considerable supply of copper may be quickly looked for from this source. The technical interest in the subject pertains to the fact that, so far as we are aware, these are the only copper placers of the world, and their exploitation will extend to copper a class of mining which heretofore has been practically confined to gold and tin stone.

Supervision Necessary Underground

A correspondent calls attention to the too common neglect of the underground operations of mining on the part of those in charge. Most mines, he says, are well equipped above ground and no trouble or expense is spared to secure efficiency at the surface, but underground everything is left to the foreman and the shift bosses. The result is that the work which should be performed with the greatest care is commonly carried on in an unsystematic and slipshod manner.

Underground operations require even more careful supervision than the processes which are conducted in the open in the light of day. It is no disparagement of mine foremen as a class to say that they, like all other members of the human species, are subject to the deadening effects of routine. If they are allowed to go their own way without the occasional stimulus of criticism or encouragement, in a few months or years, they naturally settle into a comfortable rut which is usu-

ally the path of least resistance and is always the deadly enemy of efficiency and progress.

Nothing that requires continued effort can be trusted to run itself, and the mine superintendent who expects to get the best results must give matters underground a fair share of his attention. Thousands of little evils which would vanish before a moment's application of common sense, accumulate and clog the wheels, if there is nobody who calls attention to them. The superintendent appreciates the need of an occasional letter of inquiry from the home office; a periodic prodding is quite as necessary and wholesome for his subordinates.

More Flotation-process Litigation

The end of litigation in the matter of the flotation process or processes is not yet. Scarcely has the legal contest between the Delprat and Potter interests come to an end before another battle of the law appears in view.

This time the contestants are to be the proprietors of the Elmore patents, including the vacuum process, and the Minerals Separation Syndicate. The Elmore company claims that the Minerals Separation Syndicate patents are infringements of its old oil flotation patent, and the rival corporation claims that the Elmore vacuum patent is a modification of its own patents.

The Minerals Separation Syndicate claims to have been the first to patent the use of small quantities of oil and acid to facilitate the flotation of sulphides by means of bubbles, and holds that the vacuum process is only a modification and subject to its original patent. The Elmore interests hold that their original oil-flotation patent covers all later modifications. The Delprat and Potter processes make no use of oil, but it seems that the holders of the Elmore patents profess to claim all flotation methods.

In the meantime the different processes are being adopted for actual service, and the rights and claims of patentees and mill-owners are becoming more and more involved. A legal tangle rarely fails to retard the development of any useful idea, and there is no reason to believe that this case will prove an exception. The process of separation by flotation early gave promise of great utility.

The "Mineral Resources"

The "Mineral Resources" of the United States, the annual statistical publication of the Geological Survey, made its appearance last week. The tardiness of this publication is due largely to the Government printing office, which is blamable for many of the faults that are charged commonly to the Geological Survey and other Government technical bureaus. Formerly this was a serious matter, especially in connection with the "Mineral Resources;" but the officials of the Geological Survey have come to a thorough appreciation of the value of timeliness in their statistical reports, which we have always urged, and have now adopted the expedient of publishing their figures, as soon as ready, first in the press bulletins and then in pamphlet form. In the latter way practically the whole of the present volume of the "Mineral Resources" received publication during 1906, a large part of it as early as midsummer. Through its press bulletins the Survey has already published the statistics of cement production for 1906. We understand that its other statistics are all well advanced and will be published at early dates. The Survey is to be complimented upon its activity in this respect, and fairness requires that it be relieved from charges of dilatoriness that is due, not to it, but to the Government printing office, over which no one but Congress has much control.

Wash-houses at Coal Mines

Among the many reformatory movements that coal-mine managers will eventually be obliged to consider is the installation of proper wash-houses and other hygienic facilities to provide for increased comfort and cleanliness among the men.

We venture the statement that less than 10 per cent. of the coal mines in this country have made provision for the miners to wash before going home, and surely those employed in this industry have a greater need for such an installation than any other class of labor.

The model wash-houses of this country, are found at the iron mines of Michigan, where in some instances each miner not only has a locker in which to hang his clothes, but shower baths with hot and cold water are provided, and other facilities for the comfort of the men. Colliery operators should pay more attention to this important matter. If they do not, there will be inevitably a demand for legislation compelling them to do so.

CONGRESS FAILED at its last session to take action on the bill introduced, under the inspiration of the President's recommendation, for withdrawing and leasing the public coal lands. Consequently, the latter, which had been withdrawn from entry by executive order, remain in statu quo under that order. However, the order has been modified and about half the area of land withdrawn from entry has been thrown open again. In the original order of withdrawal all the lands were included which were thought to be valuable for their coal resources. Since that time the Geological Survey has been engaged upon a study of the question and has determined that certain portions of the land are non-coal bearing or are of too little value as coal lands to be considered at the present time, and such areas have properly been thrown open again.

THE PRODUCTION OF aluminum in the United States in 1906 was 14,350,000 lb. It is expected that the output in 1907 will be twice as much, and that the output of 1908 will double that of 1907. Aluminum has often been spoken of as a possible competitor of copper, but up to the present time its production has been too small to make it a matter of serious consideration in that respect. However, it appears as if conditions may be different by 1908. Few realize that, outside of iron, steel and copper, perhaps no other metal has the possibilities before it that aluminum has.

THE STATISTICS OF THE Lake Superior iron ranges, which were the subject of editorial comment in the JOURNAL of March 2, p. 439, and of March 9, p. 484, were collected and prepared by the *Iron Trade Review* of Cleveland, which has performed this important service to the trade for a number of years. It was through oversight and not by intention that the statistics were not accompanied by the customary acknowledgment to the source whence they were obtained.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Mine Timbering

Since the invention of the square-set little progress has been made in mine timbering. Indeed, it is such an unapproachable subject at present that timbering is considered mainly a matter of judgment acquired after long experience about mines. Mining men have devoted little effort to the study of the subject.

Mr. Storms has written a pamphlet on mine timbering and frequent articles describing the routine of the timbering at different mines appear in the mining periodicals, but little has been written on the subject. I do not think one can figure on this subject as a problem in pure mathematics, but I do believe that nature has to a great extent solved this problem for us, and that, if mining men would make a systematic study of the subject and its underlying principles, data might be obtained to give some notion of the support required in underground workings.

Stopes cave until they assume a self-supporting arched or dome shape. This small local dome remains comparatively unchanged, in the writer's opinion, as long as the forces acting on the roof are those due to this stope alone. But as mining progresses, other stopes are opened up. These affect one another. One stope caves, throwing upon the roof of other stopes a sudden load, the elastic limit of the rock is passed, and with it the nature of the force changes. No longer is it the simple load of the simple stope which characterizes the scaling or caving stage, but as the loads are suddenly thrown upon the roof, the subsidence assumes a faulting nature.

This last stage is shown at Virginia City, Nevada, where the fault scrap several feet in hight caused by mining operations outlines the outcrop of the Comstock lode. The same conditions may be observed at the United Verde mine in Oregon, also to a less extent at Butte, Mont., where from time to time there is a cracking of walls in houses resting on apparently solid ground. It is this stage which is at present causing trouble at Broken Hill, in Australia, and also at a certain coal mine in New Zealand, in which mining in the part under the ocean had to be abandoned. This stage has been the subject of some study by the colliery engineers of England and France, and some data on it have been contributed to different societies.

I believe that, except in a few cases of running ground so weak that spiling is necessary, the theory of ground caving until it catches itself up is all nonsense. I have been in several caved stopes and have in all of them been able to worm my way to the top of the pile of caving, where in every case a dome-like cavity remained. I believe it is always there in the caving stage, for the following reason: In anything but running ground a large stope opening is necessary before caving begins and this opening is so large that the roof assumes a self-supporting arch shape before the caving fills the stope. Besides, the caving action is progressive, and when the caving begins to fill the stope it so supports the walls that caving ceases.

There are many circumstances affecting the shape of the dome in the same rocks such as joints, fissures, and faults, as well as local variations in the amount of silicate in the rock. As long as these variations are small their effect upon the shape of the arch will also be small. If the jointings are small in extent compared to that of the stope or opening they will cause only minor variations in the shape of the dome easily taken care of by the factor of safety used in calculations. If the fault plane is strong it becomes the ruling factor. In certain mines at Butte, Mont., the stopes cave without any warning and kill many men because the roof approaches an unsuspected fault which cuts off the ground. Many caved stopes elsewhere are due to the same cause. I am inclined to think that all caves without warning by scaling of the roof or the taking of weight by timbers are due to this cause. Some one about a mine should study the important faultings and thus prepare for unsuspected faults that cut the orebody.

The only way to test the possibilities of this theory that nature has solved the problem is by a study of the shape of the self-supporting dome whenever a stope caves. It is comparatively safe to enter after they have become fairly quiet. Then the shape of the dome, the position of the jointings, inclination of the strata or other circumstances should be noted. Many facts may be obtained by observing the shape of roofs of stopes that do not cave, but especially are these data to be obtained at mines where the caving system is in use.

It will probably be found that the crushing and transverse strengths of the rock are the main factors in determining the shape of the arch and possibly it may be well to have crushing tests made on the rock. The first thing is to find out whether there is any hope of reaching a solution of the problem. CLAUDE T. RICE.

Bisbee, Ariz., March 1, 1907.

Draining Adjoining Mines by Means of Diamond Drill Holes

In the Oct. 13 issue of the JOURNAL H. B. C. asks how to unwater the old workings of a mine 500 ft. deep through a new shaft only 150 ft. distant. Some time ago I had occasion to drill a horizontal hole from the bottom of an 800-ft. shaft. When the hole had reached a length of 700 ft. the bit broke into a water course that produced a pressure of 210 lb., nearly equal to that produced by a 500-ft. head We drilled beyond this water course 260 feet.

The water course, or vein was full of broken quartz and sand and this stuff washed into the hole in quantities. When we were drilling there was not so much water coming out of the hole, not more than the pumps could handle, but when we were drawing rods the pumps could not keep it down, and by the time the bit was on the bottom of the hole the water would be up to the knees of the drill men. We did not dare put on a valve and shut off the water for fear of the debris from the water course filling up the hole. The hole was washed so badly at this point that it must have been as large as a drift. At any rate it allowed the rods to vibrate so much that they finally broke off, and recovering them was a pretty job.

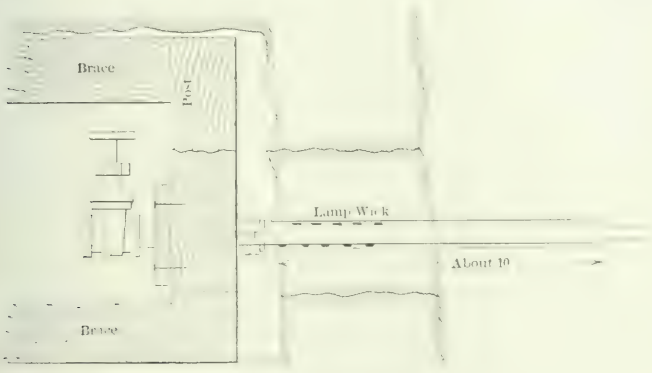
When we got through with this hole we placed a dry pine plug as near to the water course as possible, which shut off nearly all of the water; we then used the hole to pull our rods into while we were drilling another hole opposite to the first, this second hole was drilled to a length of 800 ft., so that the drill men had no need to break joints until the last 100 ft., a great saving of time.

I would advise H. B. C. if he has no diamond drill, to give a contract at so much per foot to someone who has one. The smallest size drill will do this job easily. Start the hole at a point low enough to tap the old workings at the lowest place so as to make one job of it. We will suppose that the rock between the old and new workings is reasonably solid, and will not require casing.

The next thing to be done is to place two posts—8 by 8 in. is large enough—

[illegible] apart, the upper [illegible] ward the drill hole. To these posts nail a piece of 2-in. stuff about 10 in. wide and high enough on the posts so that the center will be in line with the center of the hole, the posts must be hitched in or braced to the opposite wall.

The drill being now in position, the operator uses a 2 7/16-in. bit set with carbon, with which he drills through the 2-in. plank and beyond into the rock. Screwed to the bit is a piece of 2-in. casing, long enough to drill into the rock a foot or two before it is out of the wood, thus giving the hole a straight course. If he were to drill into the hard rock 10 ft. more, that would be still better. By this time he has selected a first-class piece of 2-in. pipe threaded on the outer end and long enough to project beyond the plank 1 in. when it is hard on the bottom; he holds the stand pipe hard on the bottom while a pair of common pipe clamps are placed back of the posts and on the pipe.



POSTS, PLANK AND CASING IN PLACE.

Before the stand pipe is placed on the bottom, say within 2 ft., candle wick, such as is used in miners' torches, should be wound around it like a spiral care being taken not to bunch it or ruffle it while it is being inserted into the hole. If this job is done neatly the drill runner will find that he will have to use a large block of wood as a battering ram to get the pipe on the bottom. While the drilling is in progress any leakage around the bottom of the pipe will soon stop by the cuttings from the bit borne in by the water and cementing the space between the pipe and the rock as far back as the wicking. The arrangement is shown in the accompanying drawing.

The operator is now ready to proceed with the drilling, which is best performed with a 1½- or a 1¾-in. bit. When the bit breaks through into the water the machine should be moved away so as to give the men room to work, for they will have a strenuous time until they get the rods out. They will most likely have to snub the cyanide process would prove superior them with a rope passed around the posts.

I have successfully solved this problem several times in the manner described, and would caution the drill man to make the hole for the stand pipe no larger than just sufficient to get it into place without injuring it.

JAMES HUMES

Basin, Mont.

Chlorination of Gold Ore

Will you inform me to what extent the process of extracting gold or copper from ore by means of chlorine gas is employed in the United States at the present time? Also, is it employed successfully or otherwise, and how does it compare in efficiency with the cyanide process? If chlorine gas could be laid down in liquid form at a mine at 5c. per lb., of which 3 lb. would treat a ton of ore, would there be a gain over the cost of chlorine gas as now produced and used for this purpose?

J. S. G.

Worcester, Mass., March 9, 1907.

A good deal of gold is produced in the United States by the chlorination process, although the process has never attained wide-spread application. It has been employed chiefly in the Black Hills, South Dakota, and on a small scale at certain gold mines in the South, for the treatment of stamp-mill sulphurets in California, and for the treatment of crude ore, especially on the Cripple Creek district, Colorado. The last has been, and is at present, by all means the most important application of the process in the United States.

In the treatment of the ore of Cripple Creek, there was for many years a strong rivalry between the chlorination process and the cyanide process, which resulted in favor of the former, and for several years the United States Reduction and Refining Company, commonly known as the "Mill Trust" has employed only the chlorination process. However, it is probable that a more modern application of to barrel chlorination, and reverse the previous result. This opinion is held by at least one excellent authority, and a new, large cyanide plant, which is shortly to go into operation, will throw some practical light on the subject.

The subject of chlorination versus cyanidation has been repeatedly discussed in the JOURNAL. We refer our correspondent especially to an article by Philip Argall in the JOURNAL, Nov. 24, 1904, page 821.

In that article, Mr. Argall states that the charge of chemicals for barrel chlorination calls for practically 5 lb. of chlorine for each ton of ore treated. He says further, "One pound of cyanide, costing 20c., will do the same work, showing quite clearly that barrel chlorination is more wasteful and extravagant; however, we have the important ratio established—1 lb. of cyanide to 5 lb. of chlorine—and hence chlorine must be produced electrolytically for 4c. per pound at the barrels to equal cyanide in cheapness, and would even then have to be used in open tanks in the form of chlorine water to approach the working cost of cyanide."

The Most Economical Degree of Concentration in Ore Dressing

Will you please give in the JOURNAL, as soon as possible, an algebraic formula or equation, which will indicate the most economical percentage of silica (or gangue) to allow to go into the concentrate in ore dressing, taking into account the loss in the tailings caused by cutting out silica from the concentrate, and also the freight on the silica to the smelter and the cost of smelting, etc. There is probably some general expression which will meet this case. (Signed) B. W. C.

Monterey, Mexico, March 13, 1907.

There is no formula covering the above case, and it would be impossible to deduce one, because the conditions vary with almost every ore. With some ores it is possible to carry the concentration up to nearly pure mineral with a comparatively small loss; in other cases, the elimination of the last portion of the gangue would lead to a large loss. Obviously, the result would be affected very much by the physical character of the ore; whether coarsely crystalline, or finely crystalline; whether the mineral be tough or brittle, etc.

An important factor in increasing the wear of wire-hoisting rope is what is known as lash. This may be caused by the fact that the shaft is not exactly vertical; it may also be due to the striking of the rope upon timbers or to a jerky handling of the cages by the hoisting engineer

New Publications

[illegible] By Brig.-Gen. Henry L. Abbot. Pp. 269, illustrated. 6x8½ in.; cloth, $2. New York, 1907: The Macmillan Company.

Modern American Lathe Practice. By Oscar E. Perrigo. Pp. 424; illustrated. 6x9 in.; cloth, $2.50. New York, 1907: Norman W. Henley Publishing Company.

[illegible] Smelting. By Edward Dyer Peters. Pp. 612; illustrated. 6x9 in.; cloth, $5. New York, 1907: Hill Publishing Company.

This work, which has just appeared, will be reviewed at length in a later issue of the Journal.

Long Distance Electric Power Transmission, being a Treatise on the Hydro-Electric Generation of Energy; its Transformation, Transmission and Distribution. By Rollin W. Hutchinson, Jr. Pp. 345; illustrated. 5x7½ in.; cloth, $3. New York, 1907: D. Van Nostrand Company.

[illegible] Hydraulics. Applied hydraulics. Hydraulic machines and accessory apparatus. Generators, switches and protective devices. Laws governing transmission of energy. The transmission line. Transformers. Motors. Converters. Practical plants. Distinctive features of prominent long distance transmissions.

New Jersey. Annual Report of the State Geologist for the Year 1905. H. B. Kümmel, State Geologist. Pp. 338; illustrated. 6x9 in.; board covers Trenton, 1906: State Printers.

Contents: Administrative report. Part I—Changes Along the New Jersey Coast, by Lewis M. Haupt. Part II—A Brief Sketch of Fossil Plants and the Flora of the Cliffwood Clays, by Edward W. Berry. Part III—The Chemical Composition of the White Crystalline Limestones of Sussex and Warren Counties, by H. B. Kümmel, with Analyses by R. B. Gage. Part IV—Lake Passaic Considered as a Storage Reservoir, by C. C. Vermeule. Part V—A Report on the Peat Deposits of Northern New Jersey. Part VI—The Mining Industry, by H. B. Kümmel. List of publications.

Canadian Mining Journal. Vol. I, No. 1, Illustrated; paper, 9x12 in. $2 per year. Published fortnightly by Mines Publishing Company, Ltd., Montreal and Toronto, Canada. J. C. Murray and H. Mortimer-Lambe, Editors.

This publication, with which is incorporated the Canadian Mining [illegible] purchased from the estate of B. T. A. Bell, made its initial appearance March 15, 1907. Mining news, under special correspondence, is confined to the Dominion of Canada, to the mineral industry of which the new magazine is to be chiefly devoted. One of the features of the first number is an interesting cover design which shows a specimen of ore from the Cobalt district, Ontario, and reproduces, in natural colors, cobalt and nickel "bloom," and the mixture of the two, smaltite and native silver.

Fifteenth Anniversary of the International Correspondence Schools, 1891-1906. Pp. 155; illustrated. 7x10½ in.; paper. Scranton, 1907: International Correspondence Schools.

The anniversary exercises described in this volume were attended by a large number of prominent engineers, educators, manufacturers and professional men. The object of the exercises was not only to mark the fifteenth anniversary of the International Correspondence Schools, but also to furnish an opportunity to explain to the guests the methods of correspondence instruction. Many of those invited could not attend, and it was chiefly to give them the benefit of the information brought out during the proceedings that the souvenir volume was issued. It contains the addresses delivered during the exercises and the portraits of many of those in attendance.

Modern Steam Engineering in Theory and Practice. By Gardner D. Hiscox, with Chapters on "Electrical Engineering," by Newton Harrison. Pp. 487; illustrated. 6x9 in.; cloth, $3. New York, 1907: Norman W. Henley Publishing Company.

Contents: Historical Steam and its properties. Generation of steam. Types of boilers. Boiler-chimney and its work. Heat-economy of the feed-water. Injector and steam-pump. Incrustation in boilers and its remedy. Steam above atmospheric pressure. Flow of steam through orifices, nozzles and pipes. Superheated steam and its work. Adiabatic expansion of steam. Indicator and its work. Steam-engine proportions. Slide valve and valve gear. Corliss engine. Compound engines. Triple and Quadruple expansion engines. The steam turbine. Mechanical refrigeration engineering. The elevator and its working. Cost of power. The engineer and his duties. "Electrical Engineering." The dynamo and its regulation. Testing and motors. The switchboard and storage batteries. Lighting and lamps.

Report of the Bureau of Mines of Ontario. Part I, 1906. T. W. Gibson, Deputy Minister of Mines. Pp. 218; illustrated. 6x9 in.; paper. Toronto, Ont.; Public Printers.

This publication covering the operations of 1905, while a valuable record of a year of remarkable progress in the mining industry of Ontario, has been anticipated, so far as its very comprehensive statistical features are concerned, by the publication of more recent figures. It may, however, be noted in passing, as an evidence of the rapid growth of the mining interests of the province, that the total production of 1905, then a record figure, was $17,809,226; an increase of 54 per cent. over the preceding year, while the output for 1906 rose to $22,221,808, an increase of about 25 per cent. A detailed statistical review gives a series of tables showing the progress made during recent years in the various branches. A report by Mining Inspector E. T. Corkill, deals with the condition and operations for the year of all the working mines in Ontario. In addition the volume as usual embraces several scientific papers of practical interest.

Einfuhrung in die Metallographie. Paul Goerens, Dept. Ing. Assistent am eisenhütten männischen Institut der Kgl. Techn. Hochschule Aachen. Pp. 185; illustrated. 6½x9½ in.; paper, 10 marks. Halle a. S., 1906, Wilhelm Knapp.

This introduction to metallography of 185 pages is divided into four main sections. The first deals with the physical properties of matter and takes up allotropy and cooling curves, embracing the measurement and recording of temperature, which is set forth in a clear and concise manner. The second section deals with the physical chemistry of solutions, fused salts and alloys. Starting out with the salt-ice freezing point curves and the water-iron chloride series, we are shown the different systems into which cooling and freezing-point curves can be grouped. The phase rule and critical curves are brought in. Binary alloys are next taken up in detail under the two headings: (a) No chemical compound is formed, i.e., the alloys form, a series of solid solutions or eutectiferous series; (b) chemical compounds are formed.

This section is specially valuable for it brings together from widely different sources a vast number of freezing-point and equilibrium curves of the various binary alloys and explains their constitution.

The third section deals with the practical metallographic microscopy, polishing development of structure, the Martens stand (made by Carl Zeiss), the La Chatelier microscope, photography, all of which have been given many times before and to our mind in a much better way.

The fourth section on the metallography of iron and its alloys is a short and clear exposition of the constitution of iron-carbon series of alloys, and is illustrated by a number of splendid photomicrographs showing the various constituents.

Taken as a whole, the book will prove a valuable addition to literature both in the works and the laboratory, for we are now waking up to the fact that the old rule-of-thumb days are past, and that scientific research must in future be our guide, that we must get down to the constitution of alloys to understand their properites.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Wilbur E. Sanders, of Butte, Mont., is visiting in New York.

John R. Stanton, of New York, has gone to the Lake Superior country, where he will remain for several weeks.

A. J. Huneke has returned to Butte, Mont., from Cuba, where he spent some time inspecting a copper property.

Harold C. E. Spence, of Steeple Rock, N. M., has arrived in New York from Europe, where he has been traveling for the past year, accompanied by his wife.

H. H. Taft, a mining engineer of Denver, Colo., is directing diamond drill operations on the property of the Butte & Summit Valley Company, in Butte, Montana.

John M. Cameron, formerly of the Lake country and Arizona, has taken the management of the property of the Butte Central & Boston Copper Company, in Butte, Montana.

F. N. Flynn, superintendent of the White Knob smelter, at Mackay, Idaho, has resigned that position, to accept the management of La Rose mine, at Cobalt, Ont., to date from April 1.

W. R. Bauder, of Ishpeming, Mich., has been appointed chief engineer for a group of mines on the Mesabi range, operated by Pickands, Mather & Co. His headquarters will be at McKinley, Minnesota.

Capt. James Chynoweth resigned as superintendent of the Centennial and Allouez mines, in the Lake Superior copper district, on April 1, and leaves for Globe, Ariz., to give his personal attention to work on the Superior & Boston property, of which he is president. His retirement is greatly regretted.

John F. Munn, who has for several years been associated with the Davis-Calyx Drill Company, also with the Cincinnati Core Drilling Company, is now connected with the Cyclone Drill Company, of Orrville, Ohio. Mr. Munn has had a large experience with core drills in various parts of the country.

Jesse F. Wellborn has been chosen by the board of directors of the Colorado Fuel and Iron Company, to succeed the late Frank J. Hearne, as president of the company. Mr. Wellborn entered the service of the company as a clerk 17 years ago, and at the time of President Hearne's death was vice-president and sales and traffic manager.

Peter Henraty, president of District 21, United Mine Workers of America, embracing Arkansas, Missouri, Kansas, Texas, and Indian Territory, who was a delegate to the constitutional convention for the new State of Oklahoma, has announced his candidacy for the office of State mine inspector of the new State, subject to the Democratic primaries. Under the constitution [illegible] is elective.

Obituary

A telegram from El Paso, Tex., reports that Benjamin Sadtler died suddenly in that city, March 29, while on his way to Denver from Sonora, Mexico, where he had been engaged in professional work. He was at one time a professor in the Colorado State School of Mines, and for years past had held high rank as a metallurgist, making a specialty of the treatment of zinc ores.

John Chiatovich, one of the oldest mining pioneers in the Tonopah field, died at his home in the Silver Peak camp, Nevada, on March 11, aged 66 years. The deceased had resided in southwestern Nevada for nearly forty years, and was the discoverer of some of the best mines in the Silver Peak district. By means of a small mill, erected at the Peak thirty years ago, he extracted a comfortable fortune from the high-grade gold ore which the mine produced. Four months ago he disposed of his principal interests for $40,000, and was just beginning to enjoy the fruits of his labors. He was highly respected by all who knew him. He leaves a wife and five children to mourn his death.

Societies and Technical Schools

Case School of Applied Science—The new catalog of this institution at Cleveland, O., has been published. It contains full information about the various departments and courses of study; also a list of the alumni.

Industrial

Owing to the rapid growth of its business, the Traylor Engineering Company has found it necessary to increase again its offices and engineering quarters, and, to that end, has secured the twenty-third floor of the new United States Express Building, corner of Rector and Trinity place, New York. The new suite consists of 14 separate offices, in addition to a large drafting and engineering department. The company will be in the new quarters about April 10. The phenomenal growth has made it also necessary to enlarge the official force, and the several departments are now in charge of the following gentlemen: President, Samuel W. Traylor; vice-president, Bruce W. Traylor; assistant treasurer, Frank W. Hopkins; general sales manager, Theron H. Tracy; assistant sales manager, William J. Roberts; general superintendent, Edwin J. Smith; chief engineer cement, stone, coal crushing and briquetting machinery department, George J. Mashek; chief engineer metallurgical department, P. E. Van Saun. In addition to the above officers and officials of the company, its field men, acting as superintendents of metallurgical plants, are: Smith McKay, H. A. Hillman, Charles Fryberger, H. A. Mackey, Carl Roberts, Mitchell Roberts, J. T. Colthart and M. D. Hayes. Recent additions to the factory capacity at Allentown, Penn., are: A new boiler and smelting equipment shop, power plant, pattern storage building, factory and machine shop addition, and 1500 ft. of extra track facilities. Recent orders now under course of construction are a 200-ton concentrating plant for the Central Mines Development Company, near Butte, Mont.; 600-ton electro-magnetic separating plant for the Salisbury Steel and Iron Company, Dolgeville, N. Y.; 80-ton stamp and cyanide plant for California; 100-ton concentrating plant for the Cobalt Central Mines Company, of Ontario.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Scully Steel and Iron Company, Chicago, Ill. Stock List. Pp. 144, illustrated, indexed, paper, 4½x7 in. March and April, 1907.

The Denver Fire Clay Company, Denver, Colo. Bulletin No. 24. Clay Crucibles, Scorifiers, Muffles, etc. Pp. 4, illustrated; paper, 3x6 in.

The Anaconda Copper Mining Company (foundry department), Anaconda, Mont., is revising and bringing its machinery catalog files up to date, and would be glad to receive catalogs from manufacturers of machinery, tools and power equipments of all kinds.

Construction News

Angels, California—The Lightner Mining Company will add 20 stamps to its mill. Alexander Chambers, Angels, Calaveras county, Cal., is superintendent.

Williamsburg, Kentucky—The Mt. Morgan Coal Company is preparing to open coal mines near Williamsburg and will need machinery. M. H. Murray, Williamsburg, Ky., is general manager.

Dry Branch, Georgia—The Atlanta Mining and Clay Company is preparing to make large additions to its plant, including a washer and other machinery. Y. A. Gresham, Atlanta, Ga., is general manager.

Bingham, Utah—The Bingham Argentine Copper Company has begun to develop a mine, and will need hoists, drills, etc. A. T. Wright, Ogden, Utah, is president; William Iglehart, Salt Lake City, secretary.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

[illegible] throughout California have been exceptionally heavy and have resulted in floods in the mountain counties and along the base of the foothill region. A great deal of damage has been done in various towns, notably at Stockton and Oroville. At the latter place two dredges owned by the Indiana Gold Dredging Company have been swept away, a loss of $90,000. Several buildings of the Ashburton Dredging Company, near Folsom, were destroyed, and the men deserted the dredge, but it still remains secure. The famous Bowman dam in Nevada county, one of the reservoirs of the North Bloomfield Mining Company, is reported to have collapsed. Power plants of the big electric power companies and of various mining companies have been put out of business for a time. One of the worst disasters reported is the destruction of the Government débris dam at Daguerre Point on the Yuba river. The dam is known as barrier No. 1 of which a series were to be built to control the hydraulic-mining débris in the upper river. It was filled level to its crest with gravel and sand amounting to several million cubic yards. The dam was built of piles and concrete, and was a mile long and 16 ft. high. It was supposed that the gravel impounded would always remain there, but now doubtless much of it will find its way to the lower river. Hydraulic miners were not allowed to dump débris behind this dam, which was intended only to check the débris already in the river. Thus far a part only of the dam has gone out, but the rest is expected to follow. The warm rains melted some 8 ft. of snow in the mountains.

The Cherokee Diamond Mining Company of America is incorporated in Reno, Nevada, to hunt for diamonds in the old hydraulic mine in Butte county, California, formerly operated by the Cherokee Hydraulic Mining Company. "Tex" Rickard, the Goldfield, Nev., promoter, obtained 2000 acres of this ground after visiting the Cooney diamond prospect near Oroville. Several small diamonds were found years ago in the hydraulic washing of the Cherokee company, but no systematic search was ever made.

Salt Lake City

March 28—The Utah legislature, during its late session, passed a bill appropriating $2000 for a mining exhibit at the [illegible] Exploration Company, has been seeking an option on the property of the Lead King Mining Company, located in the Duck Creek, Nevada, district.

Amended articles of incorporation of the Eureka-Swansea Mining Company, have been filed. The capital stock has been increased from 50,000 to 100,000 shares, and Provo, Utah, has been selected as headquarters. Jesse Knight is president of the corporation.

The Ohio Copper Company has a large force of men engaged in putting in the foundations for its mill in the lower part of Bingham. It is estimated that the total cost of the plant will be around $250,000.

Articles of incorporation of the Seminole Mining Company have been filed. The corporation owns property in the Deep Creek mining district, in western Utah, and the officers are: Clyde H. Wilson, president; William F. Wilson, vice-president; Frank L. Wilson, secretary and treasurer, with headquarters in Salt Lake City.

Much interest is being aroused again in the Stateline mining district in Iron county, and the camp is taking on some of its old-time activity. The Johnny and Ophir mines are to be operated again.

The ore and bullion settlements reported last week by Salt Lake banks, reached a total of $602,000.

Denver

March 30—Success has crowned the efforts of the Vindicator and Findley companies of Cripple Creek, to extract the values of their low-grade ores at their test plant in the Lillie shaft-house and the statement is made that after a plant of 200 tons daily capacity is completed, for which plans are being prepared, even $3.50 ore will be located at a profit. The experiments have been conducted by H. A. Shipman.

Organization papers have been filed by the Cañon City Mica Mills and Mining Company, capitalized for $50,000. The company expects to build a mill at Cañon City for the treatment of this product, the first of the kind in Colorado.

Advices from Guadalajara, Mexico, indicate the consolidation of the Cabrera and American mines in the Hostotipaquillo district and the Virginia & Mexico Mine and Smelter corporation will take these properties and construct reduction works of 200 tons daily capacity. The management will be in the hands of Jesse Scobey, mining engineer, of Denver, who has effected the consolidation.

Scranton

April 2—Commissioner C. P. Neill has notified the Conciliation Board that he has resigned his position as umpire. The board expressed its regrets, and will ask Judge Gray to appoint a successor. Before resigning Mr. Neill, who has been appointed by President Roosevelt to study the emigration problem in Europe, handed down four important decisions in cases which have been referred to him.

The most important was that dealing with the "bony" question from Plymouth, which has attracted the attention of the board and the umpire for the past two years. It was alleged that the contract provided that if there were coal underlying the bone a sufficient thickness to justify its being separated and loaded, then the miner was not entitled to yardage, but where the coal underlying the slate or bone was not of sufficient thickness to warrant its being separated and loaded into the car, the miner is to be paid the established rate of 55c., regardless of the thickness of the bone. This was the final award of the umpire, who also provides that the company is to have the right to order that the bone and coal shall be loaded into the car and sent to the surface as coal.

London

A fortnight ago, I mentioned that the ill-fated Avino Mines of Mexico was to be reconstructed so as to provide an assessment that would realize £60,000. These funds are required to carry out Mr. Nichols's development work and to provide further plant. The proposition, when it was put to the meeting of shareholders this week, met with considerable opposition, and the directors were forced to withdraw the scheme for further consideration. The dissentient shareholders voiced a grievance which is one of long standing—that the information, both financial and technical, is very incomplete. Before going further they wish that another examination of the mine should be made, for there is a general spirit of distrust of all the reports that have ever been made on the mine. Hitherto, the engineers and metallurgists responsible for the doings at Avino have been Americans. The proposition is that an Englishman should be sent over to inspect, and I do not see that the directors could do better than send over their recently appointed colleague, Edward Hooper, to restore confidence in the board and the mine.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

YAVAPAI COUNTY

Congress Consolidated—This company, which has been one of the largest gold producers in the territory, is again producing bullion; 20 stamps are now running steadily and it is reported that 20 more will be dropping in a short time.

Golden Idol—This company is installing tanks for a cyanide plant at its property in the Cherry Creek district, 25 miles east of Prescott. A large amount of ore is on the dump awaiting the completion of the mill.

Marcus—This property, 10 miles east of Congress, is being worked by leasers, who report a strike of rich gold ore.

Mount Tritle Copper Company—This company is now shipping ore from its mines, 10 miles south of Prescott, to the Humboldt smelter. The ore shipped is high-grade copper ore carrying some values in gold and silver.

United Arizona Copper Company—This company, a Kansas City corporation, has bought the Mahoney copper claims, situated in the Black Rock Mining district, and will begin development. This property has over 1000 ft. of development work, all of which shows an ore carrying copper, gold and silver values, copper predominating. The surface croppings extend for a distance of 3000 ft., and are from 5 to 50 ft. wide. The company will proceed with the sinking of a two-compartment shaft, and will go to a depth of 500 ft. before any crosscutting or drifting is done.

California

EL DORADO COUNTY

River Hill—At this mine, Placerville, Thomas Clark, manager, the shaft has now reached a depth of 1500 ft. At the 700 level it connects with the 2300-ft. tunnel, which drains the upper levels. The mine is equipped with a 20-stamp mill. The shaft is the deepest in the Mother Lode, in El Dorado county.

INYO COUNTY

Copper—H. G. McMahon, of Rhyolite, and George A. Webster, of San Francisco, have acquired a half interest in the McMahon copper claims in Greenwater district.

Southern Belle—This property is the first one of the county gold mines to be listed on the San Francisco Stock Exchange. The mine has a 10-stamp mill, electric hoists, air-compressor and a generally good equipment.

KERN COUNTY

Gold Peak—Superintendent Black states that the reported sale of this mine to the Guggenheims is incorrect.

Discovery—E. W. Hamilton, of Willow Springs, has found a large body of gold-bearing ore on the edge of the Mohave desert, nine miles from the springs.

SIERRA COUNTY

Primrose—Arrangements are being made for resumption of work on this mine at Hog cañon, near Downieville. The 10-stamp mill will be repaired.

TUOLUMNE COUNTY

Red Gravel—In this claim, above Columbia, the Yankee Hill Mining Company, while hydraulicking, has uncovered a strong vein of auriferous quartz.

App—The specimen rock discovered in this mine at Quartz Mountain, was taken from the 18-in. hanging-wall vein, at the 1100 level. W. A. Nevills is the owner of the mine, and H. M. Pease, the superintendent.

El Oro—A strike of rich ore has been made near the surface of this mine at Tuolumne. The ledge is narrow, and is owned by Paul F. Greene.

Colorado

LAKE COUNTY—LEADVILLE

Bartlett Tunnel—A few years ago this tunnel, in the Sugar Loaf district was driven into the mountain 1200 ft. and cut the Bartlett vein, from which some excellent ore was taken. A new company, with Fred Berger, of Colorado Springs, at the head, has taken hold of the Bartlett and will drive the tunnel another 1000 ft. into the mountain to cut other veins. Machinery is now arriving on the ground and buildings are being erected.

Leadville District Mining and Milling Company—This company, composed of Georgetown capitalists, is erecting a mill east of the Arkansas Valley smelter for the purpose of treating the dump of the Ibex mine. The main building will be 48x120 ft. The system to be adopted is a light concentration, by reducing three tons of dump material to two tons of concentrates; after the ore is crushed it will pass through rolls, thence to jigs; the slimes will be handled by a Card table. The new plant will be operated by electricity. In the past few months the company has done considerable work prospecting the dumps, driving tunnels and upraises and the results were satisfactory. In addition to this several carloads were sent to mills at Denver as tests. It is estimated that the dumps of the Ibex contain over a million tons and the bulk of them will be treated at the mill. The work is under the immediate supervision of Frank H. Graham, who states that the mill will be running in May.

St. Kevin District—Phil Baker and George Baker are working the Amity and shipping high-grade sulphurets. Redmond Cody, on the Griffith, is doing considerable work to connect with a large body of zinc, which can now be worked to a profit. Nat McCoy, on the Wilkesbarre, is taking out a good grade of ore.

Tuscon—The work to date on the orebody proves it to be 160 ft. wide and 15 ft. thick, with the length still unsettled. The ore is an intimate mixture of lead and zinc sulphides running from 8 to 12 lead and from 25 to 30 per cent. zinc. The ore shipped at present from the mine, about 50 tons daily, comes from development work in drifting and upraising, no stoping is being done. The shaft is 971 ft. deep and development work is being carried on from the 950-ft. level.

Indian Territory

CHOCTAW NATION

Hailey-Ola Coal Company—On Wednesday evening, March 20, while the shots were being fired in this company's mine No. 4, near Wilburton, a strong gas-feeder was shot into and fired. The fire gained headway so rapidly as to get beyond control, anl the mine was flooded and sealed. Early Friday morning the same company's machine shop at Haileyville burned to the ground.

Kentucky

LETCHER COUNTY

Letcher Coke and Railroad Company—This company has been organized to develop a tract of 16,000 acres of land. Several mines are to be opened, 500 coke ovens built, and 16 miles of railroad constructed. J. J. Phillips and James Dunn, Jr., of Cleveland, Ohio, are the organizers of the company.

Missouri

MADISON COUNTY

North American Lead Company—In our issue of March 16, page 544, it was stated

that this company's new smelter at Fredericktown was turning out blister copper containing 4 to 6 per cent. of nickel and cobalt. We are informed that the proportion is not correct. The average ore runs about 6 per cent. copper and 3 per cent. cobalt and nickel.

Montana

BUTTE DISTRICT

None of the Amalgamated subsidiary companies resume development work until the question of wages for miners and surface men is finally determined. Committees of the union have accepted the offer, which is $4 a day of 8 hours for miners while copper is 20c. per lb. or more, $3.75 while the price is between 20 and 18c., and $3.50 below 18c. On March 26 the men voted, by a large majority, to accept this offer, which ends the trouble for the present.

Butte Coalition—The Minnie Healey, Cora and Rarus mines, of this company, are yielding about 1000 tons of ore a day, mining in the two former having been resumed on a more extensive scale than formerly during the last few weeks. Two or three bodies of good ore have been opened in the lower levels of the Minnie Healey recently, and are yielding an average of 350 tons a day.

North Butte—The company is gradually increasing its production, but has almost reached the limit under present conditions, between 1300 and 1400 tons a day. The vein of the Edith May, which is one of the good producers at the 1600, is developing into a bonanza at the 1800. No attempt has been made to make this level yield largely, for it is the desire of the company to install modern conveniences for extraction and raising before mining the ore on a large scale.

Nevada

EUREKA COUNTY

Richmond-Eureka—The railroads are doing a little better as regards the amount of ore they are handling for this company, but are not yet up to the mark by any means.

Tramps Consolidated—The Denver ledge has been cut in the winze below the fourth level. The vein was found to be faulted to the east about 10 ft. About 10 ft. of ore has been penetrated and the average value of the vein material is good. The management has resolved to sink the shaft another 100 ft. in order to open out and develop this portion of the lode. Crosscutting east and west has been started from the end of the main south drift. This drift is out 400 ft. from the cross-cut tunnel and is in ore of milling grade all the way.

Frances—The shaft has reached a depth of 45 ft. and is in ore all the way. The average value for the whole width of the shaft is $28. Some samples consisting of a mixture of talc and granulated quartz, recently taken from the east side of the shaft, assayed $82 per ton. The vein appears to be of great width. It is proposed to continue the shaft to the 100-ft. level before starting crosscuts and drifts, to develop the vein.

New Jersey

WARREN COUNTY

A new cement company has taken an option on 623 acres of land between Hainesburg and Columbia, containing a large deposit of cement material, and well situated for railroad connections.

Cook Iron Mine—The Franklin Iron Company has taken a lease of this mine, near the Kishpaugh mine. The shaft will be unwatered and new hoisting machinery placed.

Pennsylvania

ANTHRACITE COAL

Philadelphia & Reading Coal and Iron Company—This company's statement for February and the eight months of its fiscal year from July 1 to Feb. 28 is as follows:

	February.	Eight Mos.
Earnings	$8,519,341	$25,326,849
Expenses	3,320,532	23,920,804
Net earnings	$ 198,809	$ 1,406,045

For the eight months there was an increase of $1,465,606 in earnings; an increase of $1,673,459 in expenses; and a consequent decrease of $207,853 in net earnings.

COKE

H. C. Frick Coke Company—This company has concluded the purchase of new electrical equipment for four of its different coal-mining operations in the Connellsville district. These equipments, which comprise main and sub-station apparatus, are intended for use in the operation of coal-mining machinery. They include rotary converters, transformers, engine-type generators and switchboard apparatus, all of Allis-Chalmers design. At Collier, in Fayette county, a sub-station will be installed with apparatus consisting of a 200-kw. Allis-Chalmers rotary converter, three 75-kw. oil-filled self-cooled transformers and switchboard. At York Run, in the main power station, additional switchboard equipment will be installed. At Dearth two 200-kw. Allis-Chalmers engine-type generators will be added to the present equipment of the power plant. At Ronco two more 200-kw. Allis-Chalmers engine-type generators, with suitable switchboard, will be added. The main station at Phillips, Penn., will be supplied with two 100-kw. Allis-Chalmers engine-type generators and switchboard.

South Dakota

LAWRENCE COUNTY

Homestake—Grading is well under way for the new pattern shop to be erected. Extra crushers will be put in at the Ellison hoist and the ore crushed to a greater fineness, and coarser screens used in the stamp batteries. This will be sufficient for the amalgamating process. For the tailings which go to the cyanide plants, a pulverizing plant will be added just below the Ellison.

Siegler Ground—A blanket of ore was discovered on this ground adjoining the Eleventh Hour. The face of the ore is 30 ft. thick and it will average better than $5 a ton. The Eleventh Hour will begin prospecting at once to catch this shoot.

Utah

IRON COUNTY

Big Fourteen—The owners of this property, at Stateline, have encountered some rich ore on the Sunflower claim. There are 8 in. of high-grade ore, while 3 ft. of the vein runs very well.

Ophir—This property is to become active again and a force of about 20 men will be put to work April 15. The property was equipped with a mill several years ago, but with equipment not suitable for the economic treatment of the ore.

Washington

WHITMAN COUNTY

Mizpah Copper—At this mine, in Hoodoo district, the manager reports that a crosscut has penetrated the vein 33 ft., at a depth of 50 ft. and over, but has not reached the hanging wall. The company has let a contract for a tunnel to be driven 500 ft. The ore shows well in copper.

Canada

ONTARIO—COBALT DISTRICT

Shipments of Cobalt ore over the Timiskaming & Northern Ontario Railway for the week ending March 23, were: O'Brien mine, 128,570 lb.; Buffalo, 40,000; Trethewey, 200; total, 168,770 lb. The small shipment of the Trethewey was made to the German-Canadian Smelting and Refining Company, Toronto, for experimental purposes.

South America

BRITISH GUIANA

Exports of gold from the colony for the two months ended Feb. 28, were $228,358 in 1906, and $176,069 in 1907; a decrease of $52,289. Exports of diamonds this year were 541 carats, valued at $3085.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, April 3. In the West the approach of spring, open weather and an improvement in the railroad situation, have combined to relieve the trade. At the same time, operators are beginning to prepare for the opening of the Lake trade. There is still some friction over railroad rates, though the Indiana trouble has been settled.

In the East there has been nothing to interfere with the regular course of spring trade. Coal is moving freely and the trade is quiet, though a fair volume of business is reported.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to March 23 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	1,188,924	1,188,087 D.	837
Bituminous	8,586,283	8,353,763 D.	232,520
Coke	2,896,977	3,120,047 I.	223,070
Total	12,672,184	12,661,897 D.	10,287

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to March 23 were 292,541 tons.

New York

Anthracite

April 3—The hard-coal market shows the usual activity at this time of the year and contracts are being closed quite rapidly. All-rail trade is moving considerable coal; but water trade, especially lighterage business, is not as active as expected, as consumers have considerable March stocks on hand. Small steam sizes still remain extremely scarce. Prices are as follows: Broken, $4.25; egg, stove and chestnut, $4.50; buckwheat No. 1, $2.50; pea, $3; rice, $1.85; barley, $1.50; all f.o.b. New York harbor points.

Bituminous

The Atlantic seaboard soft-coal trade is quiet and first contracts are now being filled; a certain portion of the trade is taking on anthracite coal at April prices and with such trade bituminous is for the moment being slighted. Vessels are carrying anthracite coal to the ports along the Sound and this side of Cape Cod, and this also affects the soft-coal market at these points.

Contracts have been fairly well closed for this part of the season. The far East is quiet and is not taking on much coal, although it is believed that consumers have not large stocks.

New York harbor trade is quiet, with very little demand and not much surplus coal at tidewater. Prices are $2.75 f.o.b. New York harbor shipping ports for good grades of steam coal. All-rail trade is being pushed and prices are $1.10@1.25 f.o.b. mines for ordinary steam grades. Vessels in the coastwise market are in fair supply and brokers and captains are endeavoring to charter at the present rates to arrive, which indicates that they think spring weather will soon reduce freight rates. We quote rates from Philadelphia on large vessels at $1@1.10 to Boston, Salem and Portland, and $1.10@1.15 to Portsmouth. From New York harbor the rate on small vessels is $1 to the first named ports.

Birmingham

April 1—Coal operations in Alabama hardly suffer from the warm weather for some time yet. The demand is just as urgent right now as it has been at any time this year and every car that can be secured is being used.

Edgar Adler, who was vice-president and general manager of the Birmingham Iron Company, announces that he and his two brothers have withdrawn from that company, and H. M. Atkinson, P. S. Arkwright and James Bonneyman, of Atlanta, Ga., are in control as president, vice-president and acting manager respectively. The Messrs. Adler have purchased 3600 acres of coal land from the University of Alabama for $100 per acre.

Chicago

April 1—The trade in bituminous coals, though large in volume, continues to suffer from low prices. It is impossible to keep out of the city any proportion of the supplies from the mines of Illinois and Indiana so as to regulate supply to demand. In consequence coal accumulates on tracks, and has to be sold at a sacrifice.

Anthracite business for April is starting off well under the announcement of the 50c. discount for the month. Retailers report that the prospects are better for consumers laying in stocks of coal early this year than for several years past. Sales of anthracite in March were, as usual, dull, though the cool weather of the last two or three days has brought many orders for piecing-out lots.

Illinois and Indiana run-of-mine sell at $1.50@2.25, with lump and egg ranging $1.75@2.50, and screenings about $1.50. Prepared sizes are weak and fine coals are strengthening.

Hocking Valley coal is quiet at about $3 for lump. Smokeless is weak because of large shipments that could not be readily absorbed by the market, and brings 25@30c. under the circular price of $3.35 for run-of-mine. Eastern coals generally are in comparatively light demand.

Contracts for the coming year are being made perhaps more freely than a year ago at this season, but there is a disposition on the part of consumers to hold off, in the belief that the previous years' low prices in the open market will be repeated.

Cleveland

April 2—The railroads have been contemplating an advance in coal rates from mines to lake ports. The rate was advanced 5c. a short time ago, making $2.55 on Pittsburg coal to Cleveland, after which a differential of 5c. was added. The latter, however, has not gone into effect, and talk of changing the first advance and the differential into a straight 10c. advance had died away. The cold snap has again tied up the channels on the lakes and from indications, navigation will not open until April 15. There is little coal afloat here in comparison with other ports. The market is quiet with normal supply on track.

Coke is quiet and firm. Floods have had little effect on the market, as a number of ovens were banked at the time. Furnace coke is contracted for at $2.90@3; foundry coke $3.50@3.60 at ovens.

Pittsburg

April 2—The principal event in the coal trade this week was the opening of shipments to the lakes for the northwestern markets. Contracts for the season so far placed exceed all previous years. One large independent interest, that had sold a part of its production to the Pittsburg Coal Company for this trade, has closed a contract with another large lake shipper for all of its surplus coal. All the mines were idle yesterday on account of the celebration of the establishment of the eight-hour workday in the mines, but most of them resumed this morning, and all are expected to be running full tomorrow. There is no complaint of a shortage of railroad cars. Prices remain firm on a basis of $1.15@1.25 for mine-run coal at the mine. The Monongahela

River Consolidated Coal and Coke Company made some large shipments by river to lower ports, and the pools and harbor are practically cleaned up. There is a good supply of empty coal boats and barges, and the river mines will be kept running steadily for several months.

Connellsville Coke—Coke prices stiffened a little this week; the minimum quotation for furnace coke is $2.85, and $3 is named for deliveries running through the last half. Foundry coke remains at $3.50@3.75 for any delivery. The *Courier* gives the production in the Connellsville field for the week ending March 23, at 285,740 tons, and in the lower Connellsville region at 103,210 tons, a total of 388,950 tons. The total shipments aggregated 13,333 cars, distributed as follows: To Pittsburg, 4494 cars; to points west of Connellsville, 7946 cars; to points east of Connellsville, 893 cars.

Foreign Coal Trade

April 3—Exports of coal and coke from the United States for the two months ended Feb. 28 are reported by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
Anthracite	293,567	341,693	I. 51,126
Bituminous	1,060,288	1,135,759	I. 75,471
Total coal	1,353,855	1,449,452	I. 129,597
Coke	117,159	129,967	I. 12,808
Total	1,446,814	1,579,419	I. 142,605

The exports do not include coal bunkered, or sold to steamships engaged in foreign trade. The coke exported went chiefly to Mexico and eastern Canada; the distribution of the coal was as follows:

	1906.	1907.	Changes.
Canada	924,159	972,535	I. 48,376
Mexico	177,837	179,590	I. 1,753
Cuba	123,825	119,980	D. 3,845
Other W. Indies	54,577	84,890	I. 30,313
Europe	6,362	11,750	I. 5,388
Other countries	32,925	80,737	I. 47,812
Total	1,353,855	1,449,452	I. 129,597

The exports to Europe were chiefly to Italy; those to other countries, to South America. The exports to Canada—67.1 per cent. of the total in 1907—were, in detail, as follows:

	1906.	1907.	Changes.
Anthracite	286,468	334,774	I. 51,206
Bituminous	639,791	667,584	I. 27,860
Total	924,159	972,535	I. 48,376

There was an increase in anthracite, but a small loss in bituminous coal.

Iron Trade Review

New York, April 3—The iron and steel markets have been comparatively quiet, so far as new business is concerned. Contracts are mainly closed well into the year, and purchasers seem disposed to hold back a little, and wait developments. Some of them are also beginning to count the cost of materials more closely than they were inclined to do a few months ago. The increasing difficulty of financing new enterprises is also a factor. This does not interfere with current work at the mills, which are receiving specifications on contracts freely and are not in a position to promise early deliveries on new orders, except in a few cases. Probably the waiting attitude, which is not unusual at this time of year, will not last very long.

Baltimore

April 2—Exports for the week included 5383 tons rails and 167 tons splice-bars to Buenos Aires.

Imports for the week included 216 tons spiegeleisen, 1674 tons ferromanganese, and 251 casks ferrosilicon. Imports of iron ore were 10,920 tons from Cuba, and 4400 tons from Spain; 15,330 tons in all. One cargo, 2500 tons iron pyrites, was received from Spain; and 745 tons copper pyrites from Chile.

Chicago

April 1—The iron market remains quiet, but there are signs of firmness all along the line. Southern iron especially is strengthening; there is little talk of $18 Birmingham for No. 2, and $18.50@19 is said to be obtained on some contracts for second-half delivery. Northern iron is quoted at $23.50@24 for second half delivery. For quick-delivery lots there is a wide range of prices, but Southern at about $22, and Northern at about $26 represent the average price. Contract sales are not large in number or in tonnage, but they represent a steady demand.

Coke is quiet, with the demand fairly good and supplies not too large. The best Connellsville sells for $6.50, with West Virginia 25@40c. lower.

Cleveland

April 2—Iron is in strong demand owing to the fact that several furnaces are out of blast. Prices are unchanged. Some sellers report spot at $26, but sales are being made under that figure. Bessemer is quoted at $21@21.50 and No. 1 Northern at 22.50 for future delivery.

Old material is scarce and in strong demand. The market stands with $25@26 for old iron rails; No. 1 R. R. wrought, $17@18.

Philadelphia

April 2—Sales of pig iron are very small and interest in the market has subsided, but the consumption of all kinds of iron continues at maximum limits. There is very little iron to sell for what is regarded as early delivery, and there appears to be less inclination among the larger consumers to rush into the market for late deliveries. Quotations are strong, and buyers are not inclined to bid any higher even for special accommodations. Basic iron is not selling, as there is none to sell, but it is wanted. Forge iron is doing remarkably well, and buyers are on the watch for iron for third-quarter delivery. Gray forge is quoted from $22.25 for remote, as high as $23.50 for early delivery. Low phosphorus is quoted at $26@26.50, according to delivery.

Steel Billets—Quotations are rather nominal, the highest figure quoted this week being $33. There is a moderate amount of business in forging steel, and the qualities sold average $26.

Pittsburg

April 2—There is nothing in the iron and steel markets to indicate weakness in any line, but there is every evidence that the mills and furnaces will be kept busy throughout the year. In finished lines considerable new business in steel rails, plates, bars, tin-plate and merchant pipe is being booked, and the mills are well filled with specifications. The Carnegie Steel Company yesterday booked orders for 20,000 tons of standard steel rails and also received inquiries for 60,000 tons. Despite the fact that the National Tube Company will not name new discounts before June 1, it is still receiving large orders for pipe, subject to the new prices and for delivery in the third quarter. It has been announced semi-officially that the leading producer cannot guarantee delivery before June 30. The Youngstown Sheet and Tube Company has sent out a new card, naming 74 and 5 per cent. as the extreme discount for large lots. This is $4 a ton above the prices recently withdrawn, and, it is believed, fixes the price to be named later by the National Tube Company. Although the plate mills are crowded with business, orders continue to come in, but mills in this district cannot guarantee delivery. One large interest has declined an order of 5000 tons. The eastern mills seem to be in a position to take on new business for prompt shipment and readily get 2c., which is $6 a ton above the established price of 1.70c. The Carnegie Steel Company, which was behind in its deliveries of plates to car and shipbuilding interests, is now in a position to catch up, as it has its new 72-in. plate mill at the Homestead works in full operation.

Pig Iron—The demand for pig iron for early delivery is greater than last week, but no large tonnages have been sold, owing to limited supply. Two small lots of No. 2 foundry were sold today for prompt delivery at $25.25, Valley. Late last week bessemer iron aggregating about 3000 tons for April and May delivery sold at $23, or $1 a ton above the price paid recently. The Midvale Steel Company has bought 3500 tons of bessemer iron for third-quarter delivery at $22. This price is 50c. a ton above the price named early in the year by the furnaces for second-half delivery. For the fourth quarter the

furnaces are ready to sell at $21, Valley. There is no doubt that the Steel Corporation will exercise its option on 14,000 tons placed with the Bessemer Pig Iron Association for delivery in May at $22. Gray forge is quoted nominally at $21.35 @21.85, Pittsburg.

Steel—There is no change in the steel market. Billets continue scarce, bessemer being quoted at $29.50 and open-hearth at $32. Plates are firm at 1.70c. and merchant steel bars at 1.60c.

Sheets—Demand continues heavy, and for prompt delivery premiums are offered ranging from $1 to $2 a ton. Black sheets are still quoted at 2.60c. and galvanized sheets at 3.75c. for No. 28 gage.

Ferro-Manganese—The market is strong, and quotations continue at $75@76 for prompt delivery.

Metal Market

NEW YORK, April 3

Gold and Silver Exports and Imports

At all United States Ports in February and year

Metal.	Exports.	Imports.	Excess.
Gold			
Feb. 1907..	$1,027,058	$ 3,275,933	Imp. $2,248,875
" 1906 .	8,486,330	2,079,683	Exp. 6,406,647
Year 1907..	3,477,130	6,546,438	Imp. 3,069,308
" 1906..	14,227,995	4,685,392	Exp. 9,542,603
Silver			
Feb. 1907..	4,223,970	3,693,061	Exp 530,909
" 1906 ..	6,435,129	4,480,449	" 1,954,680
Year 1907..	8,990,935	7,350,102	" 2,640,633
" 1906 ..	13,951,797	9,167,160	" 4,784,637

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Mar. 30 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 4,500	$ 139,642	$ 529,343	$ 73,725
1907.....	1,721,926	3,049,259	9,311,459	378,746
1906.....	3,140,925	2,062,985	18,373,802	503,261
1905.....	31,935,270	3,974,111	9,335,041	675,447

Exports of gold for the week were to the West Indies; of silver to London and Paris. Imports of gold for the week were from Holland and the West Indies; of silver from Mexico and Central America.

The joint statement of all the banks in the New York Clearing House for the week ending March 30 shows loans $1,056,545,200, an increase of $6,555,600; deposits, $1,019,817,300, an increase of $17,672,700, as compared with the preceding week. Reserve accounts show:

	1906.	1907.
Specie.....	$177,895,000	$195,659,700
Legal tenders.....	78,108,900	72,425,900
Total.....	$256,203,900	$268,085,600
Surplus.....	$5,131,275	$13,131,275

The surplus over legal requirements shows an increase of $8,421,825, as compared with the previous week.

Specie holdings of the leading banks of the world, March 30, are reported as below, in dollars:

			Total
Asset New York			$195,659,700
England.....	$174,986,210		174,986,210
France.....	72,...	$[illegible]	...
Germany.....	172,[illegible],000	87,395,000	2[illegible],000
Spain.....	77,1[illegible],000	12[illegible],000	2[illegible],000
Netherlands..	25,[illegible],000	2[illegible],000	2[illegible],000
Belgium.....	1[illegible],000	[illegible],000	24,955,000
Italy.....	162,[illegible],000	24,920,000	187,283,000
Russia.....	59[illegible],000	[illegible],000	[illegible]
Aust.-Hungary.	22[illegible],000	62,125,000	289,005,000
Sweden.....	20,805,000		20,805,000

The banks of England and Sweden report gold only. The New York bands do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to March 21:

	1905.	1906.	Changes
India.....	£ 4,761,910	£3,601,910	D. £ 1,160,000
China.....	.....	.....	.....
Straits..	.....	85,050	I. 85,050
Total.....	£ 4,761,910	£3,686,960	D £ 1,074,950

Imports for the week were £10,000 from the West Indies, $177,000 in bars, and £106,000 in Mexican dollars from New York, a total of £293,000.

Prices of Foreign Coins

	Bid	Asked
Mexican dollars.....	$0.50	$0.53½
Peruvian soles and Chilean....	0.46	0.51
Victorian sovereigns.....	4.85	4.87
Twenty francs.....	3.85	3.89
Spanish 25 pesetas.....	4.78	4.80

SILVER AND STERLING EXCHANGE.

March.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.	April.	Sterling Exchange.	Silver. New York. Cents.	Silver. London. Pence.
28	4.83	66	30	1	4.83½	65[illegible]	...
29	4.83	66	....	2	4.84[illegible]	65[illegible]	30
30	4.83	65¾	30[illegible]	3	4.84½	64[illegible]	30

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

March.	Copper. Lake. Cts. per lb.	Copper. Electrolytic. Cts. per lb.	Copper. London. £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York. Cts. per lb.	Spelter. London. £ per ton.
	25	24				6.75	6.60
28	a25⅝	a25	97[illegible]	40¼	6.00	@6.80	a[illegible]
	25	24½				6.75	6.60
29	a25	@25	....	40⅜	6.00	a[illegible]	a[illegible]
	25	24½				6.75	6.60
30	a25	a25	....	40	6.00	@6.80	@6.65
	25	24¼				6.75	6.60
1	a25	a25	....	40½	6.00	@6.80	@6.65
	25	24				6.75	6.60
2	a25⅛	a25	97	40¼	6.00	@6.80	@6.65
	25	24				6.75	6.60
3	a25⅛	@25	92	40	6.00	@6.80	@6.65

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—The market is erratic and uncertain, partly because of the absence of demand from consumers and partly from the effect of the tremendous decline in London. The low price for standard there makes it possible for refiners to buy it and sell electrolytic against it for lower prices than yet rule here. On the other hand, several large American interests are still holding electrolytic at the equivalent of 25c., but are making no sales, while other interests are offering at much lower figures. As a further confusing feature in the situation, the Calumet & Hecla is reported to have made during the last week a considerable sale at 26c., but it is to be remarked that this special brand frequently sells at a variance from general market conditions. Quotations at the close are irregular at 25@25½c. for Lake; 24@25c. for electrolytic, and 23@23¾c. for casting.

The dumping of holdings by frightened speculators and bear sales have induced declines in the London standard market from day to day, and the close is cabled as very weak at £92 for spot, £94 for three months'.

Statistics for the second half of March show an increase in the visible supplies of 1700 tons.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—While at the beginning of the week, on account of a rise in the London market, the demand here had become a little more active, 40½ being paid for spot tin, the weaker advices received from abroad at the close scared off prospective buyers, and the domestic market closes weak and nominal at 40c. London closes at £183 for spot, £181 for three months'.

Statistics for the month of March show a decrease in the visible supplies of 100 tons.

Visible stocks of tin on April 1 are reported as follows, in long tons:

	In Store.	Afloat.	Total.
Great Britain.....	2,803	3,716	6,519
Holland.....	1,835	183	2,018
United States.....	1,845	2,748	4,593
Total.....	6,483	6,647	13,130

United States stocks do not include those at Pacific ports. The total is 1282 tons greater than on April 1, last year.

Lead—The market is unchanged at 6c. New York.

The London market has been somewhat better throughout the week and quotations have advanced slightly from day to day, the closing being cabled at £19 12s. 6d. for Spanish lead, £19 15s. for English lead.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull and again slightly lower. Sales here are on a basis of 5.95@5.97½c. for Missouri brands.

Spanish Lead Market—Messrs. Bar- [illegible] price of lead is 02.50 reales per quintal, silver being paid at 14 reales per ounce. Exchange, 27.03 pesetas to £1. The price [illegible] £18 14s. 10d. per long ton, f.o.b. shipping port. Exports for the week were 1066 tons desilverized and 50 tons antimonial lead.

Spelter—The market is very dull. Offerings are on a somewhat more liberal scale, but buyers have so far not been attracted by the lower quotations. The market closes dull at 6.75@6.80 New York, 6.60@6.65 St. Louis.

The London market has shown some [illegible] and prices have gone back at the close to £26 for good ordinaries, £26 5s. for specials.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gage Nos. 9 to 22, both inclusive, widths from 32 to 60 in., both inclusive, lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of March 16, that the market is quiet. Exports for the week were 3400 tons blende to Antwerp; 2400 tons blende and calamine to Stettin.

Antimony—The market is still dull, and quotations are nominal. Ordinary brands, 22¼@22½c; Hallett's, 23½c.; Cookson's, [illegible]

Nickel—For large lots New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities [illegible] same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation shows a considerable fall, being $33 per ounce for ordinary metal. Scrap is correspondingly lower.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large [illegible] Sam[illegible] miscellaneous prices are $36@39 per flask, according to quantities for domestic orders, and $37@37.50 for export. The London [illegible] £7 per flask but £6 16s. [illegible]

Aluminum—For ton lots, or over, prices are: No. 1, over 99 per cent. pure metal, 40c. per lb.; No. 2, over 90 per cent., 37c. Small lots 1 to 3c. per lb. higher, according to size.

Imports and Exports of Metals

[illegible] United States for the two months ended [illegible] the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each:

	1906.	1907.	Changes.
Great Britain	3,051	3,668	I. 617
Belgium	402	289	D. 113
France	6,027	5,067	D. 960
Italy	908	1,107	I. 199
Germany and Holland	16,571	12,694	D. 3,877
Russia	662	360	D. 302
Other Europe	1,844	1,110	D. 734
Canada	269	246	D. 23
China	600	. .	D. 600
Other countries	28	17	D. 11
Total metal	30,392	24,853	D. 5,539
In ores and matte	1,333	564	D. 769
Total	31,725	25,417	D. 6,308

The total decrease was 19.9 per cent. The actual quantity of ore and matte exported this year was 10,088 tons, of which 8845 tons went to Canada, 1100 tons to Mexico, 123 tons to Germany and 20 tons to Great Britain.

Imports into the United States of copper and copper material for the two months ended Feb. 28, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico	6,554	2,638	9,192
Canada	1,287	990	2,277
Great Britain	4,068	.....	4,068
Japan	270	.....	270
South America	.....	576	576
Other countries	2,908	4	2,912
Total imports	15,087	4,208	19,295
Re-exports	78	....	78
Net imports	15,009	4,208	19,217
Net imports, 1906	11,818	3,941	15,759

The total increase in the net imports this year was 3458 tons, or 21.9 per cent. This heavy increase was chiefly in the imports from other countries. The actual tonnage of ores and matte imported from Mexico this year was 14,168 tons; from Canada and Newfoundland, 30,856; from South America 5304 tons.

The exports and the net imports compare as follows:

	1906.	1907.	Changes.
Exports	31,725	25,417	D. 6,308
Net imports	15,759	19,217	I. 3,458
Excess, exports	15,966	6,200	D. 9,766

This shows a decrease of 61.2 per cent. in the excess of exports this year.

Tin—Imports of tin into the United States for the two months ended Feb. 28 were as follows, in long tons:

	1906.	1907.	Changes.
Straits	3,430	2,435	D. 995
Australia	50	98	I. 48
London	1,919	3,322	D. 1,397
Holland	95	194	I. 99
Other Europe	190	176	D. 14
Other countries	3	1	D. 2
Total	5,687	6,226	D. 2,461

This shows a decrease of 28.3 per cent. in the total imports this year.

Lead—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the two months ended Feb. 28, in short tons, of 2000 lb. each:

	1906.	1907.	Changes.
Lead, metallic	1,779	2,197	I. 419
Lead in ores and base bullion	14,951	8,925	D. 6,026
Total imports	16,727	11,120	D. 5,607
Re-exports	7,055	2,673	D. 4,382
Net imports	9,672	8,447	D. 1,225

Of the imports this year 8054 tons were from Mexico, and 793 tons from Canada. Exports of domestic lead were 40 tons in 1906, and 70 tons in 1907; an increase of 30 tons this year.

Spelter—Exports of spelter from the United States for the two months ended Feb. 28 were 1508 short tons in 1906, and 185 tons in 1907; a decrease of 1323 tons. Exports of zinc dross were 2539 short tons in 1906, and 2383 tons in 1907; a decrease of 156 tons. Exports of zinc ore were 4517 tons in 1906, and 4046 tons in 1907; a decrease of 471 tons.

Imports of spelter for the two months were 257 short tons in 1906, and 192 tons in 1907; a decrease of 65 tons.

Antimony—Imports of antimony into the United States for the two months ended Feb. 28 were as follows, in pounds:

	1906.	1907.	Changes.
Metal and regulus	1,397,176	2,069,109	I. 671,933
Antimony ore	82,777	444,294	I. 361,517

There was a large increase this year, both in metal and in ore.

Nickel—Imports of nickel ore and matte into the United States for the two months ended Feb. 28 were 2020 tons in 1906, and 2067 tons, containing 2,720,105 lb. metal, in 1907. The metal contents were not reported last year.

Exports of nickel, nickel oxide and nickel matte for the two months were 1,819,954 lb. in 1906, and 1,662,283 lb. in 1907; a decrease of 157,671 lb. this year.

Platinum—Imports of platinum into the United States for the two months ended Feb. 28 were 2284 lb. in 1906, and 1853 lb. in 1907; a decrease of 431 lb. this year.

Quicksilver—Exports of quicksilver from the United States for the two months ended Feb. 28 were 165,981 lb. in 1906, and 132,466 lb. in 1907; a decrease of 33,515 lb. this year.

Aluminum—Exports of aluminum from the United States for the two months ending Feb. 28 were valued at $19,384 in 1906, and $66,264 in 1907; an increase of $46,880 this year.

New York Metal Exchange—At the annual meeting, April 1, the exchange elected the following officers: President, Robert M. Thompson, vice-president, Adolph Lewisohn; treasurer, Robert L. Crooke; managers, B. Hochschild, H. W. Hendricks, L. Nachmann, G. E. Behr, W. Jay Ives, George W. Jaques, J. H. Lang, L. Vogelstein; arbitration committee, J. Langeloth, Morton B. Smith, Edwin J. Keane, E. A. Caswell, Paul Koning.

Missouri Ore Market

Joplin, Mo., March 30—The highest price paid for zinc was $52.50 per ton on an assay basis of $48 to $51 per ton of 60 per cent. zinc. The average price for the week was $48.80.

The highest price paid for lead was $85

per ton, with medium grades selling from $81 to $83 and the average price $81.96.

The three months of the year 1907, ending today, mark an increase of 13,330 tons zinc and 3000 tons lead compared with the first three months of 1906, and the combined value of both minerals is $1,171,000 greater than last year. The highest price for zinc a year ago was $49.50 per ton and for lead $87 per ton, one being higher today and the other lower.

Following are the shipments of zinc and lead from the various camps of the district for the week ending March 30:

	Zinc lb.	Lead lb.	Value.
Webb City-Carterville	[illegible]	1,052,830	$126,345
Joplin	2,360,410	379,720	68,865
Galena-Empire	1,518,800	200,440	47,027
Alba-Neck City	1,496,040	46,650	40,821
Prosperity	883,880	307,950	22,214
Duenweg	687,850	114,950	21,745
Granby	725,000	90,000	19,600
Aurora	720,880	37,900	15,765
Badger	535,080	[illegible]	13,912
Spurgeon	390,880	51,470	8,785
Carthage	250,250	5,330	6,755
Oronogo	155,780	18,380	4,354
Sherwood	147,000	15,350	3,926
Carl Junction	142,040	1,870	3,389
Baxter Springs	117,780	[illegible]	2,773
Zincite	103,090	3,570	2,620
Stott City	105,560	[illegible]	2,586
Reeds	47,510	[illegible]	1,163
Totals	12,816,810	2,365,590	$409,743

Three months.....156,083,950 23,950,190 $4,698,113
Zinc value, the week, $312,798; 3 months, $3,698,720
Lead value, the week, 96,945; 3 months, 999,393

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	[illegible]	April	75.13	[illegible]
May	40.51	[illegible]	May	78.49	[illegible]
June	43.83	[illegible]	June	80.06	[illegible]
July	43.25	[illegible]	July	74.31	[illegible]
August	43.56	[illegible]	August	75.36	[illegible]
September	42.58	[illegible]	September	79.64	[illegible]
October	41.55	[illegible]	October	[illegible]	[illegible]
November	44.13	[illegible]	November	81.98	[illegible]
December	43.68	[illegible]	December	81.89	[illegible]
Year	43.24	[illegible]	Year	77.40	[illegible]

Wisconsin Ore Market

Platteville, Wis., March 30—It now appears that the price of 60 per cent. ore has reached the top notch of the season and those who have been talking $60 ore, do not expect to hold for higher prices. Nearly all the ore produced sold on a $50 basis for 60 per cent. zinc, and one producer reports receiving $50.50.

The camps of the district loaded ore for the week ending March 30 as follows:

Camps.	Zinc, Lb.	Lead, Lb.	Sulphur, Lb.
Platteville	[illegible]		
Linden-Hardscrabble	[illegible]		
Highland	[illegible]	[illegible]	
Benton	[illegible]		
Hazel Green	[illegible]	[illegible]	
Beetown	[illegible]		
Mineral Point	[illegible]		
Cuba City	[illegible]		
Livingston	[illegible]		
Total for week	2,414,520	49,620	
Year to March 30	21,432,814	489,390	145,169

The problem of sufficient labor is still unsolved and the numerous new plants that are starting up almost daily, increase the demand. The old question of car service still confronts the shippers and is a controlling factor as far as prompt shipment is concerned. This condition works no material hardship; it only compels the building of extra ore-bins to store the concentrates.

Chemicals

New York, April 3—On March 30 a fire at the Laurel Hill works of the General Chemical Company damaged one of the eight sets of sulphuric-acid towers and destroyed several adjoining buildings. The loss was estimated at about $30,000, but will not seriously affect the output of the plant.

Copper Sulphate—The market continues strong and the demand is unabated. Prices remain at $7.50 per 100 lb. for carload, and $7.75 for jobbing lots.

Exports of copper sulphate from the United States for the two months ended Feb. 28 were 4,646,454 lb. in 1906, and 2,870,519 lb. in 1907; a decrease of 1,775,925 lb. The exports this year contained about the equivalent of 320 long tons of copper.

Nitrate of Soda—The market is strong and the demand continues good. Spot prices are quoted at $2.70 per 100 lb. with 96 per cent. for all positions of 1907 at $2.50. The price for 95 per cent. salts is $2.45, for both 1907 and 1908.

Heavy Chemicals—Imports of heavy chemicals into the United States for the two months ended Feb. 28 are reported as follows, in pounds:

	1906.	1907.	Changes.
Bleaching powder	20,920,467	21,046,401	I. 125,934
Potash salts	28,049,436	50,879,489	I. 22,830,053
Soda salts	3,812,716	3,922,345	I. 109,629

Exports of acetate of lime were 13,056,053 lb. in 1906, and 16,860,287 lb. in 1907; an increase of 3,804,234 lb. this year.

Phosphates—Exports of phosphates from the United States for the two months ending Feb. 28 were, in long tons:

	1906.	1907.	Changes.
Crude	162,990	124,801	D. 38,189
All other	[illegible]	[illegible]	D. [illegible]
Total	[illegible]	[illegible]	D. [illegible]

The chief exports this year were 40,677 tons to Germany; 22,774 to France; 19,252 to Great Britain; 12,039 to Italy.

Sulphur—Imports of sulphur and pyrites into the United States for the two months ended Feb. 28 were, in long tons:

	1906.	1907.	Changes.
Sulphur	[illegible]	[illegible]	D. [illegible]
Pyrites	[illegible]	[illegible]	D. [illegible]

Estimating sulphur contents of pyrites, the total imports of sulphur were 59,715 tons in 1906, and 48,757 tons in 1907; a decrease of 10,958 tons.

Barytes—All grades are very scarce and market is practically bare of good qualities. We quote American ground at $14.50@21, with foreign floated at $19.50 @22.50. The demand for barytes is strong.

Manganese Di-oxide—Dealers are behind in their deliveries from three to four months and premiums are freely offered for prompt or spot delivery. The scarcity of the material makes quotations simply nominal. We quote 3@6½c. per lb. according to manganese content.

Conditions in the manganese ore market are similar, and dealers are not willing to sign contracts when they are uncertain about obtaining the ore.

Mining Stocks

New York, April 3—The stock market has again been subject to many fluctuations, with occasional advances, but a general downward tendency. Dealings during the week have been largely professional, the public having apparently made up its mind to stay out for a while. Mining shares have followed the general trend, and have been lower, without much special activity. The immediate outlook is not promising, although money is comparatively easy for the time.

Boston

April 2—After the sharp depression, shares have shown resiliency and recovered quite sharply the past week, although they are far below the high prices recorded earlier in the year.

Trinity has recorded the greatest proportionate advance the past week. From a close at $18 a week back, it sold fractionally below that, but touched $31.50 Monday with reaction to $27 tonight. Amalgamated rose $8.50 to $93.75 in the period, settling but a fraction from this. North Butte spurted $9 to $92.50, closing $2 below this, and Butte Coalition rose $4.75 to $28.50, closing at $27 tonight.

The annual meeting of the Centennial Copper Mining Company as held and Calumet & Hecla people stepped into the directory, according to program, leaving but two of the original Centennial directors on the board. Calumet & Hecla owns 46,000 shares of stock. The annual report for 1906, showed a net gain of $77,136 for the year and the total surplus Dec. 31 was $340,310. The Osceola annual meeting has been again adjourned to April 16, owing to court proceedings. The Calumet & Arizona annual report shows net earnings of $4,827,873 for 1906, of which was paid $2,600,000 in dividends. The total surplus Dec. 31 was $4,666,133. The Balaklala underwriting syndicate had to take all but about 10 per cent. of the new issue of stock.

The Old Dominion is expected to de-

[illegible] $1 in June. The Champion mine last week paid its fourth $1 dividend this year.

As indicating interest in curb securities total dealings on the Boston curb last month were over 3,277,100 shares or 1,000,000 greater than for February, which was the record.

Colorado Springs

March 30—The trading on the local stock exchange has been decidedly dull during the entire week. Prices have remained stationary and the volume of business has not been large, but the sales have been fairly well distributed through the entire list, El Paso being the most favored.

STOCK QUOTATIONS

NEW YORK	Apr. 2
Name of Comp.	Clg.
Alaska Mine	1
Am. Nev. M. & P. Co.	3
[illegible]	92
[illegible]	65
Bankers	9
British Col. Cop.	8
Buffalo Cobalt	2
[illegible]	2
[illegible]	27
[illegible] & Zinc	5⅞
Cobalt Contact	[illegible]
Colonial Silver	[illegible]
[illegible]	[illegible]
[illegible]	14
[illegible]	5
[illegible]	5
[illegible]	1⅞
Furnace Creek	1¼
[illegible]	8½
[illegible]	2⅜
[illegible]	1⅛
[illegible] & S	1⅞
[illegible]	99
Guanajuato	4
[illegible]	265
[illegible]	[illegible]
McKinley Dar.	1
[illegible]	4
[illegible]	1⅞
[illegible]	4
Mont. Sho. C. (New)	1
[illegible]	4
Newhouse M. & S.	[illegible]
[illegible]	1
[illegible]	8
[illegible]	11
[illegible]	2
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
West Columbus	11

[illegible]	[illegible]
[illegible]	[illegible]
Am. Smelt. & Ref.	1
[illegible]	[illegible]
Bethlehem Steel	1
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
National Lead, pf.	5
Pittsburg Coal	[illegible]
Republic I. & S.	[illegible]
Republic I. & S., pf.	[illegible]
[illegible]	[illegible]
Tenn. C. & I.	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]

CHEMICALS, MINERALS, RARE EARTHS, ETC. CURRENT WHOLESALE PRICES.

ABRASIVES—
Bort, good drill quality, carat $85.00
Carborundum, f.o.b. Niagara Falls, powd. lb. .08
Grains " 10@ 17
Corundum " .07@ .10
Crushed Steel, f.o.b. Pittsburg " .05¾@.06
Emery, in kegs, Turkish flour " .01½@.02½
Grains " .03½@.04½
Naxos flour " .01½@.02½
Grains " .03½@.04½
Chester flour " .01½
Grains " .03½@.04½
Peekskill, f.o.b. Easton, Pa., flour " .01½@.01½
Grains, in kegs " .02½@.02½
Garnet, per quality, ...sh ton 25.00@35.00
PumiceStone, Am. Powd. 100 lb. 1.60@2.00
Italian, powdered " .01½@ .02½
Lump, per quality " .03@ .20
Rottenstone, ground " .02½@ .04½
Lump, per quality " .05@ .25
Rouge, per quality " .05@.30
Steel Emery, f.o.b. Pittsburg " .07¾@.07¾

ACIDS—
Acetic 28% lb. .02¾@.02½
Boric " .09¾@.10
Hydrofluoric, 30% " .02¾@.03
48% " .06
" 60% " .10
Hydrochloric acid, 20° per lb. 1.25@1.50
Nitric acid, 38° per lb. 4.25@4 62½c.
Sulphuric acid, 50° bulk, per ton.. $12 up.
60°, 100 lb. in carboys .85@1.12½
60°, bulk, ton,..... 16.00@18.00
66°, 100 lb. in carboys 1.00@1.25
66°, bulk, ton..... 18.00@20.00
Oxalic " .08½@.09

ALCOHOL—Grain..... gal. 2.46½
Refined wood, 95@97% " .70@.75

ALUM—Lump..... 100 lb. $1.75
Ground " 1.85
Chrome Alum..... lb. .03¾@.03¾

ALUMINUM—Sulphate, com'l. " 1.25@1.60

AMMONIA—24 deg. lb..... .04½@.05½
26 " " ..... .04¾@.05¾

AMMONIUM—
Bromide..... lb. .23
Carbonate " .07½@.08
Muriate grain " .06¾@.07
Lump " .09@.09½
Sulphate, 100 lb..... 3.00@3.12½
Sulphocyanide com..... " .50
" chem. pure " .40

ANTIMONY—needle, lump lb..... .13½@.14

ARSENIC—White.....(nominal) " .07¼@.07¾
Red " .06½@.07

ASPHALTUM—
Barbadoes.....per ton. 40.00@80.00
West Indies..... " 20.00@60.00
Egyptian..... lb. .05@.14
Gilsonite, Utah ordinary per ton. 50.00
Trinidad " 30.00@40.00
California..... " 20.00@35.00

BARIUM—
Carb. Lump, 80@90%.....sh. ton. 30.00@35.00
Powdered, 80@90%..... lb. .02@.02½
Chloride com'l.....ton. 37.50@40.00
Nitrate, powdered, in casks..lb. .06
Sulphate (Blanc Fixe)..... " .02¾

BARYTES—
Am. Ground.....sh. ton. 14.50@21.00
Floated " 22.00
Foreign floated " 19.50@22.50

BISMUTH—Sub-nitrate..... lb. 1.50

BLEACHING POWDER—35%, 100 lb. 1.30@1.50

BLUE VITRIOL—(copper sulphate), carload, per 100 lb..... 7.00

BONE ASH..... lb. .02½@.03

BORAX..... " .07½@.07¾

CALCIUM—Acetate, gray " 2.35@2.40
Acetate, brown " 1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J..... sh. ton. 65.00
Chloride, f.o.b. N. Y. " 16.00@18.00

CEMENT—
Portland, Am. 500 lb. bbl. 1.55@1.60
Foreign " 2.25@2.40
"Rosendale," 300 lb..... " .85
(in sacks)..... .65
Slag cement " .75@1.25

CHROME ORE—
New Caledonia 50% ex. ship. N. Y. per lg. ton 17.50@20.00
Bricks, f.o.b. Pittsburg, M.. " 175.00

CLAY, CHINA—Am. common ex-dock, N. Y..... " 8.00@9.00
Foreign " 11.50@17.50

COBALT—Oxide..... lb. 2.50

COPPERAS—Bulk. 100 lb. $0.55
In bbls " .75@ .75
In bags " .60@ .70

CRYOLITE..... lb. .06½

FELDSPAR—Ground best...sh. ton. 7.00@15.00

FIRE BRICK.
American..... per M. 30.00@40.00
Imported " 20.00@45.00
St. Louis No. 1.. " 16.00
" No. 2 " 14.00
Extra " 20.00@25.00

FIRE CLAY.
St. Louis mill,.....per ton 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump..... sh. ton 8.00@10.00
Ground " 11.50@13.50
Gravel " 4.25@4.50
Foreign crude ex. dock..... 8.00@10.00

FULLER'S EARTH—Lump..100 lb. .80@.85
Powdered..... " .85@.90

GRAPHITE—
American, ore, common.... lb. .01@.10
Artificial " .06
Ceylon, common powder " .02½@.03½
Best, pulverized " .04@.08
German, com. pulv..... " .01½@.01½
Best, pulverized..... " .01½@.02
Italian, pulverized..... " .01@ 02

GYPSUM—
Fertilizer..... " 7.00
Rock.....lg. ton. 4.00

INFUSORIAL EARTH—
Ground Am. best... lb. .01¾
French.....g. ton. 55.00
German..... lb. .02½@.02

LEAD—Acetate (sugar of)..... lb. .07¾
Nitrate, com'l..... " .08½@.09

MAGNESITE—Greece.
Crude (95%).....lg. ton. 7.00@8.00
Calcined, powdered..... h. ton. 30.00@40.00
Bricks, domes, per qual. f.o.b. Pittsburg..... M. 160@200

MAGNESIUM—
Chloride, com'l.....00 lb. .80@1.15
Sulphate (Epsom salt)...100 lb. .75@1.00

MANGANESE—
Crude powdered:
70@75% binoxide. lb. .04
75@85% binoxide. " .06
85@90% binoxide. " .07
90@95% binoxide. " .08
Ore, 80%-85%..... sh. ton. 55.00@45.00

MARBLE—Flour..... sh. ton. 9.50@10.00

MINERAL WOOL—
Slag, ordinary..... " 19.00
selected " 25.00
Rock, ordinary " 32.00
Selected " 40.00

MONAZITE SAND—
Guar. 9% with 5% Thorium oxide, nominal..... lb. .08 and up.

NICKEL—
Oxide, crude, lb. (77%) for fine metal contained.. .47
Sulphate, single..... lb. .16@.20
" double..... " .10@.12

NITRATE OF SODA—100 lb. 96% for 1907 2.50
95% for 1908 2.45
95% for 1909 2.40
96% is 5c higher per 100 lb.

OZOKERITE—best..... lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered.... " .07½@.07½
English glassmakers'.... " .08½@.08½
Lithepone..... " .04½@.05
Metallic, brown.....sh. ton. 19.00
Red " 16.00
Ocher, Am. common li..... " 8.50@9.00
Best " 16.00
Dutch, washed..... lb. .02½@.03
French, washed..... " .01½@.02½
Paris green, pure, bulk..... " .21@.23
Red lead, American..... " .07½@.07½
Foreign " .08½@.08½
Turpentine, spirits bbl., per gal. .75@.75
White lead, Am., dry..... lb. .06½@.06½
American, in oil " .07 @.07½
Foreign, in oil " .09½@.10
Zinc white, Am. extra dry.. " .05½@.05½
Foreign, red seal, dry.. " .07½@.07½
Green seal, dry..... " .07½@.08½

PHOSPHATES—Acid..... 65@67½° per unit
*Fla., hard rock..... 7.50
land pebble 68%..... 4.50
†Tenn., 78@80%..... 6.50@7.00
78%..... 5.50
75%..... 5.00
68@72%..... 4.50
‡So. Car. land rock..... 7.00
" river rock..... .....

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—
Bichromate, crystal lb. $0.[illegible]@.[illegible]
Powdered or granulated " .07½@.08
Bicarbonate, Am. " .07½@.08
Scotch " .11
Bromide " .16
Carbonate (96@98%) " .03½@.04
Caustic, ordinary " .04½@.05
Elect (90%) " .[illegible]@.[illegible]
Chloride (muriate), 100 lb. 1.90
Chlorate, powdered..... " .09½@.09½
Crystals..... " .08½@.09
Cyanide (98@99%)..... " .18@.19
Kainite, long ton, 22% sulph., bags, f.o.b. " [illegible]
Permanganate..... lb. .10@.10½
Prussiate, yellow " .16@.17
Red " .32@.35
Sulphate..... 100 lb. 2.18½@2.21½

PYRITE—
Domestic, non-arsenical, furnace size, 50% sulphur..... per unit .11@11½c
Domestic, non-arsenical, fines, per unit f.o.b. mine..... " .10@10½c.
Imported, non-arsenical, furnace size, per unit..... " .13@.13½
Imported, arsenical, furnace size, per unit..... " .12@.12½c.
Imported fines, arsenical, per unit. " .8½@9c.
" " non-arsenical, per unit..... " .10½@.11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.18
N. Y. agricultural.....sh. ton. 3.00@4.00

SALTPETER—Crude..... 100 lb. 6.00@6.10
Refined, crystals..... " 6.25@6.75

SILICA—
Ground quartz, ord'ry...sh. ton 13.00@15.00
Silex " 13.00@30.00
Lump Quartz " 2.50@4.00
Glass sand..... " 2.75

SILVER—Nitrate, crystals..... oz. .43½@.45½

SODIUM—
Acetate..... lb. .03½@.04½
"Alkali," per 100 lb., 58@48% " .85@.87½
Bicarb. soda, per 100 lb..... 1.20@1.50c.
Soda, caustic, per 100 lb., 76@60... 1.80@1.90
" " powdered..... .02¾@.03
Salt cake, per 100 lb..... .65@.85
Soda, monohydrate, per lb..... 14c.
Bichromate..... lb. .06½@.06½
Bromide..... " .16
Chlorate, com'l..... " .08½@.09
Cyanide, ("100% KCN")..... " .18@.19
Hyposulphite, Am..... " 1.35 up
German " 1.60@1.70
Phosphate..... 100 lb. 1.80@1.90
Prussiate..... lb. .11@.11½
Sal soda, f.o.b. N. Y.... 100 lb. .70@.75
Foreign, f.o.b. N. Y " .80@1.00
Silicate, com'l.....100 lb. .75@1.15
Sulphate, com'l, Glauber's salt, 100 lb. 1.50@1.60
" " calcined..... .65@.85

STRONTIUM—Nitrate..... lb. .08½@.08¾

SULPHUR—
Louisiana (prime) to New York, Boston or Portland.....lg. ton 22.50
To Philadelphia or Baltimore " 22.50
Roll..... 100 lb. 1.85@2.15
Flour " " 2.00@2.40
Flowers, sublimed..... " " 2.20@2.60

TERRA ALBA—French & Eng. 100 lb. .90@1.00

TALC—Domestic.....sh. ton. 15.00@20.00
French, best " 25.00
Italian, best..... " 35.00@40.00

TIN—Bichloride, 50%..... lb. .12@.13
Crystals..... .26 up
Oxide, lb..... .47@.49

URANIUM—Oxide..... 3.50

ZINC—Metallic ch. pure..... .08
Chloride solution, com'l. .02½@.04
Chloride, granular..... .04@.04½
Dust..... .07@.07½
Sulphate..... 7[illegible]@.02¼

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

DIVIDENDS.

Metal and Mining Companies—U. S.

Name of Company and Location.	Author. Capital	Shares. Issued	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska [illegible]	$1,000,000	180,000	$ 5	$1,572,181	Jan. 1907	$ .50
Alaska Treadwell	5,000,000	200,000	25	9,235,000	Jan. 1907	1.00
Alaska [illegible]	1,000,000	180,350	5	506,410	Jan. 1907	0.30
Alta Consolidated	150,000,000	1,500,870	100	47,523,030	Feb. 1907	2.00
Am.Sm.&Ref.,com.	U. S.	50,000,000	500,000	100	76,675,000	Apr. 1907	1.75
Am. Sm. & Ref. pf.	U. S.	50,000,000	500,000	100	28,588,053	Apr. 1907	1.75
Am. Smelters, pf. A	U. S.	17,000,000	170,000	100	1,440,000	Mar. 1907	1.50
Am. Smelters, pf. B	U. S.	30,000,000	300,000	100	2,025,000	Mar. 1907	1.25
Anaconda	Mont.	30,000,000	1,200,000	25	34,500,000	Apr. 1907	1.75
Annie Laurie, g.	Utah.	5,000,000	25,000	100	465,061	July 1905	.50
Arizona	Ariz.	6,775,000	3,682,520	...	6,182,361	Apr. 1906	.05
Atlantic, c.	Mich.	2,500,000	100,000	25	990,000	Feb. 1907	1.00
B. & H., g.	Mo.	400,000	400,000	1	40,000	Dec. 1905	.01
Bear Creek, g.	Utah.	100,000	1,000,000	0.10	455,000	Feb. 1907	.10
Bingham N. H., g.	Utah.	2,000,000	226,000	5	24,600	Sept. 1906	.10
Bonanza & Montana	Mont.	3,750,000	150,000	25	47,875,000	Nov. 1906	12.00
Bull, Beck. & Cham.	Utah.	1,000,000	100,000	10	2,548,400	Mar. 1907	.10
Bunker Hill & Sull.	Ida.	3,000,000	300,000	10	8,400,000	Mar. 1907	.60
Butte Coalition, c.	Mont.	15,000,000	1,000,000	15	1,350,000	Mar. 1907	.50
Calumet & Arizona	Ariz.	2,500,000	200,000	10	7,000,000	Mar. 1907	5.00
Calumet & Hecla, c.	Mich.	2,500,000	100,000	25	101,400,000	Mar. 1907	20.00
Camp Bird, g., s.	Colo.	5,500,000	820,000	5	3,587,500	Jan. 1907	.24
Carisa, g.	Utah.	500,000	500,000	1	55,000	Nov. 1906	.01
Central Eureka, g.	Cal.	400,000	398,425	1	778,921	Mar. 1906	.07
Columbus Con. c.	Utah.	1,500,000	300,000	5	105,000	Apr. 1907	.20
Comet Quartz Co.	Nevada	400,000	320,000	1	688,000	Sept. 1906	.15
Con. Mercur, g.	Utah.	1,000,000	1,000,000	1	1,206,000	Dec. 1906	.02½
Continental, g.	Mo.	550,000	22,000	25	187,000	Jan. 1907	.50
Copper Range Con.	Mich.	38,500,000	383,781	100	4,558,896	Apr. 1907	2.00
Creede United, g.	Colo.	2,000,000	1,625,000	1	214 053	July 1906	.00½
Cripple Creek Con.	Colo.	2,000,000	2,000,000	1	180,000	Mar. 1905	.00½
Daly Judge, g. s. l.	Utah.	300,000	300,000	1	225,000	Apr. 1907	.37½
Daly West, g. s. l.	Utah.	3,680,000	180,000	20	5,007,000	Mar. 1907	.60
De Lamar, g. s.	Ida.	400,000	387,180	5	2,926,370	May 1905	.72
Dillon, g.	Colo.	1,250,000	1,250,000	1	21,875	July 1905	.01
Doctor Jack Pot	Colo.	3,000,000	3,000,000	1	268,000	July 1906	.00½
Doe Run, l.	Mo.	10,000,000	59,062	100	1,228,320	Mar. 1907	.50
Elkton Con., g.	Colo.	3,000,000	2,500,000	1	1,841,960	Feb. 1907	.01½
El Paso, g.	Colo.	2,500,000	2,450,000	1	1,022,750	June 1906	.01
Fed. Sm., com.	Idaho.	10,000,000	60,000	100	2,048,750	Mar. 1907	5.00
Federal Sm., pf.	Idaho.	20,000,000	120,000	100	2,253,250	Mar. 1907	1.75
Findley, g.	Colo.	1,250,000	1,250,000	1	325,000	Aug. 1906	.01
Frances Mohawk	Nevada	1,000,000	1,000,000	1	141,000	Dec. 1906	1.10
Gemini-Keystone	Utah.	500,000	5,000	100	1,850,000	July 1906	10.00
Gold King Con.	Colo.	5 750,370	5,750,370	1	1,407,504	May 1905	.01
Gold Sovereign	Colo.	2,000,000	2,000,000	1	10,000	Jan. 1906	.00½
Grand Central, g.	Utah.	250,000	250,000	1	1,131,000	Jan. 1907	.05
Gwin Mine, Dev.	Cal.	1,100,000	110,000	10	155,000	Apr. 1907	.25
Hecla, s. l.	Idaho.	250,000	1,000,000	0.25	870,000	Mar. 1907	.02
Homestake, g.	S. D.	21,840,000	218,400	100	22,134,840	Mar. 1907	.50
Horn Silver, g. s.	Utah.	10,000,000	400,000	25	5,602,000	Mar. 1907	.05
Inter'l Nickel, pf.	N. Y.	12,000,000	87,416	100	655,613	May 1907	1.50
Iron Silver.	Colo.	10,000,000	500,000	20	4,000,000	Apr. 1907	.20
Jamison, g.	Cal.	3,900,000	390,000	10	258,370	Jan. 1907	.03
Jerry Johnson.	Cal.	2,500,000	2,500,000	1	61,750	Apr. 1906	.03
Kendall, g.	Mont.	2,500,000	500,000	5	1,080,000	Mar. 1907	.03
Liberty Bell, g. s.	Colo.	700,000	130,551	5	110,857	Jan. 1906	.15
Lightner, g.	Cal.	125,000	102,255	1	295,694	Aug. 1905	.05
Mammoth, g. s. l.	Utah.	10,000,000	400,000	25	2,080,000	Oct. 1906	.05
Mary McKinney, g.	Colo.	1,500,000	1,304,252	1	762,629	Jan. 1907	.03
McKinley, g.	Mont.	2,500,000	100,000	25	900,000	Jan. 1907	.50
Mont. Ore Purch.	Mont.	2,500,000	80,853	25	9,457,274	Jan. 1907	15.00
Montezuma, g.	Colo.	300,000	300,000	1	27,124	Apr. 1905	.01
New Century, z., l.	Mo.	300,000	300,000	1	211,500	Nov. 1906	.01
New Idria, q.	Cal.	500,000	100,000	5	980,000	Apr. 1907	.20
New Jersey Zinc.	U. S.	10,000,000	100,000	100	8,400,000	Feb. 1906	3.00
North Butte.	Mont.	6,000,000	400,000	15	4,200,000	Mar. 1907	2.00
North Star, g.	Cal.	2,500,000	250,000	10	1,336,989	Mar. 1907	.20
Northern Light, g. s.	Utah.	2,000,000	400,000	5	20,000	Feb. 1906	.05
Old Dominion, c.	Ariz.	7,500,000	281,589	25	280,843	May 1906	.50
Old Gold	Colo.	2,101,150	2,101,150	1	10,506	Mar. 1906	.05
Ophir, g.	Nevada	302,400	100,800	3	1,797,400	July 1904	.25
Osceola	Mich.	2,500,000	96,150	25	6,362,600	Jan. 1907	6.00
Parrot, c.s.	Mont.	2,300,000	229,850	10	6,692,724	Mar. 1907	.25
Pennsylvania, g.	Cal.	5,150,000	51,500	100	284,925	July 1906	.10
Platterville	Wis.	20,000	500	40	99,500	Oct. 1906	.00
Portland, g.	Colo.	3,000,000	3,000,000	1	7,307,080	Jan. 1907	.04
Quincy	Mich.	[illegible]	[illegible]	25	16,965,446	Mar. 1907	4.50
Rex, g.	Mo.	15,000	15,000	1	9,600	May 1906	.03
Rocco Homestake, l.	Nevada	300,000	300,000	1	112,000	Dec. 1906	.02
Sacramento, g. q.	Utah.	5,000,000	1,000,000	1	245,000	Nov. 1906	.00½
Sadie, g. s. l.	Utah.	200,000	200,000	1	6,500	Aug. 1904	.01
St. Joseph, l.	Mo.	20,000,000	1,000,000	10	5,167,357	Mar. 1907	.15
Silver Hill, g. s.	Nevada	108,000	108,000	1	59,400	Feb. 1906	.05
Silver King, g. s. l.	Utah.	3,000,000	150,000	20	10,675,000	Dec. 1906	.33½
Silver Queen	Ariz.	3,000,000	300,000	10	300,000	Mar. 1907	.50
Standard	Ida.	1,500,000	1,500,000	1	135,000	Jan. 1907	.03
Stewart, g.	Utah.	1	1,000,000	1	165,500	Jan. 1906	.01
Standard Con., g. s.	Cal.	[illegible]	[illegible]	10	5,139,061	Mar. 1907	.10
Stratton's Independ.	Colo.	[illegible]	[illegible]	25	4,895,866	Apr. 1907	.20
Tamarack, c.	Mich.	1	1,000	25	9,180,000	Jan. 1907	3.00
Tennessee, c.	Tenn.	5,000,000	175,000	25	1,093,750	Jan. 1907	1.25
Tonopah, g.	Nevada	1,750,000	300,000	5	900,000	June 1906	.48
Tonopah Belmont	Nevada	[illegible]	[illegible]	1	3,000,000	Apr. 1907	.35
Tonopah Extension	Nevada	[illegible]	[illegible]	1	259,000	Jan. 1907	.10
Tonopah Mining	Nevada	1,000,000	928,433	1	278,530	Apr. 1906	.15
Tonopah of Nevada	Nevada	1,000,000	1,000,000	10	130,000	Jan. 1907	.10
Uncle Sam, g.	Utah.	500,000	500,000	1	130,000	Oct. 1906	.01
United, g.	Mont.	[illegible]	[illegible]	[illegible]	5,175,000	Apr. 1907	1.75
United, s.	Mont.	5,000,000	50,000	100	1,350,000	Nov. 1906	3.00
United, z. l., com.	Mo.	500,000	92,400	5	27,450	Oct. 1903	.05
United, z. l., pf.	Mo.	[illegible]	[illegible]	5	247,680	Jan. 1907	.50
United, (Cripple C'k)	Colo.	5,000,000	4,009,100	1	280,071	Apr. 1905	.00½
United Verde, c.	Ariz.	3,000,000	300,000	10	17,080,382	Dec. 1904	.75
Un. States, pf. g. s. c. l.	Utah.	37,500,000	750,000	50	3,281,250	Apr. 1907	.87½
U. S. Red. & Ref. Pf.	Colo.	4,000,000	39,458	100	887,130	Apr. 1907	1.50
Utah, g. (Fish Springs)	Utah.	1,000,000	100,000	10	24,000	Jan. 1903	.03
Utah Con., c.	Utah.	[illegible]	[illegible]	[illegible]	145,500	Apr. 1907	1.50
Victoria, g.	Utah.	250,000	250,000	1	77,000	Jan. 1907	.04
Vindicator Con., g.	Colo.	[illegible]	[illegible]	[illegible]	1,560,000	Jan. 1907	.03
Wolverine	Mich.	[illegible]	[illegible]	25	1,080,000	Apr. 1907	10.00
Yankee	Mo.	1,500,000	1,500,000	1	[illegible]	Apr. 1905	.01
Yellow Aster	Nevada	500,000	500,000	1	11,000	Jan. 1907	.03

*Previous to consolidation $1,436,250 were divided.

Coal, Iron and Other Industrials—United States.

Name of Company and Location.	Author. Capital.	Shares. Issued.	Par Val. $	Total to Date.	Dividends. Latest. Date.	Amt.
Ala. Con., C. & I., pf.	Ala.	$2,500,000	24,638	100	$905,265	May 1905	$1.75
Allis-Chalmers, pf.	U. S.	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
Amer. Ag. Chem., pf.	U. S.	20,000,000	181,530	100	7,375,870	Apr. 1907	3.00
American Cement.	Pa.	2,000,000	200,000	10	1,028,000	Jan. 1907	.40
American Coal.	Md.	1,500,000	50,000	25	2,195,000	Mar. 1907	7.50
Associated Oil.	Cal.	21,000,000	21,000,000	1	850,000	Aug. 1905	.01½
Bethlehem Steel, pf.	Pa.	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel.	Pa.	50,000,000	900,000	50	8,212,500	Feb. 1907	.62½
Caribou Oil.	Cal.	100,000	80,000	1	56,000	July 1905	.07
Central C. & C., com.	Mo.	5,125,000	51,250	100	1,921,875	Apr. 1907	1.50
Central C. & C., pf.	Mo.	1,875,000	18,750	100	1,265,625	Apr. 1907	1.25
Central Oil.	W. Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil.	Cal.	500,000	450,000	1	58,500	June 1905	.01
Col. & Hock. C. & I.	Ohio.	7,000,000	69,244	100	173,086	Feb. 1905	.25
Consolidated Coal.	Ill.	5,000,000	50,000	100	350,000	July 1904	1.00
Consolidation Coal.	Md.	10,250,000	102,500	100	8,801,650	Feb. 1907	3.50
Crucible Steel, pf.	Pa.	25,000,000	250,000	100	1,000,000	Sept. 1906	1.50
Empire S. & I., pf.	N. J.	5,000,000	25,000	100	637,500	Jan. 1907	3.00
Fairmont Coal.	W. Va.	12,000,000	120,000	100	1,384,000	Feb. 1907	3.00
Four Oil.	Cal.	500,000	300,000	1	105,000	May 1906	.01
General Chem. Com.	U. S.	12,500,000	74,103	100	1,745,125	Mar. 1907	2.00
General Chem., pf.	U. S.	12,500,000	100,000	100	4,540,178	Apr. 1907	1.50
George's C'k Coal.	Md.	2,500,000	22,000	100	1,188,000	July 1904	3.00
Imperial Oil.	Cal.	1,000,000	100,000	100	880,000	July 1905	.20
International Salt.		30,000,000	182,280	100	927,060	Dec. 1906	1.00
Jeff. & Cl'f C. & I., cm	Pa.	1,500,000	15,000	100	330,000	Aug. 1905	5.00
Jeff. & Cl'f C. & I., pf.	Pa.	1,500,000	15,000	100	825,000	Aug. 1905	2.00
Kern River Oil.	Cal.	1,000,000	20,000	50	39,500	Mar. 1905	.12
Lehigh Coal & Nav.	Pa.	14,345,650	346,897	50	24,920,891	Nov. 1906	2.00
Maryland Coal, pf.	Md.	2,000,000	18,850	100	1,517,160	Dec. 1906	4.00
Monon R. Coal, pf.	Pa.	10,000,000	100,000	100	3,154,945	Jan. 1906	.97
Monte Cristo Oil.	Cal.	500,000	500,000	1	120,000	July 1905	.01
National Carbon, pf.	U. S.	4,500,000	45,000	100	2,047,500	May 1905	1.75
National Lead, com.	N. Y.	15,000,000	149,054	100	1,786,848	Jan. 1907	1.00
National Lead, pf.	N. Y.	15,000,000	149,054	100	16,052,990	Jan. 1907	1.75
Nat'l Steel & Wire, pf.	N. Y.	5,000,000	25,778	100	631,561	May 1906	1.75
New Central Coal.	Md.	1,000,000	50,000	20	330,000	Nov. 1906	.40
New River Coal, pfd.	W. Va.	4,000,000	3,761,700	100	564,255	Nov. 1906	1.50
Pacific Coast Borax.	Cal.	2,000,000	19,000	100	2,086,500	Aug. 1906	1.00
Peerless Oil.	al.	1,000,000	92,000	10	396,320	May 1906	.14
Penna. Salt.	Pa.	3,000,000	60,000	50	14,528,000	Apr. 1907	3.00
Penna. Steel.	Md.	25,000,000	168,214	100	3,177,995	Mar. 1907	3.50
Phila. Gas, com.	Pa.	28,963,029	579,061	50	6,684,142	Nov. 1905	.75
Phila. Gas, pf.	Pa.	5,744,813	114,896	50	1,583,505	Mar. 1905	1.25
Pittsburg Coal, pf.	Pa.	32,000,000	297,010	100	11,434,962	Apr. 1905	1.75
Pocahontas Coll., pf.	W. Va.	1,500,000	15,000	100	437,500	Feb. 1907	1.50
Republic I. & S., pfd.	Ill.	25,000,000	204,169	100	4,136,612	Apr. 1907	3.75
Sloss-Sheffield, com.	Ala.	7,500,000	75,000	100	750,260	Oct. 1906	2.00
Sloss-Sheffield, pf.	Ala.	20,000,000	67,000	100	3,177,250	Mar. 1907	3.50
Standard Oil.	U. S.	100,000,000	970,000	100	334,035,000	Mar. 1907	15.00
Tenn. C. & I., com.	Tenn.	22,553,600	225,536	100	2,906,425	Feb. 1907	1.00
Tenn. C. & I., pf.	Tenn.	248,000	2,480	100	380,090	Feb. 1907	2.00
Texas & Pacific Coal.	Texas.	2,000,000	20,000	100	1,930,000	Mar. 1905	2.00
Thirty-three Oil.	Cal.	500,000	100,000	5	430,000	July 1905	.10
Union Oil.	Cal.	10,000,000	100,000	100	1,118,766	May 1905	.50
U. S. Steel Corp., com.	U. S.	550,000,000	5,083,025	100	63,500,028	Mar. 1907	.50
U. S. Steel Corp., pf.	U. S.	360,281,100	3,603,141	100	174,844,308	Feb. 1907	1.75
Va. Carolina Ch., pf.	U. S.	20,000,000	180,000	100	11,820,869	Apr. 1907	2.00
Westmoreland Coal.	Pa.	3,000,000	60,000	50	8,580,000	Oct. 1905	2.50

Canada, Mexico, Central and South America.

Name of Company and Location.	Author. Capital.	Shares. Issued.	Par Val. $	Total to Date.	Dividends. Latest. Date.	Amt.
Amistad y Conc'rdia.	Mex.	$480,000	9,600	50	$258,064	Jan. 1905	$1.71
Buffalo, s.	Ont.	1,000,000	900,000	100	81,000	Apr. 1907	.03
Butters' Salvador, g.	Salv.	750,000	150,000	5	600,000	Apr. 1905	.25
Cariboo McKin'y, g.	B. C.	1,250,000	1,250,000	1	546,837	Feb. 1904	.04
Consolidated M & S.	B. C.	5,500,000	48,338	100	473,255	Feb. 1907	2.50
Copiapo, c.	Chile.	1,125,000	112,500	10	3,000,901	Oct. 1904	1.20½
Crow's Nest Pass.	B. C.	3,500,000	140,000	25	1,581,148	Apr. 1906	.62½
Dominion Coal, com.	N. S.	15,000,000	150,000	100	2,100,000	Apr. 1907	1.00
Dominion Coal, pf.	N. S.	3,000,000	30,000	100	3,330,000	Jan. 1907	4.00
Dos Estrellas, g. s.	Mex.	150,000	3,000	50	1,020,555	July 1905	13.65
El Oro, g. s.	Mex.	5,750,000	1,080,000	5	2,708,806	July 1904	.18
Esperanza, s. g.	Mex.	2,275,000	455,000	5	6,121,049	Apr. 1907	1.32
Foster Cobalt, s.	Ont.	1,000,000	1,000,000	1	50,000	Jan. 1907	.05
Granby Con.	B. C.	15,000,000	1,350,000	10	2,158,630	Mar. 1907	.30
Greene Con. Copper.	Mex.	8,640,000	864,000	10	5,814,200	Mar. 1907	.40
Greene Con. Gold.	Mex.	5,000,000	500,000	10	80,000	Apr. 1907	.20
GreenGold-Sily'r, pfd.	Mex.	6,000,000	300,000	10	120,000	Mar. 1907	.40
Guanajuato.	Mex.	3,000,000	540,000	5	74,250	Oct. 1906	.07½
Guggenheim Expl.	Mex.	17,000,000	105,000	100	3,172,500	Apr. 1907	2.50
Kerr Lake, s.	Ont.	3,000,000	600,000	5	210,000	Oct. 1906	.10
LeRoi No. 2, g.	B. C.	3,000,000	120,000	25	716,400	Feb. 1907	.24
McKinley-Darragh, s.	Ont.	2,500,000	2,000,000	1	100,000	Mar. 1907	.02
Mexican Con. Coke.	Mex.	5,000,000	500,000	10	1,500,000	Feb. 1907	3.00
Mex. Con. M. & S. Co.	Mex.	2,500,000	240,000	10	360,000	Feb. 1907	.50
Mines Co. of Am.	Mex.	2,000,000	2,000,000	1	2,545,000	Mar. 1907	.02
N. Y. & Hond. Ros.	C. A.	1,500,000	150,000	10	2,257,000	Feb. 1907	.20
Nipissing, s.	Ont.	6,000,000	1,200,000	5	960,000	Apr. 1907	.15
North Star.	B. C.	1,500,000	1,300,000	1	351,000	Dec. 1904	1.00
N. S. St. & Coal, com.	N. S.	5,000,000	49,703	100	788,600	Nov. 1904	2.00
N. S. St. & Coal, pf.	N. S.	1,000,000	10,000	100	375,950	Mar. 1907	3.50
Penoles*	Mex.	250,000	2,500	100	7,813,375	Dec. 1906	20.00
Platanillo.	Mex.	500,000	206,989	1	5,588	Sept. 1906	.00½
Reco, g. s. l.	B. C.	1,000,000	958,000	1	327,082	Apr. 1906	.02
Silver Queen, s.	Ont.	1,500,000	1,500,000	1	130,000	Jan. 1907	.08
Slocan Star.	B. C.	500,000	500,000	1	575,000	Dec. 1904	.08
St. Eugene Con.	B. C.	3,500,000	3,202,000	1	402,120	Oct. 1906	.02
Tezuitlan Copper.	Mex.	1,000,000	10,000	100	[illegible]	Apr. 1907	3.00
Tilt Cove, c.	N. F.	1,000,000	89,000	2	21,360	Jan. 1905	.48
Tretheway, s.	Ont.	1,000,000	1,000,000	1	80,000	Mar. 1907	.04
Tyee, c.	B. C.	940,000	180,000	5	136,800	Dec. 1904	.24

*Mexican Currency.

THE MINING INDEX.

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BAUXITE

2772—BAUXITE INDUSTRY of the South. Edw. K. Judd. (Eng. and Min. Journ., Mar. 23, 1907; 1½ pp.) Outlines the occurrence of the ore, distribution of the mining industry, and the mining methods used in this Georgia-Alabama bauxite field, with a few notes on methods of cleaning and drying the ore. 20c.

CEMENT

2773—CEMENT BURNING—Zementbrennen im Drehrohrofen. (Tonindustrie-Zeit., Feb. 16, 1907; 1 p.) Gives some notes on the operation of revolving kilns for burning cement clinker, and points out especially the saving in fuel which results from burning finely crushed mari and coal in this type of furnace. 40c.

2774—PORTLAND CEMENT—Aus Pommerns Ziegel-, Zement- und Kalkindustrie. H. Hirsch. (Tonindustrie-Zeit., Mar. 7 and 12, 1907; 5 pp.) Describes the equipment of the "Stern" portland cement factory at Stettin in Finkenwalde, Germany, outlining the very modern methods and appliances to be found there. Also gives account of the "Quistorp" cement works in Lebbin, near Wollin, Pommerania. 60c.

CLAY

2775—BENTONITE in the Rocky Mountain Region. A. Lakes. (Min. Rep., Mar. 7, 1907.) Brief note on the occurrence of this peculiar hydrous silicate of alumina in the Rocky Mountain region. 20c.

2776—COLORADO—Whiteware Possibilities of Colorado Raw Materials. S. Geysbeek. (Trans. Am. Ceramic Soc., Vol. VIII, 1906; 13 pp.) Gives analyses of various characteristic clays and kaolins of Colorado, and describes the methods of mining the famous Denver fireclay.

2777—KAOLIN—Kaoline und feuerfeste Erzeugnisse in Russland. (Tonindustrie-Zeit., Feb. 21, 1907; 2½ pp.) Notes on the distribution and production of kaolin and refractory materials in Russia. 20c.

2778—KENTUCKY—Note on a High-Alumina Flint Clay. F. Greaves-Walker. (Trans. Am. Ceramic Soc., Vol. VIII, 1906; 3½ pp.) Describes briefly some occurrences of fire clay in Kentucky with notes on the character of several of the principal varieties.

2779—MINING—The Preparation of Clay for Dry Press Brick Manufacturing. E. Ogden. (Trans. Am. Ceramic Soc., Vol. VIII, 1906; 11 pp.) Describes the occurrence and mining of the clay deposits of Terry Co., Ohio, and the method of preparing the clay for the manufacture of bricks.

2780—ROCK DECOMPOSITION and Clay Formation in the Laboratory. A. S. Cushman. (Trans. Am. Ceramic Soc. Vol. VIII, 1906; 17 pp.) Description of the methods used and the results obtained in a series of laboratory experiments made for the purpose of kaolinizing orthoclase, with the idea of obtaining exact information upon natural processes of rock decomposition.

COAL AND COKE

2781—ACCIDENTS—Causes and Prevention of Disasters in Mines. G. Farmer. (Cassier's Mag., Feb., 1907; 8 pp.) Reviews briefly the statistics of notable colliery explosions, and discusses in considerable detail causes of explosions and practical methods by which they may be prevented. 40c.

2782—BELGIUM—Rapports Administratifs. Extraits des Rapports de O. Ledouble, A. Pepin, V. Lechat et J. Julin. (Ann. des Mines Belg., T. XII, 1 livr., 1907; 25 pp.) Extracts from administrative reports, giving a summary of conditions in the Belgian mining industry, covering accidents, developments, etc.

2783—CANADA—Western Coal Resources. J. C. Gwillim. (Can. Min. Journ., Mar. 15, 1907; 3 pp.) Mentions briefly the occurrence of coal in a few of the principal fields in British Columbia, and describes the equipment and operation of the International Coal and Coke Co., at Coleman. 20c.

2784—COAL CUTTING—Ueber das Schrämverfahren Patent Neukirch. Seyboth. (Glückauf, Feb. 23, 1907; 11 pp.) Describes the Neukirch system of coal-cutting which consists in fastening cutting edges in the strands of an endless wire rope. Tabulated data of the efficiency of the machine and method of laying out work are given. 40c.

2785—COAL FORMATION—Die fossilen Kohlen. E. Donath. (Oest. Zeit. f. B. u. H., Feb. 23, Mar. 2 and 9, 1907; 12 pp.) An inquiry into the process of coal formation, reviewing the results obtained and the opinions held by various investigators, with an account of work done by the author. $1.00.

2786—COAL HANDLING—Fördereinrichtungen vor Ort auf englischen und amerikanischen Steinkohlengruben. (Glückauf, Mar. 2, 1907; 3 pp.) A description of English and American practice in using belt conveyors for transporting coal underground, with resultant lessened handling cost. 40c.

2787—COAL HANDLING—Handling the Coal Output in Southern Illinois. E. J. Wallace. (Eng. and Min. Jour., Feb. 23, 1907; 1½ pp.) Describes the successful operation of the novel method of providing passenger transportation between coal mines and adjacent towns along with the moving of freight, as practiced on the Coal Belt Railway of Illinois. 20c.

2788—COAL MINING—Formula for Mining Thin Seams of Coal. M. S. Hachita. (Eng. and Min. Journ., Feb. 2, 1907; ½ p.) Derives a mathematical formula for breast and chamber workings in thin coal seams. 20c.

2789—COAL MINING—Large Coal Mine Outputs. F. C. Keighley. (Mines and Min., Mar., 1907; 1½ pp.) Discussion of some of the causes which fix the limit to which development of coal mines for large outputs can be carried. 20c.

2790—COAL MINING—Removing Pillars in Coal Mines. W. Hardy. (Min. Wld., Mar. 9, 1907; 1 p.) Abstract of paper read before the Coal Mining Institute, giving notes from the author's experience on various methods of robbing pillars in coal mines. 20c.

2791—COAL MINING—The Technics of Coal Mining. G. H. Winstanley. (Min. Engineering, Mar., 1907; 3½ pp.) Continuation of article previously indexed, dealing in this instalment with the principles of applied mechanics in mining. 20c.

2792—COAL STORAGE and Coal Conveying Systems. F. Koester. (Power, Apr., 1907; 6 pp.) Describes some of the modern methods employed in handling fuel for large power stations in this country and abroad. 20c.

2793—COAL STORAGE Under Water at Hawthorne, Ill. (Eng. and Min. Journ., Mar. 23, 1907; 1½ pp.) Describes the construction of concrete coal storage pits of the Western Electric Co. of Chicago, with a brief discussion of the losses in heating value of coal which is stored in open air. 20c.

2794—COKE—Census of Manufactures, 1905: Coke. (Bull. 65 of the Dept. of Com. and Labor, Bur. of the Census, 1907; 55 pp.) Gives the statistics of the production of oven coke in the United States, and describes the present state of the coking industry at the principal producing fields.

2795—COKE Die Beurteilung von Koks nach seinem Aussehen. A. Thau. (Glückauf, Mar. 9, 1907; 6 pp.) A discussion of the [illegible] be judged quickly and with reasonable certainty without chemical analysis. 40c.

2796—COKE—Manufacture of Coke from Western Coal. R. S. Moss. (Min. Wld., Mar. 16, 1907; 1 p.) Discusses the reasons for the failure of the St. Louis coal-testing plant successfully to coke Western coals, and describes the successful procedure used by the author to accomplish this end. 20c.

2797—DAM—Air-tight Dam for Underground Mine Fires. M. Delafosse. (Eng. and Min. Journ., Mar. 2, 1907; ½ p.) Abstract of paper read before the Société de l'Industrie Minérale, Paris, showing a method of constructing an air-tight dam, which can be used to seal off affected portions of workings in gaseous mines. 20c.

2798—DAMS IN COAL MINES. Richard Lee. (Eng. and Min. Journ., Feb. 23, 1907; ½ p.) Describes the construction of wooden dams for isolating portions of workings that are filled with water, these dams having the advantage of being more flexible than masonry and becoming tighter during use on account of swelling. 20c.

2799—DIAMOND DRILLING—Cost of Diamond Drilling in Coal Measures. W. F. Murray. (Eng. and Min. Journ., Feb. 23, 1907; ½ p.) A consideration of various features of prospecting for coal by diamond drills, with a statement of conditions which influence cost. Actual data of cost of drilling in three districts in Colorado are included. 20c.

2800—ELECTRIC MACHINERY—L'Electricité dans les mines. Beyling. (Ann. des Mines Belg., T. XII, 1 livr., 1907; 27 pp.) Continuation of lengthy serial previously mentioned in the Index, this instalment outlining a series of experiments to determine the efficiency of wire cloth as a means of preventing the transmission of flames in gaseous mines, with special reference to protecting electric machines from igniting gas by sparking.

2801—ELECTRIC POWER—The Use of Electricity in Anthracite Mining. H. M. Warren. (Eng. and Min. Journ., Feb. 2 and Mar. 2, 1907; 3½ pp.) Discusses some of the reasons why electricity is being introduced so extensively in coal mining and compares the advantages of modern equipment over obsolete methods. 20c.

2802—ENGLISH COLLIERIES—Number Four Pit—Baryton Domain Collieries, Cumberland, England. R. P. Cowen. (Journ. Can. Min. Inst., Vol. IX, 1906; 11 pp.) Gives details of equipment, development and surveying as practiced at this English mine.

2803—HAULAGE—Altering the Surface Haulage at a Small Colliery. J. Foster. (Journ. Brit. Soc. Min. Students, Feb., 1907; 4½ pp.) Describes a method used in making surface alterations in this Staffordshire colliery where surface arrangements made it impossible to install systematic endless rope haulage.

2804—HAULAGE—The Lubrication of Pit Tubs. H. Palmer. (Journ. Brit. Soc. Min. Students, Feb., 1907; 7½ pp.) Describes the construction and action of various types of lubricators employed on the axles and bearings of English mine wagons.

2805—HYGIENE—Hygiène des Charbonnages. (Annales des Mines de Belgique, Tome XII, 1 livr., 1907; 60 pp.) An illustrated description of the important advances in installing hygienic quarters for miners in the coal region of Liege, with illustrations of the wash rooms, baths, dressing rooms and other devices which show very humanitarian treatment of employes.

2806—ILLINOIS COAL TESTS. H. B. Dirks. (Eng. Rec., Feb. 23, 1907; 1 p.) Gives the results of various boiler tests upon different samples of Illinois coal; also a test

[illegible] Meeting in [illegible] W. [illegible] 31 pp.) [illegible] mining now in Indiana.

[illegible] MINE GASES [illegible] Mine Gases [illegible] W. Parsons. (Eng. and Min. Journ., Mar. 2, 1907; 2½ [illegible] atmospheric [illegible] common cause of colliery explosions, and discusses the fre- [illegible] explosions on Mondays.

[illegible] PENNSYLVANIA. The North Shaft Mine of the Susquehanna Coal Co. at Nanticoke, Pa. E. E. Winter. (Journ. Can. Min. Inst., Vol. IX, 1906; 11 pp.) An outline of the equipment and methods of working used at this Pennsylvania coal mine.

[illegible] PUMPS [illegible] Driven Coal [illegible] A Gradewitz. (Eng. and Min. [illegible] Mar. 9, 1907. 2 pp.) Discusses the advantages of the three-phase system as applied to driving pumps at the Belgian colliery, and describes in detail the construction of the motors and their connections which are especially designed to resist moisture. 20c.

[illegible] RESCUE APPARATUS. "Aerolith." Ein neuer Atmungsapparat. (Oest. Z. f. B. H. [illegible] Mar. 9, 1907. 2½ pp.) Illustrated description of the construction and methods of wearing the new "Aerolith" portable respiration apparatus, designed to be used in [illegible] work in collieries. 10c.

[illegible] SAFETY LAMP. The Wolf Safety Lamp. L. H. Hodgson. (Trans. Min. Inst. of Scotland, Vol. XXIX, Part 2; 4½ pp.) Describes the construction of this safety lamp, which will give indications of fire damp when only ¾ of 1 per cent. is present in the air.

[illegible] SAFETY LAMPS. Acetylene Safety Lamps. L. H. Hodgson. (Trans. Min. Inst. of Scotland, Vol. XXIX, Part 2; 2½ pp.) Brief account of the construction of some acetylene safety lamps, with costs of operating.

[illegible] SHAFT SINKING. Note sur l'Enfoncement des Sièges Nos. 6 et 7 des Charbonnages de Bascoup. L. Larsimont. (Rev. univ. des Mines, T. XVII, 1907, 1 Trimestre; 12 pp.) A set of notes upon the progress [illegible] two shafts of the Bascoup coal mine in France, describing the means adopted in penetrating through sand and water-bearing strata. $1.

[illegible] SUPPLY OF COAL. How Long will the Coal Reserves of the United States Last? M. R. Campbell. (Indus. Wld., Mar. 16, 1907; 4 pp.) An investigation into the distribution, quality and uses of various coal deposits in the United States, with a view to estimating the time that they will last. 20c.

2816—TIPPLE.—New Steel Tipple of A. L. Keister & Co. at the Lincoln Mine, Waltersburg, Pa. (Mines and Min., Mar., 1907; 1½ pp.) Describes the method of handling the coal on the surface of this Pennsylvanian mine. Illustrated. 20c.

COPPER

2817—BRASS CASTINGS. J. L. Jones. (Foundry, Feb., 1907; 6 pp.) Outlines the principles to be followed in selecting molding sands and the amounts of the various metals to be used in producing various grades of brass. 20c.

2818—BRITISH COLUMBIA COPPER COMPANY'S MINE and Smelter. F. G. Wickware. (Journ. Can. Min. Inst., Vol. IX, [illegible] the Canadian copper mine, and gives a history of mining development and smelting methods used there at present.

2819—CALIFORNIA. Trinity Copper Mine in California. Kirby Thomas. (Min. Wld., [illegible] ment of this California copper mine, in Shasta Co., with brief description of the ore body, and geology of the district surrounding [illegible]

[illegible] Relative to the Occurrence of Deposits of Copper Ore on the North Pacific Coast and Adjacent Islands, from the Southern Boundary of British Columbia to the Alaskan Peninsula. W. M. Brewer. (Paper read before the Toronto meeting. Can. Min. Inst., Mar., 1907; 13 pp.) Describes the classes of copper ore occurrences in the various dis- [illegible]

[illegible] fahren zur elektrolytischen Herstellung nahtloser Kupferrohre. E. Krause. (Zeit. f. angew. Chem., Feb. 22, 1907; 3 pp.) Describes in considerable detail this new process [illegible] trolytic means, with illustrations of apparatus and formula for electrolyte. 40c.

2822—COPPER WIRE—Hard Drawn Copper Wire. T. Bolton. (Elec. Rev., Lond., Jan. 25, 1907; 2 pp.) Sums up the chief points in the present specifications for standards of copper wire, criticises them as not being practical, and suggests new standards as a result of many experiments on properties of wire. 40c.

2823—MONTANA—Washoe Smelter, Anaconda, Montana. (Bol. de la Soc. Nac. de Mineria, Nov., 1906; 10 pp.) A description of the organization, equipment and operations carried on at the Washoe smelter at Anaconda.

2824—NEVADA—Low-grade Copper Deposits at Ely, Nevada. W. S. Bullock. (Eng. and Min. Journ., Mar. 16, 1907; 3 pp.) Brief descriptions of the various mines in this copper camp, with an account of the methods of mining, and the concentrating and smelting works. 20c.

2825—NEVADA—The Old Camp of Ward, Nevada. H. R. Plate. (Min. and Sci. Press, Mar. 2, 1907; 1 p.) Brief account of the geological formations of this mine, and a description of the present state of the workings. 20c.

2826—NORTH CAROLINA—Copper in North Carolina. Richard Eames, Jr. (Eng. and Min. Journ., Mar. 23, 1907; ½ p.) Describes briefly several notable occurrences of copper in this State. 20c.

2827—ONTARIO—The Bruce Mines, Ontario, 1846—1906. H. J. C. Williams. (Paper read before the Can. Min. Inst., Toronto meeting, Mar., 1907; 19 pp.) Discusses the history of these famous copper mines and gives brief notes on the geology of the district, and the method of treating the ore.

2828—PERU—Region cuprifera de Cachicachi, Provincias de Tarma y Jauja. F. G. Fuchs. (Boletin de Minas, Lima, Peru, Jan. 21, 1907; 5½ pp.) A description of the physical, geological and mineralogical features of the copper district of Cachi-cachi, in the provinces of Tarma and Jauja, Peru.

2829—PYRITIC SMELTING—Lo que es la fundicion piritica. (Bol. de la Soc. Nac. de Mineria, Nov. and Dec., 1906; 5½ pp.) Continuation of article, discussing the composition and temperatures of formation of the typical slags and silicates obtained during pyritic smelting operations at Mount Lyell, N. S. W.

2830—PYRITIC SMELTING. Notes and Comments on the Pyritic Process of Mount Lyell, Tasmania. R. Nicholls. (Journ. Chem. Met. and Min. Soc. of South Africa, Jan., 1907; 2 pp.) Discussion by members of the Society of the above paper, which was previously mentioned in the Index. 60c.

2831—QUEENSLAND—The Cloncurry District. (Queens. Gov. Min. Journ., Jan., 1907; 2 pp.) General and superficial account of present conditions in this Queensland copper field. 60c.

2832—QUEENSLAND—The O. K. Copper Mine, North Queensland. R. L. Jack. (Queens. Gov. Min. Journ., Jan., 1907; 3½ pp.) Report of the engineer who examined this property, giving a description of the principal ore bodies, and the development which has been done on them, with statement of the ore reserves and prospects of future work. 60c.

2833—SERVIA—Les Mines and Usines de Bor. (L'Echo des Mines, Mar. 11, 1907; ½ p.) Gives a brief account of the situation, equipment, organization and present condition of the Bor copper mine in Servia. 20c.

2834—SIBERIA—Mining and Smelting in Southern Siberia. H. E. West. (Eng. and Min. Journ., Mar. 9, 1907; 3 pp.) Gives an account of the visit of the author to the Spassky Zavod copper smelter in Southern Siberia, describing the nature of the mineral deposit, and the means of transport from the Yuspenssky copper mines to the smelter. 20c.

2835—UTAH—The Sierra Madre Copper Region. (S. L. Min. Rev., Feb. 28, 1907; 3 pp.) General description of the physical, geographical and geological features of this Utah copper district, with brief references to the various producing mines in the region. 20c.

2836—WYOMING. Platinum Copper Ores in Wyoming. (Min. Rep., March 7, 1907; 1¼ pp.) Describes the location and ores in this noted Wyoming copper mine, and discusses briefly the metallurgy of the ores, which is complicated by the presence of platinum with the copper. 20c.

DIAMONDS

2837—SOUTH AFRICA—The Pniel Estate. Geology and Possibilities Described. W. Bleloch. (So. Afr. Mines, Feb. 9, 1907; 2½ pp.) Describes the geology of this African diamond district, gives a few notes on the river diggings, and discusses the probability of finding other payable diamond deposits in the region. 40c.

GOLD AND SILVER

2838—ALASKA—The Year 1906 in the Klondike District. J. P. Hutchins. (Eng. and Min. Journ., March 15, 1907; 2 pp.) Reviews mining progress during 1906 in this district, showing how the large-corporation plan is displacing the individual miner. 20c.

2839—ARIZONA—The Vulture Mine, Arizona. C. W. Purington. (Min. and Sci. Press, March 9, 1907; 2 pp.) Describes the mineralogical and geological features of this Arizona gold-mining camp, discussing also the genesis of the ore deposits. 20c.

2840—ARIZONA—Tombstone, Arizona, Restored. R. B. Brinsmade. (Mines and Min., March, 1907; 3½ pp.) Describes geological mining and milling conditions in Cochise county, with remarks on new developments of some of the old mines and the introduction of the cyanide process. 20c.

2841—ASSAY of Silver Bullion by Volhard's Method. E. A. Smith. (Instn. of Mg. & Met., Bull. No. 29, Feb. 14, 1907, and No. 30, March 14, 1907; 11 pp.) Discussion by members of the Institution of the above paper, which was previously mentioned in the Index, together with author's reply.

2842—BRITISH COLUMBIA—Cassiar and the Berry Creek Mine. C. Phillips-Wooley. (Can. Min. Journ., March 15, 1907; 1½ pp.) Describes mining operations at this placer in British Columbia, with brief notes on the results of some of the clean-ups. 20c.

2843—CALIFORNIA—The East Country of the Mother Lode. J. A. Reid. (Min. and Sci. Press, March 2, 1907; 1 p.) A description of the character of the ore deposits, and the results of the microscopical examination of the various country rocks and minerals which occur at the Shady Run mine in the Mother Lode. 20c.

2844—COBALT—Mines and Mining at Cobalt. W. G. Miller. (Can. Min. Journ., March 15, 1907; 4 pp.) Account of the history of the discovery of this camp, together with description of the geology and of the veins and their contained ores. 20c.

2845—COLORADO—The Gold Prince Mine and Mill. G. P. Scholl and R. L. Herrick. (Mines and Min., March, 1907; 8½ pp.) A very complete account of methods of mining on the Sunnyside lode, Colorado, describing in detail the concentrating process and the apparatus in use in the mills. 20c.

2846—COLORADO—The Maple Leaf Mine, Colorado. A. Lakes. (Min. Wld., March 9, 1907; 1 p.) Describes the mineral occurrences and geological features of this gold mine in the Gunnison district of Colorado. 20c.

2847—CYANIDATION at Copala, Mexico. L. N. B. Bullock. (Min. and Sci. Press, March 16, 1907; 1 p.) Describes briefly the methods used in cyaniding in this Mexico plant, where the briquetted product, incorporated with flux, is smelted without regrinding. 20c.

2848—CYANIDATION—Cyanide Works' Clean-up Practice. J. E. Thomas. (Journ. Chem. Met. and Min. Soc. of South Africa, Dec. and Jan., 1907; 4 pp.) Discussion by members of the Society of the above paper, which was previously mentioned in the Index. $1.

2849—CYANIDATION—Electrolytic Precipitation of Cyanide Solutions. C. P. Richmond. (Eng. and Min. Journ., March 16, 1907; 3½ pp.) Describes this process as perfected at the San Sebastian mine, at San Salvador, having the advantage of separating the copper in marketable form from the gold. 20c.

2850—CYANIDATION—Metallurgical Chart of Operations in the Mill of the Butters Copala mines in Sinaloa, Mexico. (Min. and Sci. Press, Feb. 16, 1907; 1 p.) Graphic representation of the work accomplished in this mill, showing the consumption of reagents, flow of pulp and time of treatment. 20c.

2851—CYANIDATION—Mr. Lamb and the Butters Filter. E. H. Nutter. (Min. and Sci. Press, Feb. 16, 1907; 1 p.) Contains replies to the objections made to this author's first paper on the subject of filter presses, in the light of additional information received. 20c.

2852—CYANIDATION. The Bullfrog Cyanide Mill. E. R. Ayres. (Eng. and Min. Journ., Feb. 23, 1907; 2½ pp.) Describes the course of operations by which the ore is treated in this Nevada mill, with elevations of the plant. 20c.

2853—CYANIDE PROCESS. Methods of Precipitation in the Cyanide Process. A. P. Busey, Jr. (Colo. Sch. of Mines Bull., Jan., 1907; 21 pp.) Discusses the principal methods of precipitating values from cyanide so-

buttons, with notes on the factors to be observed in obtaining the most efficient results. 60c.

2854—CYANIDE PROCESS—Recommending the Cyanide Process. H. F. A. Fiedling. (Min. Rep., Feb. 28, 1907; 1 p.) Points out some precautions to be observed before accepting the results of favorable cyanide tests upon small-sized samples, which ordinarily would justify the erection of a large cyanide plant. 20c.

2855—CYANIDE TESTS on Timiskaming Ores. J. J. Robertson. (Journ. Can. Min. Inst. Vol. IX. 1906; 5½ pp.) Describes and discusses the results of cyanide tests made upon dump ore which contained native silver, nickel and cobalt.

2856—FRENCH GUIANA—Placer Mining in French Guiana. L. Delvaux. (Eng. and Min. Journ., March 2, 1907; 3½ pp.) Describes the dredging for gold on the Elysee placer, which has been highly successful, and gives an account of the new installation, which promises still better results. 20c.

2857—GENESIS OF ORE DEPOSITS—Pockets in the Upper Portion of Gold Veins. G. W. Kimble. (Min. and Sci. Press, March 16, 1907; 1½ pp.) Description of the occurrence of enriched pockets of ore at the intersection of dikes with quartz veins on the slopes of Mt. Thompson, Eldorado Co., Cal. 20c.

2858—GOLD DREDGING PRACTICE in Central Otago. H. R. Macdonald. (N. Z. Mines Rec., Dec. 17, 1906; 6 pp.) Continuation of article previously indexed, discussing in this instalment various gold-saving devices, methods used in cleaning up, and the system of elevating tailings. 40c.

2859—GOLD MILLING—The Milling of Gold Ores. (L. A. Min. Rev., March 16, 1907; 1 p.) Describes the evolution of stamp-mill appliances and milling practice from early times to the present day in the West, and especially in California. To be continued. 20c.

2860—HYDROELECTRIC POWER—The Highest Hydroelectric Transmission Plant in the World, Cayloma Silver Mines, Peru. (Min. Journ., Feb. 23, 1907; 1½ pp.; and Engineer, London, Feb. 22, 1907; 2 pp.) Gives a brief history of the silver mines of Cayloma, with a description of the installation of an electric-power plant to supply power for compressors and pumps. 40c.

2861—IDAHO—Progress in the Coeur d'Alene. (Min. and Sci. Press, Feb. 23, 1907; 2½ pp.) Enumerates the principal mills in this silver-lead district and describes briefly their present state of development. 20c.

2862—IDAHO—The Lincoln Gold Mine of Pearl, Idaho. (S. F. Min. Rev., Jan. 30, 1907; 2 pp.) Outlines the mine and mill equipment and the mill practice at this Idaho gold mine, with a few notes on the character of the ore. 20c.

2863—MEXICO—Mining Conditions in the Mountains of Chihuahua. J. R. Parish. (Eng. and Min. Journ., Feb. 2, 1907; 5 pp.) General description of mining conditions in this Mexican field, outlining some of the difficulties of operating. 20c.

2864—MINE AIR—Witwatersrand Mine Air: Recent Investigations. J. Moir. (Journ. Chem. Met. and Min. Soc. of So. Africa, Dec. and Jan., 1907; 9½ pp.) Continued discussion of the above paper by members of the Society. 81

2865—NEVADA—Preliminary Account of Goldfield, Bullfrog and Other Mining Districts in Southern Nevada. F. L. Ransome, with Notes on the Manhattan District by G. H. Garrey and W. H. Emmons. (Bull. No. 303, U. S. Geol. Surv., 98 pp.) Gives a general account of the geology of these regions, with a description of the form and development of ore deposits, and a brief account of milling operations as they now exist.

2866—NOVA SCOTIA—Gold in Nova Scotia. (Industrial Advocate, Feb., 1907; 11 pp.) Review of gold-mining conditions in all of the principal districts of Nova Scotia. 20c.

2867—ORE RESERVES—Notes on the Estimation and Valuation of Ore Reserves. W. R. Tait. (Journ. Chem. Met. and Min. Soc. of South Africa, Jan., 1907; 4½ pp.) Discusses briefly several methods of sampling ore in place, and gives specimen calculation sheets and examples in calculating tonnages and values. 60c.

2868—PLACER MINING—L. Kingsbury. (Ores and Metals, Feb. 20, 1907; ½ p.) Gives the results of the author's experience in placer mining in Summit Co., Colo., and describes the use of vibrating riffles as a means of catching black sand and flake gold. 20c.

2869—PLACER MINING. W. J. Wimer. (Ores and Metals, Feb. 20, 1907; ½ p.) Brief comments on the action of certain forms of gold which are not readily caught in the usual methods of placer mining. 20c.

2870—PLACER MINING—Loss of Gold in Placer Mining. D. H. Stevens. (Min. and Sci. Press, Feb. 23, 1907; 1 p.) Discussion of the efficiency of the various types of sluices and riffles for saving gold, showing that a riffle which causes boiling of the current results in considerable loss in values. 20c.

2871—PRODUCTION OF GOLD—The Increased Production of Gold and Its Relation to the Standard of Value. A. E. Outerbridge, Jr. (Cassier's Mag., March, 1907; 6 pp.) Discussion of the distribution of gold in the arts and in the commercial world, and an analysis of the effect which increased production has had upon purchasing power. 40c.

2872—SAMPLING AND ASSAYING a Car of Bonanza Ore. L. M. King. (Min. and Sci. Press, Feb. 23, 1907; 1 p.) A very interesting account of the results of sampling and assaying a car of rich ore from the famous Hayes and Monette lease at Goldfield, tabulating and comparing the results obtained by three independent assays. 20c.

2873—SHAFTS—The Big Shafts of Guanajuato. T. A. Rickard. (Min. and Sci. Press, Feb. 9, 1907; 3½ pp.) Historical account of the construction and unwatering of these shafts at Guanajuato, Mexico. 20c.

2874—SILVER LEAD SMELTING PRACTICE. T. S. Austin. (Min. and Sci. Press, Feb. 23 and March 16, 1907; 3½ pp.) Discussion of the physical characteristics and the chemical composition of various slags obtained in silver-lead smelting, and their relation to the satisfactory reduction of the metals. Gives also notes on furnace operation, with reference to quantity of fuel, amount of blast and mechanical condition of the charge.

2875—SLIME TREATMENT. E. Parrish. (Min. and Sci. Press, Feb. 9, 1907; 1½ pp.) Notes on the design and operation of a horizontal revolving filter of the continuous type to be used in the treatment of slimes in the cyanide process. 20c.

2876—SLIME TREATMENT—The Homestake Slime Plant. M. Ehle. (Mines and Min., March, 1907; 5½ pp.) Describes the present system of treating the very low-grade slime coming from the Homestake plant, with notes on the Merrill automatic filter presses. 20c.

2877—SOUTH AFRICA—Conditions Met with in South African Mining. J. H. Pitchford. (Eng. and Min. Journ., Mar. 9, 1907; 4 pp.) Address delivered before the mining students of the Univ. of Cal., describing the mining conditions on the Rand and in the Transvaal, with notes on methods of ore treatment and mine development. 20c.

2878—SOUTH AFRICA—Jumpers Gold Mining Company. (S. A. Mines, Jan. 19, 1907; 1 p.) Statement of various methods in use for promoting labor efficiency in this South African mine, and describing the new contract system of working. 20c.

2879—SOUTH AFRICA—Latest Developments at the Village Deep. (S. A. Mines, Feb. 2, 1907. 1 p.) Sums up the present state of operations at this South African mine, giving a few notes on underground developments, labor employed, and the sampling and sorting process now in use. 20c.

2880—TAVENER PROCESS. L. A. E. Swinney. (Instn. Min. and Met., Bull. No. 29, Feb. 14, 1907; 3 pp.) Author's reply to the discussion of his paper of above title.

2881—TUBE MILLS—The Computation of the Crushing Efficiency of Tube Mills. S. H. Pearce and W. A. Caldecott. (Journ. Chem. Met. and Min. Soc. of South Africa, Jan., 1907; 4 pp.) Discussion by members of the Society of the above paper, which was previously mentioned in the Index. 60c.

2882—YUKON TERRITORY—Recent Developments in Mining in the Southern Yukon D. D. Cairnes. (Paper read before the Can. Min. Inst., Toronto meeting, March, 1907; 9 pp.) Outlines the present state of mining conditions in the White Horse district of the Yukon.

GRAPHITE

2883—CANADIAN GRAPHITE. H. P. H. Brumell. (Paper read at Toronto meeting, March, 1907, of the Can. Min. Inst.; 20 pp.) Discusses the history, origin and character of graphite in Canada, with notes on the methods of mining it, its uses, and statistics of production.

2884—GRAPHITE and Its Uses. (Bull. Imperial Institute, Vol. IV. No. 4, 1906; 7 pp.) Notes on the chemical and physical characters of graphite, uses and mode of occurrence, and methods of concentration. To be continued. 40c.

IRON AND STEEL

2885—AUSTRIA—Die Eisen- und Stahlgewinnung in Innerösterreich, speziall am steirischen Erzberge im Mittelalter. A. Müll-

[illegible] (Stahl u. Eisen, Feb. 15, 1907; 2 pp.) Conclusion of article previously mentioned in [illegible]

2886—BLAST FURNACE—The [illegible] wanna Steel Co.'s New Furnace. (Iron Tr. Rev., Feb. 21, 1907; 7 pp.) Very interesting account of the construction of stack No. 7 [illegible] which many interesting and difficult engineering problems were solved. 20c.

2887—BLAST FURNACE GAS—The Utility of Cleaning Blast Furnace Gas. H. G. Scott. (Min. Journ., Jan. 26, 1907; ½ p.) Abstract of paper read before the Cleveland (England) Institute of Engineers, reviewing briefly the reasons which make it advisable to clean blast-furnace gas before using it in engines. 40c.

2888—BLAST FURNACE LABORATORY NOTES. C. B. Campbell. (Iron Age, Feb. 21, 1907; ½ p.) Gives simple and rapid procedures for the analysis of cinder and the determination of manganese and silicon in pig iron. 20c.

2889—BLAST FURNACE PLANT—The New Blast Furnace Plant of the Frodingham Iron and Steel Company. (Iron and Coal Tr. Rev., Jan. 25, 1907; 2½ pp.) An account of the construction of the first modern plant for producing iron and steel in the North Lincolnshire district of England. 40c.

2890—BLAST FURNACE PRACTICE—Die Lürmann'sche Schlackenform und der Betrieb der Hochöfen. F. W. Lürmann. (Stahl u. Eisen, Feb. 6, 1907; 2 pp.) Describes and illustrates the Lürmann slag tuyere, and discusses the advantages of this device, which is designed to overcome difficulties resulting from fluctuations in blast pressure. 40c.

2891—BLAST FURNACE PRACTICE—Improved Dust Catcher at Pulaski Furnace. J. J. Howard. (Iron Age, Feb. 28, 1907; 1 p.) Describes a device for removing dust from furnace gases, by means of which the gases are given a whirling motion so that the particles of dust are thrown out against the sides of an improved dust catcher. 20c.

2892—CAST-IRON PIG BED. W. A. Jenkins. (Foundry, March, 1907; 1½ pp.) Describes the design and construction of a cast-iron pig bed which is to be used to take care of surplus iron after a heat, or to receive small amounts of iron which are too dull to pour. 20c.

2893—COLORADO FUEL AND IRON COMPANY—Steel Making at Pueblo. Lawrence Lewis. (Eng. and Min. Journ., Feb. 2, 1907; 2 pp.) Describes the reconstructed plant of the Colorado Fuel and Iron Co., with notes on the bessemer and rail departments and the capacity of the plant. 20c.

2894—CORROSION OF IRON. R. O. E. Davis. (Chem. Engr., Feb., 1907; 2 pp.) Gives the results of an inquiry as to the various causes of the rusting of iron, coming to the conclusion that rusting takes place with water and oxygen, but not with water and carbon dioxide. 40c.

2895—CRYSTALLIZATION—Cenni sulla cristallizzione degli acciai, cause e remedi. G. V. Bianchetti. (Rassegna Mineraria, Feb. 11, 1907; 1½ pp.) A brief contribution to the subject of crystallization in steel, with some notes on its cause and remedies therefor. 40c.

2896—CUPOLA FURNACE—Bau und Betrieb der Kupolöfen. C. H. Jaeger. (Stahl u. Eisen, March 6, 1907; 4 pp.) A consideration of the effects which the design, construction and operation of a cupola furnace have upon the quality of the output. 40c.

2897—ELECTRIC SMELTING—La electrosiderurgia en Espana. (Madrid Cientifico, Feb. 20, 1907; 1 p.) Describes an electric furnace in the steel plant of Araya, Spain, which is equipped with novel electrodes. 20c.

2898—FOUNDRY—A Modern Gray Iron Foundry. (Foundry, March, 1907; 6 pp.) Very complete account of the novel features of design and construction of this modern foundry, describing the unique molding methods practiced there. 20c.

2899—FOUNDRY—Die Chemie in der Eisengiesserei. M. Orthey. (Metallurgie, Feb. 8, 1907; 6½ pp.) Discusses the applications of chemistry to iron founding, giving specific purposes for which chemical analysis is essential. 40c.

2900—FOUNDRY IRON—The Characteristics of Foundry Iron. G. Hailstone. (Foundry, March, 1907; 10 pp.) Paper read before the Brit. Foundrymen's Assn., June 5, 1907. Gives a resume of the micro-constituents of foundry iron, the results of mixing different grades, and some of the causes of defective castings. 20c.

2901—GAS ENGINES—Körting Gas Engines at the Shelton Iron Works, Stoke. (Engineering, Feb. 15, 1907; 2½ pp.) Describes in great detail the design and operation of

have resulted in great efficiency in the Ger-

AY TREATMENT.—The Talbot Heat of Recalescence in Iron and Steel. F. K. [illegible] 1907; 20½ pp.) Records the results of a very complete set of experiments undertaken to investigate the properties and changes in iron and steel at their recalescent point. 80c.

IRON ORE TREATMENT.—Utilizing Impure Iron Ores. (Min. Wld., March 23, 1907; 2 pp.) Describes the crushing and concentration of low-grade iron ores and the [illegible] handling and briquetting them, according to the Gröndal process. 20c.

JAPANESE GOVERNMENT STEEL WORKS. (Iron Age, Mar. 21, 1907; 2½ pp.) Notes on the work accomplished in the development of steel works by the Japanese government during the last five years, describing the equipment of the plant and the recent opening of iron mines within the Islands. 20c.

2906—MARTIN PROCESS—Beitrag zur Metallurgie des Martinprozesses. T. Naske. (Stahl u. Eisen, Feb. 6, 13 and 20, 1907; 16 pp.) Continuation of article previously mentioned in the Index, containing a further discussion of the investigations to determine the influences and behavior of manganese and phosphorus during the process of refining the pig iron. 80c.

2907—MECHANICAL EQUIPMENT FOR STEEL WORKS—Maschinelle Einrichtungen für das Eisen-Hüttenwesen. F. Frölich. (Zeit. des Vereines deutscher Ingenieure, Feb. 9, 1907; 7½ pp.) Continuation of lengthy serial which was previously mentioned in the Index. 40c.

2908—MINING METHOD—Grab System of Mining at the Grant Mine, Buhl, Minn. (Iron Tr. Rev., Mar. 14, 1907; 2½ pp.) Describes the apparatus used in this open system of mining; gives the capacity and comparative costs of the process, and enumerates some of the advantages. 20c.

2909—NICKEL-IRON ALLOYS. Das Nickeleisen. Bericht über die Verhandlungen auf dem Kongress des Internationalen Verbandes für die Materialprüfungen der Technik in Brüssel 1906. (Stahl u. Eisen, Feb. 6, 1907; 3 pp.) Describes the making of various alloys of pure nickel and iron and the tests which were made of the strength and properties of these alloys which contained from 16 to 30 per cent. nickel. Also tests upon iron-nickel alloys, contaminated by carbon, manganese, etc. 40c.

2910—ONTARIO—Iron Mining in Northern Ontario. A. B. Willmott. (Can. Min. Journ., Mar. 15, 1907; 1½ pp.) A review of the results accomplished by exploration for iron ore in Ontario. 20c.

2911—OPEN-HEARTH FURNACE. A Russian. W. M. Carr. (Iron Tr. Rev., Mar. 7, 1907; ½ p.) Describes an acid open-hearth furnace used in Russia, interesting because it is used both in malleable iron and steel melting, frequently alternating between the two. 20c.

2912—OPEN-HEARTH FURNACES—Thermal Efficiency of Open-Hearth Furnaces. J. W. Richards. (Electrochem. and Met. Ind., Mar., 1907; 4 pp.) Continuation of the author's series of articles on "Metallurgical Calculations," discussing the various sources of heat consumption and heat losses in open-hearth practice. 40c.

2913—OPEN-HEARTH STEEL—Making Open Hearth Steel at Pueblo. Lawrence Lewis. (Eng. and Min. Journ., Feb. 23, 1907; 4½ pp.) Describes the design and construction of the basic and acid furnaces of the Colo. Fuel and Iron Co., the operations of charging hot and cold metal, and the disposition of the products. 20c.

2914—OPEN-HEARTH STEEL RAILS. B. Talbot. (Engineering Times Supplement, Feb. 13, 1907.) Discusses the comparative [illegible] hearth and the bessemer processes for producing steel rails, and discusses the reasons for the displacement of the bessemer product.

2915—PIG IRON—The Economical Production of Pig Iron. H. Allen. (Iron Tr. Rev., Mar. 14, 1907; 2½ pp.) A study of the usual conditions existing in the blast furnace, with theoretical and mathematical discussion of the factors necessary for maximum efficiency in smelting. 20c.

[illegible] Ore in the Torbrook Iron District, Annapolis County, Nova Scotia. W. F. C. Parsons. (Journ. Can. Min. Inst., Vol. IX, 1906; 3 pp.) Brief notes on the indications of iron ore obtained from a series of bore-holes in Annapolis Co., Nova Scotia.

2917—QUEBEC—Iron Mining Possibilities in the Province of Quebec. Fritz Cirkel. (Paper read before the Can. Min. Inst., Toronto meeting, Mar., 1907; 10 pp.) Account of a few of the principal iron mines of Quebec, with brief notes on the methods of ore concentration used by each.

2918—ROLLING MILLS—Electrically Driven Rolling Mills. G. M. Brown. (Mechan. Engr., Feb. 16, 1907; 3 pp.) Discusses the application of electricity to the heavy and exacting work of driving main rolls. To be continued. 40c.

2919—RUSSIAN STEEL MAKING—Das Hüttenwerk der Metallurgischen Gesellschaft zu Taganrog. L. Fortunato. (Oest. Zeit. f. B. u. H., Feb. 9 and 16, 1907; 7 pp.) Conclusion of article previously mentioned in the Index, dealing in these instalments with the rolling of the steel, and the construction of the rolls, and considering mathematically the effect of expansion of the rolls upon the product. 60c.

2920—SEGREGATION—Ueber Saigerungserscheinungen in Stahlblöcken. J. E. Stead. (Metallurgie, Feb. 8, 1907; 4½ pp.) Enumerates a series of facts relating to segregation and liquation in steel billets accumulated during the long experience of the author, and sums up the conclusions to be drawn from them. 40c.

2921—SMELTING—Die Bewertung der Eisenerze. M. Drees. (Stahl u. Eisen, Mar. 6, 1907; 4½ pp.) A discussion of methods of estimating the amounts of coke and fluxes needed to smelt various iron ores, and the influence of the cost of these substances upon the value of the ore. 40c.

2922—STEEL WORKS—Modern Equipment in Old Plants. H. M. Lane. (Iron Age, Mar. 14, 1907; 4 pp.) Describes the development of molding machinery in an Ohio foundry, with a few notes on early molding machine practice, and its present status in this plant. 20c.

2923—STEEL WORKS—The Krupp Works. (Engineer, Lond., Feb. 15, 1907; 2 pp.) Continuation of article, containing in this instalment the description of the second group of the Krupp works, which includes 6 blast furnaces, steel works and rolling mills. 40c.

2924—SULPHUR IN STEEL—Ueber die Gewichtsbestimmung des Schwefels im Stahl. (Centralblatt der Hütten u. Walzwerke, Feb. 15, 1907; 1 p.) A review of the influence of sulphur on steel and a brief comparison of the relative merits of some of the chief methods now in use for determining sulphur in steel. 40c.

2925—SWEDEN—Zwei schwedische Eisenerzfelder. (Bergbau, Feb. 7, 1907; 1 p.) A short description of the size and character of the Swedish iron ore deposits, with comments on the composition of the principal ores. 40c.

2926—TENNESSEE—Soft Iron Ore in Tennessee. Edw. K. Judd. (Eng. and Min. Journ., Mar. 23, 1907; ½ p.) Brief description of the present condition of the soft iron industry in this State. 20c.

2927—TESTING—Feststellung von Untersuchungsmethoden über die Homogenität von Eisen and Stahl behufs eventueller Benützung bei Abnahme. (Metallurgie, Feb. 22, 1907; 6 pp.) A very thorough review of the work done by the Commission of the International Society for Testing Materials, undertaken to investigate present methods of testing the homogeneity of iron and steel, with a view to removing the existing difficulties in testing practice. 40c.

2928—TITANIUM—The Fusibility and Fluidity of Titaniferous Silicates. L. C. Lennox and C. N. Cox. Jr. (Colo. College Publication, Engineering Series, Vol. I, No. 1; 21 pp.) Gives the results of experiments to determine the possibility of obtaining fusible and fluid mixtures of titanium ores in the blast furnace, and gives several examples of compelling charges to be used in smelting titanic iron ores.

2929—TITANIUM IN IRON—Die kolorimetrische Bestimmung des Titans und ihre Anwendbarkeit neben Eisen. P. Faber. (Chem. Zeit., Mar. 13, 1907; 2 pp.) Describes experiments undertaken to develop an accurate colorimetric method of determining titanium and outlines the procedure to use. The method is intended especially for titanium in pig iron. 20c.

2930—VELOCITY OF GASES—Direkte Messung der Geschwindigkeit heisser Gasströme. R. Vambera and F. Schraml. (Stahl u. Eisen, Mar. 6, 1907; 4½ pp.) Describes the use of Pitot tubes as applied to the direct determination of the velocity of hot gases and discusses the mathematical features of the problem. 40c.

2931—ZINC PLATING—Verzinkungs-Selbstkosten-Berechnung von Blechen. W. Schwarz. (Stahl u. Eisen, Feb. 27, 1907; 2 pp.) A discussion of methods of calculating costs of covering plates with zinc, giving specimen tables for cost keeping. 20c.

LEAD

2932—IDAHO LEAD MINES in 1906. R. N. Bell. (Eng. and Min. Journ., Feb. 2, 1907; ½ p.) Enumerates the chief lead mines of Idaho and work done by them during 1906. 20c.

2933—LEAD SMELTING Works of Port Pirie. G. D. Delprat. (Eng. and Min. Journ., Mar. 16, 1907; 3½ pp.) Portions of a paper read before the Aus. Inst. of Min. Engrs., Sept., 1906, describing the processes and furnaces used in smelting lead ores from Broken Hill, N. S. W., with some notes on the refining and preparation of the bullion for the market. 20c.

MANGANESE

2934—GERMANY—Mangan im Grundwasser der Breslauer Wasserleitung und die Frage der Abschiedung des Mangansulfates aus demselben. H. Lührig and A. Blasky. (Chem. Zeit., Mar. 9, 1907; 2½ pp.) Discusses the occurrence of considerable amounts of manganese in the ground water in and around Breslau, Germany, and reviews possible methods of extracting the manganese from the water as sulphate. 40c.

2935—ORE DEPOSITS—On the Association of Gibbsite with Manganese Ore from Talevadi, Belgaum District, and on Gibbsite from Bhekowli, Satara District. L. L. Fermor. (Records, Geol. Survey of India, Vol. XXXIV, Part 3, 1906; 4½ pp.) Tabulates the results of examinations of specimens of associated gibbsite with manganese ore, and discusses the significance of the analyses.

2936—VIRGINIA—The Crimora Manganese Mine. E. K. Judd. (Eng. and Min. Journ., Mar. 9, 1907; 1 p.) A description of the location and geology of the ore deposits of this Virginia manganese mine, giving also an account of the method of mining and concentrating the ore. 20c.

PETROLEUM

2937—OIL FUEL—Commercial Aspects of Oil as Fuel for Power Generation. F. E. Junge. (Power, Mar., 1907; 3½ pp.) Considers the use of oil as fuel when put in competition with other combustibles used in power generation. 20c.

2938—RUMANIAN PETROLEUM INDUSTRY during 1906. (Petrol. Rev., Feb. 15, 1907; 1½ pp.) Brief review of the chief events of the petroleum industry in Rumania during 1906, with a statement of prices and exports. 40c.

2939—SCOTLAND—The Oil Industry in Scotland. (Pet. Rev., Mar. 2, 1907; 2½ pp.) Interesting account of the geological features of the oil shales of Scotland, together with detailed notes on the methods used in working them. 40c.

2940—SOUTH AMERICA—Les Pétroles dans l'Amérique du Sud. M. Frochot. (Journ. du Pétrole, Mar. 1, 1907; 4 pp.) Discusses the geological and geographical aspects of petroleum in South America and outlines the probable origin and formation of the oil. 40c.

PHOSPHATE ROCK

2941—RUSSIAN PHOSPHATES. (Am. Fertilizer, Feb., 1907; 1 p.) Describes briefly several large deposits of phosphates in Russia. 20c.

2942—TENNESSEE—Phosphate Mining in Tennessee. H. D. Ruhm. (Eng. and Min. Journ., Mar. 16, 1907; 4 pp.) Brief history of the early development of this industry, with very full notes on the present operating methods, and the situation and prospects of phosphate mining. 20c.

POTASH

2943—POTASH MINING—The Two-shaft System for Prussian Potash Works. R. Grimshaw. (Eng. and Min. Journ., Feb. 2, 1907; ½ p.) Sums up the reasons which have induced the German government to require the construction of a second shaft on all potash properties as a measure of safety. 20c.

RARE MINERALS

2944—MONAZITE—Occurrence of Monazite in the Tin-bearing Alluvium of the Malay Peninsula. (Bull. Imperial Institute, Vol. IV, No. 4, 1906; 6½ pp.) Describes the discovery of this mineral among the tin-bearing gravels of the Malay peninsula, and gives the

results of tests made to devise a way of economically separating it in marketable form. 40c.

2945—PROSPECTING for Rare Minerals and Earths. G. E. Walsh. (Min. and Sci. Press, Feb. 16, 1907; 1½ pp.) Enumerates the chief uses to which rare earths may be put, and mentions briefly some of the likely districts where these minerals may be found. 20c.

SULPHUR AND PYRITES

2946—PYRITE MINING. W. B. Phillips. (Am. Fertilizer, Feb., 1907; 2 pp.) An account of the present situation of the sulphur industry in Alabama, pointing out future possibilities of making this field an important producer. 20c

TIN

2947—ASSAYING. The Assay and Analysis of Tin Ores and Other Stanniferous Materials. P. J. Thibault. (Aust. Min. Stand., Jan. 16 and Feb. 13, 1907; 2 pp.) The first instalments of a monograph on the metallurgy of tin, describing three standard methods for the dry assay of tin ores, giving amounts and character of flux to be used in each case. 60c.

2948—CORNISH TIN MINING. H. E. West. (Min. and Sci. Press, Feb. 9 and 16, 1907; 4 pp.) Description of the methods of mining employed in this famous tin field, with some discussion of costs of mining and ore treatment.

2949—CORNWALL—Revival of the Mining Industry in Cornwall. Edward Walker. (Eng. and Min. Journ., March 9, 1907; 6 pp.) First of a series of articles, showing how new enterprise and modern methods are likely to restore many of the old abandoned properties to the list of producers. 20c.

2950—TASMANIA—Report on Cox's Bight Tin Field. W. H. Twelvetrees, Gov. Geologist. (Published by John Vail, State Printer, Tasmania; 16 pp.; 1 map.) Enumerates the principal producing mines in this field, with brief descriptions of the present state of development work.

TUNGSTEN

2951—GERMANY—Ueber ein kürzlich aufgeschlossenes Wolframerzgangfeld und einige andere neue Aufschlüsse in sächsischen Wolframerzgruben. R. Beck. (Zeit. f. prak. Geol., Feb., 1907; 9 pp.) Discusses some mineralogical and geological features of a few deposits of tungsten ore in Saxony. 40c.

ZINC

2952—ARKANSAS—Dodd City, Ark., Zinc Fields. (Min. Wld., Feb. 23, 1907; 1½ pp.) Describes the present state of the zinc mining industry in this comparatively unknown Arkansas field, and enumerates the present producing mines of the district. 20c.

2953—CALAMINE DEPOSITS—Les Gites calaminaires de l'Algerie et ceux de la Sardaigne. (Gazette des Mines, Feb. 1, 1907; 2 pp.) Describes and compares the geological and mineralogical features of the calamine deposits of Algeria and Sardinia. The same article is given in *Rassegna Mineraria*, Mar. 1, 1907. 40c.

2954—COLORADO—The Zinc Industry in Colorado. (Min. Rep., Feb. 28 and Mar. 7, 1907; 4 pp.) An account of the zinc industry in Colorado and statistics of production and value since 1902. Deals with the character of ores and methods of concentration. 40c.

2955—ELECTROMETALLURGY OF ZINC. Woolsey McA. Johnson. (Electrochem. and Met. Ind., Mar., 1907; 1½ pp.) Paper read before the Am. Electrochem. Soc., Jan. 30, 1907. Briefly mentions the various electrical devices for concentrating and reducing zinc ores, with a comparison of electric furnace smelting with distilling from retorts. 40c.

2956—HOISTING in Small Zinc Mines in Wisconsin. G. S. Brooks. (Eng. and Min. Journ., Feb. 23, 1907; 1 p.) A discussion of present conditions in the small zinc mines of Wisconsin, comparing the relative merits of cage-car and tub systems, and considering the operating and first costs of each system. 20c.

2957—SMELTING — Gattierung von Zinkblende und Galmei. F. Juretzka. (Metallurgie, Feb. 8, 1907; 6 pp.) Discusses very briefly the historical aspect of zinc smelting practice, and gives in detail the present state of the art of reducing zinc from mixtures of calamine and blende; also discusses the principles which govern the composition of the mixtures to be smelted. 40c.

2958—ZINC DETERMINATION. The Determination of Zinc Present as Carbonate and Silicate in Ores. P. H. Walker and H. Schreiber. (Journ. Am. Chem. Soc., Feb., 1907; 3½ pp.) Comments upon the weak points of several existing methods of distinguishing between these two zinc minerals in ores, and describes exact procedure for their quantitative determination. 60c.

2959—ZINC MINING in Mississippi Valley. E. Hedburg. (Min. Wld., Mar. 2, 1907; 1 p.) Short review of the present condition of zinc mining in this region, and a few notes on certain recent occurrences of zinc ore in Arkansas. 20c.

ECONOMIC GEOLOGY—GENERAL

2960—ASIA—Tschuktschenhalbinsel (Ostasien). J. Korsuchin. (Zeit. f. prak. Geologies, Dec., 1905; 5½ pp.) An account of geological reconnaissance of the Tschukschen peninsula in northeastern Asia, undertaken to investigate the possible occurrence of gold there in the same manner as at Cape Nome which adjoins it. 40c.

2961—BRITISH COLUMBIA — Explorations in British Columbia. H. F. Evans. (Min. Wld., Mar. 9 and 23, 1907; 2 pp.) Summary of the results of geological explorations in British Columbia, with a few notes on the development of various Carboniferous and Cretaceous rocks. 20c.

2962—BRITISH COLUMBIA—Some Notes on the Economic Geology of the Skeena River. W. W. Leach. (Paper read before the Can. Min. Inst., Toronto meeting, Mar., 1907; 11 pp.) Reviews briefly the chief economic features of this Canadian district.

2963—CALIFORNIA—Map of the Forest Reserves of California. Compiled by State Mining Bureau from data furnished by U. S. Forest Service. (Pub. by State Mining Bureau, San Francisco, Cal., 1907; 30x34 in.) 40c.

2964 — CALIFORNIA — The Crystalline Rocks of the Oak Hill Area near San Jose, California. E. P. Carey and W. J. Miller. (Journ. of Geol., Feb.-Mar., 1907; 18 pp.) Gives notes on the character, composition and distribution of some of the principal igneous rocks of this Californian district. 60c.

2965—COLORADO—A Trip to San Juan, Colorado. A. Lakes. (Mines and Min., Mar., 1907; 1 p.) An account of a trip by the author through this Colorado district, with notes upon the geological formations which can be readily studied there. 20c.

2966—ECONOMIC GEOLOGY and Mineral Deposits. F. C. Nicholas. (Min. Wld., Mar. 9, 1907; 1 p.) Discusses the means through which chemical activity in ore deposition may take place, and describes the mineralizing influences resulting from the chemical reactions which have produced ore bodies. 20c.

2967—INDIA—Minerals and Metalliferous Lodes of Kulu and Lahaol, Kangra District, Punjab Himalayas. F. C. Hughes. (Paper read before the Instn. Min. and Met., Feb. 21, 1907; 3½ pp.) Describes the situation of this India mining district and gives a brief account of the geology of the ore occurrences in the districts of Kulu and Lahaol.

2968—MINOR MINERALS—Notes on Lawsonite, Columbite, Beryl, Barite and Calcite. A. S. Eakle. (Univ. of Cal. Pub., Vol. V, No. 6, Jan., 1907; 14 pp.) Describes the occurrences of these minerals, gives the results of measurements of various crystals and illustrations of special forms. 20c.

2969 — QUEBEC — New Discoveries in Northern Quebec. J. Obalski. (Eng. and Min. Journ., March 23, 1907; 1 p.) Paper read before the March, 1907, meeting of Canadian Min. Inst., giving notes on the mineral occurrences of the northern part of Quebec obtained by the author while on a prospecting trip through the region in 1906. 20c.

2970—ROCK EROSION—The Decomposition of the Feldspars. A. S. Cushman and P. Hubbard. (U. S. Dept. of Agriculture Publication, Jan. 30, 1907; 29 pp.) Monograph published by the Dept. of Agriculture dealing with the chemical factors which result in the decomposition of feldspars.

2971—SICILY—Die geologischen und tektonischen Verhältnisse der Erzlagerstätten Nordost-Siziliens. B. Lotti. (Zeit. f. prak. Geol., Feb., 1907; 4 pp.) An account of a few prominent geological and technical aspects of the lead, zinc, copper and iron ores in northeast Sicily. 40c.

2972—TRANSVAAL—Ueber das Vorkommen von Kimberlit in Gängen und Vulkan-Embryonen. F. W. Volt. (Zeit. f. prak Geologie, Dec., 1906; 2 pp.) Brief notes on the characteristics and occurrence of the mineral Kimberlite in the veins and plutonic rocks of the Transvaal. 40c.

MINING—GENERAL

2973 — ALASKA — Ketchikan Mining District in Southeastern Alaska. (Brit. Col. Min. Record, Jan., 1907; 7 pp.) A general account of mining conditions in this Alaskan district, with some particulars of its mines and smelters. 20c

2974 — ASSAY SAMPLES — A Device for Reducing the Size of Assay Samples. W. S. Brown. (Eng. and Min. Journ., Feb. 2, 1907; 1 p.) Describes the construction and operation of a handy device for quickly cutting down assay samples. 20c.

2975 — BAVARIA — Das bayrische Berg- [illegible] 1906. (Montan Zeitung, [illegible] 1906, [illegible] mining and production of minerals in Bavaria during 1906. 20c.

2976—BOLIVIA—Industrie Minière de la Bolivie. (L'Echo des Mines, Feb. 28, 1907; 1 p.) Treats in a brief manner the present condition of tin, silver, gold, copper and zinc mining in Bolivia, and gives a review of general considerations which are retarding development. 20c.

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3019—DENSITY OF PULP—A New Method for Obtaining the Density of Settled Sand D. I. R. Simpson (Journ. Chem., Met. and Min. Soc. of South Africa, Dec., 1906; 1 p.) Describes a very simple and unique means of arriving at the true tonnage of pulp in settling tanks by a novel method of obtaining its density. 60c.

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3058—ELECTRIC FURNACE—Ueber elektrische Oefen älterer und neuer Systeme. G. A. Hummer. (Oest. Z. f. B. u. H., March 2 and 9, 1907; 9 pp.) Discusses various types of electric furnaces and describes several plants where much attention is paid to electro-metallurgy, with a few notes on the efficiency of some systems in use. 40c.

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3074—PROSPECTING DRILLS. W. Dickson. (Journ. Can. Min. Inst., Vol. IX, 1906; 8 pp.) Description of several types of diamond drills, methods of running them, and the ordinary routine of sinking prospecting holes.

3075—PUMPING PLANT—Electrically Driven Centrifugal Pumping Plant at the Tywarnhaile Mine. W. R. Thomas. (Paper read before the Instn. Min. and Met., Feb. 21, 1907; advance sheets; 7 pp.) Gives the details of unwatering this Cornwall mine by the aid of electrically driven pumps, the power being generated by gas producers.

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3077—SMOKE PREVENTION—The Suppression of Industrial Smoke, with Particular Reference to Steam Boilers. A. Bement. (Journ. West. Soc. Eng., Dec., 1906; 59½ pp.) Reprint of the above paper, which was read before the West. Soc. of Eng., Oct. 17, 1906, together with lengthy discussion by various members. 40c.

3078—STEAM ENGINES—Hints on the Considerations which Determine the Position of Steam Engines. C. Hurst. (Min. Engineering, Feb., 1907; 1 p.) Gives a few notes on various features which will determine the proper location of the power engine, derived from the practical experience of the author. 40c.

3079—STEAM PIPE COVERINGS—Heat Non-Conducting Coverings for Steam Pipes. D. R. Maclachlan. (Mechan. Wld., Feb. 9 and 16, 1907; 10 pp.) An account of a series of experiments to determine the efficiency of non-conducting coverings for steam pipes, taking account of the value of different thicknesses of covering when used with pipes of varying diameters and with varying steam pressures. 60c.

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3086—WINDING—Effects of Acceleration on Winding Torques, and Test of Tarbrax Electrical Winding Plant. G. Ness. (Trans. Min. Inst. of Scotland, Vol. XXIX, Part 2; ... an account of the tests made on this winding plant, and discusses and interprets the results obtained.

3087—WIRE ROPES. Some Notes on an Electrical Apparatus for Ascertaining the Cross Sectional Area of Wire Ropes. C. McCann. (Journ. Transvaal Inst. Mechan. Engrs., Jan., 1907; 2 pp.) Describes an invention by which a continuous record of the diameter of a wire hoisting rope may be obtained, and designed to prevent the breaking of such rope, or to locate the cause if such an accident has occurred. 60c.

3088—WOOD PIPE. Method of Construction and Use. R. B. Lloyd. (Cal. Journ. Technology, March, 1907; 3½ pp.) Describes the process of constructing several forms of wooden pipe, with notes on the use of preservatives for the metal banding. 20c.

3089—WOODEN STAVE PIPE. A. Swickard. (Cal. Journ. Technology, Jan., 1907; 2 pp.) The various causes of decay in wooden pipe are discussed and the advantages of wooden pipe over steel in various localities are briefly considered. 20c.

3090—WOODEN STAVE PIPE—Additional Information on the Durability of Wooden Stave Pipe. (Proc. A. S. C. E., Jan., 1907; 12½ pp.) Discussion by members of the Society of the above paper, which was previously mentioned in the Index.

3091—ACETYLENE. H. C. Biddle. (Cal. Journ. Technology Jan., 1907; 8 pp.) Contains a short history of the application of calcium carbide and acetylene for illuminating; describes the manufacture of carbide at Niagara Falls, and discusses the chemistry of acetylene. 20c.

3092—ACID MANUFACTURE—Jahresbericht über die Industrie der Mineralsäuren und des Chlorkalkes. K. Reusch. (Chem. Zeit., Feb. 23, 1907; 3½ pp.) A review of the progress of the chemical industry in Germany in so far as it relates to mineral ... the effects of prices of raw ... production and selling prices.

INDUSTRIAL CHEMISTRY

3093—ELECTRIC FURNACE—Electric Heating and its Application to the Fusion and Firing of Refractory Materials. R. S. Hutton. (Trans. Eng. Ceramic Soc., Vol. V, Part 2, 1905-6; 11 pp.) Brief summaries of the results of using the electric furnace in the production of carborundum, artificial graphite, magnesia and silica glass.

3094—ELECTROLYSIS—McDonald Electrolytic Bleach and Caustic Soda Plant. J. R. Crocker. (Electrochem. and Met. Ind., Feb., 1907; 1 p.) A detailed description of the electrolytic plant of this Pennsylvanian company for the production of caustic soda, which is notable for its construction that allows the automatic handling of nearly all the solutions used. 40c.

3095—ELECTROPLATING—Elektrolytische Reinigung der Metalle vor dem Galvanisieren. (Deutsche Metall-Industrie-Zeitung, Jan. 26, 1907; ½ p.) Describes a process of cleaning metals by electrolysis in preparation for galvanizing. The metal to be cleaned is suspended in a special bath and the current turned on. The evolved bubbles of gas then clean the surface of the metal thoroughly.

3096—SILICIDES—An Investigation of the Borides and the Silicides. O. P. Watts (Bull. Univ. of Wis., No. 145, Nov., 1906; 38 pp.) Presents the results of experimental investigation of these chemical compounds, which have become of scientific and commercial importance through the utilization of the ...

...ELECTRIC Welding Steel ... C. A. Graumann. (Metallürgie, Feb. 8, 1907; ... the manipulation, and the results obtained in a series of experiments undertaken to deter...

3098—SULPHURIC ACID—Tower Fillings. J. M. Liebig. (Chem. Engr., Feb., 1907; 8 pp.) Translation from *Zeit. f. Angew. Chem.*, Oct. 26, 1906. A valuable paper on the material adaptable for the filling of Glover towers in sulphuric acid manufacture, and the methods of setting special chemical tiling. 40c.

ANALYTICAL CHEMISTRY

3099—ASSAYING—Blacksmith's Forge as an Assay Furnace. W. R. Wade. (Eng. and Min. Journ., March 2, 1907; ½ p.) Describes a very ingenious use of the forge for assaying purposes, and describes the fusion and cupellation as it was carried out in this apparatus. 20c.

3100—ASSAYING—Notes on the Separation of Gold, Silver and Platinum. H. Carmichael. (Publication of the B. C. Assayers' Inst., Nov., 1906; 1 p.) Describes the results of a series of tests upon the solubility of various alloys of gold, platinum and silver in nitric and sulphuric acids of different strengths. 20c.

3101—ASSAYING—Some Notes on Assaying. C. H. Fulton. (West. Chem. and Met., Jan., 1907; 9½ pp.) Continuation of article previously indexed, dealing in this instalment with the theory of cupellation, giving many directions for avoiding loss by spitting and like means, and discusses the effect of various impurities in the lead button. 60c.

3102—COPPER-TIN ALLOYS—Kupfer, Zinn und Sauerstoff. E. Heyn and O. Bauer. (Zeit. f. Anorg. Chem., Band 45, Heft 1; 16 pp.) A long and interesting account of experiments to determine the behavior of oxygen on copper-tin alloys, describing the furnaces and apparatus used, the methods developed for producing various alloys, and giving a concise summary of the conclusions arrived at.

3103—ELECTROLYSIS—Elektroanalyse der Metalle. A. Fischer. (Zeit. f. angew. Chem., Jan. 25, 1907; 4½ pp.) A supplementary article to the paper by Prof. Förster which appeared previously in this periodical. The author of the present contribution is thus appointed at the narrow field covered by Prof. Förster, and gives descriptions of many new electrolytic separations of metals. 40c.

3104—GOLD AND THALLIUM ALLOYS—Ueber Gold- Thalliumlegierungen. M. Levin. (Zeit. f. Anorg. Chem., Band 45, Heft 1; 7 pp.) An account of experiments undertaken to determine the chemical properties of gold and thallium alloys. The studies were carried out by determining the cooling curves of various different alloys of the two metals.

3105—MANGANESE DETERMINATION—Ueber die Manganbestimmung bei Anwesenheit von Wolfram. G. V. Knorre. (Stahl u. Eisen, March 6, 1907; 3 pp.) Discusses the effect of tungsten upon the accuracy of the usual methods of determining manganese, and outlines the modifications to be used when tungsten is present. 40c.

3106—METALLOGRAPHY—Ueber die Anwendung der thermischen Analyse in abnormen Fällen. G. Tammann. (Zeit. f. Anorg. Chem., Band 45, Heft 1; 7 pp.) A description and discussion of the method of thermal analysis, whereby the composition of fusible masses of crystalline substances is established without any mechanical separation. The process is an application of the study of cooling curves.

3107—MINERALS—Tables for Determining Economic Minerals. (Chem. Engr., Feb., 1907; 3 pp.) Continuation of article previously indexed, giving notes on the characteristic reactions given by various metals when their minerals are tested in the open tube. Also a list of borax bead reactions. 40c.

3107a—TIN AND ARSENIC—Versuche über die elektrolytische Trennung von Zinn und Arsen. A. Lampen. (Chem. Ind., Mar. 15, 1907; 1 p.) Gives the results of some investigations upon the accuracy of an electrolytic method of separating and determining tin and arsenic. 40c.

3108—VOLUMETRIC ANALYSIS—On Technical Volumetric Methods in General. V. H. Gottschalk. (West. Chem. and Met., Feb., 1907; 10½ pp.) An inquiry into the factors which are of chief importance in determining the accuracy of a volumetric method, such as the nature of the indicator, conditions of titration, and proper manipulation of measuring instruments. 60c.

3109—VOLUMETRIC ANALYSIS—Studie über Indikatoren. E. Salm. (Chem. Zeit., Feb. 2, 1907; ½ p.) Discusses some of the inaccuracies of volumetric processes, due to the dissociation of strong salts upon the indicators in acidimetry and alkalinity. 40c.

3110—ZINC—Die Elektrolytische Zinkfällung unter Anwendung Rotierender Elektroden. T. S. Price and G. H. B. Dudge. (Elektro. Zeit., Feb., 1907; 4½ pp.) A complete summary of a series of experiments made upon zinc sulphate solutions, to precipitate zinc electrolytically upon a rotating cathode. The results of varying many factors connected with the analyses are tabulated concisely and briefly discussed. 40c.

MATERIALS OF CONSTRUCTION

3111—CEMENT-MORTAR—The Effect of Mica on Cement-Mortar. W. N. Willis. (Cement Age, Mar., 1907; 2½ pp.) Records briefly the results of some experiments made to determine the injurious effect of mica in coarse and fine sands to be used for concrete. 20c.

3112—CEMENT-MORTAR—Ueber Ausdehnung von Portlandzementmörtel im Süsswasser und im Meerwasser. S. Kasai. (Tonindustrie-Zeit., Mar. 2 and 9, 1907; 5 pp.) Sums up the results of many tests made to determine the expansion of portland cement mortars when mixed and hardened with fresh and salt water. 40c.

3113—CONCRETE—Physical Test on Concrete. E. H. Beckstrand. (S. L. Min. Rev., Feb. 15, 1907; 2 pp.) Describes the results obtained from a series of experiments made on full size reinforced concrete beams, and upon cement briquets and cubes all made from Utah cement. 20c.

3114—CONCRETE—The Fatigue of Concrete. J. L. Van Ornum. (Proc., A. S. C. E., Dec., 1906; 26 pp.) Very complete article dealing with the strength of concrete as determined by repetition and time tests, with a short discussion as to the value of the curves obtained.

3115—CONCRETE CONSTRUCTION—Practical Hints for Concrete Constructors. W. J. Douglas. (Eng. News, Dec. 29, 1906, and Jan. 24, 1907; 9 pp.) Contains a very large number of hints and rules for success in concrete work, selected from a long experience by a practical concrete engineer. 40c.

3116—PORTLAND CEMENT—The Chemistry and Testing of Portland Cement. C. H. Desch. (Eng. Times, Feb. 28, 1907; 2 pp.) Discusses the theory of the various tests which are now in use for determining the quality of portland cement. 20c.

3117—REINFORCED CONCRETE—Electrolytic Corrosion of Iron and Steel in Concrete. A. A. Knudson. (Proc., Am. Inst. Elec. Engrs., Feb., 1907; 15 pp.) Gives the result of a set of investigations to determine the amount of corrosion which takes place in the reinforcement steel of concrete, and which is occasioned by electric current. Illustrations of various examples of corroded steel taken from structures are given. 60c.

3118—REINFORCED CONCRETE—Steel for Reinforced Concrete. J. S. E. de Vesian. (Eng. Times, Feb. 21, 1907; 1 p.) Few notes on certain requisite properties which all steel should possess, in order to make safe reinforcement for concrete. 20c.

3119—REINFORCED CONCRETE—Tests of Bond Between Concrete and Embedded Steel Bars. (Engineering-Contracting, Feb. 13, 1907; 1¼ pp.) Gives the results of tests to determine the strength of the bond between the concrete and the reinforcing steel, describing the methods of testing, and tabulating the results of the tests. 20c.

3120—REINFORCED CONCRETE—The Mechanics of Reinforced Concrete. C. B. Wing. (Journ. Assn. Eng. Societies, Feb., 1907; 22½ pp.) Discusses the development of formulæ for calculating stresses in reinforced concrete, also the principles and methods to be used in their application. 40c.

3121—REINFORCED CONCRETE BEAMS. Tests on. Ernest A. Moritz. (Bull. Univ. of Wis., No. 148, Jan., 1906; 73 pp.) Gives in compact form the reports of tests on reinforced concrete beams which have been made during the past three years in the laboratory for testing materials of the University of Wisconsin. Describes the apparatus used, various methods of reinforcing, and gives tabulated data of results, together with many diagrams. 40c.

3122—SAND-LIME BRICK—Tests of L. N. Reeve. (Journ., Worcester Poly. Inst., Jan., 1907; 5 pp.) Gives the results of tests upon sand-lime brick of various compositions and fillers. 40c.

3123—WROUGHT PIPE. Materials and Properties of Wrought Pipe. F. N. Speller. (Proc., Eng. Soc. W. Penn., Jan., 1907; 21 pp.) Describes the manufacture of wrought iron pipe, and discusses with considerable detail the principal characteristics of pipe material, the corrosion of iron and steel, and gives the results of torsion tests of butt-welded pipe. 40c.

The Engineering and Mining Journal

VOL. LXXXIII. NEW YORK, APRIL 13, 1907. NO. 15.

The Mines of the Fairview District, Nevada

A New Silver-Gold Camp in Churchill County, Where the Chief Difficulties Are Lack of Water and a Long Haul to the Railroad

BY EDWARD R. ZALINSKI*

Reno, the largest and most important trade center in Nevada, is located on the main line of the Southern Pacific Railroad, in the foot hills of the Sierras. It is a short distance east of the Nevada-California State line, and is the natural center and outfitting point for the many camps in this region. Mining men bound for Tonopah, Goldfield, Fairview, Wonder, Ramsey, Olinghouse, the Walker river district, Yerrington, and other camps, find it convenient to stop off here either going or coming.

From Reno to Fairview

Fairview is situated in the south central part of Churchill county, about 120 miles southeast of Reno. Wonder is 18 miles north of Fairview. Leaving Reno at 8:20 a.m. on the Tonopah and Goldfield train, Hazen on the main line, is reached about 11 o'clock. The branch railroad to Tonopah turns off to the south at this point. A new branch of the Southern Pacific connects Hazen with Fallon, a distance of 16 miles. The regular passenger service is not in operation yet, and a stage makes the trip to Fallon daily. The the fare is $2.50.

The stage leaves Fallon at 7:30 in the morning for the 42-mile trip from Fallon to Fairview. The roads in the winter are poor. Fallon is in a farming district and the road for about 10 miles passes east through a flat country intersected by large irrigating canals and ditches. This low land lies south of the Carson sink and has been irrigated under Government supervision. A change of horses is made at a ranch about 12 miles out. From here on to the station where lunch is eaten, about half way to Fairview, the roads are hard and good.

The road swings southerly and follows the north side of Salt flat. Several large basalt flows extending out on the flat are crossed, and an old borax works is seen to the right. Before reaching Sand springs the road crosses a portion of the Salt flat and is soft and muddy. The wheels sink up to the hubs and freight wagons have much difficulty in getting through. Most teams are now compelled to take the longer road around the north end of the marsh.

At Sand Springs horses are again changed. Sand Springs was a station on the old Overland trail. The road to Fairview follows approximately this route. A mountain of white sand about a mile to the north, gave the station its name. This is robably of aeolian origin.

It is about 12 miles to Fairview, and the road is up-grade to the divide, which separates Fairview valley and Salt flat. Claim monuments are seen along the road on both sides of the pass, and a black shale is crossed which is cut by light-colored dikes. The summit is reached in 3 to 4 miles from the Sand Springs station. Fairview can be seen on the opposite side of the valley at the foot of Fairview peak. A gradual descent is made with a level stretch in the bottom of the flat and up grade on the Fairview side.

The stage pulls up in front of the Hotel Fairview about 6 o'clock in the evening. Automobiles can make the trip from Hazen to Fairview over dry roads, in 5 hours.

Fairview

The town of Fairview is [illegible]

EAGLE'S NEST KNOB, BOULDER AND BOULDER NO. 1 CLAIMS

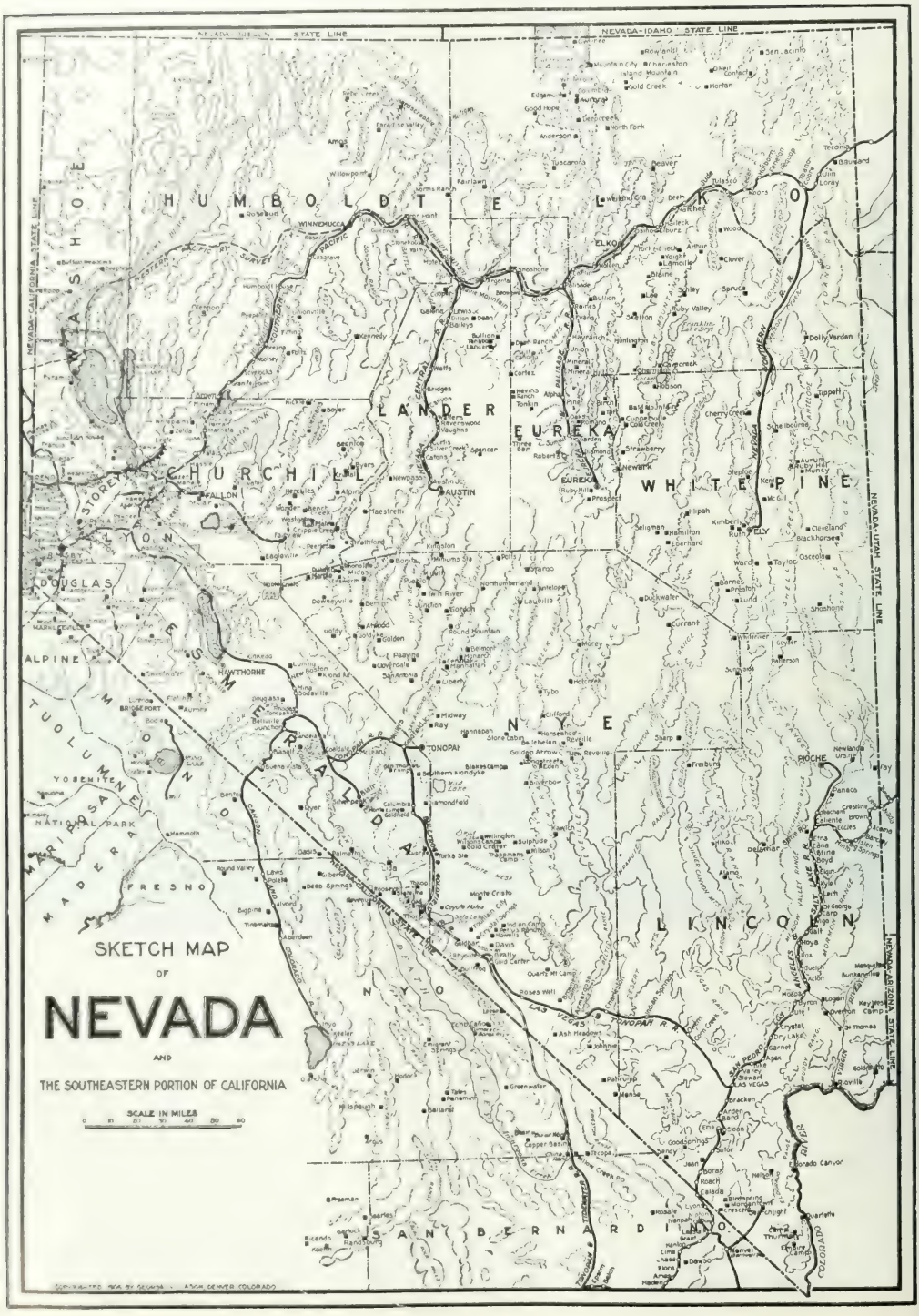
SOUTHWEST FROM THE KNOX LEASE

The town has grown rapidly. It is only a few months since the townsite was laid out and frame buildings are already replacing tents. Lots are selling at good prices. The town has a population of more than 1000 and about 200 men are employed in the mines. There are several hotels and rooming houses, restaurants, saloons, and stores, also a post office, and two newspapers, *The Fairview Miner* and *The News*.

The town has stage-line connection with Wonder and Fallon, also telephone connections to points on the railroad. Three surveyors make headquarters in,

*Mining engineer, University Club, Salt Lake City, Utah.

Note—The sketch map which accompanies this article is published by permission of the Olason Map Company, Denver, Colo.


SKETCH MAP
OF
NEVADA
AND
THE SOUTHEASTERN PORTION OF CALIFORNIA
SCALE IN MILES
0 10 20 30 40 50 60
NEVADA-IDAHO STATE LINE
NEVADA-CALIFORNIA STATE LINE
NEVADA-UTAH STATE LINE
HUMBOLDT
ELKO
LANDER
EUREKA
WHITE PINE
CHURCHILL
LYON
STOREY
DOUGLAS
ALPINE
MINERAL
ESMERALDA
NYE
LINCOLN
CLARK
INYO
MONO
TULARE
FRESNO
MADERA
MARIPOSA
TUOLUMNE
SAN BERNARDINO
WASHOE
PERSHING
CHURCHILL
LAS VEGAS
TONOPAH
AUSTIN
EUREKA
ELY
FALLON
HAWTHORNE
YOSEMITE NATIONAL PARK
COLORADO

Fairview and several lawyers and doctors hang out signs. Beside these, the town has a justice of the peace and a constable, who so far have had nothing to do. The climate is healthy though very hot in summer.

Freight coming in costs 1¼ to 1½c. per lb. from the railroad at Hazen, and from Fallon to Fairview 1c. per lb. Since Dec. 30 all freight from Hazen to Fallon has come by train.

The average freight rate on mining machinery is 1½c. per lb.; lumber, 1½ to 1¾c., and liquors 2¼c per lb. Bulky material, furniture, etc., costs more. Freight from Fallon to Wonder varies from 2 to 2½c. per lb.

Ore is hauled from the Nevada Hills to the railroad for about $12.50 per ton by returning teams. It is hauled from the mine to the loading platform below, at $1.50 a ton.

The country rock is mostly andesite and this is cut by later rhyolite and andesite dikes. Strong fissuring has occured with silification of the andesite. Along these fissure zones, the rock outcrops prominently. North-south fissuring and faulting has taken place after the ore deposition; in several cases noted the displacement has not been great. The strongest mineral-bearing fissures strike northwest and dip to the south, though there are undoubtedly others. As far as observed little mineralization accompanies the faulting fissures. In the main ore-bearing zones the vein material is quartz, and silicified andesite with values often extending several feet into the hanging. Free gold, cerargyrite, and argentite carry most of the values. Ruby silver and some silver bromides occur in smaller amount. The gold is alloyed with silver and is sometimes of a white color. Roughly speaking, about one-fifth of the values are in gold.

It is probable that stephanite, tetrahedrite, polybasite and other silver minerals occur. Argentite, however, occurs in greatest quantity, and is found on the outcrops entirely inclosed in quartz. The rich float found before the mines were discovered, owed its high value mostly to argentite. Small amounts of copper staining are occasionally found; also limonite and hematite staining in considerable quantity, together with manganese staining accompanying the ore. Rich shoots containing large quantities of hornsilver occur near the surface, but values are in some cases uniformly distributed. Pyrite is not plentiful.

OUTCROPPING DIKES OF ANDESITE AND RHYOLITE

TOPOGRAPHY OF THE FAIRVIEW RANGE

Water and Supplies

Water costs $2.50 a bbl. Hotel Fairview hauls its own water from East Gate. It costs 25c. a bbl. at the well, and unloaded at the hotel costs them $1.65 a bbl. East Gate, 11 to 12 miles east of town, is an old silver camp. It furnishes water from three wells, 15 to 35 ft. deep. The water is good and contains no alkali. A well is being bored below Fairview on the flat, about 3 miles from town. The well is now down over 300 ft. with a 12-in. hole. They expect to strike water from 600 to 1000 ft. below the surface. If water is found a second hole will be bored about a mile nearer town, possibly also a third. A company has been organized to pipe water from Bench creek near Wonder.

Mining machinery if bought in Fairview costs from 20 to 30 per cent. more than if bought on the railroad. Wood costs $25 a cord; coal, more than $50 a ton; lumber, about $60 per M. Wages are $4 to $4.50 a day, and board can be obtained for $1.50.

Nevada Hills Mining Company

The mines are situated about two miles southeast of town in the foot hills north of Fairview peak. A prominent knob called the Eagles Nest, can be seen for some distance. This is on the Boulder company's property. The road from Fairview leads southeasterly up a wash to the foot of the Eagles Nest, passing the Ida Mines Company's claims on the right, and swings east through a sharp cañon to the Fairview Eagle, Eagles Nest, and Hailstone properties. The loading station for the Nevada Hills ore is at the turn of the road into the cañon; the sacked ore being piled on a large platform. A branch road from here leads up a steep grade to the mine.

The company owns the Boulder and Boulder No. 1 claims, and the Florence No. 4 and Pappais fractions, in all about 50 acres. The company also owns a controlling interest in three other properties.

The Boulder claims were located by P. Langdell, in Jan., 1906. J. T. Hodson and W. H. Webber came into the district about two months later, and thoroughly prospected the strong outcrops which ran parallel to the large Eagles Nest ledge on the summit of the ridge. They bought the property for $5000.

Ore was first found on a fairly prominent andesite outcrop, to the west of a small north-south gulch caused by a fault. A quartz vein about 18 in. wide was exposed on this ledge, and on close examination was seen to contain fine black grains of silver sulphide disseminated through the quartz. After seeing the discovery it is not easy to understand why this property had not been located before, although crossed many times by prospectors and others.

The discovery is shown in one of the illustrations to the right, and above the pile of sacked ore. The dump is from tunnels Nos. 3 and 4, which are driven here. North-south fissures parallel to the fault can be seen cutting the outcrop near the point of discovery. Rich mineral has been opened up along this vein for a distance of more than 1300 ft., and five tunnels have been driven.

vein, and south of the large Eagles Nest rock, a rich ore shoot has been opened up on the surface. The vein strikes about north 60 deg. west at this point, and dips to the south 70 to 80 deg. Tunnel No. 2 has been run in on the vein here giving about 40 ft. depth, and some high-grade ore has been shipped from the development work. The vein outcrops 1 to 2 ft. wide above this tunnel. In places it does not show. The country rock, both walls,

A few feet south of the tunnel entrance is a light-colored dike about 12 to 15 ft. wide, probably rhyolite, striking nearly north; it appears to cut off the ore shoot on the northwest end. So far as now known on the Nevada Hills property no ore occurs on the northwest side of this dike. The continuation of the dike can be seen across the cañon on the opposite hill.

In tunnel No. 2 the high-grade shoot exposed along the foot-wall is 1 to 1½ ft wide. It is a soft, dark vein material, which contains large quantities of horn-silver, in scales and ribbons, often holding two lumps of gangue together, as by a string. Greenish silver bromide and possibly silver iodide occur. No tests have been made with a mineral supposed to be iodyrite, and it is probable that this dark blue mineral is a rare color of horn-silver. Some free gold can be seen in this rich ore, which runs more than $2000 to the ton.

A winze sunk on the vein from No. 2 tunnel level is down 85 ft. At 30 ft. it encountered the shoot exposed above. The shoot pitches to the east, and has changed over to the hanging-wall. Lumps of nearly pure hornsilver approximately 8 in. long by 5 in. wide, and 2 to 3 in. thick, which came from the ore shoot here were shown. These lumps are porous, give a metallic ring when struck with a knife, and are easily whittled. The walls of the vein at this point are clearly defined, and show evidence of movement. Above, between the high-grade shoot and the vein, which is about 3 ft. wide, is a horse which contains ruby silver in places. The vein widens out at this point and values occur in the hanging.

There appears to be three nearly parallel ledges, showing silicified andesite and quartz along the outcrop. Calling the one in which No. 2 tunnel is driven the main ledge, another lies above this, and still another near the top of the ridge. These follow nearly parallel for some distance and then swing sharply to the south and join the lower ledge. The outcrop east from No. 2 tunnel exposes a quartz vein averaging 2 ft. in width, but running anywhere from 1 to 4 ft. Frequent iron and manganese stains occur, and dark specks and stringers of silver sulphide show plainly in the white vein quartz.

The ore resembles that of Tonopah, and is a typical southern Nevada ore. The gangue is not always entirely quartz but sometimes a silicified andesite with quartz veinlets and disseminated gold and silver. Unless closely observed this rock does not appear of special value, though running $100 to $200 or more to the ton, and was undoubtedly passed over by prospectors many times. In places it contains vugs and cavities. Nearly always black disseminated silver sulphides are found with sometimes a little pyrite and some free gold.

The outcrop can be followed east 1300 ft. from No. 2 tunnel, and is rich nearly all the way. Silver sulphides are exposed in most places where a piece is knocked from the vein.

About 1000 ft. east of tunnel No. 2 a north-south fault cuts the ledge, and the west side of the fissure has moved about 40 ft. to the south. The fault seems to dip east, but is nearly vertical. Still farther east is a second fault, but with a smaller horizontal displacement. In this case the west side has moved north, or the block of ground between these two faults, with a portion of the vein, has moved to the north. A third fault of small displacement moves the west side to the south as in the first one mentioned.

NEVADA HILLS MINING COMPANY—PLACE OF DISCOVERY

The Knox Lease

In the saddle west of the Knox Lease is apparently another north-south fault. An open cut exposes a heavy gouge; a short distance west of here is a second open cut on the vein, from which a carload of ore running $212 has been shipped. The leasers have not yet found ore. On the Knox lease a diamond drill is in operation, and is drilling a hole dipping about 50 deg. north. At the depth of 263 ft. no ledge had been encountered. Tunnels Nos. 3 and 4 are about 70 ft. below tunnel No. 2, and are driven from a small gulch near the discovery. Tunnel No. 3 follows the north-south fault, and finds the continuation of the vein in a short distance. As shown on the surface the east side has moved north. Good ore with about 80 ft. of backs to the surface is cut here by a drift east on the vein; $200 rock is in the face.

Tunnel No. 4 is driven 140 ft. west parallel to the vein in the foot wall. Little pyrite was seen anywhere, except in this tunnel, where the foot wall appears to be mineralized.

Tunnel No. 5, on the east, has cut the ledge at the depth of about 60 ft. below tunnel No. 4, and runs $300 across the vein as against $200 above in No. 4 tunnel. Places here show 5 ft. of very rich ore with about 140 ft. of backs. Some $400 assays have been obtained.

Tunnel No. 1, driven from the lowest point to cut the vein at about 220 ft. depth, is in about 400 ft., and has cut the ledge. The shoot of high-grade ore exposed above in tunnel No. 2, pitches 30 to 40 deg. east, and could not be expected to be found at this point, which is too far to the northwest. A drift is being run southeast on the vein, and should strike the shoot inside of another 100 ft.

The average of the ore sacked is from $200 to $300 a ton. One shipment of 31 tons netted $209 a ton. Shipments of ore assaying $300 and $400 have been made, and one carload is said to have averaged more than $1000 a ton. From the rich shoot assays as high as $4627 have been obtained, 91.68 oz. of gold and 4298.5 oz. of silver, and assays of special samples

have run as high as 15,000 oz. of silver. The quartz vein 2 to 4 ft. wide, has given assays from $133 to $750 a ton. From the winze in tunnel No. 2 the ore is valuable as that it is mixed with a lower-grade ore as a matter of precaution. At present it could not be shipped [illegible]

The Nevada Hills Mining Company is capitalized for one million shares of par value of $5. Approximately 50,000 shares are out for the public, and the rest is being held closely by the owners. A dividend of 10c. a share on 750,000 shares, was paid in December. The mine has only been worked 8 months, and is 60 miles from the nearest railroad. The output was more than $70,000 for the month of September, and more than 10 carloads of ore are now piled up waiting an improved condition of the roads.

The Ida Mines Company

The Ida Mines Company's claims are passed on the right, by the road to the Nevada Hills, before reaching the foot of the Eagles Nest rock. This company has done considerable surface work. Long trenches 4 to 5 ft. deep, have been cut looking for the continuation of the Nevada Hills vein. A force of 8 or 10 men is employed and the open-cut work is being systematically and thoroughly done before any underground development is attempted. Several veins have been uncovered assaying from $30 to $70 a ton.

The large hog-back ridge on the property is generally believed to be the northwest extension of the Nevada Hills ledge and was one of the first properties to change hands.

A tunnel is now being driven on the Ida No. 3, to cut the intersection of the main ledge with another almost at right angles. It is expected to strike the ledge in a little more than 300 ft., and will give about 250 ft. vertical depth.

Passing on up the cañon in a northerly direction the road turns to the east, and again to the north. At the second turn a short branch road leads to the shaft house of the Fairview Eagle.

Fairview Eagle Mining Company

The Fairview Eagles Mining Company's ground is situated on the north and east of the Nevada hills, on the north side of the ridge of which Eagles Nest rock forms the summit. It owns the Boulder No. 2 and Boulder No. 3, Eagles Nest Nos. 2 and 4, and Fairview claims, comprising about 53 acres.

The main shaft is inclined, and is down about 185 ft. A 25-h.p. Fairbanks-Morse gasolene hoist has been installed. At the 70-ft. level a station has been cut. This is in an altered grayish andesite which carries values. There is a well defined streak of ore along the foot-wall, which gradually shades off into this altered hanging. The true hanging wall has not been cut.

Ore has ben sacked from a shaft on the vein a few hundred feet east of the main shaft. The strike of the vein is northeast and dip 70 deg. to the south. The vein material is quartz, with considerable manganese staining. No shipments have been made. Considerable pyrite shows in the altered hanging wall. Some of the sacked ore showed hornsilver. The Eagle vein is headed directly toward the Eagles Nest Fairview Mining Company's ground, and across a small gulch a shaft is being sunk.

Eagles Nest Fairview Mining Company

The Eagles Nest Fairview Mining Company's claims are directly northeast of the Fairview Eagle. A shaft has been sunk on the vein which enters the ground from the Eagle, and is down about 100 ft., so that work is no longer satisfactory with a windlass. A gasolene hoist will soon be installed. Ground is now being broken for the hoist house.

On the Eagles Nest drifting on the vein has begun from the bottom of the main shaft. On the Hailstone considerable trenching and surface development work has been done. The country rock on both properties is andesite.

The Animikie Iron Range

The report of the Ontario Bureau of Mines for 1906, which has just appeared, contains an interesting paper on the "Animikie Iron Range," by L. P. Silver, which embodies the results of a close examination of the country extending from Loon lake westward to Port Arthur, a distance of 30 miles. The Animikie iron-bearing series, which is the eastward extension of the Mesabi or upper Huronian series of Minnesota, is best developed east of Port Arthur. Within the last few years some systematic work has been done in test-pitting and drilling by Rinaldo McConnell, Wiley Bros. & Marks, T. Hogan and Flaherty & Knobell, of Port Arthur. As the Canadian Pacific Railway passes over the iron lands, the facilities for shipping ore to the furnace at Port Arthur are good. The writer's observations on the geology of the region are largely supplementary to the conclusions of Prof. C. K. Leith, N. H. Winchell and other predecessors in the field. The Animikie, or upper Huronian, is the formation in which the iron ore occurs, and is composed of several members in descending order as follows: (1) black slate; (2) upper iron formation; (3) slate; (4) semi-bedded impure limestones; (5) iron formation proper; (6) quartz conglomerate.

The iron formation proper is a ferriferous, cherty carbonate called taconite by Winchell; and this is the term by which it is generally known by miners. The taconite has a spotted appearance and is of various shades of gray, red or green. It [illegible] of crypto-crystalline, chalcedonic or finely pheno-crystalline silica, evidently of secondary origin, and a precipitate from solution. Throughout this are distributed numerous rounded or subangular bodies of mineral, very slightly pleochroic and without distinct cleavage, which on analysis proved to be ferrous silicate. The banded taconite of the Animikie, which simulates the jasperlites of the other ranges, though not so distinctly banded, is really a fine-grained chert, containing the usual granules of the same composition as those of the ground mass, but the striping is due to iron oxide in evenly distributed particles.

The upper iron formation is somewhat more slaty than the lower, has less taconite in its composition, is higher in phosphorus and lower in iron. The iron ores of the Animikie range consist mainly of hematite and limonite, throughout which may be seen almost unaltered to very much altered lenses of siderite. This siderite is abundant throughout the ore of every pit and tunnel in the lower iron formation. Magnetite occurs in small quantities generally near intrusions, and is clearly a metamorphic product of the hematite. The ore has been concentrated along and near the fault zone, much of it being changed to carbonate. That the deposits in question are still in process of formation may be seen by the presence in the ore of lenses of the comparatively unaltered taconite and carbonate, which reduce the percentage of the otherwise high iron content of the ore.

Unlike the Mesabi and other iron regions south of Lake Superior, the deposits do not occur in pitching troughs, nor do they rest on an impervious basement. This may in part also account for the absence of the pure concentrations of iron ore so common to the south of the lake. The deposits here are, however, concentrations produced by meteoric waters, circulating along faults, and the best ore occurs along the best defined faults, becoming leaner at a distance from them, and gradually shading into little altered taconite.

Some analyses of the ore are given, showing metallic iron content varying from 27.64 to 40.45 per cent. It is explained that the iron content is somewhat higher than indicated by the figures, as the high percentage of carbon dioxide in the ore is soon driven off in the furnace, leaving the remaining ore of a higher iron value. The result of some experiments in concentration, made by Mr. Knobell, of Port Arthur, is also presented, showing in round figures that 70 per cent. of the top 10 ft. of the orebody will produce a grade of concentrate averaging 55 per cent. iron, 0.022 per cent. phosphorus, and 17 per cent. silica, and that 30 per cent. must be discarded as waste.

Central Electric Drive for Collieries

The Central Power System Offers Advantages for Coal Mines and Coke-oven Plants Whether Steam or Gas Engines Are Used

BY FRANZ ERICH JUNGE*

[illegible] the advantages which are to be derived by central electric drive irrespective of whether gas or steam prime movers are used in the power house, and compare them with what obtains with either direct gas or direct steam drive.

It is an undeniable fact, established in numerous cases of actual practice, that electric centralization enables a colliery, when working under normal conditions, to cover all outside power demands from the available coke-oven gases even when steam drive is adopted in the central station. Therefore, when laying out the power scheme for a new mine, regardless what be the character of the mineral or metallic ores to be produced, it is wise to give to the central electric drive the first consideration, also to reserve in the general lay-out provisions for future expansion and for the distribution of surplus power to neighboring districts and for the operation of electric railways throughout the commercial-distribution sphere of the works, which application might be projected later on.

Systems of Power Transmission Compared

Obviously the most economical method of power generation in the central plant will be of no value unless the planning of the transmission and distribution system and of the mode of application is done with proper care and with observing, in the layout, definite and predetermined principles, since otherwise the losses occurring in the application will annul the savings realized in the production. There are today five different systems of power transmision in vogue in combined iron-smelting plants and coal mines: Steam, compressed air, hydraulic, gas and electric transmission. They all have one feature in common, namely, that the area of cross section of the transmission line bears a definite economic relation to the pressure of transmission of the dynamic medium.

With steam it is the loss through condensation in the pipe lines that demands a smaller pipe cross section, which in turn necessitates the adoption of higher steam pressures. With compressed-air transmission, also, heat losses must be compensated for by a reduction of the radiating surface, viz., smaller diameter of pipes, which can only be had at the expense of higher air pressures. The larger the pipe cross section of hydraulic mains, the greater the danger of freezing, and the greater the difficulty to guard against leakage. With gas, conditions are much more favorable, because condensation losses are entirely absent, and the higher the calorific value or heat density of the available gas, the better will be the all-round economy of the system. Yet it would not pay at all to transmit the weak-power gases, such as blast-furnace gas, beyond the immediate proximity of the blast-furnace plant.

The above mentioned losses through leakage and condensation are entirely absent in the electric-transmission system, so that the efficiency of long-distance transmission is relatively high, from 95 to 98 per cent., provided that the voltage has been correctly proportioned to the respective distance. The losses which do occur in the electric-transmission system are pure tension losses, being dependent on total length, cross section and capacity of the conductor; but there are none due to changes in the form of energy. Of course insulation must be perfect, and here is where the main difficulty lies, as we shall see later on.

Direct versus Alternating Current

The economy of electric transmission depends on the proper selection of the mode of current and of its voltage. But since the determination of these factors does not to any great extent affect the economy of power generation proper, with which we are here chiefly concerned, it will suffice to say just a few explanatory words on this subject.

Speaking first of combined iron-smelting plants and coal mines, which combinations grow rapidly in number and extent owing to the general modern tendency to combine in order to be able to work with maximum industrial economy, direct current between 440 and 550 volts will be applicable for all purposes in or near the blast furnace, coke oven and power plant, also in rolling mills if closely located. For transmission over large distances, direct current is also preferred, so long as the places of usage fall within the commercial-distribution center (some 600 volts tension). Beyond that alternating (three-phase) current of 5000 volts and more must be chosen. F. Janssen-Berlin, in discussing this question, gives the following comparison of the respective advantages and disadvantages of direct current versus alternating curent.

Direct Current

Central Station—Possibility of equalizing load fluctuations to a large extent; "Puffers," storage batteries or other means for the accumulation of energy, therefore favorable conditions for efficient fuel conversion and utilization in the prime movers.

Transmission—Tension limited to 600 or 700 volts as a maximum, therefore distribution of electric energy over wide distances uneconomical or impossible.

Substation—Motors susceptible of control, with economical means for starting, braking and speed regulation; simplest conduction of current.

Alternating Current

Central Station—Bad load equalization, inefficient utilization of the dynamo. Therefore "puffer" or accumulator stations between generators and motors are necessary.

Transmission—High tension is possible; therefore also the distribution of electric energy over any distance practical and economical.

Substation—Motors are simple and can be connected directly to the high-tension net. They are best suited for working in one direction of rotation and at constant speed. (Ideal transmission motors.) They are less fit for reversible and such drives that must be capable of control (steel works, rolling mills), and for transportation purposes. Transformers and converters are necessary.

From the above it is seen that the realm of application of direct current is limited to blast-furnace plants, steel works, rolling mills, coke ovens and auxiliary drives. Moreover, it is necessary that the central station is located near the principal place of usage. Alternating current is best suited for such central stations which are to transmit the energy of waste gases over wide distances, for instance to neighboring blast-furnace plants and coal mines. Also for parallel operation of distant central stations. Further, for the distribution from some central plant of electric current to several industrial establishments (overland centrals), and for the transmission of energy over wide distances (electric railways).

A combination of both systems by the interposition of alternating-current direct-current converters as intermediary members, will obviously be suited to all conditions, the higher initial cost being counterbalanced by a number of other advantages.

Central versus Scattered Drive

Now, as to the superiority of electric centralization over scattered gas or steam

[illegible] of the principal points: The main conductors from the central station to the various departments can be laid as underground [illegible] cause to interruptions in the supply service. Pipe lines for gas and principally for steam must be carried overground and be easily accessible on account of the repairs which occur frequently. Their initial cost is also higher. Direct steam drive causes enormous condensation losses in the pipe lines, which continue even when the engines are not running and which preclude the employment of high steam pressures, which otherwise would be adopted for securing higher economy.

With scattered gas engines there are, it was said, no condensation losses in the supply pipes. But there is this drawback, that each set requires separate provisions for back-cooling the jacket water, which are both costly and complex. The securing of skilled attendance at reasonable cost, which is yet a factor of some weight for the successful operation of gas engines, especially in this country, is a problem that is multiplied the greater the number of independent installations, while in the central station it is a single factor that can very well be taken care of.

The same line of thought applies to the matters of floor space, foundation, complication, necessity of reserves, etc., which are less favorable for gas engines than for steam turbines. Therefore the future and the success of gas engines for large scale production lie with large units operating in the central station, where all its weaknesses can be equalized and minimized. Provisions for ample reserves and spare units, for high-class attendance, perfect control, and a favorable distribution of the plant's loads can best be made in one central power house.

Difficulties of Electric Drive

The generation of high-tension electric current is just as simple and reliable a matter as is that of current of lower potential. The only real difficulty which still exists lies in the transmission system. The interdependence of the different sections of one net and their liability to break down owing to insulation troubles, short circuiting, sparking, overloading, etc., are its weakest points.

While there are automatic provisions to protect every individual generator against overloading, there are none as far as the effects of surges on the line are concerned. Altogether, our understanding of the phenomena occurring in a high-tension transmission net are still very limited and the possibilities to amplify our knowledge by proper experimentation are almost nil. But, as was said, this is perhaps the only point which is capable of improving. Generators, transformers and electric motors, it is conceded, are simple, compact, self-contained and reliable machines. Their operation and up-keep does not require extraordinary expenditures. Their floor space is small and therefore the housing for each separate drive is cheaper than it would be with either gas or steam engine. Their initial cost and the cost of [illegible] required is [illegible] less.

Adaptability to Fluctuating Loads

Another principal point: Electric motors adapt themselves much more easily to fluctuating-load conditions and the whole system looses its rigidity of operation, becomes widely elastic, better regulated and more easily controllable from the central plant. It is much easier to throw in a new motor when so desired and the provision for reserves or spare units at the different places of usage is decidedly cheaper.

Further, there is this great advantage about electric drive: that the great variety of types and models, which is a feature or necessity of direct drive, can be dispensed with in favor of a few standard forms and sizes. For the efficiency of electromotors decreases only very slightly with the lowering load in contradistinction to that obtained with gas and steam engines. If a small electric motor breaks down, a reserve moto rcan be installed immediately. Not so with gas and steam engines. Extremely heavy overloads, which occur quite frequently in colliery work, can be fully met by electric motors, which are susceptible of momentary overloads of 100 per cent. and more, without suffering harm. They may therefore be selected of a medium capacity and will yet suffice for the maximum demands.

One of the greatest and well known drawbacks of the gas engine is, beside that its range of economical load is limited to between 50 per cent. and the maximum, that it cannot be overloaded. When underrated by the manufacturer, a nominal overload capacity of 15 per cent. is all that may be reasonably expected. As already mentioned, the possibility offered by electric centralization to so distribute the various phases of a daily load that a more even curve results enables one to protect the gas engines in the central station against undue maxima and minima.

With scattered drive the capacity of (gas) engines must be made to correspond to the maximum load which may eventually occur. Therefore they will work normally with lower efficiency and higher fuel consumption than what could be attained under more favorable load conditions. Besides all this it is a very desirable feature with central electric drive that the consumption of power and its fluctuating demand can be readily observed and registered at the switchboard in the central station, while with direct gas drive this is more difficult and with direct steam drive it is practically impossible. This continuous control means a [illegible] in plant fuel cost.

[illegible] to Boiler Plant

It was held until a short while ago, and by some is held even now, that electric drive of those machines which are located in the near vicinity of the boiler plant, and especially those that work continuously, like compressors, fans, etc., would bring no advantages through a reduction of plant fuel consumption. That this idea is erroneous so far as steam drive is concerned will be appreciated when making the following consideration: Large and continuously operating steam engines of from 100 to 500 h.p. capacity are normally built as compound engines having a steam consumption of about 8.5 kg. (18.7 lb.) per effective h.p. per hour. By combining, through centralization, all their power in the central station, we get units of 1500 h.p. and more, which are normally built for a steam consumption of 5.6 kg. (12.3 lb.) per effective h.p. per hour.

Assuming for the conversion of the mechanical power into electrical energy, and for transmission of the current to the place of usage, and for its transformation there into motion a liberal loss of 20 per cent., then the item of steam consumption in the power house increases in a ratio of 5.6:0.8, that is to 7 kg. (15.4 lb.), so that even then 1.5 kg. or 3.3 lb. of steam are saved per h.p. per hour through the employment of large prime movers.

A similar line of thought shows that the small electric motors are equally benefited since the current for them is produced cheaper than in smaller generators, such as are used nowadays for delivering current to the smaller motors. It should be considered that the great condensation losses in the pipe lines and engines during idle periods or with low load factor are not included in the consumption figure of 18 lb. given above, and that all these losses are absent in central electric drive.

Pumping Service

Constituting as it does the most important item of power consumption in colliery work, we shall have to devote a few remarks to the development which led to electric centralization in this particular department. Formerly the subterranean steam pumping plants used to occupy the predominant and undisputed place. Their efficiency depends greatly on whether the service rendered is intermittent or continuous, since there is obviously a great loss due to condensation in the pipes descending down the shaft, such loss lasting all the time, regardless whether or not the pumps are operating. Under very favorable conditions of operation such as obtain, for example, in the 1500-h.p. plant in the Victor mine, Germany, on which a test is available, as high efficiencies as 89 per cent. may be attained, the total loss

per cent. The largest steam plant of this type ever built in Europe is working with triple expansion, and is supposed to lift 25 cu.m (883 cu.ft.) of water against a head of 500 m. (1640 ft.), corresponding to a power capacity of 3000 h.p.

Later on, the hydraulic system of raising water, of which we have in Germany 46 installations with a combined capacity [illegible] the steam drive, to be finally superseded by the electrically driven pump. The advantages embodied in this latest application are so obvious that there were, according to Dr. Hoffmann's report at the beginning of 1906, in the Ruhrkohlen district alone, 110 installations aggregating a prime-mover capacity of 50,000 h.p.

It was a natural consequence of the introduction of electric drive that the design and construction of pumps would thereby be modified to a certain extent, especially that the profitableness of higher speeds would be considered. And so we find now, with piston pumps, an average working speed of 100 and even 120 r.p.m. against the 60 revolutions of earlier years. This, which we may call a transient type, is known also in this country under the name "Riedler Express Pump," and has served as a model to many builders. The largest electrically driven pumping plant of this kind, and I think the largest altogether, is the one operating on the Colonia mine, near Langendeer, which lifts 20 cu.m. per min. against a head of 435 m. (703 cu.ft. 1427 ft. high).

Centrifugal Pumps

The desirability of even higher speeds led to the adoption of centrifugal pumps, which are cheaper in first cost, attendance and floor space, and though considerably inferior in efficiency have conquered within very little time a remarkable percentage of the total service. As a matter of fact, by far the greatest quantity of water in continental mines is lifted by centrifugal pumps.

It was said that it had been conceded for a number of years that electric drive [illegible] and small engines which are located at a good distance from the boiler plant, and that the saving in fuel cost, attendance, lubrication, and waste, also the low initial cost and other advantages referred to, warranted the installation of electric motors at those specific places. It has now also been evidenced that the draining and pumping of water in mine work can be done with greater all-round satisfaction by the adoption of high-speed centrifugal pumps, which are driven by air- or water-cooled inclosed electric motors of the three-phase current type, and which receive their energy and are controlled usually from transformers located at the mouth of the pit, with greater all round efficiency, reliability and economy of oper[illegible]

The pumps are usually of the twin-series and triple-series types, running at from 800 to 1000 r.p.m., and are mounted with the motor on a common base plate carried on trolley wheels, so that they may be used in any part of the mine. In the lead and silver mines of Ems, Germany, a pump of this type is lifting 9000 cu.ft. of water per minute against a head of 800 ft. Also for washing work in collieries these electrically driven pumps are now largely employed.

Another remarkable installation of this kind which was recently tested as to its all-round efficiency is operating in the Victor mine, near Rauxel, Germany. It lifts a quantity of 7 cu.m. per min. against a head of 500 m. (247 cu.ft. 1640 ft.) at 1000 r.p.m. The capacity of the prime mover which serves to generate the necessary electric current is 1400 h.p. indicated. The total plant efficiency is 59 per cent.

In commenting on relative efficiencies of steam, hydraulic, and electric pumps it must be considered that the issue of a comparison is largely dependent on the respective favorable or unfavorable conditions under which the different systems, especially electrically driven centrifugal pumps, are operating. Conditions are poor for the latter type when the quantity of water is small and the head high.

Also, the results are greatly influenced by the manner in which the centrifugal pumps are driven, whether they receive their current from the network of a central station, or whether they possess their own separate generators driven by either gas or steam engines or turbines. The advantage of the last named combination with centrifugal pumps consists, first, in that the number of revolutions of the pumps is kept constant without additional water-throttling regulation, since the prime mover will keep its speed automatically with fixed governor. While, when the pump is taking its energy from a network of unchangeable frequency a special throttling device for the water must be provided in order to prevent interruptions in the flow, such throttling being apt to decrease the efficiency of the pumping process more or less.

Another advantage of employing a separate engine- or turbine-driven alternating-current generator lies in the possibility thus rendered to distribute the pumping work, which represents the largest single factor in the plant's load, over such periods during which other (hoisting) engines are not running, for example, over night, thereby keeping the consumption of power proportionate to the production of gas, that is nearly constant.

Fig. 2 gives an approximate idea of the relative efficiencies of a steam, a hydraulic and an electric pumping plant for mining work, and also shows the distribution of losses which occur in electric centralization. The test was made in the Franzeska mine in Witten, by the Verein deutscher Ingenieure, and represents results such as are obtained under actual working conditions. The term "efficiency" applied to electric pumping means the ratio of water lifted to work indicated in the (steam) engine. In the particular case under discussion the latter serves to drive an electric alternating-current generator, which in turn delivers three-phase current to the subterranean motor-driven pumping equipment (piston pumps at 80 r.p.m.).

It is seen that, notwithstanding the many losses occurring between prime mover and pumps as indicated in the diagram, the total efficiency of the electrical pumping equipment runs almost as high as 70 per cent. Since the long-distance distribution of high-tension electric current has been through the economic generation of electricity in gas-engine driven central stations operating on coke-oven gas, etc., so widely adopted all through

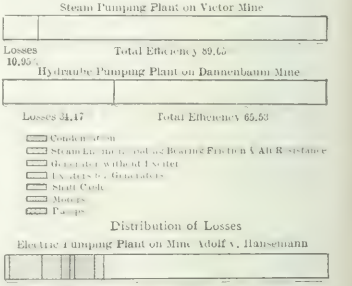


FIG. 1. RELATIVE EFFICIENCY OF THREE MODES OF PUMPING

the industrial districts in Germany, it is to be expected that complete centralization, that is, centrifugal pumps driven by electric motors which derive their current directly from the line, will be the predominent mode of operation before long.

Recovery of Arsenic at the Washoe Smelting Works

The plant for the recovery of arsenic from the flue dust from the smelting furnaces at the Washoe smelting plant is described in a pamphlet prepared by the members of the Anaconda Copper Mining Company staff. The flue dust is conveyed into two Brunton roasting furnaces. The arsenic fumes from these are conducted through 240 ft. of zigzag flue, cooling the gases and giving a product of about 90 per cent. As_2O_3. When a sufficient quantity has been produced, the roasting furnaces are shut down and the product removed in wheel-barrows to a small reverberatory refining furnace, fired by coke, and resublimed in a similar zigzag flue, yielding a product of 99.80 per cent. As_2O_3, which is ground and barreled for shipment.

The Valuation of Roasted Blende with Regard to Its Sulphur Content*

By V. Hassreiter—Trooz

The results of analyses of ten different blendes roasted at six plants A-F are shown in Table I. At each of these plants muffle furnaces are employed and the roaster gases are converted into sulphuric acid.

The total sulphur *a* (column 7) was in each case determined by fusing the roasted blende with a mixture of sodium carbonate and potassium chlorate, extracting the melt with water, filtering, acidifying with hydrochloric acid, boiling off every trace of chlorine, and precipitating with barium chloride.

TABLE I. ANALYSES OF BLENDES ROASTED AT DIFFERENT PLANTS

Blende.	Plant.	Pb Per Cent	CaO Per Cent.	MgO Per Cent.	BaO Per Cent.	Total S a Per Cent	S Calculated from $PbSO_4$ etc. Per Cent	Acid Per Cent.	Zinc Sulphate Per Cent	Zinc Sulphide Per Cent	1
1	2	3	4	5	6	7	8	9	10	11	12
I	A	2.78	2.48	0.54		5.18	[illegible]	−0.96	0.65	0.80	1.45
II	B	4.98	0.75	0.34	.	1.80	1.52	0.28	0.40	0.08	0.48
III	C	8.89	1.00	1.00	7.62	4.29	4.41	−0.05	0.08	0.05	0.10
IV	B	7.23	1.70	1.08	13.47	5.67	5.04	0.63	0.57	0.05	0.62
V	C	7.78	3.75	0.40		2.40	1.84	0.56	0.19	0.42	0.61
VI	A	7.80	1.35	1.04	12.47	6.55	5.40	1.12	1.15	0.15	1.30
VII	B	10.92	4.42	0.65	....	5.58	6.33	−0.75	0.37	0.04	0.41
VIII	D	11.35	1.75	0.17	.	2.13	2.89	−0.76	0.03	0.28	0.31
IX	E	11.98	2.88	5.70		3.14	8.06	−4.92	0.05	0.00	0.05
X	E	1.50	8.45	2.50	....	7.10	7.22	−0.11	0.00	2.00	2.00

In column 8 is given the sum *b* of the sulphur corresponding to the lead, calcium, magnesium and barium, assuming that each of these elements is completely converted into sulphate.

Column 9 shows the "objecionable" sulphur, calculated on the basis of the same assumption $(a - b)$.

Lastly, column 12 shows this "objectionable" sulphur determined directly as the sum of the sulphur present in the form of zinc sulphate *d* and zinc sulphide *e*.

Significance of Results

Now, if the assumption that all the lead, etc., is completely converted into sulphate in the roast were correct, the figures in column 9 should never have a negative value, and they should be identical with the corresponding figures under 12, or $(a - b)$ should be equal to $(d + e)$.

It will be seen that this is the less nearly the case, the higher the percentage of lead and magnesia. The divergence is particularly marked in the blendes VII — X, where the difference $(a - b)$—the "objectionable" sulphur—actually assumes a negative value.

The blende X, which, judging from the figure in column 9, would be considered thoroughly well roasted, shows by direct analysis no less than 2 per cent. sulphide S, and is rather incompletely roasted.

It should be noted also that the figures under 10 and 11 not only enable us to deduce directly the amount of objectionable and unexpelled sulphur, but further expose the character of the roast. Thus, for instance, the roasting plant *A* has partially sulphatized the blendes I and VI, while plant *E* leaves the objectionable sulphur in the roasted ore as sulphide.

When the roasted blende IX is treated for some time with warm water, only 0.18 per cent. MgO out of the total 5.70 per cent. passed into solution, showing that only a small portion of the Mg is present in the form of sulphate after roasting. The condition was similar in the case of blende X, 0.53 per cent. MgO out of 2.70 per cent. being extracted by water.[1]

As regards the behavior of the lead, the analysis of the blendes VII to X show that 55 to 75 per cent. of the lead in the roasted ore is present as sulphate. In consideration of the variation in the composition of different blendes, in the construction of the furnaces, etc., it is hardly possible to draw any more definite conclusions with regard to the sulphatization of the elements in question.

Conclusions

It appears then that for the determination of the objectionable sulphur we have the choice only between the extraction method (ammonium acetate or hydrochloric acid) on the one hand, in which the $PbSO_4$, $MgSO_4$, $ZnSO_4$ and $CaSO_4$ are brought into solution, and the direct estimation of the zinc sulphate and zinc sulphide on the other.

According to the first method the sulphate S, dissolved, must be determined and deducted from the total sulphur (estimated in the wet way). The zinc sulphate must be determined separately, with due regard to any Cd or Mn which may have gone into solution. This method then involves three separate determinations, and has the inherent weakness of all "difference" methods.

The following example may nevertheless be quoted, as showing the results obtained by the extraction and by the direct method, the roasted ore examined being poor in lead:

[illegible]	
Extracted with [illegible]	
tate, *f*	0.90
Sulphur present as $ZnSO_4$	[illegible]
[illegible]	
(2). Extracted with HCl, *f*	0.97
Sulphur present as $ZnSO_4$	[illegible]
[illegible]	
DIRECT DETERMINATION	
Sulphur present as $ZnSO_4$	[illegible]
Sulphur present as ZnS	[illegible]
Objectionable sulphur	[illegible]

We have, therefore, the means for estimating that portion of the residual sulphur which, from the point of view of the zinc producer, is objectionable, and also of that which, from the point of view of the acidmaker, is described as "unexpelled," whether we resort to the direct-estimation of the $ZnSO_4$ and ZnS, or to the less satisfactory extraction method.

It is probably very much more difficult to estimate in a given blende of given composition the quantity of sulphur available for acid making, and this problem at present still awaits solution.

The Lawson Mine at Cobalt

The long-protracted litigation over the Lawson mine at Cobalt, which had reached the Supreme Court, has been settled by an agreement between the parties. The four original prospectors who secured the claim were T. Crawford, Donald Crawford, John McLeod, and Murdoch McLeod. The claim stood in the name of T. Crawford, who, without consulting his associates, leased it to H. E. Lawson. The property was afterward discovered to be very valuable. The rights of the three other prospectors interested were bought by John McMartin, of Cornwall, for $25,000 each, conditioned upon their establishing their title. The High Court of Justice at Toronto decided that each of the four prospectors was entitled to a one-quarter interest. In the meantime C. Millar, S. R. Clarke and others, of Toronto, had taken interests in Lawson's claim and the case was appealed. The settlement arrived at is virtually a consent to the original decision, and under it John McMartin becomes owner of three-fourths of the mine and Millar, Clarke and their associates of the remaining one-fourth. The location, the value of which is estimated at $5,000,000, has a rich surface showing of silver, and development work will be begun at once. The property is in the south half of the northwest quarter of lot 3, concession 4, Coleman township. Some confusion has been caused by the use of the name "Lawson" in connection with other mines in the neighborhood.

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*Abstracted by Alfred J. Lotka, General Chemical Company, Laurel Hill, L. I., from an article in the *Zeit. f. angew. Chemie*, 1906, p. 522.

[1] The green liquid contained the Mg as carbonate.

Cornish Methods of Crushing and Ore Dressing

The Old Machines Combine Low First Cost with Simplicity. Labor Scarcity is a Factor in the Introduction of Modern Methods

BY EDWARD WALKER

Cornish practice in ore dressing is at present in a transition stage between the old fashion and the new. In using the words "old fashion," I do not intend to imply any contempt. Far from it. Those who have read my previous articles will remember my defense of the Cornish engineer who had to adapt himself to the requirements of the cost-book system and the circumstances of the uncertain tenure of mining leases. The orders of those who put up money or granted leases were: "Do the thing as cheaply as possible, and be quick about it."

It is often said that it is outsiders who have introduced the new fashion in crushing and dressing, and have taught Cornishmen a lesson in up-to-date machinery. I do not think that this is quite fair. It is certainly true that Cornishmen have been paralyzed by the financial conditions under which they worked, but when the scarcity of labor and the falling off in the grade of tin ores occurred, ten or more

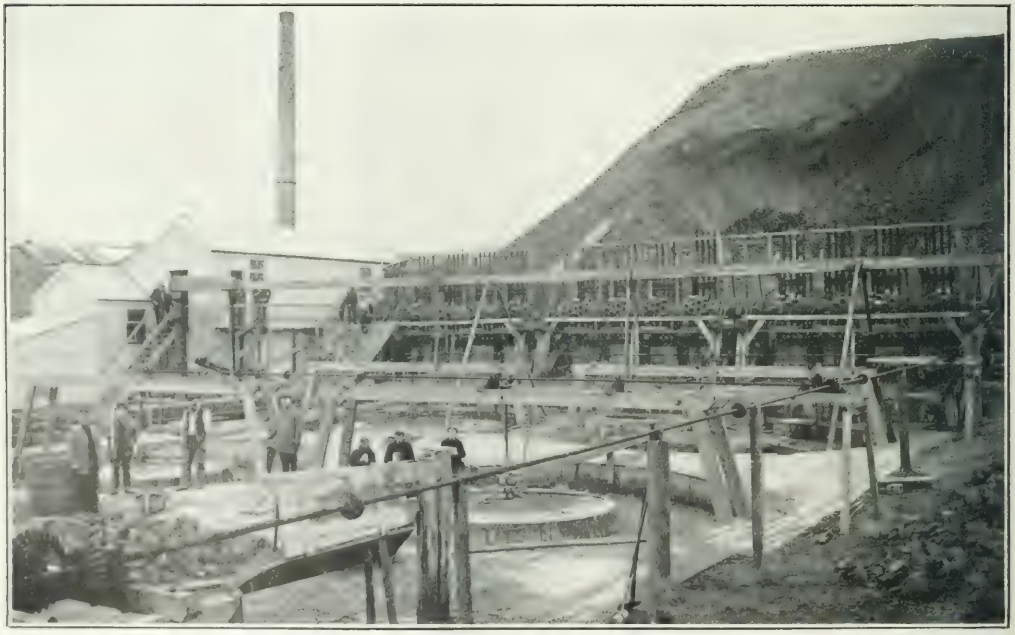


FIG. 1. CORNISH STAMPS AND BUDDLES AT WHEAL SETON

It is to the everlasting credit of the [illegible] a system of crushing and dressing that was perfection in its way. The first cost of the stamps and the buddles and frames was wonderfully low, and the labor required to operate the plant was mostly of the unskilled type. In the old days even skilled labor was cheap, and plentiful, so that the cost of operation was fairly low. Nowadays labor is not so plentiful, either skilled or unskilled, owing to the general exodus, so that the old fashion has perforce to be abandoned in favor of the new. For the old fashion in the old days it is to be said that the first cost was far less than the new fashion, and the cost of operation very little more.

Efficiency of Old Methods

The actual mechanical efficiency, apart from the question of cost of labor, of the old fashion, is a point on which there is some divergence of opinion. I suppose that a quarter of the tin was and is still lost at most of the Cornish mines, and the fact that the people who re-work the tailings sent down the Red river and other streams, make a big return and consider-

[illegible] it was chiefly Cornishmen who carried out the work of remodeling their plant and inventing labor-saving appliances. At the present time the chief firm of mining machinery makers in Cornwall is as up-to-date as any that exists, and has actively introduced many excellent modern apparatus.

The old cost-book system has much to answer for. It was impossible to put up machinery that would pay in the long run, by increasing extraction and lowering the cost of operation. Such a thing as [illegible] capital to experimenting on

able profits shows that the dressing plant is far from perfect.

The old question of available capital here crops up again. In the old days the operators of the mines may not have cared about embarking on further expense for extracting plant. Besides I do not think that modern engineers, especially American engineers, should poke fun at the Cornishman for losing so much in his tailings, for the case comes under the general principle that the maximum profit is to be achieved under the conditions existing at the time.

It is not at all clear that the modern plant [illegible] better saving than the old plant. Its chief advantage is the decrease in the cost of operation.

The above remarks refer entirely to the extraction of tin oxide itself. This, however, is not the only problem or even the most important problem that modern methods have to deal with in Cornwall. The tin oxide often occurs with wolfram and pyrites, and these mixtures require modern methods for their profitable handling. In the old days, unless a complex ore could be hand picked, it was utterly neglected. Not only was capital unavailable for the exploitation of complex ores, but there were no known processes by

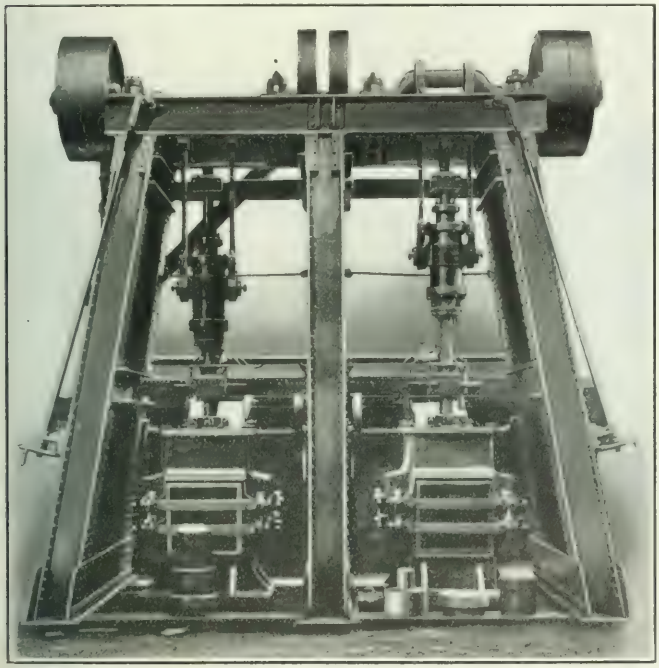


FIG. 2.—THE HUSBAND PNEUMATIC STAMP.

means of which they could be handled to benefit.

From this point of view, also, the criticisms of the inability of the Cornishmen to tackle complex tin ores are quite unjust. It is only during recent years that magnetic concentration has been invented and applied to the separation of wolfram from tin oxide, and even now the question of mechanically separating pyrites from tin oxide and wolfram is in abeyance, until such time as a flotation process shall be applied.

Cornish Methods of Crushing

The old Cornish practice in crushing is to spall the ore by hand and to feed the broken ore by hand to the stamps. No rock breakers were ever used, and at some of the biggest mines are not used even now. The Cornish stamp was like all other stamps originally, a wooden mallet on a wooden stem, but what I may call the real Cornish stamp is a chilled cast-iron shoe attached to a wrought-iron stem.

The frames and mortar box are fixed directly into the ground, and instead of a metal die the bed on which the crushing is done consists of hard rock pounded into the ground. Later modifications have introduced metal dies instead of rock beds, but I consider the rock bed more typical of real Cornish practice. The stamps are lifted by cams fixed to a revolving cylinder. The accompanying illustration, Fig. 1, gives an admirable view of an installation of these stamps at Wheal Seton.

The stamps are not rotated, and there is a good deal of friction on the cams and torsion on the cam cylinder. The screens are mostly of Russian iron or gun metal and the holes are punched 20 to 30 to the linear inch. So it will be seen that the ores are crushed finely to start with.

There are certain advantages in Cornish stamps, but owing to their preponderating disadvantages it is not necessary to enter into a discussion of them at this time of day. It is not probable that any more will be built. At some of the mines where modern improvements have been introduced, such as Dolcoath, the old stamps are still at work, for there were other purposes for which the available capital was more pressingly needed instead of providing new installations of crushing machinery. At other mines, such as South Crofts, the whole of the plant is being replaced. At other mines, where operations had been suspended for many years, it was naturally necessary to provide entirely new plant, and this has always been of the modern fashion.

As regards the new methods of crushing, it is of course unnecessary to say anything about California stamps. I think, however, they are receivng undue preference over the pneumatic stamp, which has done good work in Cornwall and has been in operation at Dolcoath and elsewhere for some few years. Its advantages are being overlooked by those engineers who are now for the first time taking hold of Cornish propositions.

At the risk of coming into conflict with writers of various textbooks and other authorities, I would like to draw attention to this stamp. It was originally invented by William Husband, of Hayle, and was made by Harveys. It was never actively pushed by Harveys, and it was only when this firm was dissolved and the stamp taken over by Holman Brothers, of Camborne, that it received much of a chance I give illustrations herewith.

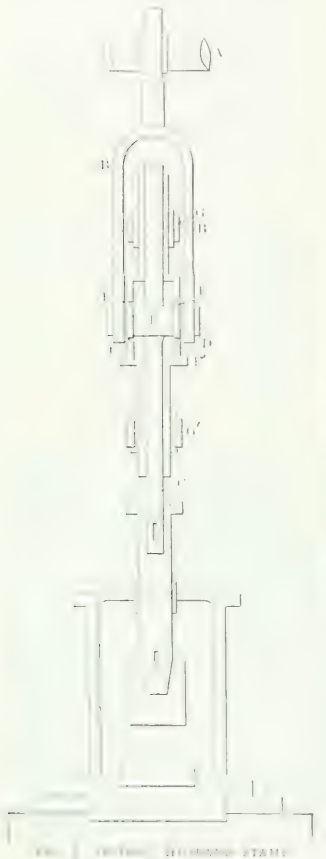
The Husband Stamp

In most textbooks the description of this stamp is perfunctory and its real object is not made clear. The descriptions lead one to believe that it is operated by compressed air, just as the steam stamps are worked. This is quite a mistake. The stamp is driven from shafting *A*, Fig. 3, by a crank or eccentric and connecting-rods *B*, and an air cushion is interposed in the stem so as to obtain a better crushing blow and also to enable the stamp to be driven more rapidly without knocking itself to pieces. The stem *C* passes through a cylinder *D*, which in its turn is suspended by two connecting-rods *B* to the crank shaft *A* at the top.

On the stamp stem inside the cylinder is a piston *E*. In the walls of the cylinder above and below the middle position of the piston are two series of holes *F* and *F'*. The stem and cylinder are kept in alinement by the guides *G* and *G'*. As the piston travels up or down, it traps the air above or below the holes, and the air thus compressed acts as a cushion and on the return stroke assists in the propulsion of the stem.

At Dolcoath there are three head of these stamps, each of which crushes about twelve times as much as a Californian stamp. I do not consider this a perfect comparison, for the stamps do not work under exactly the same conditions, but the comparison is near enough for a *prima facie* case.

mechanical method of separating complex ores. Unless such ores could be hand picked they were neglected. Fifty years ago Cornwall was a by-copper producer, and the copper and tin occurred on the same lodes. The lines of demarcation of the tin and copper were often distinct enough to enable the miners to effect a clean separation by hand, but very large amounts of ore were mixed, and it was a



puzzle whether to sell this ore as copper or as tin ore.

The amount of copper that can be separated by hand picking is now very small and perhaps only the Levant mine makes an income from this source. It is still a problem for the future how to separate mechanically the copper and other pyrites from the tin oxide. The flotation inventors are now having a good try at the problem.

Leaving the question of complex ores for the present, I will give an outline of the old method of concentrating the tin ores. The pulp as it comes from the Cornish stamps passes into strips. These consist of troughs 1 or 2 ft. wide and perhaps 20 ft. long arranged at a slope of 1 in 30. These "strips" are crude classifiers and separate the heavier sands from the slimes.

The sands are concentrated on stationary buddles. I would here interpolate the remark that the word "buddle" is as often misused as the words "mesh" or "ore-in-sight." A buddle is a concentrator on which the heavier particles are caught and kept in position until a thick bed is formed that can then be dug off and removed. It is a mistake to use the word buddle in connection with concentrators of conical form fixed or rotating on which the heavier and lighter particles are separated and from which they are continuously removed. Cannot some authority on concentration invent a suitable generic name for this latter class?

Originally the Cornish buddles were fed by hand and many still are. All that have been put down recently are fed automatically, as is shown in Fig. 4. They are also shown in Fig. 1. The concentrates from these buddles are calcined usually in a Brunton furnace, with the object of oxidizing any pyrites, and they are then buddled again so as to remove the oxides produced by roasting the pyrites.

FIG. 4. CORNISH BUDDLE WITH AUTOMATIC FEED.

Rack Frames

The slimes from the "strips" and also the tailings from the buddles are sent to settling tanks and are afterward dealt with on a series of frames called "rack" frames, or "rag" frames, according to the degree of provincialism in the dialect of the speaker. It is not necessary to illustrate these frames in detail, but I give in Fig. 5 a view of an installation of them at Dolcoath. The detailed drawings are found in most textbooks. Suffice it to say that the frame consists of an inclined board about 6 ft. each way. Launders carrying slimes and water respectively run along at the top of the frames. The slimes run down the frames, and at intervals of a few minutes, a flush of water is sent down to remove the heavy particles that have adhered. At the same time the lip of the board at the bottom is moved so that the flush carries the heavier particles into a separate discharge launder. The flush and the opening of the lip are effected automatically by the water supply itself, and after the discharge of the water, the apparatus is righted by counterbalancing weights or otherwise.

The concentrates obtained from these frames are still of very low grade, and are by no means a marketable product. In fact the action of the frames is only to produce a concentrate which is suitable for further treatment on the buddles and the concentrate is sent either to the buddles that treat the sands or to a further series of buddles down below. After buddling, the concentrates from the frames are sent to the calciner along with the concentrates from the buddled sands. The ultimate product from all the buddles is further concentrated in the kieves, which consist of tubs. The concentrates are poured in while the water in the kieves is stirred rapidly. Thus the best quality of concentrates goes to the bottom and the poorer quality is found on the top. The latter may be returned to the buddles or added to the next charge in the kieves.

Other Concentrating Apparatus

I desire to point out that the buddles, frames and kieves, described here, are the outcome of the genius of the Cornishman for devising apparatus which costs very little, just as in the case of the stamps. The buddles and kieves cost very little to build. The frames cost about $8 each. They are perfectly automatic and require no attention, and they will last for 6 or 8

years. They are [illegible] cal machines for treating slimes running only a few pounds to the ton and so preparing them for treatment in the buddles.

During recent years a new slime concentrator has been in use in various Cornish mines, called the "Acme," and made by Holman Brothers. This machine is comparatively little known; it is of the revolving-table type and is a combination of a convex and a concave table.

Owing to the mutiplicity of operations and the repeated handling of the products, it is impossible to figure out any accurate figures for the efficiency of the processes. In fact, the average Cornishman does not keep any records of actual results in ore dressing. The only real uncontradicted fact in connection with losses in dressing is the Red river. The tailings from the mine are all discharged into the river, and independent tin streamers work the stream

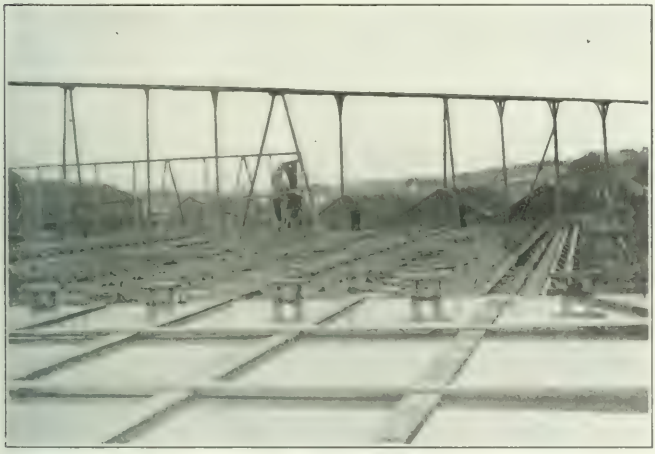


FIG. 5. BACK FRAMES AT DOLCOATH.

over again. Whether it would pay the owners of the mines in the old days to have erected additional plant, such as the streamers use, is not a point that can be profitably discussed now; but certainly under the modern methods of treatment these losses should be seriously tackled.

Another criticism to be offered is that no chemical analysis is made of the ore to find out how much tin it contains. The vanning shovel used in assay work is only a concentrator and is no guide to what is in the ore or what can be got out of it. The Cornishman argues that the vanning shovel is the best guide, as it shows what can be got out of the ore and not what is actually in the ore. This may be good enough for roughly estimating the value of the ore, but it is altogether too crude for the purposes of studying ores systematically.

Before proceeding with descriptions of modern plants at Cornish mines, it will be of interest to give some particulars of the first introduction of new methods. The first and most important innovation was at Dolcoath. Twelve years ago, the drop in tin and the reduction in the grade of the ore brought about a crisis, and the managers were obliged to forsake the old cost-book system and to appeal to London for financial help. A large amount of new capital was subscribed on the limited liability system, and the mine was once more put on its legs.

The question of ore dressing was referred to Fraser & Chalmers, and after considerable inquiry it was decided to make a compromise between the old and the new fashions. As the grade of the ore was lower, it was decided to increase the output, but instead of abolishing Cornish stamps, the old ones were kept in operation, and were supplemented by California stamps and pneumatic stamps. The present equipment of crushing machinery consists of 162 Cornish stamps, 60 California stamps, and three pneumatic stamps.

The chief innovation introduced was the substitution of Frue vanners for buddles. At the present time, the whole of the product of the stamps passes over vanners. The concentrates run about 40 per cent. of tin. The tailings from the vanners are treated in the same way as the tailings from the buddles previously used in concentrating the sands, and as the slimes from the strips. The concentrates from the vanners are calcined, and afterward separated in classifiers into sands and slimes.

The sands are concentrated on Wilfleys and the slimes buddled. Instead of the old Cornish buddles several new forms of slimers have been introduced, of which the Acme table already mentioned, is the most interesting. As an example of a transition period, Dolcoath is without rival. The variety of plant is exceptional, and if I may be permitted to say so without offense, it is a veritable museum of ancient and modern metallurgical plant.

Your readers may expect me to say something about sizing or want of sizing in Cornish practice, and may ask why the whole of the pulp is passed over vanners direct from the stamps without any preliminary sizing. The fact is there is a sharp conflict of opinion on this sizing question. The German engineers at Clitters are keen on sizing, while other engineers are not. It is really a subject which is as yet only in an experimental stage, and I prefer to defer any comments on it for a time.

Increased Cost of Cement Manufacture in England

An influence operating against the British manufacturer, says F. G. White, chairman of the Associated Portland Cement Manufacturers, Ltd., of England, is the advance in the price of fuel and other material required by the manufacturer. On this point the London *Financier* says that for the next 12 months the cement trade will have to pay dearer for the greater portion, at least, of its fuel, for coke is a far more important item to them than coal. Already the manufacturing processes of cement and the administration of the works owned by the associated firms are carried on with an economy which would have been considered impracticable a few years ago. All that science and technical experience can suggest has been carried into practice, where possible, with a view to reducing expenses to a minimum in every department; so that it seems scarcely probable that what will be lost by the higher price of fuel will be saved by the reduction of any other expenditure whatever. . . . It is the price of fuel which has to be considered as perhaps the most variable factor in the economic production of portland cement. During the next 12 months there will be a slight increase in the expense of manufacture due to this cause. It will affect all cement works in very much the same way, although the large undertakings will probably have a certain small advantage.

In brief, the English manufacturer and the English trade and financial journals are undecided as to whether the enhanced cost of production can be successfully met.

A tin mine in the extreme north of the province of Kwangsi, China, is operated on a small scale, its product being exported through the port of Wuchow. An other tin mine is to be opened in the prefecture of Wuchow.

United States Steel Corporation

[illegible] from the annual report of the United States Steel Corporation for 1906, on points of special interest:

[illegible]

At Dec. 31, 1906, the book valuation of the inventories of all properties equaled $119,897,467, an increase in comparison with Dec. 31, 1905, of $6,509,470. This increase is represented entirely in the valuations of ores, raw materials and manufacturing and operating supplies on hand. The large volume of business conducted by the subsidiary companies required increased quantities of operating supplies, and prices of the same are somewhat higher than at close of preceding year. Semi-finished products for further conversion and finished products on hand show decreases.

As in previous years, inventories were taken on the basis of actual purchase or production cost of materials to the respective companies holding the same, unless such cost was above the market value on Dec. 31, 1906, in which case the market price was used. Inventory valuations are believed to be conservative. The aggregate inventory valuation of all raw, partly finished and finished materials produced within the organization is very much below the market price on Dec. 31, 1906. Inventories, however, include the profits on materials embraced in inventories which have been purchased by one subsidiary company from another; but such profits are segregated and carried in a specific surplus account, and will not be included in the reported earnings of the entire organization until such profits shall have been converted into cash or a cash asset to the organization. The specific surplus account referred to is, therefore, practically a guaranty fund for these profits so locked up in inventories, pending realization in cash.

New Construction

In the annual report for 1905 reference was made to the decision to erect a large and modern steel plant in the Chicago district. The plant will be located at Gary, Lake county, Indiana. There have been organized the Indiana Steel Company, which will construct the steel plant, and also the Gary Land Company, which will own and improve the site for the city, and will construct a large number of dwellings and business buildings. It is proposed to sell improved and unimproved property in the city to residents at about cost plus a fair interest charge, but under such restrictions as to the uses to be made of the property as may be found to be fair and reasonable. During the year substantial progress was made in the construction work, both on the steel plant and the city; the expenditures, including payments made for real estate, amounted to $4,720,159. There has been acquired for use for plant purposes, for the City of Gary, and for railroad yards and terminals, about 7500 acres of property, with a large frontage on the shore of Lake Michigan. The appropriations approved to this date for construction work at the steel plant comprehend eight blast furnaces, together with ore unloading and handling machinery, 56 open-hearth furnaces, blooming and rail mill, various finishing mills, central power plant, foundries, machine shop and equipment, central pumping station and other accessory works; also the construction of harbor and docks.

On Oct. 1, 1906, the Universal Portland Cement Company, a subsidiary company, took over the business theretofore conducted by the Illinois Steel Company of the manufacture and sale of portland cement. The new company has in operation in the Chicago district three cement plants, the output of which in 1906 equaled 2,076,000 bbl., being more than the entire production of the United States in 1896. The company has now under construction at Buffington, Ind., a new plant, which will have a capacity of 2,000,000 bbl. per annum, and at Universal, Penn., near Pittsburg, a plant with a capacity of 1,500,000 bbl. annually. It is expected that in the summer of 1907 both these plants will be completed and in operation. They will increase the company's capacity to 6,000,000 bbl. per annum.

The Hill Ore Lands

From time to time since the organization of the corporation various additional iron-ore properties have been acquired in the Lake Superior ore region. The tonnage of new ore thus obtained is very large. It is, however, doubtful if the quantity of new ore so obtained will prove to be sufficient to meet the constantly increasing demands upon the ore reserves made by the country's growing requirements for steel products. In each succeeding year it has become more difficult to acquire new ore properties geographically located so as to permit of the economical use of their ores at the furnaces of the subsidiary companies. Moreover, for such properties as occasionally could be obtained it has been found necessary to pay constantly increasing rates of royalty. In view of the foregoing and in order to safeguard its future requirements for ore, the corporation, after extended negotiations and careful consideration, made an arrangement (subject to authorization by the stockholders) for the lease on a royalty basis of the so called Great Northern Railway ore properties, comprising the properties owned in fee by, or under lease to, the Great Northern, the Northern Pacific and others. When concluded this lease is to be taken by the Great Western Mining Company, a subsidiary company of the United States Steel Corporation, and the performance of the obligations assumed by that lessee is to be guaranteed by the United States Steel Corporation. Under the proposed lease the royalty to be paid for the ore is $1.65 per gross ton, for ore containing 59 per cent. of metallic iron, delivered in docks at head of Lake Superior. If ore grades higher or lower than 59 per cent. in metallic iron, the royalty will be increased or decreased according to a fixed scale. The above royalty of $1.65 per ton is for ore to be shipped in 1907, and the base price increases at the rate of 3.4c. per ton each succeeding year. The minimum to be mined and shipped is 750,000 tons in 1907 and increases by 750,000 tons per year until it reaches 8,250,000 tons, and thereafter the annual minimum continues on that basis. The lease will continue until the ore is exhausted unless on Jan. 1, 1915 the lease is terminated, under the option reserved to the said lessee. The ore is to be mined by the lessee. As several directors of the corporation are directly or indirectly interested in the companies which own or control these ore properties, the transaction will be submitted to the stockholders and proxies at the annual meeting.

Method for Assaying Mercury Ores

The following method of assaying mercury ores is given by Holloway in the *Analyst*. Mix the ore in a crucible with 10 grams of iron filings, through 60 mesh, and cover with 5 grams of iron filings through 30 mesh. Set the crucible in a hole in a tin plate or asbestos board in such a way that the bottom of the crucible may be heated by the flame, while the top remains cool. Cover the crucible with two pieces of clean silver foil which have been weighed, and which are of unequal size, the upper piece being the larger. Set on top of the silver covers a copper or metal vessel through which cold water may be passed in order to keep the plates cool. Heat for 20 min., allowing only the bottom of the crucible to become red hot. Cool the crucible, dry and weigh the covers. If tarry substances appear on the foil, they may be rinsed off with alcohol before drying. The amount of ore to be taken for assay depends upon its richness. For less than 1 per cent. of mercury use 2 grams, between 1 and 2 per cent. mercury, use 1 gram, and so on.

A mineral recently discovered in British Columbia, known as souesite, is a native nickel-iron alloy similar to the josephinite of Oregon. It is a gray metallic sand having a specific gravity of 8.215. Dr. C. G. Hoffmann of the Canadian Geological Survey states that platinum, iridosmine and gold were found associated with it.

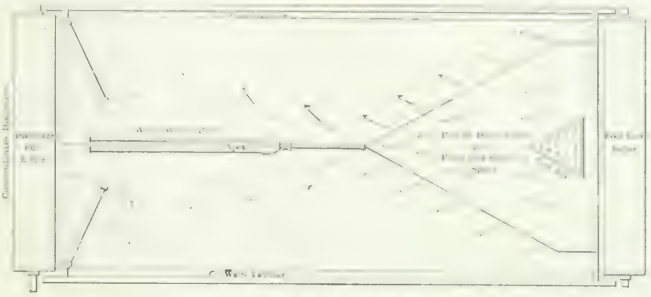
The A. & E. Slime Concentrator

The A. & E. slime concentrator derives its name from Randall P. Akins and James P. Evans, to whom its novel features are due, is one of the more recent ore-dressing machines of the Colorado Iron Works Company, Denver, Colo. It is of the traveling-belt, shaking-table type, its distinctive feature being a peculiar form or countour of the deck, produced by a fixed form beneath the deck to which the flexible belt of canvas or duck conforms in performing its work.

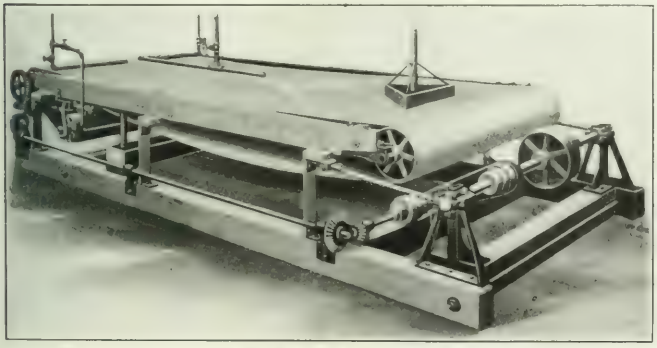
On the working surface there is a triangular pan or depression, the feed and settling space, the forward lines of which are substantially level. The central line from the apex of the triangle to the discharge end is the high line or ridge of the surface which slopes gently to the discharge launders at the sides of the table The wash water pipes are above the ridge at the discharge end. Those at the finishing end are attached at the corners of the table and may be swung into any position desired for the final washing. The concentrates are carried over the end roller and washed into a box in the usual manner.

The mechanical features of the machine are simple. The deck or top is supported by six flat oak or hickory legs, 4 in. wide and one-quarter inch thick at the thinnest part. These legs, while supporting the top and preventing any side sway, are sufficiently flexible to allow of a reciprocal motion. The main drive shaft is located at the head or feed end, and is fitted with cranks on each side, from which lead two side rods, which in turn are attached to the deck near supports under the head end and which impart the reciprocal motion or end shake. On the drive shaft are tight and loose pulleys, each 3x14 in., to receive the drive from the mill shaft. The tight pulley is cast heavy and also serves as a balance wheel. A four-step cone pulley on this shaft is belted to a similar one on a countershaft on the supporting frame. A pair of bevel gears connects the countershaft with a shaft from the countershaft through the long side of the frame, near the head end of the table, where, by means of cut gears which allow for the motion of the table, it is communicated to the roller at the discharge end by a worm and worm wheel, which in its turn imparts the travel to the concentrator belt, the speed being adjusted by shifting the belt on the cone pulleys. The travel of the belt is approximately 26, 33, 43 and 56 in. respectively per minute, as governed by the step-cone pulleys, at a speed of 225 r.p.m. of the drive shaft. The drive shaft can be run up to 250 r.p.m., however, without disadvantage, and on some ores to advantage.

The floor space occupied is 7x16 ft., or about the same as any standard concentrator and less than one h.p. is required for operation. The weight of the machine boxed and ready for shipment, is about 2000 pounds.



DECK PLAN, A. & E. CONCENTRATOR.



THE A. & E. SLIME CONCENTRATOR.

Much difficulty is usually found in making paint adhere firmly to galvanized iron. The United States Government has adopted specifications which appear to give satisfactory results and which call for the use of vinegar in washing the surfaces before painting, which washing roughens or corrodes the surface and gives the paint better adhesion.

Scotch Coal Shipments

The Scotch Board of Trade has just issued its report on the shipment of coal from Scotland, during 1906, as follows:

The total amount of coal shipped was 13,921,584 tons, being an increase over 1905 of 1,390,094 tons. The exports to the various countries amounted to 9,072,115 tons, against 7,863,511 for 1905, an increase of 1,208,604 tons. This would leave an increase of only 181,490 tons in the coastwise consumption of coal in 1906 over 1905. The 1906 coastwise shipment, including bunker coal, was 4,849,469 tons, while that for 1905 was 4,667,979 tons.

The average freight rate paid on foreign shipments of coal during 1906 was slightly higher than the 1905 rate. The following are some of the rates from Glasgow in 1906: The average rate to the Italian ports of Genoa, Savona, Leghorn and Terre was $1.54 per ton; to Venice, $2.12; to River Plata, South America, from $2.55 to $3.77 per ton; to Rio de Janeiro, Brazil, $3.40 to $3.77; to Barcelona, Spain, $1.88 to $1.64; to Oran, Algeria, $1.33, and to Marseilles, $1.58.

The export prices of coal per ton in January, 1906, were: Splint, $2.42 to $2.54; steam, $2 to $2.17, and ell or house, $2.29 to $2.54. The prices continued to advance during the year, and after Nov. 1, when the export duty of 24c. was taken off, they had reached the following figures: Splint coal, $2.67 to $2.69; steam, $2.25 to $2.42, and ell or house, $2.44 to $2.69. On Jan. 29, 1907, export coal was quoted as follows: Splint, per ton, $2.92 to $3.04; steam, $2.50 to $2.67, and house, $2.79 to $3.04. House or domestic coal retails in Glasgow in small quantities at $4.86 per ton of 2240 lb. A reduction varying from 12 to 60c. per ton is made on the sale of larger quantities.

Mining concessions in Norway are granted by the Government to foreign people only under the condition that one-third of the stockholders must be Norwegians, that all the agents and workmen be of this nationality, and that the company shall pay a considerable royalty into the treasury of the State.

The Development of the Air-hammer Drill

Modifications of the Pneumatic Riveting Hammer Have Made This Light and Handy Tool Useful for General Mining Purposes

BY H. L. SINCLAIR*

No doubt those who are interested in mining or the improvements in mining machinery are aware that during the past three years many changes are noticeable in the methods used in breaking ground. Since the introduction of the first piston drills, many years ago, improvements have of course been made from time to time, but the general construction has been the same. While admitting that the cost per foot broken was, in many cases, higher than with hand drilling, operators have continued using the larger 3-in. to 3¼-in. machines in their crosscuts and shafts, and 2½-in. to 2¾-in. machines in their drifts, raises and stopes. At the same time there have been many complaints made against the operating and maintenance expenses.

Fuel costs in most mining camps were high and there was very little ground in a crosscut or a shaft which could be broken and mucked for less than $10 per foot. It was necessary to have a drill runner and helper for each machine, or, where two drills were worked in the some heading, two drill runners and a helper. The runners were supposed to be experienced men, both in the art of breaking ground and in keeping their drills in good running order, and were entitled to at least $4 for an 8-hour shift. In drift and crosscut work it was necessary to either work but one drill shift or handle part of the muck twice in order to give the runners a "set up." For these reasons it was no wonder that the costs of breaking ground ran into money, and the operators were at their wits' end to find means of cutting down the expense.

Early Difficulties

In the stopes, raises and drifts the lighter 2¼-in. drills would give fairly satisfactory results, as they could, in a pinch, be handled by one man with a little assistance now and then from a mucker or timberman. Still, each drill, even when new, consumed 80 to 90 cu.ft. of free air compressed to 90 or 100 lb. receiver pressure, and the cost of fuel, coupled with the monthly repair bills, often made the mine manager wish he had never seen a machine drill. Then, too, he was caused no end of worry and trouble in getting good runners. One man would break as much ground as was expected of him, but in so doing would likewise break side rods, pistons, pawls, etc. Another would get along with few repairs, but would not get results, evidently from fear of breaking the machine.

One runner preferred one make of drill and another would not have it, so the manager was, to use a common expression, "in hot water all of the time." He could not have several different makes of drills on hand on account of the large stock of repairs he would be forced to carry, and as a consequence had to take such men as he could get and "break in" new runners. For these reasons he kept at the drill manufacturers with suggestions to cut down the number of parts in their machines and make them less complicated and more substantial. His suggestions were taken in good spirit, perhaps, but the machine makers were loath to make any changes whereby the repair bills would be materially lessened, as their real income came from this source.

The larger manufacturers had men covering every camp, and when it became known that a certain property would soon be equipped with a compressor, the manager was besieged by drill salesmen who offered all sorts of inducements in order to get their machines introduced, knowing well that it was not a question as to what they would make on the original sale, but what orders would come to them for repairs later on. The compressor bought, the manager was forced to decide on some make of drill.

A decision once arrived at, it was seldom that he could be weaned from his first love, and henceforth would be known as a Sullivan, Ingersoll or Rand man, and would spend hours arguing with some fellow operator about the merits of his pet drill, while in his letters sent with orders for repairs to the manufacturer, he would probably accuse this innocent person of sitting up nights figuring how he could change parts of his machine so that the repair bills would mount up. I know one large operator who has been using a certain make of drill for nearly twenty years, but who is always complaining about the maintenance expense and threatens to make a change on the next plant he installs. About the time he is ready to purchase, if approached by the representative of a rival concern, he will argue for an hour or so on the subject and will probably conclude by saying: "Well, I guess I'll stay with the old machine. If I buy yours, I expect I would be jumping from the frying pan into the fire."

Introduction of the Air-hammer Drill

As I said before, many changes have been inaugurated in the past three years in the methods of rock breaking, and from the subject of this paper you will naturally infer that I intend to show what results have been obtained by the use of the air hammer drill. Before offering any argument, however, on the advantages or disadvantages of this type of machine, it might be well to explain how the machine was first used in mining operations and how I came to be personally interested in its development.

About seven or eight years ago I was employed on a property where a great portion of the value of the ore lay in a 6- to 10-in. streak of honeycombed quartz which was frozen to the wall; in fact the gangue, which made up the major portion of a 4-foot vein, contained little or no value. Our method of mining had been to strip the quartz and take it down on sorting sheets in a filled stope by the use of gads. This was rather slow and arduous work, but the value of the gold was sufficient to leave a small margin of profit, even after excessive hauling, freight and smelter charges were paid. At this time I had occasion to go East to a directors' meeting of the company, where the difficulty of saving the ore was fully explained and, in the discussion which followed, various methods of overcoming the obstacle were considered.

At this time the pneumatic riveting hammer was coming into general use in boiler shops, and one of the directors, who was of a rather ingenious turn of mind, suggested that a hammer of this sort might be brought into play; and by the use of a gad in place of the riveting tool, be used to take down the ore. While I did not think the plan would prove feasible, I consented to visit a boiler shop and even experimented at driving rivets in an effort to ascertain what the possibility might be of using them for the purpose mentioned.

At that time the hammers were not as well designed as they are to-day, and the vibration was so great that I was forced to express the opinion that excessive wages would have to be paid the miners to get them to use the tool. In considering the question, however, one very important point, which has since been brought to light, was overlooked, i.e., that there was much less "kick back" in operating the hammer against rock than against a rivet in the shell of a boiler. The reason for this difference in the action

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*Mining engineer, Denver, Colo.

of the tool is probably due to the fact that after the first few blows of the piston against the steel, the elasticity of the boiler sheet is such that it seems to spring back a trifle after each blow of the hammer. As the steel recoils it meets the next blow half way on the rebound and a shock is caused which is very trying on the nervous system of the operator. It has since been proved conclusively that with the improved type of hammer there is very little shock or vibration to inconvenience the operator, and that the remedy does not lie entirely in the improved machines. The conclusion is that, with a gad made with the proper taper, at each blow of the piston the tool is forced into the crevice and remains there until the next blow is struck. This leaves the operator with but the natural vibration of the hammer to contend with. In the later types of machines the piston is made to cushion on live air on the back stroke, and no excessive jar occurs.

First Experience Not Encouraging

The tools were, however, not put in use at the mine, and although I thought of the subject many times during the three or four years following, and before their trial as hitch cutters in various camps, it was not until nearly three years ago that I had the opportunity of trying them in Cripple Creek. At that time they were being tried for block holing and hitch cutting, and the tool used was a 12-in. hollow piece of steel with about 14 or 16 cutting edges. The manufacturers were claiming great results for both of these purposes and for drilling as high as a 4-ft. hole, finishing about 1⅛-in. in diameter.

It fell to my lot to attempt to drill a round of holes in a narrow stope in one of the Cripple Creek properties, and I must admit that the result of the test offered no encouragement. The makers of the machine had evidently based their somewhat astounding records on tests made in some very even-cutting soft formation; for, when the drill was operated against Cripple Creek phonolite, it was soon discovered that unless some very radical changes were made in the drill bits they would not do the work. The greatest difficulty was experienced in getting the bits spread to a gage so that they would follow. Then, too, the cutting edges were so fine that it was next to impossible to temper them to stand for more than an inch or two in that character of ground.

Another difficulty developed in the construction of the drill bits. These were made of ⅞-in. hollow staybolt iron, with 6 in. of hollow steel welded to either end for a shank and bit. It was found that crystallization would take place at the welds and either the shank or bit would [illegible]. I decided, however, that the machine could be perfected, and with the assistance of my father, who is a mechanical as well as a mining engineer, set about remedying the faults mentioned. We turned our attention at first to the steel, and after careful experiments found that the bits with six cutting edges cut faster and held their gage better than any other style. The cross bit was tried, but was discarded on account of its tendency to "rifle" a hole and "hang up" in crossing slips at an acute angle. We also found that with this shape of bit it was hard work to rotate the drill by hand in soft ground, and, while it cleared better, the six-tooth bits gave much better results. Sharpening tools were made for the six-tooth bits and little difficulty was experienced in drill sharpening after the blacksmith had acquired the knack of spreading the gage.

Necessary Modifications

Hollow steel was necessary in drilling down holes or flat holes in sticky ground, as it was essential to force part of the exhaust air through the steel to clear the hole of cuttings. The welded bits would not stand in hard rock, and we were in a quandary as to how we would overcome this difficulty, until it was discovered that a ⅜-in. hole could be drilled through a 4-ft. piece of steel in a gun-barrel lathe. We used this class of steel for some little time, until we found that we could purchase a brand of hollow rolled steel in Sheffield, England.

With these changes we were able to drill 4-ft. holes in any ground at a speed varying with the formation of from 1 to 10 in. per minute. In testing the machine thoroughly, however, we found that a cast-steel cylinder would crystallize easily and we were forced to change the material used in its construction to the best grade of steel shafting, forming the complete cylinder out of the solid metal.

We then found that it was next to impossible to get men who would hold the machine over their heads and drill uppers. One could not blame the drill runners, as it was certainly an awful task to set a man at, and only the very strongest could stand it for any length of time. The screw-feed machine mounted on a light drift column was tried, but finally discarded, when one of the manufacturers constructed an air-feed attachment. With this machine it was possible to "set up" and "tear down" in less than a minute and the drilling capacity of the machine was increased 100 per cent. Machines of this type were placed in all of the larger mines of the country, and it was soon found in competitive tests that they would out-drill any of the 2¼-in. machines.

The manufacturers of the old-line machines soon found that they were rapidly losing ground and began to experiment on the same line themselves. Several new companies were formed, principally by mining men who realized the advantages of the air-hammer drills, as compared with the piston machines, and during the

As this brings us down to the present time, it only remains for me to attempt to show why this new type of drill has come to stay, and wherein it possesses advantages over the old-line drills. This I will attempt to do by taking up each class of work separately.

[illegible]

In the large crosscut or railway tunnel, the large piston drill still holds the advantage, as it is possible to drill deep rounds and break the ground far more economically and rapidly than would be possible with the small hammer type. Even in this class of work, however, there is a place for the small drill as they can be used most successfully in block holing and in taking up bottom or trimming up the walls where projections are left, either on account of missed holes, or because the drill runner has miscalculated the load he had on a certain hole. They can also be used for drilling uppers in the roof for pipe hangers, or for putting in short relief holes in the heading where they will give the cut holes a better chance to break.

In shaft or winze work, however, they can be used for drilling the full round of holes and even in the larger sized shafts, records show a saving which is simply astounding. To those who are familiar with this class of work, the reason is obvious. With piston drills, even in the hands of the best of runners, more time is lost in setting up, tearing down, lining up, cranking in and out of holes and in changing steel, than is consumed in drilling. Where the ground is even and breaks well, it is not so bad, but where slips are encountered frequently, and time is consumed in preventing a "hang up," or where the formation is such that a great many holes must be drilled to break the ground, the air-hammer drill has all the best of the argument.

The machine, steel and hose, can all be put into one bucket and the drill runner can be at work in five minutes from the time he goes on shift. The steel being loose in the chuck, he loses no time in changes, and he can start a new hole while a piston drill runner would be cranking out. Holes can be drilled in any direction and pointed to take advantage of any slip. No holes need be lost as it is practically impossible to get a "fitchured" hole even in the worst kind of ground. All of the holes can be drilled to any depth desired, up to 4 ft., except in very heavy sulphide ore, and the sump holes can be put in in any part of the shaft.

With a piston drill, the runner may get a hole down 3 ft., and then get hung up, and rather than lose time he will take a chance on breaking the ground and start another hole. On this hole he may have no trouble and he will perhaps drill it 6

When the shaft is cleaned up he will find he has no sump, or one corner of his shaft sticks out so that he is unable to get a set up which will enable him to drill his round to advantage. He may even have to drill a hole by hand and shoot it before he can get in to do any good with his next round. As a consequence, the shifts are thrown out and valuable time is lost. When timbering commences, the small hammer drill is indispensable for cutting hitches and taking out projections where they interfere with the sets, and for these purposes alone, will pay for itself in 30 days.

In a drift, a drill runner can either mount the air-feed drill on a column or, where it is possible to pull the cut out of the top, he can work with the air feed alone, and in any ordinary ground, one man can drill a round of holes in half a shift. Where the cut is pulled from the center or bottom, he can either drill the back and top cut holes off a bar or simply use a stick of timber and butt the air feed against it. I have known of one man breaking 42 ft. in 19 shifts in a drift in granite, and not only did he do all the drilling alone, but the tramming as well.

There is a diversity of opinion as to whether it is advisable to use a 2¼-in. piston drill or an air-hammer drill in this class of work, and a decision, from an economical standpoint, can only be obtained by actual tests. As a usual thing, however, the hammer drill can be used advantageously in all drifts where a 4-ft. round, bottoming 1⅛-in. will break without leaving any "guns." With a piston drill of the size mentioned or larger, it is possible to make more rapid progress but the cost per foot will probably be greater as much more powder and air will be required and it is a hard matter for a drill runner to set up and tear down without some help from a timberman or trammer. In ground which breaks short, however, the piston drill usually has the advantage as a larger hole is drilled and the powder can be gotten to the bottom of the holes where it belongs.

Cost of Stoping

In stope work the 2¼-in. machine does not have a chance against the air-hammer tool and the records on some of the Cripple Creek properties show that their stoping costs have been reduced one-half since the introduction of the small machines. Where the values lie in small streaks of very high-grade ore, the saving is enormous as the stopes can be carried even narrower than by hand as the drill can be run in any place a runner can get his body.

I installed a small machine for a leaser in Cripple Creek some 18 months ago, and he informed me after his lease had expired, that the little drill was worth $1000 a month to him. He was stoping on a 14- to 18-in. streak of 4- to 5-oz. ore and found that the ground was too hard to break by hand. He then put in a 2¼-in. machine and was forced to carry his stope 3½ to 4 ft. wide. In doing this he lowered his values to $30 to $35 per ton. After the installation of the little air-feed drill, he was able to break one-third more ore in an 18-in. stope than he had with the 2¼-in. machine in one 3½ to 4 ft. wide. He ran his values back again $80 to $90, cut his hoisting and powder bills down to one-half, and his timber to one-third, and yet kept his production up to more than the tonnage he was able to get back of the 2¼-in. drill. With the piston machine his air cost him $3 per shift, while with the hammer drill the charge was but $1 for the same length of time. He figured the difference in net returns and found that the small machine saved him a little more than $1000 per month. The usual method of operating the machine in an open stope is to put in a couple of light sprags well up to the back and about 10 or 12 ft. apart. By putting a 2x12-in. plank on the timbers and drilling from it, a drill runner can fill a stope full of holes in half the time he would consume with a larger drill. Not only can he drill more holes, but he can drill them in any place he desires and take advantage of every slip.

The same method is used in upraising, and data furnished by some of the largest mines in the west shows that a saving of 50 per cent. can be readily given as the average.

Repairs

Not only can more work be done with the hammer drills than with piston machines, but the saving in repairs is well worth considering. In nearly all of the small hammer drills, there is but the one moving part and when properly made this should last for months. The rotation being accomplished by hand there are no pawls or springs to break and no rifle nuts to wear out. As the machines are fed by air, no feed screws or nuts are required. Taken as a whole, with a properly made air-hammer drill, the repairs are less than 25 per cent. of those of a 2¼-in. machine.

Working at a drill pressure of 100 lb., a 2¼-in. machine requires 100 cu.ft. of free air per min., while an air-hammer drill of the valveless type uses but 25 cu.ft. at the same pressure.

Another advantage possessed by the hammer drill lies in the fact that it is not necessary to employ a first-class drill runner, as a good miner who knows how to point his holes will do just as much work after two or three days' experience, as the best man one could hire.

While I could, perhaps, describe the various machines of this type manufactured, and give my ideas regarding the merits and defects of the different drills now on the market, I believe that it would be wise to confine my remarks to the air-hammer drills in general and concluded by saying, as the "old toper" did of brands of whisky, "that they are all good but some are better than others."

The De Beers Consolidated Mines

The latest report of the De Beers Consolidated Mines deals with the company's operations at Kimberley, South Africa, during the year ending June 30, 1906. In that period £5,607,718 worth of diamonds was produced, while the expenditure amounted to £3,504,182; the net profit being £2,103,536. Dividends amounting to £1,800,000 were disbursed, and a sum of £916,057 was carried forward. The company's reserve fund, which is invested in British consols, amounts to £1,178,000.

On Jan. 30, 1906, the company's contract with the diamond trust expired, but was immediately renewed for a period of five years.

The company's dynamite factory at West Somerset, S. A., was disposed of during the year to the Cape Explosives Works, a corporation composed of De Beers shareholders. The contracts with the Transvaal gold-mining companies, binding themselves to purchase at least half of their explosives from the trust for a period of seven years from Sept. 1, 1903, were transferred to the new corporation.

The mining prospects continue good, and the market for diamonds is so strong that the selling trust is able to advance prices at frequent intervals.

The average yield of diamonds per load for the De Beers and Kimberley mines is 0.41 carat, value per carat being £3 1s., and the value per load £1 4s. 9d. The yield of the Wesselton mine is 0.282 carat per load, the value per carat £1 3s. 9d., and value per load 12s. 4d. The yield of the Bultfontein mine is 0.363 carat per load, the gems being worth £1 2s. 11d. per carat, and the wash dirt is worth 15s. 7d. per load. The yield per load of the Dutoitspan mine is 0.245 carat per load, valued at £4 per carat and £1 per load.

The company's engineer estimated the stock of diamond-bearing ground in stock, and on the washing-room floors on June 30, 1906, as follows: At De Beers and Kimberley mines, 2,644,690 loads, Wesselton mine, 1,889,956 loads; Bultfontein mine, 1,212,669 loads, and Dutoitspan mine, 1,349,385 loads; the total being 7,096,700 loads.

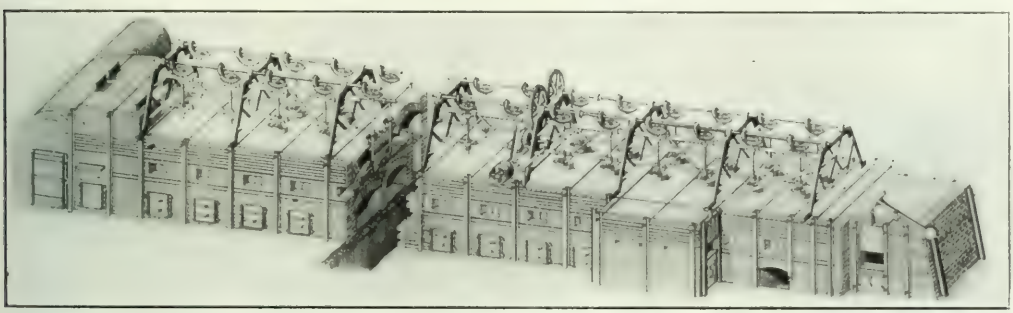
The report concludes with a reference to the death of Alfred Beit, a life governor of the company, who in conjunction with the late Cecil Rhodes, promoted the company and its subsidiary organizations.

According to the *Chemical Trade Journal*, the total sales of bromine in Germany in 1906 amounted to 906,991 kg., against 717,432 kg. in 1905, or an increase of 20 per cent.; 13.5 per cent. of this consisted of exports to the United States.

The Edwards Duplex Roasting Furnace

The latest form of the Edwards Duplex roasting furnace, as shown in the accompanying illustration. The details of the mechanical parts of this furnace have been described in the JOURNAL of Feb. 11, 1904, pp. 242-243 and Dec. 22, 1904, p. 1000. The chief difference between the new and the earlier form is that the hearth of the present furnace is built on the ground with a sub-flue underneath, if so desired, while in the earlier type the hearth was mounted upon a tilting device.

Edwards Duplex furnaces have been installed and used at a number of plants in Australia and America. Four roasters of the type here shown have recently been supplied to the Golden Cycle mill at Colorado Springs, Colo., by the agents, Chisholm, Matthews & Co., of Colorado Springs.



EDWARDS DUPLEX ORE ROASTING FURNACE

Price of Old Range Ores

The average price of Old Range bessemer ores, from the Lake Superior district, for the season of 1906, was $4.25 at Lake Erie ports. The average charges are estimated as follows: Mining, 85c.; rail freight to lake, $1; lake freight, 75c.; taxes, 5.5c.; interest, 2c.; royalty, 40c.; total, $3.075. This leaves a net value of $1.175 per ton at the mines.

The Rio Tinto Company

This company owns the great deposit of copper-bearing pyrites in Spain, which is well known for its extent, and from the fact that is the oldest mine in the world, having been first worked over 2500 years ago. Its latest report covers the year 1906. The capital stock is £3,500,000, of which £1,625,000 is in 325,000 shares of £5 par value, 5 per cent. preferred stock; and £1,875,000 in 375,000 shares, also £5 par value, of ordinary stock. There is no bonded debt.

The income account shows results as follows, the net earnings being the amount remaining after paying all working expenses, general expenses and taxes:

Net earnings for the year	£2,368,787
Fixed charges on ore mined	£ 17,824
Ore burden account	12,724
Depreciation of plant and securities	61,891
Provident fund	5,000
Total charges	£ 97,449
Surplus for the year	£2,271,338
Dividends, preferred stock, 5 per cent.	£ 77,188
Dividends, ordinary stock, 110 per cent.	2,062,500
Total dividends	£2,139,688
Surplus	£ 31,580

The general expenses, not included above, were made up as follows: Taxes, £168,974; general expenses in Spain, £81,205; directors' allowance, £17,209; total, £267,388. The dividends paid were two of 2s. 5d., or 5 per cent. in all, on preferred stock; one of 50s. and one of 60s.—110 per cent. in all—on the ordinary shares. The capital was increased in December, 1905, by the issue of 50,000 new ordinary shares, £250,000 par value, which realized £3,150,000. With this the company paid off the debenture issues, the total cost, with incidental charges, being £3,103,158, a surplus of £46,842 being left.

The production of copper ores is reported as follows, in long tons:

	1905.	1906.	Changes.
For shipment	627,336	656,928	I. 27,592
For local treatment	1,202,768	1,268,388	I. 65,620
Total	1,830,104	1,924,716	I. 93,612
Av. per cent. copper	2.365	2.411	I. 0.048

The quantity of cupreous ore invoiced to consumers was 660,723 tons in 1905, and 632,307 tons in 1906; a decrease of 28,416 tons. Of the 1906 deliveries Germany took 292,467 tons, Great Britain 168,597, and the United States 171,243 tons. The deliveries of sulphur ore were 308,184 tons in 1905, and 477,843 tons in 1906; an increase of 169,659 tons.

The production of copper for the year is given as below, in long tons:

	1905.	1906.	Changes.
Treatment at mines	19,530	21,287	I. 1,757
Shipped in pyrites	11,300	10,811	D. 455
Total	32,790	34,098	I. 1,302

The quantity of copper brought to market in 1906 was: Refined copper, 20,698 tons; copper in sulphate, 677; copper in pyrites, 11,704; total, 3,079 long tons.

From all of the open workings there were 1,871,256 cubic meters of overburden removed in 1906; an increase of 61,287 cubic meters over the previous year.

The report says that the average market price of standard copper over the whole of 1906 was £87 9s. 3d. The price advanced considerably in the closing months of the year and remains at a high figure. The world's consumption is very large and the output of all the mines continues to be absorbed.

A further reduction in the contents and value of the reserve heaps at the mines, as they stand in the books, has been made. Other copper stocks are, as usual, carried forward at cost price.

The railway and pier again had to deal with a considerable increase in mineral carried. They are kept in full efficiency and working order out of revenue. The public traffic again increased, and further rolling stock for all purposes has been supplied.

The shortage in the rainfall during the past four years has culminated in another exceedingly dry season. The usual period of rains is again near at hand, but unfortunately the stock of water in the reservoirs has been greatly reduced. The utmost economy in consumption is being practiced, and all possible steps have been taken to add to existing sources of supply; but if no rain falls before the end of May, it is feared that a reduced output of copper for 1907 must be expected.

The corrosive action of certain alkali salts upon gold and platinum is accounted for by the fact that when potassium is fused in the presence of air or oxygen, it is at once converted into a higher oxide which exerts a corrosive action on refractory metals such as gold and platinum. Pure silver is only slightly affected, probably because silver, unlike the other noble metals, is incapable of forming salts which correspond to potassium aurate and potassium platinate.

Electric Winding Plant at a German Colliery

The Vereinigte Marie Luise Mine at Neindorf Employs the Ilgner System with Starting Motor and Fly-wheel Equalizer

BY ALFRED GRADENWITZ*

In the electrically operated winding plant employing the Ilgner system, recently [illegible] Gesellschaft at the Vereinigte Marie Luise mine, near Neindorf, Germany, a special starting dynamo is operated by a motor assisted by fly-wheel masses. Heavy fluctuations in load due to the winding service compensate one another in the converter set, a practically constant current being taken from the circuit.

The electrical energy is generated by a central engine and boiler plant installed by the Buckau Limited Machine Works. The winding engine, shown in Fig. 1, has been designed as a drum engine without

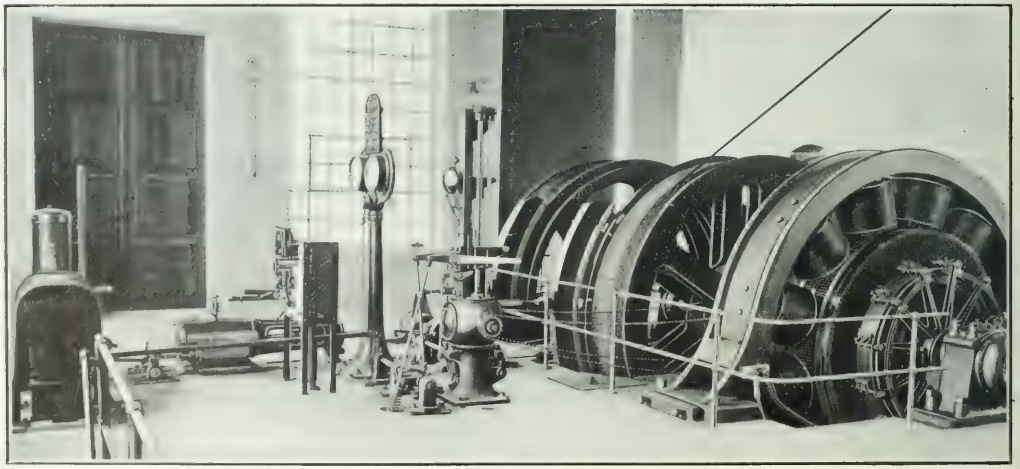


FIG. 1. GENERAL VIEW OF WINDING ROOM

lower rope, and is calculated for 110 m. maximum depth; it serves in hauling both loads and crews, the speed being 5 m. per sec. in both cases. The machine is used also in revising the pit, running at a speed of about 0.2 to 0.3 m. per sec. Four trucks with an aggregate effective load of 1500 kg. are hauled in each run, while in hoisting crews six men are conveyed each time. As the winding frame has two stories, a transfer of the load is necessary.

[illegible]

On a substantial iron foundation-frame are mounted three ring-lubrication bearings 400 mm. wide and 220 mm. in diameter, [illegible] Berlin.

between which the two winding drums, 3000 mm. in diameter and 600 mm. wide, are mounted on a shaft of Siemens-Martin steel 250 mm. thick. The drum located near the driving motor has been designed for shifting, while the other drum is rigidly connected to the drum shaft. The latter is coupled by a flange clutch immediately to the motor axle, which latter is supported also by an external bearing carried by an especially heavy foundation plate.

The drums have hardwood linings with turned-in rope grooves for a round-rope 32 mm. in thickness. Substantial braking rings acted upon by compressed air and falling-weight brakes acting independently are cast on the inside.

The Brakes

The brakes are of the jaw type, the controlling brake being operated by means of a horizontal compressed-air cylinder at a working pressure of 5 atmospheres. The safety brake is of the falling-weight design; the weight is supported by a vertical compressed-air cylinder and can be actuated in three different ways: first, voluntarily by hand, allowing the air below the piston of the vertical cylinder to escape by actuating a three-way cock; second, automatically, by the indicator, which as the rising cage passes by the pit mouth, disengages a small weight, opening in the same way the three-way cock and thus causing the air to escape from the lifting cylinder; and third, by the braking magnet, connected up in series with the magnet coils of the winding motor, the magnet disengaging the small weight referred to and thus actuating the falling weight of the safety brake in case of a breakdown in the magnet coil or of arbitrary disconnection of the shunt.

By shifting the three-way cock the falling-weight brake may be released by the aid of the compressed-air cylinder.

Indicator

The winding engine is fitted with an indicator showing the position of the cages in the pit. It is of the double-spindle type, each spindle being operated separately and being adjusted automatically to the proper depth in shifting the drums. The indicator also actuates the winding-motor controller by means of a special rod. The speed of the winding motor is gradually reduced to zero as the rising cage approaches the pit mouth, by gradually shifting the controlling lever to its zero position. The engine is thus stopped automatically and practically without shock when the engineer fails to arrest the cage.

Another rod causes the falling-weight brake to be actuated as soon as the pit mouth has been passed by the rising cage. As the speed has been automatically re-

closed before the falling weight brake is disengaged, the stopping of the winding engine by the application of the falling weight brake is effected at a very low speed, and without any material shock.

The indicator is further provided with an alarm bell which rings as soon as the slackening mechanism has been actuated.

All moving parts of the hauling engine, the drums and driving motor, are protected by a railing.

Electrical Equipment.

The electrical equipment of the winding engine comprises a rotary-current direct-current fly-wheel converter shown in Fig. 2, using the Ilgner system, the hauling motor and controller, and necessary auxiliary apparatus, switches and measuring instruments.

The energy required in operating the winding engine is derived from a central station yielding rotary current at a tension of 3000 volts and at 100 cycles per second. This current is supplied to a slip-ring armature rotary-current motor, yielding an output of about 75 h.p. with 570 r.p.m. in normal working order. The motor is connected by a clutch with a steel shaft carrying in two ring-lubricated bearings 180 mm. in diameter a fly-wheel 2470 mm. in external diameter and with a rim of 280 mm. width. This fly-wheel, designed as a full cast-steel disk, has a weight of about 6300 kg., its maximum circumferential speed being about 74 m. per second. The fly-wheel bearings are provided with ring lubrication and water cooling.

Upon an extension of the fly-wheel shaft is mounted what is called the starting machine, a direct-current dynamo of about 100 kw. output with 230 volts tension supplying the energy required by the winding motor. Both the starting machine and winding motor are excited from the outside by an exciter machine of about 6.5 kw. output with 110 volts tension mounted upon the end of the fly-wheel shaft, the casing of which is fixed to the outside bearing of the starting machine. By altering the excitation of the starting machine, its tension is made to vary between zero and the maximum figure of 230 volts, thus regulating the speed of rotation of the motor.

Motors and Transformers

The starting dynamo must commutate a multiple value of the normal full-load current with a tension practically equivalent to zero and a neutral position of the brushes, when the winding engine is started. As there is only the transverse field due to the reaction of the armature in that case, a machine constructed according to the normal design could not comply with these requirements. A compensated direct-current dynamo has therefore been used in which a winding arranged between each two field coils and traversed by the armature current fully compensates the transverse magnetizing effect of the armature, thus insuring a reliable service with any load and field intensity without sparking.

In order to be able to stop the transformer quickly in case of danger, or during extensive intervals in operation, a jaw brake, acting from below on the fly-wheel, has been provided, which is worked by means of a hand wheel and spindle. The locking cock for the water-cooling conduit is arranged immediately beside the hand wheel of the braking spindle. In order to avoid splashing, the wheel has been provided with a protective sheet-iron cap, which at the same time avoids any trouble due to the draft produced by the rapid rotation of the fly-wheel. The whole of the converter is surrounded by a protective railing, interrupted only where the hand-wheel jack is situated.

Ilgner System.

The arrangement of the Ilgner converter and fly-wheel brake is shown in Figs. 3 and 4. The converter serves a double purpose. It converts the high-tension rotary current into the direct current, which is more convenient in the present case, and it insures by its reaction on the central station a practically perfect compensation of any oscillation in load due to fluctuations of the hauling service. The latter effect is insured by supplying the surplus required in starting the hauling motor and during the acceleration period from the energy stored in the fly-wheel masses. At times of low energy requirements the energy of the primary station is used in accelerating the fly-wheel masses slackened by the work performed.

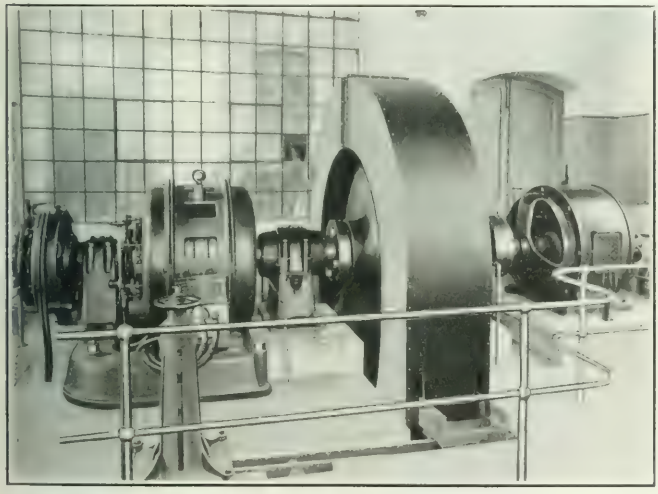


FIG. 2. CONVERTER WITH FLY WHEEL BALANCE

FIG. 3

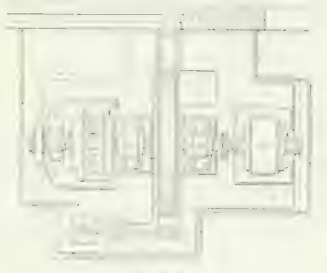


FIG. 4

In order sufficiently to actuate the fly-wheel [illegible] preventing any excessive increase of the energy supplied to the rotary-current motor from the circuit, and to keep any oscillation of energy within moderate limits, the liquid starter serving to start the rotary-current converter motor is provided with an automatic lag regulator. This, as shown in Fig. 5, comprises a liquid reservoir, at the bottom of which are placed plate electrodes connected to the slip-rings of the rotary-current motor. The counter-electrodes are suspended from a partly equilibrated beam, pivoting round the axle of an auxiliary motor, which merely performs a tilting motion.

If during the starting of the winding engine the current absorption of the converter exceeds its normal figure, the auxiliary motor tilts the lever, lifting the electrode plates suspended from the beam and thus inserting additional resistance. If, on the other hand, the current absorption during an interval in operation drops below its normal figure, the motor tilts in an opposite direction, thus approaching the electrode-plates and reducing resistance.

By inserting additional resistance the lag of the converter motor is not only increased by about 14 per cent., putting the fly-wheel upon an extraordinary energy supply, but any increase in the intensity of the motor current is also prevented, the armature resistance being augmented in proportion to the reduction in number of revolutions. As the fly-wheel masses are recharged during an interval in operation, the same phenomenon will occur in an opposite direction, any sudden drop in current intensity below its normal figure being prevented while the rotary-current motor is enabled gradually to reach its maximum number of revolutions.

Winding-engine Motor

The motor operating the winding engine, the shaft of which is flanged directly to the drum shaft, is designed for a tension of 220 volts with about 32 r.p.m. This motor has an output of about 108 h.p. during full operation, while yielding up to about 240 h.p. at the end of the period of acceleration.

The motor is started, controlled and reversed entirely by altering the excitation of the starting dynamo. This alteration in the exciting current, which is only a few per cent. of the main current, is effected by simple resistance regulation through a small controller, and which is operated from the driver's cab by means of a hand lever. Each position of the controlling lever corresponds with a given traveling speed between zero and the maximum figure of 5 m. per sec., the tension between the terminals of the winding motor being determined by the intensity of the exciting current, which is adjusted by the controlling lever.

The winding motor is reversed by altering the direction of the exciting current. The contact device of the controller is designed on lines similar to the collector of a direct-current dynamo, and is of substantial construction. The whole apparatus is inclosed in a dust-tight casing. Fig. 7 represents the regulating resistance apparatus.

The braking magnet above referred to for the falling-weight brake has been designed for a lifting service of 150 kg. per cm., and is connected in series with the field of the hauling motor.

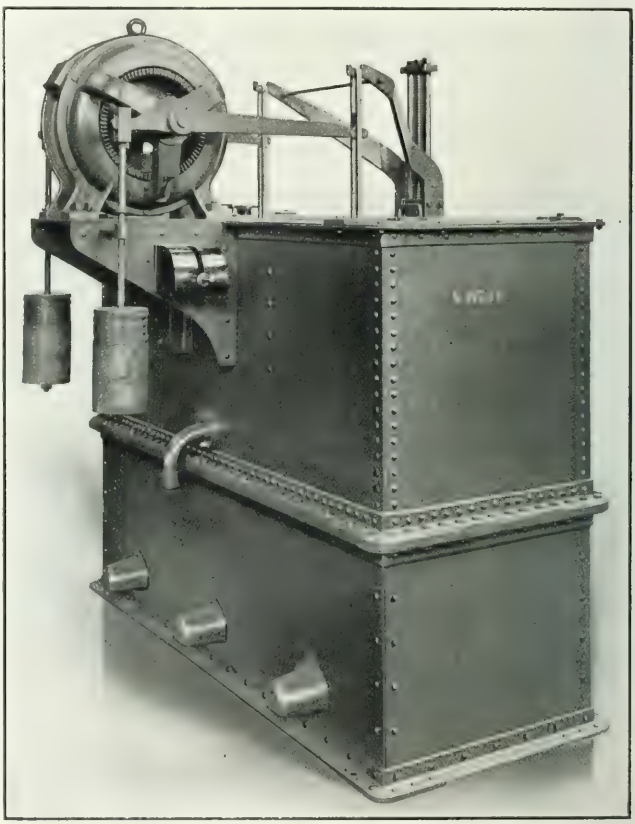


FIG. 5

Controllers and Safety Devices

The armature circuit has between the starting dynamo and the hauling motor an automatic maximum-current switchout, which when the current intensity exceeds a given (adjustable) maximum breaks the circuit, thus preventing damage to the machine. As the safety brake should operate when the current is cut out from the motor, a single-pole switch has been connected with the maximum switchout, in order to short-circuit the field of the braking magnet, thus disengaging the falling-weight brake. Another single-pole switch is arranged on the foundation plate of the maximum-current switchout in the armature circuit between the starting dynamo and hauling motor, which switch is removed before again inserting the maximum switch whenever this has been in action, thus avoiding any damage to the latter.

In order to stop the winding engine in case the controller for some reason cannot be used, an emergency switch operated by a crank and worm gear has been arranged in the neighborhood of the engineer's cab, by means of which the tension of the starting machine is reduced to zero within a few seconds, thus arresting the hauling motor. This switch is shown in Fig. 6.

Near the engineer's stand, Fig. 7, there is on a cast-iron column a double-side deflection ampere meter, a double-side volt meter, and a manometer. The engineer can thus tell at any time the current intensity, and the tension of the machine; the manometer indicates whether the working pressure required to operate the compressed-air brake is available.

Compressor

The compressor required for generating the compressed air used in braking is of the single-stage twin type, with a suction output of 18 cu.m. at a working pressure of 5.5 atmospheres. It is operated by a special rotary-current motor of about 5 h.p. output through a simple toothed-wheel gearing.

The compressor forces the air into a drum of about 2 cu.m. capacity from which the compressed air required for the two air cylinders of the hauling engine is drawn. The capacity of the drum is sufficient for several brakings. The air supply to the lifting cylinder for the falling-weight brake has been so designed as to cause the piston to drop whenever the air supply from the drum fails. The suction pipe of the compressor is automatically closed when a maximum pressure of 6 to 6.5 atmosphere is exceeded in the drum, opening automatically as soon as the pressure drops below about 5 atmospheres.

Switchboard

The switchboard for the Ilgner transformer comprises two marble panels mounted on an iron frame. All connections and safety fuses are located at the rear of the switchboard.

The right-hand panel includes the rotary-current instruments and apparatus and the left-hand panel the direct-curent appliances. The former comprises the two measuring instruments for the converter with their transformers arranged behind the switchboard, below which there is the handle of the high-tension oil switch. On the same panel are the single-pole high-tension safety fuses for the rotary-current motor driving the converter, three single-pole high-tension safety fuses for the transformer, reducing the tension from 3000 volts to 215 volts for the driving motor of the compressor, and a converter switch for the transformer of the auxiliary motor used in regulating the lag.

The direct-current panel has the volt meter and the ampere meter, in addition

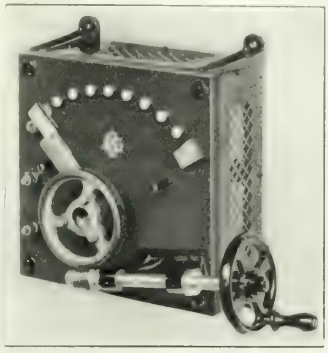


FIG. 6

to a double-pole switching lever with intermediary contact and spark extinguisher for the exciter machine of the transformer.

The compressor transformer, as well as the small transformer for the motor of the regulating device, is located behind the switchboard.

National Lead Company

This company's report for 1906 shows $20,750,000 common stock and $20,713,000 preferred stock issued. The net earnings for the year were $2,499,632; dividends paid —7 per cent. on preferred and 3 per cent. on common stock—were $2,015,406, leaving a surplus of $484,226. The balance from previous year was $3,554,596, making a total of $4,038,822. The report says: "In addition to the net earnings shown the company has an interest exceeding $600,000 in undivided earnings of other companies, which is reserved by them for working capital and other uses. The financial statement shows a healthy condition with no liabilities other than those in process of payment and an adequate working capital fully employed in our business. Sales of properties not in use resulted in a reduction of $191,036 in plant-investment account. Raw materials have continued to advance and are now at the highest point in the history of the company, but provision has been made in the inventory for any probable shrinkage in values. The efficiency of plants has been maintained by expenditures for repairs and maintenance aggregating $188,418, which was charged to the cost of operation. The aggregate volume of business done (expressed in tons) was slightly less than the preceding year, due to the rapid advance in prices and the reluctance of consumers to believe in their continuance. With the close of the year, however, orders for future business indicate an increased distribution."

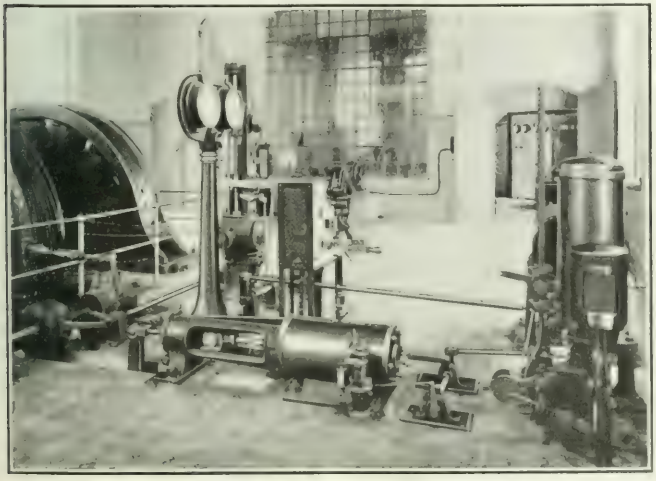


FIG. 7 ENGINEER'S STAND

Isle Royale Copper Company

This company owns a copper property in the Lake Superior region, which has been worked with varying success for a number of years. Its report is for the year 1906.

The mining report shows 192,210 tons of rock mined and stamped, from which was saved 4,076,509 lb. mineral, yielding 2,937,098 lb. refined copper. This shows an average of 15.3 lb., or 0.765 per cent. of copper, to the ton. The cost of mining and stamping was $1.53 per ton; of stamping alone, 27.25c. per ton.

The income account is as follows for the year:

	Total	Per Lb. Copper
Copper sold	$552,371	18.81
Interest, etc.	36,169	1.22
Total receipts	$588,540	20.03
Mine expenses	$441,357	15.03
Smelting, freight, etc.	64,174	2.19
Exploration work	72,462	2.47
Total charges	$441,370	15.03
Net earnings	$156,967	5.34

Adding $615,626 brought forward from previous year, made a total of $772,593 surplus.

Opening work for the year included 865 ft. shaft sinking, 6937 ft. drifting and 450 ft. crosscutting; a total of 8252 ft. The new ground opened was more extensive than in any year since 1901. Work was pushed in order to provide sufficient stoping ground. Work has been pushed especially on the new No. 2 shaft.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

The coal production of the State of Washington for 1906 was 3,290,523 tons, as compared with 2,846,001 tons for the year 1905, an increase of about 15½ per cent.

In horizontal drives it is advisable to have the slack side of the rope or belt on the top, so that it will embrace a greater angle of the pulley and thus give a firmer drive. When the belts or ropes are unduly tight, there results undue friction and wear on the brasses of the pedestals.

A masonry dam built underground to resist heavy pressure, should be recessed into the sides of the entry a distance not less than 3 ft. If bricks are used to construct the dam, they should be laid in concentric rings with a ½- or ¾-in. space between, which is filled in with pure cement. It is advisable to use only the hardest bricks and not mix sand with the cement, which latter should be quick-setting.

In building an anthracite coal bin, the following is the space required for the different sizes of coal:

10 tons (2240 lb.)	lump	393.0 cu.ft.
	broken	422.6 "
	egg	430.8 "
	large stove	434.9 "
	small stove	437.7 "
	chestnut	439.2 "
	pea	441.4 "
	No. 1 buckwheat	441.4 "
	No. 2 buckwheat	441.4 "
"	ordinary coke	814.0 "

Two kinds of air bridges are used in mines, overcast and undercast. The former is preferable to the latter for several reasons: If the mine makes water, it is out of the question to build an undercast, as the water might accumulate at the bridge, resulting in a decrease of the sectional area; it is liable to be filled with carbon dioxide when the ventilation is sluggish, besides, an undercast cannot be built so air tight as an overcast and also has the further disadvantage of collecting dust and small particles of coal, in time becoming choked.

The amount of water necessary to flush culm into a mine depends on the distance the material is to be carried and the slope of the pipe. When flushing to level and down-hill places, 1 lb. of culm requires about 1¾ lb. of water; if it is desired to flush up-hill or to workings at a hight from 25 to 100 ft. above the level of the shaft bottom, the weight of the water must be from three to six times as great as the weight of the culm. It should be borne in mind that when the flushed material is packed tightly into a chamber, and the roof pressure comes on, the culm will be compressed from one-third to one-fourth.

Burning coal dust is not generally practiced in the United States, but in Europe there are several arrangements on the market for burning powdered coal. The coal is ground in a mill and conveyed to the hopper or bin by means of a conveyer and is delivered into the furnace by a forced draft. The amount of fuel and quantity of air fed into the furnace are controlled by slides. The method of firing is an automatic stoker, together with forced draft; consequently, the combustion of the fuel is complete and smokeless. But the objectionable features of this system are the cost of grinding the coal to a fine powder, driving the fan and providing labor to keep the flues open, and the accumulation of ashes in a fine condition.

From an English source it is learned that a seam of coal 24 ft. thick has been reached at a depth of 580 yd. in South Staffordshire. It is estimated that with the new machinery installed it will be possible to raise 3200 tons per working day of eight hours, an output which, it is claimed, has never been reached from a single shaft in the history of mining. The work will be done by hydraulic lifts working subsidiary cages designed in a manner to embody a combination of the best English, American and German practices. Electricity will be used not only for lighting on the surface, but to some extent in the mines and for haulage purposes. Employment will be given to 1500 to 2000 miners. The new coal area is said to cover 2000 acres.

A ready rule for calculating the pressure exerted on a pipe by a column of water is to allow a pressure of ½ lb. per square inch for each foot in depth. If more accurate results are desired, we may consider that a column of water 1 ft. high exerts a pressure of 0.434 lb. per sq.in., therefore a column of water, say, 200 ft. high would exert 86.8 lb. pressure. Now, if we let d equal the internal diameter of pipe in inches, p equal pressure in lb. per sq.in., t equal thickness in inches, then for a 6-in. cast-iron pipe we have

$$t = \frac{d \times p}{5600} = \frac{6 \times 86.8}{5600} = 0.093$$

in. This result should be increased by at least 15 per cent. to provide a margin of safety.

For many years the United Kingdom produced more than one-half of the world's total coal output, and this exalted position as the largest coal producer was only relinquished to the United States in 1899. The total production of the United Kingdom since its earliest shipment has amounted to approximately 11,000,000,000 metric tons, while the production of coal in the United States since its earliest development in 1814, has totaled nearly 6,000,000,000 tons. In 1871, this country surpassed Germany, and in 1899, with a production of 230,000,000 tons, we exceeded the British output. Germany has steadily maintained its position as the third largest coal-producing country, and has increased its production from 26,000,000 tons in 18064 to 190,000,000 tons in 1906.

The most important things to be considered in furnace ventilation are the general arrangement and size of the furnace. This method of ventilation is prohibited in some States, especially in gaseous mines. In case the mine is gaseous and a furnace is employed the air feeding the furnace fire should be taken directly from the main air course. The return should be conducted through a dumb drift or an inclined plane connected with the air shaft at a point about 75 ft. above the furnace, so that the heat from the furnace gases will not be sufficiently hot to ignite the mine gas. The products of combustion from the furnace, if sufficiently mixed, render the mine gases inexplosive. If a dumb drift is not provided, the fresh air in a sufficient quantity should be allowed to mix with the return current so as to insure its dilution below the explosive point before it reaches the furnace.

When a wooden dam is used for stopping water in mines, it is important to see that every joint is wedged in from the back after the dam has been built. For this purpose, fir or pine wedges about 1 ft. long, 2 to 4 in. wide, and 1 in. thick, are best adapted. In filling the smaller joints, it is best to use small oak wedges 3 or 4 in. long. One consideration of much importance in building wooden dams, is to see that only dry wood is used both for building and wedging; the benefit results from the wood swelling when it gets wet, thus causing the joints to further tighten. The pipe placed at the bottom of the dam to permit the water to escape during construction, may be closed either by a wooden plug or a valve on the outer end. The latter method is preferable as it need not be closed until all the men are out and the large man-hole is plugged. A valve will also permit the water to be run off at any desired time.

George Otis Smith

George Otis Smith, who has just been appointed director of the United States Geological Survey, is a native of Maine and retains his legal residence in that State, having a summer home at Skowhegan. He was born at Hodgdon, Aroostook county, February 22, 1871.

He graduated from Colby college in 1893 and immediately joined a geological survey field party working on the Marquette iron range, Michigan. During the next three years he took a post graduate course in geology at Johns Hopkins University, spending one field season on the Marquette range, and another in reconnaissance work in the State of Washington. On his graduation with the degree of Ph.D. in June, 1896, he joined the United States Geological Survey as assistant geologist, having taken the first civil service examination held for that position.

GEORGE OTIS SMITH

As assistant geologist and geologist, Dr. Smith has worked in Michigan, Washington, Utah, North Carolina, the New England States, New Jersey, and Pennsylvania. For seven field seasons he was engaged in reconnaissance, and detailed surveys in Washington. In the course of this work he made a special study of several artesian basins, and the results were published as a water-supply paper. His experience in Washington included also economic work in the coalfields of that State, the results being published in a Survey report on the coalfields of the Pacific coast. In connection with a special reconnaissance along the northwestern boundary, and across the Cascade range, in 1901, the geologist was obliged to make a topographic map upon which to record his geologic observations, exact geographic locations being necessary in the course of the examination of the boundary monuments.

The results of Dr. Smith's investigations in Washington, in addition to the report on coal, were published by the Survey as a report on the rocks of Mount Rainier; in the Tacoma, Ellensburg, and Mount Stuart folios, in a professional paper on the geology and physiography of central Washington, and in a paper on gold mining in central Washington. In addition Dr. Smith contributed papers to the bulletins of the Geological Society of America, and to various periodicals; an article on the Mount Baker mining district, from his pen, appeared in this JOURNAL in 1902; the Clealum iron ores were described in a contribution to the "Transactions" of the American Institute of Mining Engineers, in 1901, and W. P. Jenney's paper on the mineral crest was discussed in the "Transactions," in 1903.

In 1900 the United States Geological Survey issued the Tintic special folio, in which Dr. Smith described the geologic structure of a famous Utah camp. An account of the occurrence and origin of the orebodies, the joint work of Dr. Smith and G. W. Tower, Jr., had appeared the year before, as a report on the geology and mining industry of the Tintic district.

After his western experience Dr. Smith began areal work in Maine, and later was assigned general supervision of all the Survey's geologic work in New England, and in the areas of crystalline rocks in New Jersey, Pennsylvania, and Maryland. While pursuing his investigations of the crystalline rocks, including the granites used as building stones, he made a special study of several minerals of economic value, including molybdenite. The 1905 production reports on mica, graphite and asbestos were prepared by him. Last July he was appointed geologist in charge of petrology with scientific supervision of the Survey work in that department.

In addition to doing geologic work Dr. Smith, during the past year, has served as chairman of a committee on accounting and bookkeeping, working under the direction of the committee on departmental methods, otherwise known as the Keep Commission. This has given him an opportunity to familiarize himself with the details of departmental administration, and at present he is chairman of the committee on business methods in the Geological Survey.

Dr. Smith is a fellow of the Geological Society of America, and a member of the American Association for the Advancement of Science, and the American Institute of Mining Engineers.

Metalliferous mining, other than for hematite iron ores, has been more active in the Cumberland district than for several years, says the *Chemical Trade Journal*. The chief products have been galena, zinc blende, barytes (sulphate and carbonate), with about five tons of tungsten ore, some antimony, and arsenical pyrites carrying nickel and cobalt. A number of abandoned mines have been reopened and others have increased their output.

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The Situation in Copper

Although the copper market is unsettled, and the future is uncertain, the facts as to the present situation are clear enough. The situation is decidedly reminiscent of January and February, 1906, although there are important differences. History never repeats itself precisely. At the end of 1905, the price for electrolytic copper had risen as high as 19c. per lb. In January, 1906, there was a slackening in the demand, and a recession in the price, which at first was conceded by the largest selling interests, but when the price reached 18 5/16c., these interests withdrew from the market, and held their copper firmly at 18½c., delivered, 30 days. In the meanwhile outside interests continued to sell copper, and the price declined to about 17⅝@17⅞c. About the end of February, demand started up again in an active way, and the price for copper rose quickly to the asking price of the large interests which had been holding aloof. They had correctly interpreted the situation, and by their firmness had prevented any large decline in the market.

The similarity in the present situation is that last month the price had risen to 25⅝c. for some lots, the highest daily average being 25⅜c. There was then a recession, which at first was admitted by everyone, but after a while, the same interests which upheld the market in 1906, decided to make a stand at 25c. (25¼c., delivered, 30 days). In the meanwhile, other interests have offered copper much lower, and sales have been made between 24 and 25c., although their volume has not been large. The recession has been due, of course, to the absence of buyers from the market. It is true that they have largely provided for their consumption up to the end of June, but it is equally true that for many months past, they have been buying a long way ahead, and their present cessation must have a cause. Unquestionably the cause has been partly the tremendous decline in the London market for standard copper, irrespective as to what may have been the causes for that decline.

The chief copper market of the world is New York, but New York is not absolutely independent of London under all conditions. It is evident that the price at London cannot remain on the basis of 20c. for standard, and a level of 24 to 25c. be maintained at New York, because at such disparity, American refiners can buy standard in London, import it into the United States for refining, and sell cheaper than our current quotation. If the decline at London be due merely to manipulation, buying for consumption will quickly elevate the price again. It is the fact that such has not yet occurred, which causes American consumers to be cautious. Another ground for caution is possibly a falling off in the demand for manufactured copper, as to which, however, there is great difference in opinion. It is the latter which creates the uncertainty as to the future. If there be no falling off in business, the demand for consumption, as soon as confidence is restored, will put prices back to where they were a month ago. If, on the other hand, there is being actually a contraction in business, the asking price of 25c. per lb. cannot long be maintained. It is therefore a question now, as it was in the early part of 1906, as to who is correctly interpreting the prospects of business in general. It is not too optimistic to say that the outlook is in no way gloomy. If there is to be a contraction in business, it appears unlikely to be of serious character.

The Utilization of Black Sand

We have several times referred in a complimentary way to the investigations of the U. S. Geological Survey, conducted under the direction of Dr. David T. Day, upon the utilization of the black sand of the Pacific coast, but while recognizing that those investigations have shown how the valuable metals contained in the black sand may be separated, we have pointed out that the greatest problem, namely the economical collection of the black sand, has not yet been satisfactorily solved. In fact, very little consideration has been devoted to that important matter. It was, perhaps, considered to be outside of the scope of the investigation conducted by the Geological Survey to enter into a problem which is so distinctly of an engineering character. Perhaps a further step in the development of this industry can be taken by the inauguration of a discussion in the columns of the JOURNAL. We shall be glad if our readers who are interested in the matter, which we are able to indorse as one that promises to be

important, will contribute their views and the results of their experience.

We are aware of the patenting recently of various forms of riffles for sluice boxes, undercurrents, dredges, etc., all having in view the collection of black sand and associated heavy minerals as a by-product. Several of these devices have already been installed. At one place, over 1200 tons of black sand was saved and is now being successfully treated by concentration. At one dredge many tons were collected. At this particular dredge the daily operating expense was $70. It was discovered that the operators were deliberately washing away material to the value of nearly $100 per day. There is no doubt if all placer miners and dredge operators will pay attention to the saving of their black sand, which in most cases is feasible and practicable, there will be a considerable increase in the platinum production of the United States to the advantage, not only of the producers, but also of the consumers, the latter being indeed the prime movers in securing the recent black sand investigation. // It is now possible to amalgamate platinum with gold and easily remove the platinum from the amalgam without separating the gold from the amalgam. // There are cases where the platinum content of bullion is valuable, but the producers get nothing for it, although the value of platinum per ounce is more than half as much again as that of gold.

There are many places on the Pacific coast where black sand exists in large quantity. At many localities gold and platinum are present in it in appreciable quantity, but most of the places where they occur are so exposed to storms and other unfavorable conditions, as to power, accessibility, etc., that it would be unwise to attempt to operate. On the other hand, there are some occurrences on the shores of land-locked bays where operations would be comparatively easy. A correspondent who has devoted some attention to this matter wrote us recently as follows: "I have personally dug pits near low-tide points in which the gold fairly glistened, but it would require dredges, steam shovels, elevators and general hydraulic operations. One place was so attractive that I located two miles of it. In another place I found a 6-in. streak for two miles, which averaged 13 oz. of gold per ton, together with some platinum."

The subject is a fascinating one. To sum up, it may be stated that at present there is no difficulty in making a high extraction of the gold and platinum content of black sand by comparatively simple means, but in general the black sand is so widely scattered that its economical collection for treatment at suitable points and the methods to be employed are doubtful. It is upon those points that further light is required. In the interest of the industry in general, we hope that our readers, especially those who are experienced in placer mining and dredging, will offer their suggestions.

Production of Spelter in 1906

The production of virgin spelter in the United States in 1906 was 225,494 short tons, that figure being the total of reports received from all the producers. In the JOURNAL of January 6, 1907, we reported the production in 1906 as having been 225,395 tons, which figure was based on reports from the producers, with their own estimates of probable production during the last 10 or 15 days of the year. The close agreement of the two reports shows how accurately the early statistics can be compiled. The details of the production in 1906, compared with 1905, are as follows:

PRODUCTION OF SPELTER IN UNITED STATES
(In tons of 2000 lb.)

States.	1905.	1906.
Colorado	6,599	6,260
Illinois	45,357	48,238
Kansas	114,948	129,741
Missouri	11,800	11,088
South and East	23,044	30,167
Total	201,748	225,494

The above statistics include only virgin spelter, i.e., spelter produced from ore. There is an additional production of several thousand tons per annum in the United States from the re-smelting of galvanizers' dross and other waste products. Some of these are converted into spelter of very good quality. Also there is a considerable exportation of dross to the European smelters. A more detailed report of the production and consumption of spelter and zinc ore in the United States in 1906 will appear in an early issue of the JOURNAL.

The Production of Copper in 1906

We have received this week the annual report of Henry R. Merton & Co., Ltd., of London, giving the production of copper in the world in 1906. The total is 711,675 long tons, against 682,125 long tons in 1905, the increase being scarcely 4½ per cent. For the United States, the statistics reported in the JOURNAL of Jan. 5, 1906, viz., 915,000,000 lb. are adopted. We hope to be able to publish before the end of this month our revised statistics. We may say now, however, that although they will probably be a little larger than our preliminary report, the change will be comparatively immaterial.

Among the principal copper-producing countries, Australasia, Canada, Japan, Russia, and Spain-Portugal showed important increases in 1906. Chile, Mexico, and Germany showed decreases. It is interesting to compare the statistics of Henry R. Merton & Co., with those which have been previously published. Aron Hirsch & Son, of Halberstadt, Germany, have reported the copper production of the world as 736,711 metric tons in 1906, while James Lewis & Son, of Liverpool, in the earliest estimate published, reported 730,000 long tons.

The New Director of the Geological Survey

The new director of the Geological Survey, Dr. George Otis Smith, whose appointment is announced this week, is one of the younger members of the Survey in point of age, though he has a record of 14 years of continuous active service. During that time he has worked in many parts of the country, chiefly in the East, though his contributions to the literature of the Survey include monographs on Washington and on the Tintic district in Utah.

He brings to his work as director the qualifications of a record of good executive ability in subordinate positions, and a reputation as a keen, alert observer. Moreover, he has had recently special opportunities of studying closely the methods and organization of the Survey. While he is only 35 years old, with his reputation still largely to be made, he is well equipped for the work before him. The Survey will have in him an active and ambitious director, who has every opportunity to stamp the mark of a strong personality on its future work.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

The Location of Reduction Works

Herbert Lang has, in your issue of March 23, set forth the advantages of the level as compared with the terrace site for smelting works. In a paper in Trans. A. I. M. E., Vol. XXVI, p. 389, I advocated the use of the flat site, and my contention was farther supported by Henry A. Vezin, in the discussion of the paper, who summarized the advantages as follows:

(1) The cost of the works is smaller.

(2) The arrangement can be made more convenient, as the lay of the ground does not compel placing the different buildings or departments in a certain predestined order so as to obtain the fall required.

(3) Every square foot of the ground may be at will alternatively the equivalent of an inferior and superior terrace to every other, and, hence parts of a works, that on a terrace site must be far apart in vertical distance, can on a level be placed side by side.

Not a Parallel Case

So far as the iron blast-furnace is concerned, it must be remembered that the stock is raised 100 ft. vertically, prohibiting practically the use of trestles to deliver at the tunnel head, while the corresponding distance from slag to charge-floor in copper smelting need be no more than 12 to 20 ft. Again, many of the iron furnaces, depending upon lake ores are stocked up at the beginning of the winter with a six months' supply, which needs plenty of yard room and special provision for the rehandling of ore, fluxes and fuel.

Mr. Lang has in view the design of plants to handle material up to 1000 tons daily, and for such the level site may be considered the most advantageous. When, however, we arrive at conditions where it is cheaper to use the industrial locomotive, many of the objections to the side-hill site fall away, since it is then possible to return by practicable grades to any higher level, using the mechanical force of the locomotive, where by hand it would be practically impossible.

At the Washoe plant of the Anaconda Copper Mining Company, when I asked Mr. Mathewson, the manager, what he thought of the side-hill location, he replied that for their conditions the sloping or side-hill site was better. At this plant, as described in my paper (*Bimonthly Bulletin A. I. M. E.*, July, 1906, and in a recent pamphlet isued by that company) 13,000 tons of materials are daily handled by compressed-air locomotives with certainty and despatch, and where any desired materials, such as slimes or flue-dust, are readily returned for retreatment. Not only this, but extensions of the present buildings have been put in without crowding the plant.

Other Conditions to Be Considered

On the other hand, I have in mind a recently constructed side-hill plant of capacity sufficient for 400 tons of ore daily. With a difference of level of 120 ft. the slag is yet returned by an elevator to storage bins for resmelting. Excavation and retaining walls added much to the cost of the plant, and yet the gravity idea was not fully caried out; in fact the plant lacked the advantages urged by Vezin as cited above.

In concentrating mills the centrifugal pump is freely used for returning the pulp or tailing for retreatment. Both in the copper country of Lake Superior and in South Africa tailings wheels of large diameter are employed to dispose of the tailings of large plants. In the cyanide practice of South Dakota the pulp from the stamps is elevated as fast as made, and delivered at a higher level to launders which discharge to classifying cones.

In many cases about stamp mills, where gold or silver ores are treated, it would be much better if the heavy rock-breakers were placed upon the ground, and the ore, crushed during the 10-hour day shift delivered to the storage bins which feed the stamps. Even the product of the stamps, after passing over the amalgamating plates, could well be elevated to classifiers by centrifugal pump before going to concentrating tables, as at the cyanide annexes to stamp mills now coming so much into use.

In other words, elevating and conveying machinery has been so perfected that it may be, and is, freely used about reduction works, and at a very low cost per ton for moving materials. At the Garfield plant, Utah, and at Cananea, mechanical methods have been happily installed. At these places the troughed conveying belt is used for delivering materials from the sampling mill to the storage bins or piles. Long bins or stock piles are filled by traveling trippers, so that the entire lot is throughout of uniform constitution, and thus uniform operation of the furnaces is assured. Philip Argall, in designing and erecting the Golden Cycle cyanide mill at Colorado City, has carried out the same ideas for the regular storage of ore.

Slag for Mine Filling

Mr. Lang's idea of using slag blocks for mine filling, it seems to me, would hardly work out. Even with care in casting and tempering, by quickly covering with dirt, they are likely to split and break in handling. Those of us who have had to handle slag a good deal, have had more or less to do with making slag blocks and slag squares for paving the ground near the furnaces, but except for slag floors have generally given it up.

L. S. Austin.

Houghton, Mich., April 6, 1907.

Mine Explosions and Atmospheric Pressure

With reference to your recent articles on this subject, it may interest some of your readers to know that a similar correspondence between barometrical pressure and the emission of gases has been observed in metalliferous mines. In Gilpin county, Colo., there is a considerable area in the east-central part of the principal producing district, in which many or all of the mines are troubled at times by a heavy colorless gas, which consists in part or entirely of CO_2. This gas appears to be stored in the country-rock as well as in the veins, and sometimes issues under considerable pressure. The country is gneiss, and neither it nor the veins contain any large percentage of carbonate minerals; siderite occurs occasionally, but is by no means common, nor is it at all characteristic of the mines where the gas is found.

In investigating the cause of an accident at the Brooklyn mine, in this area, some 11 years ago, my brother, the late Arthur L. Collins, made a series of observations which clearly demonstrated that the periods when the rate of flow of the gas in that mine was greatest coincided with periods of low barometer. His observations were embodied in a note contributed to the Proceedings of the Colorado Scientific Society for 1898; and were afterward confirmed by a series of experiments of my own in other mines.

I have recently observed what appears to be an illustration of the same principle in the behavior of acetylene lamps. In the Newhouse tunnel, at Idaho Springs, we are using lamps of the Wolf type.

happening to be near the face of the tunnel recently while blasting was going on in one of the laterals, at a distance of nearly 1/4 of a mile, my lamp was as usual extinguished by the concussion. Relighting it with a candle flame, it was immediately re-extinguished; but without the candle flame being in the least affected. Keeping the latter close to the lamp, and re-lighting it each time it was extinguished, this was repeated at least a dozen times. Even after it ceased to be extinguished, the flame could be observed to "dip" at regular intervals. Evidently this was not due to any direct movement of the air, for the acetylene lamps are infinitely less affected by air-currents than a candle-flame. I attribute the effect observed, which I have since often repeated, to pressure waves following the explosion; transmitted either through the rock, or through the air in the drifts. As each little wave of compressed air (and they follow one another at intervals of not over a second) reaches the acetylene lamp, it momentarily arrests the emission of gas from the carbide in the generating chamber, so extinguishing the flame.

Similarly, I take it, the pressure of the air in times of high barometrical reading temporarily arrests the emission of gas from rock or coal, to be correspondingly released when the pressure is lessened. .

I am of opinion that in districts which are troubled with these outbursts of noxious gases every mine should be furnished with a recording barometer; and that it should be the duty of the shift-boss to consult the readings daily before each shift of men goes below.

GEORGE E. COLLINS.

Denver, Colo., March 30, 1907.

Increase of Moisture Shipped in Sealed Cars

The trouble with moisture in coke met with by your correspondent may be due to some extent at least to the action of the well known natural law that the surface tension between solids and liquids diminishes with rise of temperature, as everyone has experienced who has held an apparently dry cloth before a fire and noticed how damp it seems to get. Of course the moisture is equally present in both cases, but is not apparent to the touch in the normal condition, being too firmly bound in the interstices of the material.

In the case of such an exceedingly porous body as coke the phenomenon would show itself markedly, and coke shipped "dry" in higher latitudes might be dripping wet on arrival in Mexico, and yet the moisture content as ascertained by analysis be practically the same.

Some of the facts mentioned by your correspondent appear to point to an explanation of this kind, such as the influence of the seasons and of the physical characteristics of the coke, and although various tests have been made, including moisture analyses, they do not seem to me to have been very well directed. Coke shipped warm, with 1 per cent. moisture, would be cool before leaving the cold belt, and consequently condense all the moisture it could take up at that temperature, to liberate it again higher up the thermometer, the sealing of the car, unless absolutely hermetical, not preventing the admission of water in the state in which it normally exists in air, as a gas and subject to the gas laws, but hindering its subsequent evaporation as a liquid.

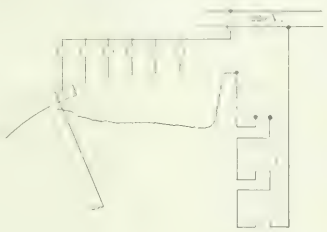
On a rough calculation for 14 per cent. moisture, your correspondent's theory would require that the coke should be about one-third metallic iron.

R. T. HANCOCK.

School of Mines, Camborne, Cornwell, Feb. 25, 1907.

Electric Indicator for Water Tanks

In the description of "An Electrical Indicator for Water Tanks," in a recent number of the JOURNAL, there is an evident error in the cut showing the electrical connections to the device. The indicating instruments (ammeters) are shown connected in multiple with the lamps and with the 220-volt supply. These indicators should be shown in series with the branch of supply circuit which furnishes current to the lamps, as shown in the accompanying sketch. EUGENE BETTS.



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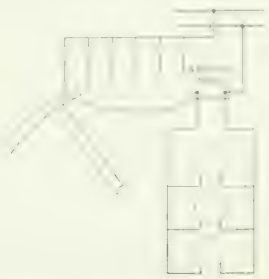

ARRANGEMENT FOR SHUNT AMMETERS

Nashville, Tenn., March 7, 1907.

Storage of Tailings for Future Handling

There are in various parts of the American continent and also in South Africa, dumps of tailings, varying from a few thousand tons to well over a hundred thousand tons, which have, by the method of storage employed, been rendered valueless, or at least, much less valuable than should have been the case. To take a concrete example: a certain wet-crushing mill crushes a free-milling gold ore, the average value of the mill tailings being 1¾ dwt. These tailings, considered as a whole, are, under existing local conditions, too lean to work at a profit. The tailings consist of about 40 per cent. slimes assaying 1 dwt. per ton, and about 60 per cent. good leachable material, assaying 2¼ dwt. per ton.

If these tailings were separated by suitable classifier into low-grade slimes and relatively high-grade sands, the slimes would be almost certainly of no value, while the sands at 2¼ dwt., if in condition to be treated, would be an asset at any time. But all the tailings are commonly run into one dam without any attempt at classification, other than that which is the natural result of a tendency on the part of the coarser and heavier material to deposit at the head of the dam. In this and similar cases, either the sand or the slimes taken separately might have been a valuable asset had the proper classification been effected as the tailngs, carried by water, left the mill.

Another striking example was a case in which a clean, free-milling quartz ore yielded to ordinary plate amalgamation all except a shade over 1 dwt. per ton. A mechanical analysis of the tailings showed that practically 50 per cent. of the total gold was located in that coarser portion constituting about 10 per cent. by weight of the total tailings. This coarser and richer portion could easily have been separated by hydraulic classification, or other means, during the passage of the tailings from the mill.

Whatever may be the character of the tailings, the necessary classification can generally be carried out with greater ultimate profit concurrently with the milling. If this is not done the product will be valueless or, at best, the tailings will be treated at a greater cost or with unsatisfactory recovery.

These remarks apply more especially to gold or gold-silver tailings, but they are no doubt also applicable to tailings from other ores.

H. T. DURANT.

Bulawayo, Rhodesia, Feb. 9, 1907.

The Brazilian Government is about to levy a heavy export tax upon monazite sand, says the *"London Engineer,"* which will effect the incandescent gas mantle industry.

New Publications

Because of a series of unforeseen contingencies, especially in connection with the revision of the proofs and an accident to the engravings, the publication of "Mine Timbering" by Messrs. Saunders, McDonald, Parlee, and others, which was announced last fall, has been unexpectedly delayed. We make this announcement in view of the large number of inquiries as to the whereabouts of this book. The large number of subscribers who have sent in advance orders for it are requested to have a little more patience, with our assurance that everything possible is being done to make publication without any unnecessary delay.

SCHOOL OF MINES OF COLORADO, QUARTERLY, VOL. I, No. 2. Catalog Edition. Pp. 148. 6x9 in.; paper. Golden, Colo., 1906-1908: School of Mines.

DIE TURBINEN FUER WASSERKRAFTBETRIEB. By A. Pfarr. 2 vols., pp. 819; 46 plates, 496 figs. 7½x10½ in.; cloth, 36 marks. Berlin, 1907: Julius Springer.

NEW ZEALAND MINING HANDBOOK. Edited by P. Galvin, Secretary Mining Bureau. Pp. 589; illustrated. 5½x8½ in.; cloth. Wellington, New Zealand, 1905: John Mackay, Government Printer.

SYNOPSIS OF MINERAL CHARACTERS ALPHABETICALLY ARRANGED FOR LABORATORY AND FIELD USE. By Ralph W. Richards. Pp. 99; illustrated, 4½x6½ in.; leather, $1.25. New York, 1907: John Wiley & Sons.

MINERAL RESOURCES OF THE UNITED STATES. CALENDAR YEAR 1905. David T. Day, Chief of Division of Mining and Mineral Resources. Pp. 1403. 6x9 in.; cloth. Washington, 1906: Government Printing Office.

IOWA GEOLOGICAL SURVEY, VOLUME XVI, ANNUAL REPORT, 1905, WITH ACCOMPANYING PAPERS. Frank A. Wilder, State Geologist; T. E. Savage, Assistant State Geologist. Pp. 673; illustrated, including numerous maps. 7½x10 in.; cloth. Des Moines, 1906: Iowa Geological Survey.

PEABODY ATLAS. Shipping Mines and Coal Railroads in the Central Commercial District of the United States, Accompanied by Chemical, Geological and Engineering Data. By A. Bement. Pp. 149; illustrated; 17x18 in.; cloth, $5. Chicago, 1906: Peabody Coal Company.

THE GEOLOGY OF FALMOUTH AND TRURO OF THE MINING DISTRICT OF CAMBORNE AND REDRUTH. By J. B. Hill and D. A. MacAlister, with petrological notes by J. S. Flett. Memoirs of the Geological Survey, England and Wales. Pp. 257; illustrated. 6x10 in.; cloth, 7s. 6d. London, 1906: Printed for His Majesty's Stationery Office by Wyman & Sons.

HANDBOOK OF MATHEMATICS. By J. Claudel. Translated from the seventh French edition by Otis Allen Kenyon. Pp. 708. 6x9 in.; cloth, $3.50. New York, 1906: McGraw Publishing Company.

This book treats of arithmetic, algebra, geometry, trigonometry, analytic geometry (conic sections, etc.), and differential and integral calculus. The larger part of the material has been taken from Claudel's "Introduction à la Science de l'Ingenieur," which has had a remarkably large sale in France. The translator has added a little material relating especially to American weights and measures, etc. Certainly it was a good idea to combine in one book a series of treatises on all the common branches of mathematics, prepared on a uniform system and simplified by cross-references, and we predict for the American translation a wide field of usefulness and a high measure of appreciation.

RELAZIONE SUGLI STUDI E LAVORI ESEGUITE DAS 1897 AL 1905 (con un Album di N. 74 Tavole). Società Italiana per de Strade Ferrate del Mediterraneo. Two volumes. Pp. 382; illustrated. 12x16 in.; board covers. Toma, 1906: Premiata Tipografia d. Squarci.

The two large volumes contain a description of the engineering details connected with the building of the railroads named, including excavation, grading, bridge construction, etc. The text is profusely and beautifully illustrated with photographs, working drawings of bridges and machinery, and with colored maps and sections showing the geological structure of the territory pierced by tunnels. The details of driving a number of tunnels, mostly in rock, but also in soft ground, are given in full. The official specifications of the Italian Government for railroad bridges are also given.

HENLEY'S TWENTIETH CENTURY BOOK OF RECIPES, FORMULAS AND PROCESSES. Edited by Gardner D. Hiscox. Pp. 787; 6x9 in.; cloth, $3. New York, 1907: The Norman W. Henley Publishing Company.

This book is a collection of what its title indicates. It is a highly varied assortment, beginning with acid proofing, ending with zinc ointment and including such different subjects as the compounding of beverages and the manufacture of artificial stone. The editor modestly hopes that his recipes and formulas will give satisfactory results, inasmuch as he has carefully selected them from trustworthy authorities, but he honestly paves the way for possible disappointments. We are disposed to think that users of the book will encounter many of the latter, yet we have no doubt that it will prove a valuable reference, sometimes yielding much information that is exactly what is needed and sometimes furnishing ideas that will be worth while.

HYDROMETALLURGY OF SILVER, WITH SPECIAL REFERENCE TO CHLORIDIZING ROASTING OF SILVER ORES AND THE EXTRACTION OF SILVER BY HYPOSULPHITE AND CYANIDE SOLUTIONS. By Ottokar Hofmann. Pp. 345; illustrated. 6x9 in.; cloth, $4. New York, 1907: Hill Publishing Company.

Contents: Theory of chloridizing roasting. Crushing of the ore. Percentage of salt required. Loss of silver by volatilization. Methods of roasting. Consumption of fuel. Reverberatory furnaces worked by hand. Mechanical roasting furnaces. Collecting flue-dust. Sulphate roasting. Chloridizing of argentiferous zinc-lead ore. Chloridizing of calcareous ores. Lixiviation with sodium hyposulphite. Precipitation of silver. Treatment of the precipitate. Construction of troughs. Trough lixiviation. The Russel and Kiss processes. The Augustin process. Extraction with sulphuric acid. The Ziervogel process. Treatment of silver ores rich in gold. Cyanidation of auriferous silver ores.

The scope of this important work is clearly indicated by the above enumeration of its contents. Its distinguished author needs no introduction to the metallurgists of the world. He is recognized as the leading authority on the subject whereof he writes in the present work. A large part of the development of the extraction of silver by hyposulphite lixiviation as a modern process is due to him, and in the practice of the art there is probably no metallurgist who has had so extensive an experience. His present contribution to technical literature is largely a record of that experience, which makes it rank among that rare class of books by authors who tell chiefly about the things that they have actually done.

The lixiviation of silver by means of hyposulphite solution is not now so important a metallurgical process as it used to be, although it still finds considerable application. It is a good process for many kinds of ore, which appears to have fallen recently into an unmerited neglect. However, the hydrometallurgy of silver has recently attracted renewed attention through the application of the cyanide process to the treatment of silver ore, and the appearance of Mr. Hofmann's work, which treats of that subject at considerable length, is consequently timely. It is possible that a combination of hyposulphite and cyanide lixiviation will be found to be the best treatment for many kinds of ore. If the present treatise directs attention to that subject, it will serve a useful purpose. The book is one that most metallurgists and chemists will want to have in their libraries.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Leo von Rosenberg, of New York, is in Prescott, Arizona.

F. H. Minard left Denver for New York a few days ago.

G. D. Doveton has returned to Denver from El Oro, Mexico.

W. C. Russell has returned to Tonopah, Nev., from a business trip to New York.

R. L. Lechner, of New York, spent a few days in Butte, Mont., recently on mining business.

Dr. R. A. F. Penrose, Jr., of Philadelphia, has gone to South America on professional business.

W. H. Paul is now manager of the Dolores Mines Company, San Isidro, Chihuahua, Mexico.

Hudson H. Nicholson passed through Denver recently on his way from Goldfield, Nev., to Chicago.

H. W. Hardinge was in Denver a few days ago on his way from Mexico and Arizona to New York.

G. Lavagnino, of Salt Lake City, was in Denver last week and left there for his home at Pasadena, California.

Theodore E. Schwarz returned last week to Denver, Colo., from New Mexico, and leaves again this week for Leadville.

James W. Neill, consulting engineer for the East Butte Company, who lives in Pasadena, Cal., has been in Butte on business.

Dr. Shadwell, a British economist, has sailed from Liverpool to report on Canadian industrial conditions for the London Times.

E. C. Engelhardt, superintendent of the Hercules Gold Mining Company, of Deadwood, S. D., spent a few days in Denver last week.

James Epperson has been reappointed State inspector of mines of Indiana. His appointment was opposed by the United Mine Workers.

William Parnell, formerly superintendent of the Tamarack mine, but now of Denver, Colo., has been in the Lake copper country.

Walter Harvey Weed, of New York, who has been in Arizona on professional business, is expected to return to New York this week.

Charles M. MacNeill, president of the Utah Copper Company, has been in Utah making an inspection of the properties of that corporation.

Prof. J. E. Spurr is in Leadville, Colo., making a special geological examination of the conditions in the Leadville basin, down-town section.

Aug. Mathez, of Denver, has lately been examining property in Summit county, Colo., and is at present in Wisconsin on professional business.

J. D. Irving, of Lehigh University at Bethlehem, Penn., is at present in Leadville, Colo., securing data for a monograph on that district.

Edwin E. Chase returned to Denver recently from the Cœur d'Alene and Black Hills districts, and left there again for New Mexico and Arizona.

Silas W. Eccles, vice-president of the American Smelting and Refining Company, is making an inspection of the Utah and Nevada properties of that corporation.

R. A. Varden, of the firm of Bambridge, Seymour & Co., has returned to London after a visit to various mining fields in South America, extending over 12 months.

W. H. Linney, manager of the Nipissing Mining Company, Ltd., at Cobalt, Ont., has resigned. He has been in charge of operations since the company was formed.

William F. Gordon, general manager of the Mistletoe Mining Company and Magdalena Tunnel Company, is now at Magdalena, N. M., where he will remain for several months.

Right Hon. James Bryce, British ambassador to Washington, while in Canada last week visited the Geological Survey at Ottawa and displayed a thorough knowledge of geological matters.

Evans W. Buskett, formerly metallurgist at the zinc oxide works, at Coffeyville, Kan., is now connected with the Mineral Point Zinc Company, at Joplin, Mo., in its ore-buying department.

George Otis Smith, it is announced, has been selected for the office of director of the United States Geological Survey, to succeed Charles D. Walcott, now secretary of the Smithsonian Institution.

Eli T. Conner, recently with the Pennsylvania Coal and Coke Company, at Cresson, Penn., is now general manager of the New River Collieries Company, with office at Thurmond, West Virginia.

William Shovell, formerly of Butte, Mont., and for some time superintendent of the Big Master gold mine, Manitou lake, Ont., has been appointed superintendent of the Columbus mine at Cobalt, Ontario.

Charles C. Christensen, for 28 years mechanical engineer in the mining machinery department of Fraser & Chalmers and the Allis-Chalmers Company, will remove his office on May 1 from Chicago to West Allis.

Fred S. Eaton has been appointed chief clerk of the Calumet & Hecla mine, succeeding the late J. H. Lathrop. Mr. Eaton has been cashier of the mine for a number of years. Harry Harper will succeed Mr. Eaton.

Dr. Reginald A. Daly, geologist for the Canada International Boundary Commission, has been offered the professorship of physical geology at the Massachusetts Institute of Technology, in Boston, and has accepted the position.

Dr. Ellis, of the Canadian Geological Survey, has returned from a three-months trip to the West Indies, where he made a study of the oilfields and asphalt deposits in Trinidad and Barbadoes, as well as the sulphur deposits on the Dutch island of Saba.

James MacNaughton, general manager of the Calumet & Hecla, and James B. Cooper, superintendent of smelters, have been attending the session of the United States court at Grand Rapids, Mich., in the Calumet & Hecla-Osceola controversy.

E. E. Hoffman, of Portland, Oregon, is considering bringing an exhibit to illustrate the progress of mining in the Northwest to the Jamestown Exposition with a view of familiarizing the East with the present state of mining development in that territory.

John Hammell, of New York, who has for some months been prospecting in the Elk lake country in Ontario, where he located a number of claims, is leaving with a party to look for gold in the region beyond Lake Abitibi and the Hight of Land, on and near the Quebec border.

H. D. Richardson has resigned his position as assistant superintendent at the Nipissing mines, Cobalt, Ont., where he has been for the past year, to look after the development of some property in which he is interested in Idaho. His address will be Boise, Idaho, after May 15 next.

Henry C. Schmidt has resigned his position as superintendent of Minas Dolores y Anexas plant of the American Smelters' Securities Company, at Matehuala, San Luis Potosi, Mexico, to take the position of superintendent of mines for the National Metallurgical Company of the same place.

Obituary

Thomas Palmer, a pioneer of the iron industry of Cleveland, Ohio, died in that city March 16. He was born in England and on coming to America in 1855, was employed by Cooper & Hewitt, becoming superintendent of the plant at Trenton, N. J. In 1865 Mr. Palmer went to Cleveland and operated the old Butterfly iron mill; later he was made superintendent and manager of the Cleveland Rolling Mill Company, at Newburg, in which capacity he remained until his retirement 10 years ago.

Jacob Reese, for many years a prominent figure in the Pittsburg iron trade,

died March 20 at his home in Sharon Hill, Philadelphia, aged 82 years. He was a prolific inventor, having taken out over 200 patents in connection with the manufacture of steel and iron. With his father he is said to have made the first iron by the boiling process in this country. The universal mill is also credited to him. One of his patents covered the basic process, but it was not commercially developed by him, this being due to the subsequent exploitation of the same field by Thomas and Gilchrist, in England. In many other matters he anticipated improvements in iron and steel processes, being in advance of his time. He was actively engaged for many years in the operation of rolling mills at Pittsburg, his firm of Reese, Graff & Woods occupying a leading position in the trade. He was also connected with other manufacturing enterprises.

Societies and Technical Schools

American Water Works Association—Notice is given that the twenty-seventh annual convention will be held at Toronto, Ontario, June 17 to 22, instead of June 11 to 14, as at first announced.

McGill University—On April 5 the McDonald engineering building of this institution at Montreal was destroyed by fire, the cause of which is unknown. The loss is complete, only the walls being left. The building, which was completed in 1893, was one of a group, which includes the Physics, the Chemistry and Mining buildings. It was erected, equipped and endowed by Sir William C. MacDonald. Beside numerous lecture rooms, students' rooms, and departmental library, and a large technical museum, which contained the Reauleux collection of kinematic models, believed to be the most complete in America, the building contained large and thoroughly equipped electrical and magnetic laboratories, dynamo rooms, lighting station, and laboratories of mathematics, dynamics, mechanics, geodesy and thermo-dynamics. The building and its equipment when it was opened represented an outlay of $484,646. Since then considerable additions have been made to its contents. There was $320,000 insurance on the property. Several of the professors lost private libraries, papers and other valuables.

Industrial

The office of Way's Pocket Smelter Company has been removed to the Merchants' Trust building, Los Angeles, Cal., with George H. Parker in charge. The factory will remain at South Pasadena for the present.

The National Wood Pipe Company, Los Angeles, Cal., is moving into new [illegible] quarters in the Equitable Savings Bank building in that city. The San Francisco office has been removed to the Hansford building, Market and Davis streets.

The Cyclone Drill Company, of Orrville, Ohio, recently shipped one of its combined core and hollow rod drilling outfits to Wm. Gelder & Co., of New York, for prospecting their property at Tonopah, Nev., and a duplicate outfit to O. W. Dunlap, Carlsbad, N. M., where a large mineral property is to be developed.

The Witte Iron Works Company is completing a new factory of steel, brick and stone construction at Sixteenth to Seventeenth streets, Oakland to Eastern avenues, Kansas City. The new factory has 60,000 sq.ft. of floor space and is equipped with the best machinery. The company owns its own supply of natural gas and water, and has provided its own independent electric lighting plant, telephone service, etc. The new works are situated on the Missouri Pacific and Kansas City Southern railroads and are only 30 minutes by street-car line from the center of Kansas City. The new plant has been necessitated largely by the expansion of the business of the company in the manufacture of gasolene mining hoists.

The German-American Portland Cement Company, of La Salle, Ill., whose plant is equipped throughout with Allis-Chalmers cement making and electrical machinery, recently ordered two additional 5x22 ft. Gates tube-mills, and a special Allis-Chalmers induction motor which will operate geared to the tube mill, at a speed of 660 r.p.m. The Sydney Cement Company, engaged in the manufacture of slag cement in Sydney, N. S., has recently purchased a set of Allis-Chalmers crushing rolls, 26x15 in., as an addition to its present equipment. The new rolls are designed to reduce the granulated slag from 8 to 30 mesh, and will have an approximate capacity of 3 to 4 tons an hour when operating at a speed of 125 r.p.m.

About six months ago the Electro Metallurgical Company was incorporated and began the manufacture at Niagara Falls, N. Y., of ferro-alloys, principally ferro-vanadium, ferrotungsten and low carbon ferrochrome. Additional equipment is now being installed. In February the company acquired the works at Kanawha Falls, W. Va., and the business, good will and patents, so far as they relate to the manufacture and sale of ferro-alloys, of the Willson Aluminum Company. Additions are now being made to these works with the object of increasing the output and more particularly of ferro-chromium and ferrosilicon. The Electro Metallurgical Company's general offices are at 157 Michigan avenue, Chicago, and it has [illegible] at 70 Wall street, New York.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

United Engineering and Foundry Company, Pittsburg, Penn. Lever Shears and Vertical Shears. Pp. 52, illustrated, paper, 3½x6 in. 1907.

Hayward Company, 97 to 103 Cedar street, New York City. Net Price List of Orange-Peel and Clam-Shell Buckets. Pp. 14, illustrated, paper, 3½x6 in. 1907.

The North Coast Engineering Company, Seattle, Wash. Manufacturers and Dealers in Fuel Oil Burning Appliances, Pump Governors and Reducing Valves. Pp. 24, illustrated, indexed, paper, 6x8½ inches.

Construction News

Eureka, Utah—The Beck Tunnel Mining Company intends to install a new hoisting plant. Jesse Knight, Provo, Utah, is president.

Copper Ridge, Colorado—The Copper Ridge Mining Company proposes to put in machinery for sinking a deep shaft. Bert Goldsworthy, Steamboat Springs, Colo., is manager.

Rollinsville, Colorado—The Mountain Monarch Mining Company intends to put in an air-compressor plant at its tunnel. Frank Augustus, Rollinsville, Colo., is manager.

Idaho Springs, Colorado—It is reported that extensive additions are to be made to the power plant of the Stanley Consolidated Mines Company. A. G. Brownlee, Idaho Springs, Colo., is manager.

Tolland, Colo.—Herrod & Co., operating in Jenny Lind gulch, are figuring on the erection of a five- or ten-stamp amalgamating mill before summer. Reuben Herrod, Tolland, Colo., is manager.

Black Hawk, Colo.—The New National Tunnel Mining Company, G. Whitney Adams, Central City, Colo., manager, is contemplating the purchase of an air-compressor plant for tunnel operations.

Gilpin County, Colorado—The Ingram Mining and Milling Company intends to erect a 20-stamp mill and concentrating plant on Elk creek. Ira Pollard, 522 Mining Exchange building, Denver, Colo., is manager.

Quartz Valley, Colorado—F. W. Hearne & Co., operating the Tucker property in Quartz Valley district, are going to increase the capacity of their concentrating mill. H. W. Kane, Central City, Colo., is manager.

Hawkeye District, Colorado—At the Dirigo group arrangements are to be made for a new air compressor, additional machinery for the mill, and a wire-rope tramway. G. H. Elling, E. & C. building, Denver, Colorado, is manager.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

March 4—The rain storms have been still heavier throughout the State, and much damage has been done by floods. Bridges in all directions have been washed away and train service generally interrupted. At Dredgeville, below Oroville, several lives were lost, and the people made homeless. The mines in nearly all the camps have been hampered for lack of power, the floods having put the electric power plants out of commission. Land slides have carried away mine buildings, and immense quantities of surface water have come into the mines. Flumes and ditches have been materially damaged and numbers of mines, both quartz and gravel, have had to close down for the time being. The loss of bridges has stopped ore shipments from some properties, notably in Shasta county. The big hydraulic restraining dam in Bear river, between Dutch Flat and Liberty Hill, which has stood previous high waters for 16 years, has been destroyed. The Bowman dam near North Bloomfield, reported carried away, still stands, however. Snow has fallen lower down toward the valleys than usual, there being, for instance, 6 feet at the Balaklala mine in Shasta county. At the present writing the rain has ceased and the rivers have passed the highest water mark. It will, however, be some time before repairs can be made to the various electric power plants.

Asbestos of the chrysotile variety is reported as found by F. T. Smith and J. T. Dillon near Washington, Nevada county. Very little work has so far been done in the claim. Asbestos is found in many places in this State, but it is not generally of a superior quality, the fiber being somewhat short and more or less brittle.

Assemblyman Geo. W. Foot is arranging for a general meeting of hydraulic miners at Grass Valley early this spring to take steps toward the resumption of hydraulic mining on a more general scale. Mr. Root succeeded in passing a resolution through the late legislature, which permits the Government to take charge of caring for the débris washed down into the streams by the miners, on certain conditions. At the proposed meeting ways and means of sending a representative or delegation to the next Congress will be agreed upon and a plan of action outlined. The Root resolution proposed that the Government permit hydraulicking to be resumed after it has erected a series of dams in the [illegible] in addition to installing a fleet of big dredgers below. The latter are expected to keep the streams clear of silt and maintain the rivers in a serviceable condition, while huge pumps will assist in depositing the silt on swamp land, thus eventually reclaiming these. Of course, the Government will not be asked to do this simply as a matter of accommodation to the miners, as a provision will be made in the proposed bill in Congress whereby a certain per cent. of values obtained from each cubic yard of mined ground will revert to the United States to defray the expense. The bill providing for three members of the consulting board in the State engineers' department, was so amended that it is not required that these men shall be directly engaged in hydraulic or placer mining. They may be mining men of any kind. This consulting board has not yet been appointed.

The Northern California Water and Power Company has been engaged for some time past in securing patents to much of its ground between French Corral and North Bloomfield, in Nevada county. The company purchased the Eureka, Lake and Bloomfield water and mining systems and, it is believed, will utilize these holdings in a great power enterprise. W. B. Bourn is one of the chief promoters, and he is principal owner in the North Bloomfield, Kate Hayes and other gravel properties. It is hardly probable that he expects to resume hydraulicking under present conditions, but the water rights, reservoirs, ditches, etc., of the mines are now more valuable than the mines themselves.

Salt Lake City

April 6—The ore and bullion settlements for the month of March, as reported by Salt Lake banks, reached a total of $3,202,000; while dividends were reported to the amount of $798,500, the contributing mines and respective amounts being: Utah Consolidated, $450,000; Daly West, $108,000; Utah, $3000; Beck Tunnel Consolidated, $40,000; Grand Central, $15,000; Victoria, $10,000; Columbus Consolidated, $60,000; Daly Judge, $112,500. Payments will be made by Utah Consolidated and Columbus Consolidated during the present month.

Shareholders of the Bingham Standard Copper Company have ratified the action of the board of directors in effecting a coalition with the Bingham Central Min[illegible] be formed to be known as the Bingham Central-Standard Copper Company. With the merger completed the holding company will be in possession of over 500 acres of ground.

The Jennie Extension Mining Company has been formed to develop a property at Gold Springs, Iron county. The officers are: F. R. Davis, president; C. A. Short, vice-president; H. R. Elliott, secretary and treasurer.

The Reuben Gold Mines Company has been formed in Salt Lake to develop the Reuben group of lode mining claims situated in the Stateline district in Iron county. The officers are: Will J. Dooly, president; C. E. Peak, vice-president; Lewis H. Beason, secretary and treasurer. The headquarters of the company will be 314 Herald building, Salt Lake City.

Governor John C. Cutler has disapproved the bill passed by the late legislature giving smelting companies the right to condemn land within a radius of four miles of smelter sites in counties of a population of less than 75,000. The executive took the ground that the measure bore the distinct marks of class legislation, and was therefore unconstitutional.

The operators of the Alta, Utah, district, believe that they have effectively solved the transportation problem for that camp, and will use aërial tramways between the mines and Wasatch, about two miles from the entrance to Little Cottonwood cañon. Wasatch is to be the terminus of a standard-gage railroad to be built during the present year. Aërial tramways will be utilized for a distance of from 7 to 10 miles.

Considerable mining activity is reported from the Gold Butte region, in southeastern Nevada. Prospectors have been flocking in there for some time, and late reports from Gold Butte are to the effect that numerous sales of mining property have been made lately. The Gold Butte Mines Company is carrying on the principal operations at the present time. Charles M. Schwab is said to have acquired an option on the Lincoln group of copper-bearing claims, and the Savanic copper mine, just over the Arizona line, has been taken up by a New York syndicate.

Two judgments, one for $23,444, and the other for $9,473, have been entered in the district court at Salt Lake against the Sheba Mining Company, with property in Juab county. A sale of the property has been ordered.

The Copper Belt and Revenue Deep Tunnel mining companies have consolidated their properties, which are situated in the Gold Mountain Mining district. A. B. Sawyer, Jr., of Salt Lake, is secretary.

A suit has been filed in the district court by Richard F. Smythe and others against the Bingham Group Mining Company, and others, to quiet title to the Cresus lode mining claim, in Bingham. It is alleged that the defendants have attempted to place a mortgage of $30,500 on the property in question, by which plaintiff's title has been clouded.

Denver

April 6—On March 27 Deputy United States Marshal Frank, of Denver, seized 34 sacks of ore, at the Pueblo office of the Wells-Fargo Express Company. The ore is supposed to have been stolen from the Mohawk mines in Nevada. A writ of replevin was issued by the United States court against the express company, and the ore placed in charge of the Federal authorities.

For the first time in its history, the Denver mint will shortly be coining a large amount of 50-centavo pieces for Mexico. During the month of February more than $7,000,000 worth of $10 American gold pieces was turned out, and at present the whole force is at work on $5 pieces and subsidiary silver coin.

Judge Wood having denied the motion of the attorneys of Charles H. Moyer, William D. Haywood and George A. Pettibone, for a change of venue, the trial of these parties will be held in Boise, Idaho, probably early in May.

It is estimated that 50,000 h.p. can be developed on the seven drops of the Gunnison tunnel, which the United States Government is building to carry the water from the Gunnison river through the mountains to the Uncompahgre valley, where 150,000 acres of land will be irrigated. Estimates on an electric-power scheme in connection with that enterprise, are being made, which would reduce the cost of the work considerably to the settlers who will pay for the same in 10 years, for water rights at a certain amount per acre. It is expected that the tunnel will be completed next year, its entire length being 30,582 ft., of which about 19,000 ft. have been completed.

Scranton

April 7—A small breaker recently transformed into a washery at the Hurry Up colliery, near Fishbach, has been destroyed by fire. The plant was recently purchased by the Herskers, of Mahanoy City, from the Williams Coal Company, of Wilkes-Barre. The loss was $50,000.

Recently the State constabulary were called out to interfere in a quarrel between two coal companies. There was a conflict between the officials of the Reliance Coal Company, of Pittston, and the Pennsylvania Coal Company. The trouble arose over the placing of a steam pump by the Reliance company, pipes from which would lead through the mine workings of the other company, which, not long ago, closed up a waterway that afforded natural drainage into the deeper workings of its mine. The Reliance alleged that this was done to force it to sell the mining rights to the Pennsylvania company. Twenty-five troopers replied to the call and a number of the officials of the Reliance company were arrested for assaulting officials of the other company.

Duluth

April 4—Iron-ore shipments by the leading producers of the Lake Superior region for the past two years show some decided changes in proportionate positions and some interesting facts. Some of these are given herewith:

	1905.	1906.	Changes.
Oliver Iron Mg.Co.	18,163,112	20,414,818	I. 2,254,706
Pickands, Mather & Co.	2,010,450	2,766,031	I. 755,581
Corrigan, McKinney & Co.	2,542,443	2,622,688	I. 80,245
Cleveland-Cliffs Iron Co.	1,859,806	2,221,753	I. 361,947
Jones & Laughlin Steel Co.	795,996	584,222	D. 211,774

There are many others operating groups of mines, but their totals are small. The decline of the merchant firm of Corrigan, McKinney & Co. from second to third place is due to a falling off in production from their Stevenson mine, for which the addition of St. Paul, in 1906, and others in 1907 will scarcely compensate. The advance of Pickands, Mather & Co. shows the desire of the Buffalo Steel Company to secure sufficent ore from that firm for the operations of its works. Besides the two firms named, the Cleveland-Cliffs Iron Company is a large producer of merchant ore.

The Great Northern Railway is preeminently the road of the Mesabi district over which independent ore is shipped, but the production of mines along that line shows a remarkable decline in the volume of ore sent forward by non-consumers. Out of a business for 1906 of 6,083,057 tons all but 429,500 tons was by consuming companies, as shown in the following table:

	1905.	1906.
Minnesota Ore & Steel Co.	1,009,171	1,275,661
Corrigan, McKinney & Co.	1,688,552	1,409,242
Pickands, Mather & Co.	649,775	797,163
International Harvester Co.	246,442	450,117
Pittsburg Iron Ore Co.	319,775	412,032
Chamberlain Ore Co.	228,169	417,743
Jones & Laughlin Steel Co.	419,224	309,488
Shenango Furnace Co.	165,604	71,295
Inland Steel Co.	137,129	19,500
Oliver Iron Mining Co.	129,215	24,014
Cleveland-Cliffs Iron Co.	114,880	. .
Republic & Susquehanna Iron Co.	20,984	. .
Ludlow Iron Works.	5,955	. .

All the above are consumers of at least a large part of their own ore production. The following are the few non-consumers left on the Great Northern lines, and of these the largest, Leonard, will next season be among the mines operated for the benefit of its owners, now the United States Steel Corporation:

	1905.	1906.
Leonard Iron Mining Co.	284,725	243,915
E. H. Jennings & Bros.	....	82,889
Meriden Iron Co.	.....	53,624
Bradford Mining Co.	53,473	49,372

There are, to be sure, several independent operators on the Gogebic, Menominee and Marquette ranges, in addition to the firms mentioned in the first list above, but their totals are well tied up, and are not great at the best. The elimination of the independent ore producer has proceeded with rapidity during the past year, owing to the continued absorption of mines by consuming interests, and this tendency is still marked.

London

March 30—For the first time for 10 years the ordinary shares of the United Alkali Company have received a dividend. The distribution for the year 1906 is at the rate of 2 per cent. At the start of the company these shares received 6 per cent. in 1892 and 5 in 1893. Since then the only distribution has been 1 per cent. in 1895 and 2 per cent. in 1896. The general trade of the country has been extremely prosperous during the past two years, and the chemical trade has once more proved an excellent index of the state of affairs. The gross profits of the company during 1906 amounted to £588,804 as compared with £487,264 during 1905, and £411,584 in 1904. The debentures take £134,900 as interest, and management and taxes about £60,000, so that the net divisible profit for the year was £393,293. Out of this £140,000 is applied to depreciation, reserve and extinction of debentures. The distribution on the 7 per cent. preference shares absorbed £187,800, and £56,875 was distributed among ordinary share holders. Year after year goes by without any mention of a reorganization of the capital, As I have often written in this column, the United Alkali Company was floated at the hight of chemical prosperity in this country, and the capital does not nowadays correctly show its present position.

The Salt Union, Ltd., was formed at about the same time, and under the same commercial conditions as the United Alkali Company, but its history has been a much more depressing one. Not only have the ordinary shares received nothing for 10 years, but the preference dividend has often been passed. The results of the operations during 1906 are as discouraging as ever, for the gross profit was only £101,000, as compared with £166,000 in 1905. The net profit was £70,300, out of which £54,000 had to be paid for debenture interest. During the year 910,000 tons of salt were sold, a slight increase over the production during 1905. There does not appear to be any very rosy prospect before the company.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

Considerable development is going on in the iron-ore fields of Alabama. The Tennessee Coal, Iron and Railroad Company is placing machinery for mining ore in the southern part of Jefferson county, along the Red Mountain tract. The ore bed is said to be 14 ft. thick and runs higher in metal value than any red ore found in the district. It is intended to get mines opened at this point just as fast as possible. It is stated that the ore in this district carries an average of 55 per cent. metallic iron. In addition to this considerable development is under way in the brown-ore properties of the State.

Arizona

YAVAPAI COUNTY

H. J. Beemer Company—This company has been developing the Storm Cloud group of mines in the Hassayampa district, 10 miles south of Prescott; the property was taken over about one year ago.

Mount Tritle Copper Company—A correspondent writes: This company has acquired what was formerly known as the Dunkirk mine, which is held under bond and lease; the last payment will be made in April when the title passes to the new company. The property consists of two claims held under the above bond, eight claims held under an option, and one claim located by the new company. It is situated in the Hassayampa district, 15 miles from Prescott, and in the immediate vicinity of the Senator, the Stormcloud and the Davis mines. Active development has been carried on by the new company, new buildings having been erected; and underground work is being pushed. Four tunnels are being run into the side of Mount Tritle through which the main vein cuts. When driven a distance of 2000 ft. the lowest adit will give 1000 ft. of stoping round. The tunnels are now in respectively, 160 ft., 170 ft., 270 ft. and 150 ft.; the four tunnels lie one over the other and about 100 ft. apart vertically; there is developed 1000 tons of ore averaging $42.40 per ton; there is partially developed 2000 tons of ore averaging $40 per ton. The average width of the pay streak is 2½ ft., varying from 1 to 4 ft. The ore is all shipping ore and the company is now making regular shipments to the smelter at Humboldt. All this ore is developed in one ore-shoot, and at least five other shoots are known to exist on the vein, though they are not yet opened by the tunnels. The latest news from the mine announces the striking of a new shoot of ore, sampling $43 per ton, and 4 ft. wide. The management is contemplating the immediate erection of a concentrating plant to handle about 2000 tons of ore now on the dumps and averaging about $11 per ton; also a large amount of low-grade ore that is being developed underground between the richer shoots. The Mount Tritle Copper Company is an Arizona corporation, with an authorized capital of 500,000 shares of $1 par value. Of this stock 100,000 shares will remain in the treasury; 400,000 shares will be issued, and have been underwritten by responsible parties.

Neiman—This mine, situated in the Santa Maria river district, has been taken over by Montana parties, who propose to develop it on a large scale. The ledge is developed to the depth of only 100 ft. The ledge has an average width of 3 ft., and the ore is said to run well in gold.

California

AMADOR COUNTY

Argonaut—At this mine, Jackson, the new owners are opening up the 2500 level, and it promises as well as the level above, though no ore has been milled yet.

Wildman—All work has ceased on this property at Sutter Creek, the men refusing to work any longer without cash payments.

EL DORADO COUNTY

Long Cañon—The mining excitement in the Long Cañon country has called 500 miners from the Nevada fields recently. Some of these rich mines are in Placer and some in El Dorado counties.

Woodside-Eureka—This company has been organized by A. K. Grimm, A. C. Capwell, C. Esterly, F. P. Mitchell and R. B. Myers, of Oakland, to open the Eureka and Woodside mines near Georgetown, which were at one time large gold producers.

Horseshoe Bar—This company, owning several mines on the river between Forest Hill and Josephine, is putting in a hydraulic elevator at Horseshoe Bar and is building an eight-mile ditch to tap a water right.

INYO COUNTY

Montezuma Mining and Smelting Company—This company, owning five claims near Big Pine, has been shipping silver-lead-gold ore to the Salt Lake smelters, but developments are now such that the directors intend erecting a 50-ton smelter.

Molus—Brown Brothers & Key have resumed work in this once well known mine, at a point some hundreds of feet from the old workings.

Greenwater & Death Valley—In the Queen shaft of one of the properties of this company at Greenwater, a small stringer of sulphide of copper has been struck at the depth of 270 ft. This is one of the Schwab properties.

Furnace Creek—On this mine a depth of 500 feet has been attained, and several bodies of good copper ore have been cut.

Bermuda and Oban—Development work has commenced on these properties, adjoining the Saratoga and Red Boy, owned by Harry Chickering. Machinery is shortly to be installed.

Gladstone-Greenwater—An extension of time on the bond has been given and instructions have been received to proceed with the work, which was suspended pending negotiations for an extension.

KERN COUNTY

Amalie—This mine in Amalie district, now owned by the Bawden-Marx Company, has been unwatered and the work of taking out ore will begin at once.

Sunshine—Negotiations are pending for the purchase of this mine at Randsburg from Thomas and William Atkinson, the original discoverers.

MARIPOSA COUNTY

Mount Washington Consolidated—This company, composed of Los Angeles men, has purchased from James F. Peck, of San Francisco, a group of mine claims near Hornitos, for a large sum. The principal mine is the Washington, famous years ago as the Quartz Mountain, and at that time a large producer. A mill is to be erected at once.

NEVADA COUNTY

Dolly Madison Mining Company—Operations have commenced on this property, at Randolph Flat, under Superintendent Hay. The old shaft will be pumped out.

Resartus Mining Company—This company, H. H. Hicks, superintendent, is opening the Lincoln mine, near Nevada City, and ore carrying free gold and high-grade sulphurets, has been found east of the shaft at 65 ft. depth.

Canada Hill Consolidated Mining Com-

[illegible] formerly known as the Charronat, sinking has been resumed, and a 2-ft. vein has been found

[illegible] company—This company, operating the Herman mine, on the Deadwood Divide, is putting in an extensive electric plant.

Three Queens—This is the name of a rich mine recently bought by Wingfield, of Nevada, from Mr. Savage. C. D. Wilkinson has been selected as superintendent. Seven other locations have been made near by, and aside from the rich pocket, the vein carries ore ranging as high as $84 per ton.

PLUMAS COUNTY

Genessee—This mine, commonly known as the Gruss, has been sold to a mining syndicate and a new shaft will be sunk.

RIVERSIDE COUNTY

Turtle Mountain District—Rich gold finds have been made in this new district, about 40 miles from Needles. The ledges so far found are large, and a number of prospectors are at work.

SACRAMENTO COUNTY

Prosperity—This drift mine at Blue Ravine above Folsom has been sold to T. F. Hornung, of San Francisco, who with others will reopen it.

[illegible] A new company has started to drift on this ranch near Folsom, where Hupp & Roberts spent considerable money without finding pay gravel. Further prospecting is to be done.

SISKIYOU COUNTY

Advance—Henry Wood & Co., of Denver, Colo., have made the final payment of $70,000 on the purchase of this mine near Etna, in the Salmon river district.

BOULDER COUNTY

Ingram—A shipment of high-grade ore to the Denver smelters brought returns of $7.50 per pound. Mine is located at Salina, Colo., and Henry Meyring is manager.

Nederland Tungsten Mining and Milling Company—Incorporation papers have been filed showing capital stock of $500,000. T. L. Owings, Bascom Scruggs and C. Marquardt being incorporators. Company will operate at Nederland.

FREMONT COUNTY

Federal Mica Mining Company—This company, of Duluth, Minn., is developing a large deposit of mica in Fremont county and the company is preparing plans for a mill. Some good sized sheet mica is found and the balance of the product will be pulverized.

LAKE COUNTY—LEADVILLE

On account of the condition of the roads during the month of March, and the scarcity of cars, the tonnage for the district amounted to 76,000 tons only. With the disappearance of snow, the drying of the roads and the necessary cars the tonnage for the present month will reach 80,000 tons of all classes of ore.

Etta Alma—A good plant of machinery has been installed at this shaft, Ball mountain, and sinking is now in progress. The bottom of the shaft is in good porphyry and the conditions are favorable for the striking of a good body of mineral. The shaft adjoins the Sunday.

Evans Gulch—Big and South Evans gulches are at present commanding a great deal of attention from investors; this is due to the rich ore that has been opened in the Winnie and the Mammoth. The Cleveland, which is the northern extension of the Winnie, will complete its sinking during the month, having reached a depth of 625 ft. A drift will be run to the south to connect with the Winnie drift, and the ground to the north will be thoroughly prospected. The unwatering of the Boulder shaft started at the beginning of the week and by the middle of the month the bottom should be reached. The Hoosier Girl, Little Ellen hill, has resumed work. A new plant of machinery has been installed at the Silent Friend and sinking the shaft another 100 ft. is in progress. The Mammoth shaft has been unwatered to below 525 ft. and the water is being lowered steadily.

Iowa Gulch—This section is unusually busy and a quantity of ore is being sent out. At the Helena from the 300-ft. level 30 tons daily is being shipped from a perpendicular vein; this vein has also been opened at the 500-ft. level. The tunnel being driven to the Mansfield shaft by the Midland Mining Company is making good progress and the shaft should be cut about the middle of the month. When this is accomplished, work will be carried on at the 175-ft. level on a small vein that is in the shaft, and which may lead to the main ore channel.

Leo Shaft—This shaft, head of California gulch, has been unwatered and the company is now drifting on a streak of mineral from the 550-ft. level.

McCrae Shaft—This shaft of the Little Pittsburg Mining Company, Fryer hill, was recently secured under lease to Leadville parties; a new shaft was sunk, and when it reached a depth of 370 ft. drifting was started and an excellent body of ore has been opened.

President—In this mine, Breece hill, a good body of ore was recently opened in one of the drifts at the 500-ft. level, and from it two carloads of gold ore weekly are being shipped.

Red Hook Tunnel—It is learned on good authority that another tunnel project will be started in the early summer in the Sugar Loaf district. It will start from the Colorado gulch side and be driven to open and develop the Red Hook claim.

TELLER COUNTY—CRIPPLE CREEK

The production of the Cripple Creek district, during the month of March, amounted to nearly 56,000 tons, valued at $1,207,555.

Stratton Cripple Creek Mining and Development Company—This company has just declared a dividend of $50,000, which is the fourth time that this amount has been distributed among the stockholders.

Stratton Estate—The legislative committee, appointed to investigate the affairs of the Stratton Estate, has made its report and this shows that it is worth more today than when Mr. Stratton died. Since then a number of suits have been instituted but this litigation has all been practically settled except in one case which was tried in the district court and decided in favor of the estate, but a writ of error was issued, so that the Supreme Court was applied to and the committee found that the plaintiffs were understood to have offered to settle at a small figure. It is the opinion of the committee that the State of Colorado is entitled to the interest on the inheritance tax—the latter amounting to $284,000—as well as to the principal. This interest amounts to about $77,000 at the present time.

Work—The annual meeting was held on April 1, and the report to the stockholders shows that during the past year, the gross production was 13,404 tons, valued at $856,063. About $140,000 was received from royalties. The Little Clara lease produced the principal part of this revenue. The sum of $75,000 was paid in dividends during the year.

Indiana

VANDERBURG COUNTY

Winifred E. Mining Company—This company, with office in Evansville, has incorporated. The company proposes to open mines in this county near the Gibson county line.

VIGO COUNTY

Oil development in this county is assuming large and profitable proportions. A number of coal operators are turning their attention to the work of sinking wells. Several refineries are being constructed. The field promises well.

WARRICK COUNTY

Mining is slack in this county. Of the six large coal mines near Boonville only one, the Wooley, is running with sufficient regularity to afford the miners satisfactory employment. The other operators are only running part of the time. Decreased demand and lack of cars are the causes.

Epworth Coal Mining Company—This company has incorporated with ample capital. It will develop new mines and lands recently leased near Newburg.

Kentucky

Knox County

Moss Rock Coal Company—This company has been organized by D. W. and C. F. Clark and G. W. Taylor for the purpose of developing coal lands in the vicinity of Barboursville. The company has secured property on the Louisville & Nashville Railroad, and arrangements have been made for the immediate beginning of work.

Whitley County

Mount Morgan Coal Company—This company, which has recently been reorganized, owns about 2000 acres of coal lands near Williamsport, Ky., and is developing the Jellico seam, at present producing about 10 or 12 carloads per day. Officers: T. B. Mahan, Williamsburg, Ky., president; W. T. Underwood, Lexington, Ky., vice-president; M. H. Maury, Williamsburg, Ky., general manager; S. E. Mahan, secretary and treasurer.

Michigan

Houghton County—Copper

Copper Range Consolidated—This company is ready to close for two 2000-kw. turbine generators for the new electric plant to be erected on the site of the Michigan smelters. This plant is to furnish light and power for all the Range mines. The company contemplates using electricity quite extensively.

Missouri

Jasper County

Elliott Land—In a drill hole on this tract, near Carl Junction, ore was encountered at 137 ft. The drill showed 26 ft. of what is reported to be a rich deposit of ore.

Hardy & Wyly—These parties have drilled through 34 ft. of zinc ore on their 10-acre lease of the Aylor, Hannum & Stickney land at Alba. A shaft will be sunk at once.

Mattes Brothers—Mattes Brothers several months ago purchased the land of the old Jackson estate from the John Jackson Investment Company. Parts of this land had produced ore in past years but at the time of the purchase every mine on the land was abandoned. As soon as they secured control they placed a drill at work on the high level land—an arm of the divide between Shoal creek and Short creek—and in seven consecutive drill holes they have encountered a 12-ft. vein of zinc and lead at from 85 to 97 ft. The old Thanksgiving mine on this land has been reopened, near the north line, and is making weekly sales of ore. West of this mine is the McHenry Mining Company with a development on the 100-ft. level that is promising. This land is situated west and southwest of Joplin. Mattes Brothers also have a lease on the divide east of Duenweg, on which they have made some of the best strikes in that section and where they are erecting two concentrating plants, one of 1000 and one of 500 tons capacity.

Noble Land—Col. James O'Neill, of Webb City, who purchased the fee of four acres on Sucker Flat in the south edge of Webb City, from the estate of the late John W. Noble, of St. Louis, reports that the blanket vein is being proven to exist over this tract, being encountered at the 180-ft. level. This establishes the existance of the blanket vein on the south as well as north and east of Webb City.

Old Times Lead & Zinc Mining Company—This company has let a contract for the erection of a modern concentrating plant on one of its properties, one mile south of Galena. It will be of 300 tons daily capacity and will be driven by electricity furnished by the Spring River Power and Light Company.

Newton County

Deep Ore—On the Jesse Trent land, 3 miles south of Granby, 75 ft. of ore is reported shown by the drill. This is the first deep drill hole, but it is Mr. Trent's intention to keep a drill operating steadily in an effort to determine the extent of the orebody. This new location of a deep ore deposit at a distance from any tested ground renews interest in deep deposits.

Montana

Butte District

The output of copper in Butte during March was about 25,500,000 lb., according to estimates made by leading mining officials here. This is greater than it has been in any month since last October. Producers are making an extra effort to have the March output equal that of some of the summer months. They are wasting little or no time in working ground that does not contain mineral. Development work, suspended Feb. 26, will be resumed by the companies within a few days.

Amalgamated—Ore production is heavy, shipments to the smelters aggregating 13,000 tons a day. Not all of this ore is from mines of the company; other operators are contributing to it. The Washoe plant is receiving about 10,000 tons and Great Falls the remainder. During a tie-up of the street railway system, which lasted two days, all second-class ore mined in the Original, a Clark mine, was shipped to the Washoe and the West Stewart was closed. The barren zone in the latter has been penetrated, and at a depth of 1900 ft. the company has a 60-ft. vein of ore, all of commercial value.

North Butte—Shipments from this property are heavy and the month promises to break all records. No dead work is in progress. The vein of the Edith May is showing well at the 1800, and when further developed will add greatly to production, although the hoisting plant is taxed almost to capacity. The company has planned extensive development work at the northern end of its property, and will begin operations there as soon as prevailing contentions with employees are adjusted.

Pittsburg & Montana—Shaft No. 2 is nearing the 1400-ft. level. A large station will be cut when sinking is finished, and equipped with adequate pumping machinery. Openings will then be made toward the west to connect with winzes sunk on the 1200. Shipments of ore average about 200 tons a day. When the showing of ore in the property warrants, the old smelter, which went out of commission last spring, will be remodeled and operated.

Boston & Montana—A despatch from Butte, April 8, says: "Because 52 electrical workers, machinists, and blacksmiths, employed in the Great Falls Smelters of the Boston & Montana Company, were denied an increase in pay and walked out today 5000 men were thrown out of work in Butte tonight when the mines belonging to the company were shut down."

Nevada

A bill passed by the Nevada legislature provides that all grub-stake agreements must be recorded the same as mining locations, otherwise they are not valid. The measure also provides that each grub-stake agreement must have some definite time of terminating, so that after that time the prospector will be able to locate claims for himself, and not be bound to the man backing him.

Nye County—Tonopah

Denver Annex—The workings in this property continue to look well. About 45 ft. of drifting has been done on the bottom level in ore, some of which is of shipping grade.

West Extension—The drifts on the 115-ft. level are among the show workings on the field. Characteristic green ore is visible all the way and in places patches of shipping-grade ore are noticeable in which free gold shows well. The vein is over 30 ft. in width.

California—The west tunnel is in 143 ft., with quartz-stringers showing in the face. The Davis tunnel has been driven 270 ft. in the south drift, and the vein carries good milling values.

Tonopah Railroad for the week ending [illegible] Tonopah Company, 2050 tons; Belmont, 300; Montana-Tonopah, 100; total, 2450 tons. In addition to ore shipped, the new mill of the Tonopah Company crushed 2250 tons, and the Midway mill, 280; a total of 2530 tons. This made a total of 4970 tons of ore.

Pennsylvania

Anthracite Coal

[illegible] & Hudson—This company will open its large new breaker at Olyphant in a few days. It will be the largest owned by the company, and replaces the breaker destroyed by fire three years ago. The combined capacity of the breaker and washer will be 3000 tons per day. It is also the best equipped plant in the system of this company. There are so many mechanical pickers and other labor-saving devices that there will be fewer boys employed than in any other of the company's breakers. It has been painted inside and outside with fireproof paint.

[illegible] Lackawanna & Western—After an idleness of more than five years the Hallstead colliery will be reopened. It is at Duryea, and was shut down in 1902 during the strike at the time that the steam men and pump-runners were called out by the mine workers. As a result the pumps were idle and water from the Susquehanna river flowed into the workings flooding the entire mine. The work of pumping out the water has been going on continuously for five years, and has just been completed. The breaker is an old one, but has been renovated. About 400 men and boys were thrown out of employment when the mine was flooded.

Lehigh Coal and Navigation—This company will build a private telephone line 112 miles in length. This will be the longest private line in the State. It will connect all the collieries with the head offices in Philadelphia, and it will run along the company's canal from Mauch Chunk to Philadelphia.

Lehigh Valley Coal—This company will drive tunnels on the Otto and Pardee tracts, and will make extensive improvements at the Blackwood colliery so that it will be one of the large producers. This company will reopen the Centralia mine, which has been closed down for some time.

South Dakota

Custer County

Interstate—Preparations have been completed for extensive development work on this property, 8½ miles southwest of Custer, near the Saginaw. The holdings include 17 claims all patented. A shaft has been sunk 200 ft. on a quartz ledge, 18 ft. wide. Crosscuts will be run at this level. A shaft will also be sunk 100 ft. on another ledge carrying values. The company also owns 60 acres of placer ground on French creek.

Lawrence County

Maitland—A deal has been consummated by which this company will add to its holdings a tract of land lying between False Bottom and City creek. Prospecting with a diamond drill has proved good ore in a vertical ledge to the depth of 200 feet. A station is now being cut for setting up the drill to explore another vertical.

Homestake South Extension—Development work is being carried on at the 150-ft. level, and in a few days sinking will be resumed. When the shaft reaches the 300-ft. level, crosscutting will again be done. Air drills and electric machinery are about to be installed, the power to be furnished by the Consolidated Light and Power Company of Pluma.

Pennington County

Holy Terror—W. F. Collins, manager of this company, has been discharged and proceedings are now on in the courts to compel him to give up the books. The management will place Messrs. Warner, Gray and Simm, of Keystone, in charge of the property for the present.

MacKay-Shepherd—A deposit of mica has been encountered on this ground, 7 miles southeast of Keystone on Sheep mountain. Samples have been taken which could readily be cut into sections 5 inches square.

Mills—Copper prospects have been uncovered on this ground on Middle Squaw creek. The ledge is 3 ft. wide at one place and 4 ft. at another.

Tennessee

Maury County

People's Phosphate Company—This company has been organized by R. L. Kimbrough and others at Mount Pleasant to work phosphate deposits.

Utah

Beaver County

Frisco Contact—The new steam hoisting plant at this property is in commission. The mine has been shut down for several months, owing to the fuel shortage.

Juab County

May Day—The control of this Tintic property has passed to John Dern and associates of Salt Lake.

Tintic Ore Shipments—Shipments during the past week amounted to 148 carloads, the contributing mines and respective amounts being: Ajax, 4; Beck Tunnel, 9; Bullion Beck, 8; Bullock, 1; Centennial Eureka, 53; Carisa, 4; Eureka Hill, 9; Eagle & Blue Bell, 7; Grand Central, 6; Godiva, 2; La Clede, 1; May Day, 5; Mammoth, 6; Ridge & Valley, 3; Scranton, 6; Swansea, 2; Star Consolidated, 4; Tintic Iron, 3; Uncle Sam, 5 cars.

Lower Mammoth—After considerable difficulty, this company has one of the new electric hoists, recently installed, in working order.

Summit County

West Quincy—This company has been prospecting with diamond core drills for some time past and has succeeded in striking the contact vein, believed to be an extension of the one opened in the Quincy mine which is now owned by the Daly West Mining Company. A permanent working shaft will be sunk.

Vermont

Orange County

More work has been done recently in the copper mines around Corinth than for a long time past. The Pike mine is shipping some ore, which is hauled by teams to the railroad. Copper ore is reported found on the Bicknell property. The mineral rights on the Hastings property have been bonded by Boston parties, who are preparing to do some development work.

Washington

Stevens County

First Thought—This company has applied for patents for the Gibbons, Keystone and Defender lodes, consolidated, 40.2 acres, in all, and the Rosalie, Noonday traction and Danby lodes, consolidated, 27 acres, all in the Pierre Lake district. The First Thought mine is now having its ore conveyed by aërial tramway to the railway and shipping to the Granby smelter, at Grand Forks, B. C., and the Northport smelter, when it runs.

Napoleon—The B. C. Copper Company, it is reported, contemplates installing a cyaniding plant, to mill the product from a large body of decomposed quartz and iron oxide, situated above the present main workings of the mine.

Sure Thing—Galena has been encountered associated with the usual copper-gold ore, an unusual thing on Toulon mountain.

Orient—From the end of an 800-ft. tunnel, after boring a short distance, the diamond drill struck into quartz and continued in it nearly 200 ft.

Hester—This company is opening the Regina claim, on Pierre creek, by sinking a shaft on the foot-wall side of the vein and crosscutting. Some good copper-gold ore has been found. Thos. Foran is manager; address Orient.

Tungsten Mine Company—This company is owned by the Krupp Company, of Essen, Germany, who bought a group of 5 claims last year 1½ miles south of

Deer Trail. An electric plant, for power and lighting the mine has been installed, and a concentrator equipment has been shipped from Ohio. This company is said to have bonded a group of claims 15 miles north of Davenport, Lincoln county, known as the Putney Butte mines. It is reported that those claims have a deposit of molybdenite.

West Virginia

KANAWHA COUNTY

Thirteen coal properties on Cabin creek have been consolidated. The new company is known as the Cabin Creek Consolidated Coal Company. The companies merged in the new company are the Cabin Creek, Raccoon Fork, United Colliery, Shamrock, Thistle Coal, M. T. Davis Coal, Holley Coal, Quarrier Coal, Belleclare Coal, Red Warrior, Cherokee Coal, Caledonia Coal and Coke, Stevens Coal, and a new lease from the Shonk-Garrison Coal Company, of 3700 acres, as well as the river tipple of the Stevens Coal Company at the mouth of Cabin creek. The deal embraces about 20,000 acres on Cabin creek. The officers of the Consolidated company are: President, M. T. Davis; vice-president, James Kay; treasurer, W. M. Packett; secretary, S. P. Richmond; board of directors, M. T. Davis, James Kay, W. A. Ohley, Azel Ford, W. M. Puckett, E. W. Knight and Malcolm Jackson.

Canada

BRITISH COLUMBIA

An amended statement of mineral production in 1906 has been made, which will, it is believed, closely approximate the actual result. The metal production was as follows:

	Quantities.	Values.
Gold, placer, oz.	46,000	$920,000
Gold, lode, oz.	250,000	5,167,500
Total gold, oz.	296,000	$6,087,500
Silver, oz.	3,470,000	2,301,765
Copper, lb.	37,492,251	8,675,100
Lead, lb.	53,100,000	2,742,750
Zinc, tons	4,000	60,000
Total values		$19,767,115

The non-metallic production for the year was as follows:

	Quantities.	Value.
Coal, tons	1,530,000	$4,590,000
Coke, tons	210,000	1,050,000
Building materials, etc.		950,000
Total values		$6,590,000

This makes a total value of $26,357,115, which is $3,895,790 in excess of the amount reported for the previous year.

NOVA SCOTIA

Dominion Coal Company—Owing to severe weather the output for March fell 100,000 tons below the estimate. It was 203,184 tons as against 309,809 in March, 1906. The output for the first three months of the year was 681,482 tons, as against 767,131 tons in the corresponding months of last year.

ONTARIO—COBALT DISTRICT

Shipments of Cobalt ore over the Timiskaming & Northern Ontario Railway for the week ending March 30 were as follows: Coniagas, 650,070 lb.; Nipissing, 117,720; O'Brien, 145,090; Right-of-Way, 3800; Trethewey, 101,650; Cobalt-Townsite, 43,000; total, 477,230 lb. The small Right-of-Way shipment was consigned to the Anglo-French Nickel Company, of Swansea, Wales.

Cobalt Lake—A bill has been introduced into the Ontario legislature by Attorney General J. J. Foy to validate the titles of the holders of the Cobalt Lake and Kerr Lake mining properties. It was explained that the measure did not exclude the claim based upon discoveries which would be dealt with under the existing law.

Barnard's Point Gold Mining Company—A plant comprising a Rand drill, 25-h.p. boiler, hoist, etc., has been shipped to Barnard's Point, Larder Lake. John Macdonald, late of the Silver Queen, has been engaged as manager, and a gang of men will start on development work.

Beaver Mine—This property, Cobalt, has been taken over by a new company, the Beaver Consolidated Mines. The recent strike on the Timiskaming property, immediately adjoining, has encouraged active development. Two main shafts are down 45 and 50 ft., respectively.

Prince Rupert—This property of 100 acres, located near the Edison mine, Coleman township, west of the Montreal river, is to be developed. A steam drill air compressor and hoist are now on the way.

Rochester—The new steam plant, at Cobalt, comprising 5x5 hoisting engine, 25-h.p. boiler, and steam drills, is now in operation. The main shaft is down 45 ft., and will be sunk to the 100-ft. level, when drifting will be done east and west. Some fine samples of native silver have been obtained.

Temagami Reserve—English steel-makers have ordered from H. Dreany, of Toronto, a ton of molybdenite from the deposit on the Temagami Forest Reserve. It is to be used for experimental purposes.

ONTARIO—PORCUPINE BAY DISTRICT

Silver Ridge Mining Company—Operations will be begun immediately, with Wilkie Evans, managing director in charge. A small plant will be put in.

ONTARIO—MOOSE MOUNTAIN

Moose Mountain Iron—The iron-ore handbook of Oglebay, Norton & Co., Cleveland, Ohio, for 1907 includes, in addition to the old range Lake Superior ores this firm has handled heretofore, Moose mountain magnetite, from the property 18 miles north of Sudbury, Ont., in which the Gates-Lambert party has a controlling interest. The ore is crushed to 1-in. size and the guarantee in iron, natural, is 54 per cent., or 55 per cent. dried at 212 deg., the ores containing 2.60 per cent. moisture. The analysis shows 0.10 phosphorus, 13.19 silica, 0.02 manganese, 1.21 alumina, 3.60 lime, 3.15 magnesia, 0.011 sulphur and no titanium.

Mexico

GUANAJUATO

Guanajuato Consolidated—The success of this company in operating its Sirena mine, in the Guanajuato district, has practically decided that company on doubling its present plant, which has gradually grown until it now consists of 80 stamps, and is treating some 300 tons a day, together with some 35 to 50 tons daily from the Carmen mine, of a closely associated company. The Guanajuato Consolidated was the first modern company to take up the old mines in Guanajuato. From the very start success has followed, though the earnings were continually put into extensive development work and additions to its mill. The constant improvement of the orebodies with depth placed the company last year on a dividend-paying basis, in spite of its heavy expenditures on development and plant. Now it is understood that a remarkably rich strike has been made in the Sirena that bids fair to rival the historic bonanzas of the Valenciana and others in Guanajuato. This company was also the first to change over from amalgamation to cyanide in the treatment of the silver ores.

Carmen—Encouraged by the success at the Sirena mine, the principal stockholders in the company have organized the Carmen Gold Mining Company, and bought up the Carmen claim, a small property on one of the cross veins. These cross veins had before been considered rather treacherous, but development work on the Carmen has shown not only remarkable continuity but also that the principal values in these cross viens were liable to be in gold. In the last six months work along the vein to connect with the Pinguico mine, has shown ore, and a 25-stamp mill is proposed.

Republic—The latest deal by the principal owners in the Sirena and Carmen mines has been the organization of the Republic Mines Company, Limited, with a capital of $2,000,000, of which all that is to be put on the market has been underwritten by the Exploration Company of New York. The object of the new company was to obtain and operate the Cardones and Barragana, but it has gone farther and taken up the option held by M. E. MacDonald and W. Murdock Wiley from Dwight Furness, on La Union, adjoining the Cardones. Machinery is being put in, a hoist is being installed at the Barragana, and La Union tunnel will be continued to the Cardones. Plans are being drawn up for an 100-ton stamp and cyanide mill, to be located probably at the mouth of La Union tunnel.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, April 10—The coal trade in the West is quiet at present, but preparations are being made for the Lake trade. The weather so far this month has rather checked the expectations of an early opening of navigation, which were aroused by the mild days in March, and it is still uncertain when the first boats will start. The railroad situation is much improved, and it is quite possible that coal may be shipped too freely, overloading the markets.

In the East the situation is unchanged, and the trade is generally quiet. The domestic demand for anthracite has been a little better, under the influence of stormy weather. Steam coal continues in steady demand.

The Lehigh Coal and Navigation Company report shows that in 1906 the small or steam sizes of anthracite were more than half its shipments. The figures are: Pea, 14.41; buckwheat, 16.47; No. 2 buckwheat, 20.45; No. 3 buckwheat, 2.64; total small, 53.97 per cent.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to March 30 were as follows, in short tons:

	1907.	1906.	Changes.	
Anthracite	[illegible]	1,[illegible]081	D.	11,656
Bituminous	[illegible]	3,[illegible]623	D.	136,246
Coke	[illegible]	3,[illegible]088	I.	282,682
Total	13,[illegible]702	13,[illegible]702	I.	134,770

The gain this year has been wholly in coke, coal showing a small decrease.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to April 6 were 277,908 tons.

Coal and coke tonnage of the Chesapeake & Ohio Railway for the eight months of its fiscal year from July 1 to Feb. 28 is reported as below, in short tons:

	Coal.	Coke.	Total.
New [illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]		[illegible]
Connecting lines...	297,403	78,843	376,296
Total	[illegible]	[illegible]	[illegible]
Increase	[illegible]	[illegible]	[illegible]

The total increase was 417,324 tons, or 7.3 per cent. Deliveries of tonnage originating on the line this year were: Points west of mines, 2,835,008 tons coal and 147,512 tons coke; points east, 1,209,055 tons of coal and 49,411 tons coke; tidewater, 1,983,955 tons coal.

Anthracite shipments in March are reported at 5,234,814 long tons, a decrease of 562,353 tons, as compared with March, 1906. For the three months ended March 31, the shipments were, in long tons:

	1906 Tons.	Per Ct.	1907. Tons.	Per Ct.
Reading	3,301,673	20.7	2,890,392	19.2
Lehigh Valley	2,828,990	17.4	2,597,830	17.3
N. J. Central	2,061,706	13.0	1,888,592	12.5
Lackawanna	2,613,741	16.4	2,515,496	16.7
Del. & Hudson	1,691,867	10.1	1,508,313	10.0
Pennsylvania	1,385,630	8.7	1,402,590	9.3
Erie	1,494,920	9.4	1,595,778	10.6
N. Y., Ont. & W.	679,830	4.3	660,483	4.4
Total	15,968,361	100.0	15,059,474	100.0

The Lehigh Valley tonnage now includes that of the Delaware, Susquehanna & Schuylkill, or Coxe Brothers & Co., formerly reported separately. The total decrease for the three months was 908,879 tons, or 5.7 per cent. In the first quarter of 1906 unusually heavy shipments were made, in anticipation of a strike.

New York

Anthracite

March 10—The hard-coal market is fairly active, although the usual April demand is not as heavy as was expected. The small steam sizes are in good demand, but the supply shows no tendency to increase. There seems to be a smaller amount produced from the washeries and there is a tendency among producers to cut down the output of small coal as much as possible. Prices are as follows: Broken, $4.25; egg, stove and chestnut, $4.50; buckwheat No. 1, $2.50; pea, $3; rice, $1.85; barley, $1.50, all f.o.b. New York harbor shippping points.

Bituminous

The Atlantic Seaboard soft-coal trade shows some dullness, which was rather unexpected at this time. Consumers are supplying themselves with anthracite, and most of the boats are being monopolized by hard-coal shippers. Contracts for the coming season have nearly all been closed, and some first orders on new contracts are coming into the hands of the shippers.

Trade in the far East is taking on a fair amount of coal, especially for those ports which have been closed until recently. Trade along the Sound is quiet, the attention being given to anthracite rather than to bituminous coal.

New York harbor trade is showing a small amount of business at $2.70@2.75 for good grades of steam coal. All-rail trade is fairly active at prices ranging from $1@1.25 at mine., according to grade. Transportation from mines to tide is about up to schedule but is irregular; car supply is up to demand in most cases.

In the Coastwise market, vessels are showing a disposition to charter promptly, which indicates an expected falling off in rates. We quote current rates of freight from Philadelphia to Boston, Salem and Portland, $1.10; to Portsmouth and Bath, $1.15; to Lynn, Saco and Gardner, $1.25; to the Sound, $1. All include discharge and the loading and discharging clause.

Birmingham

April 8—Negotiations are under way again in Alabama for the purchase of large tracts of coal lands and indications point to some big deals. These negotiations are said to be for the purpose of development, and not speculation. The coal production improves as the railroad service improves. As far as can be learned there will be no decided reduction in output during the summer this year. The operators have heavy orders on hand, and mine workers will find steady employment.

Chicago

April 8—The local coal market continues to be sluggish, as regards bituminous coals, but somewhat active in April scales of anthracite. This is probably due to the fact that in every line of business consumers are becoming more prudent. The April reduction of 50c. from circular price increases the demand for standard sizes, particularly chestnut. It is noted, however, that more consumers are coming to use the smaller sizes of anthracite, on which the discounts between March and September do not apply. Something of the increase is doubtless due to the apprehension that freight rates on all-rail coal will be advanced May 1.

In the bituminous market there is a steady demand for coal in industrial lines, but prices have continued low; and many operators are trying to ease the market by suspending production. Contracts for the coming year's supply are not being made to any large extent, the consumer being apparently satisfied to trust to open market conditions. Illinois and Indiana are quoted at $2.15@2.50 for the greater part of the lump and egg being marketed; run-of-mine is $1.70@2.20 and screenings sell for $1.35@1.50.

Eastern coals are quiet, the demand being fairly steady and the supply good. Smokeless is holding up fairly to circular

prices of $3.35 for run of mine and $3.65 for lump and egg.

Cleveland

[illegible] Lake season opened to-date Monday night, when two boats left for Milwaukee and Chicago, respectively, with an aggregate of 15,000 tons of coal. The car shortage in the Ohio territory has greatly hampered the loading of coal for this center, and in consequence few boats have yet their full cargoes. Prices on track have undergone no change, as consumers are fairly well supplied under contract, and there is little inquiry in the open market. Anthracite dealers report a continuance of the strong demand noted last week.

The coke market shows some improvement, but prices are unchanged. Connellsville receipts have been light. Foundry is quoted at $3.50@3.60 for this year delivery; furnace, $2.90.

J. J. Phillips, a leading coal operator in the Ohio fields, is placing on the local market $2,000,000 of the bonds and stock of the Letcher Coke Company, recently incorporated in Kentucky.

Indianapolis

April 7—There was less demand for coal for domestic use during the month of March than for any previous March in the memory of the oldest coal dealer. This was due to the uncommonly mild weather. Local dealers begin to stack up for the coming season after April 1. This is usually deferred until April because the operators make some concession in the price for April orders, and dealers avoid taxation on coal received after April 1.

Operators in this State are feeling more encouraged than a few weeks ago. Orders are being booked more rapidly than usual and the railroads are endeavoring to move coal promptly. This is necessary during the next three months, since harvest time makes a demand on the roads to move the crops.

After the block-coal operators conferred with representatives of the railroad companies interested, they withdrew their complaint against the roads. The freight rate on block coal is 10c. a ton higher than the rate to similar points on bituminous coal, and it was to this differential that block-coal men objected. The complaint was withdrawn at the request of the railroad officials pending an investigation.

Pittsburg

April 9—Heavy shipments were made this week to lake ports for the northwestern markets as the advanced rate from this district to the lakes will go into effect April 15. The new rate is 88c. on cargo and 98c. on vessel fuel coal, an increase of 5c. over last season. According to reports received, contracts have been made for a larger tonnage for lake shipment than last year, but prices are practically the same. There is a good supply of railroad cars and the mines are being operated fairly well. Prices remain unchanged on the basis of $1.15@1.25 for mine-run coal at the mine.

Connellsville Coke—Prices are a trifle lower this week, sales having been made at $2.75@2.85 for furnace, and $3.40@3.65 for foundry coke. The prices, however, are temporary and are due to an accumulation. For last-half delivery furnace coke is reported at $3. The *Courier* for the week ending March 30 gives the production in both regions at 404,478 tons. The shipment aggregated 15,445 cars distributed as follows: To Pittsburg, 4754 cars; to points west of Connellsville, 9736 cars; to points east of Connellsville, 905 cars.

Foreign Coal Trade

April 3—The coal production of Spain for the full year is reported by the *Revista Minera* as follows, in metric tons:

	1905.	1906.	Changes.
Coal	3,075,741	3,079,736	I. 3,995
Lignite	168,994	204,840	I. 35,846
Total mined	3,244,735	3,284,576	I. 39,841
Coke made	675,812	659,927	D. 15,885
Briquets made	296,501	333,086	I. 36,585

The chief producing region in Spain is the Asturias, which furnishes about 60 per cent. of the total. Of the coke reported in 1906 there was 449,927 tons made in coke ovens, chiefly at the large iron works, and 210,000 tons at gas works. Of the coal reported there was classed as anthracite 163,275 tons in 1905, and 159,519 tons in 1906; a decrease of 3756 tons.

The approximate consumption of coal, coke and briquets in Spain for the year 1906 were as follows, in metric tons:

	Coal.	Coke.	Briquets.
Production	3,284,576	659,927	333,086
Imports	2,199,091	228,101	.....
Total	5,483,667	888,028	333,086
Exports	4,498	.....	.....
Consumption	5,479,209	888,028	333,086
Consumption, 1905	5,448,962	821,100	296,501

The increase in coal was 30,307 tons; coke, 62,928; briquets, 36,585; a total advance of 129,820 tons in fuel consumption.

Imports of coal and coke into the United States for the two months ended Feb. 28 are reported as follows, in tons:

	1906.	1907.	Changes.
Great Britain	45,774	7,954	D. 37,820
Canada	309,225	232,847	D. 76,378
Japan	4,962	17,784	I. 12,822
Australia	50,441	56,542	I. 6,101
Other countries	4,985	485	D. 4,502
Total coal	394,387	315,510	D. 78,877
Coke	29,560	32,206	I. 2,646
Total	423,947	347,716	D. 76,231

Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal is on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Iron Trade Review

[illegible] ing has been better, several large concerns having come into the market for foundry iron for third-quarter delivery. Little business has been done in spot iron, as there is not much to be had.

In steel and finished products there is no special change. New business is not plentiful, but the mills are all very busy on orders. Railroad orders for structural and bridge work are held back, but this does not seem to affect those for new rails. There are a good many orders coming in for rails and other material for electric railroads.

The waiting tendency still seems to exist, but is, if anything, less pronounced than it was recently.

It is announced that the United States Steel Corporation has authorized the construction of a steel plant at Duluth to meet the requirements of that section of the country. The plant will probably cost from $5,000,000 to $7,000,000, and include, it is said, one blast furnace, six open-hearth furnaces, one blooming mill, one rail and shape mill, two bar mills, by-product coke ovens, coal docks and other necessary appurtenances. The corporation recently bought property at Sandwich, Ont., on the Detroit river, probably with the purpose of erecting a plant for Canadian trade.

It is announced that the Canadian Government will give bounties for four years on iron ore smelted by electricity according to the following sliding scales: On pig iron manufactured from Canadian ore by the process of electric smelting: 1909, $2.10 per ton; 1910, $2.10; 1911, $1.70; 1912, $0.90 per ton. On steel ingots manufactured by electric process direct from Canadian ore, or from pig iron smelted by electricity in Canada from Canadian ore: 1909, $1.65; 1910, $1.65; 1911, $1.05; 1912, $0.60 per ton.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for February, and the two months ended Feb. 28, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
February	$12,738,927	$16,000,042	I. $3,261,115
Two months	25,729,363	28,273,978	I. 2,544,615

The total increase for the two months was 9.9 per cent. The leading items of export for the two months were, in long tons:

	1906.	1907.	Changes.
Pig iron	11,730	13,850	I. 2,120
Billets, ingots & blooms	40,726	16,518	D. 24,208
Bars	12,404	16,217	I. 3,813
Rails	1,211	1,233	I. 22
Sheets and plates	12,014	19,312	I. 7,298
Structural steel	34,466	28,162	D. 6,304
Wire	2,262	3,407	I. 1,145
Nails and spikes	11,776	8,867	D. 2,909

The notable increases were in sheets and structural steel; while the larger decreases were in nails and in billets, ingots and blooms.

[illegible] Imports of iron and steel, including machinery, from the United States for February and the two months ending Feb. 28, are valued by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
[illegible]	$1,875,173	$3,020,986	I. $1,145,813
[illegible]	1,460,190	3,317,048	I. 2,016,858

The increase for the two months was 46.7 per cent. The chief items of the iron and steel imports for the two months were, in long tons:

	1906.	1907.	Changes.
Pig iron	40,042	98,987	I. 58,945
Scrap	6,026	3,551	D. 2,475
Ingots, blooms, etc.	3,655	3,294	D. 361
Bars	8,159	5,732	D. 2,427
Wire rods	2,915	2,812	D. 103
Tin plates	5,237	5,381	I. 144

The only large proportional change was the increase in pig iron, which came chiefly from Great Britain.

Iron Ore Movement—Exports and imports of iron ore in the United States for the two months ended Feb. 28, are reported as follows, in long tons:

	1906.	1907.	Changes.
Exports	7,079	1,646	D. 5,432
Imports	182,018	188,899	I. 6,881

Most of the exports were to Canada. The imports were chiefly from Cuba and Spain.

Imports of manganese ore for the two months were 28,333 tons in 1906, and 34,431 tons in 1907; an increase of 6098 tons. These imports were from Cuba, India and Brazil.

Baltimore

April 9—Imports of spiegeleisen for the week were 1000 tons; of ferromanganese, 350 tons; of ferrosilicon, 76 tons. Imports of iron ore for the week were 11,800 tons from Cuba and 8710 tons from Spain; 20,510 tons in all. Imports of manganese ore were 580 tons from Liverpool and 5500 tons from Bombay; 6080 tons in all. There were also received 6732 tons iron pyrites from Spain.

Exports included 1453 tons steel rails and 48 tons splice-bars to Buenos Aires.

Birmingham

April 8—The Southern iron market is in a strong condition. Deliveries now are good, the railroads furnishing almost as many cars as desired, and the accumulated stocks are reduced to less than 25,000 tons. All sales now being made are for delivery during the last quarter of the year. Spot iron is out of the question, despite the fact that the quotation for this class of iron is placed at $23@24 per ton, No. 2 foundry. Third-quarter iron is not an easy quantity either, and commands over $20. Fourth-quarter iron is selling right along at $19 per ton, though some iron at $18.50 is to be found. The production is still off, with no prospects of an immediate recovery. In addition to furnaces out for repairs some of the companies are suffering from a short supply of raw materials, especially ore.

The advance in freight rates on iron and pipe out of the Southern territory to the Ohio river, has not disturbed the market. Several furnaces in the Birmingham district had to have hasty repairs made during the past week, losing from three to six days. In cast-iron pipe conditions continue good. In steel there has been a little hesitation in the output.

Chicago

April 8—The demand for pig iron continues light, though the market holds firm. Many shipments of Southern are being brought forward at the request of consignees, and with the supply at Southern yards limited this would seem to indicate a sharp demand for iron. The truth probably is, however, that the melters are running closer and closer to the wind and preparing to place heavy contracts as soon as the market shall be definitely settled.

Supplies of Northern as well as Southern iron are limited, several local furnaces being out of blast. In consequence charcoal iron is largely in demand. A small amount of Scotch iron has been sold at about $28.50. For quick delivery Northern No. 2 is quoted at $26@26.50. Southern No. 2 brings about $22.50, Birmingham, for deliveries in April, and about $21.50 for May and June. On second-half contract business Southern brings about $18.50, Birmingham.

Coke is easy and there is plenty of every grade. The best Connellsville sells for $6.15@6.40, with 48-hour coke at $5.65 per ton.

Cleveland

April 9—The mills note a stronger inquiry for wire products, nails, etc., due, presumably to the opening of the spring building season. Between 30,000 and 40,000 tons of steel bars have been sold during the week for delivery during the last half.

Pig iron remains stationary on a light demand; spot shipments are commanding steady prices, but as a number of furnaces are yet out of blast the market is rather inactive. Spot foundry iron is quoted $23.50@24 f.o.b. Cleveland. Cleveland furnaces are sold up to the fourth quarter and ask $22 for No. 2 foundry for late shipments. Last-half delivery is quoted: Bessemer $21@21.50; No. 1 foundry $22.50; No. 2, $22; No. 3, $21.50; No. 2 Southern $22.60; all f.o.b. Cleveland.

Philadelphia

April 10—The keynote of the pig-iron situation this week is the appearance in the market of quite a number of small consumers, who are in the habit of buying from hand to mouth, and who, perhaps, are not well able to do otherwise; they now want to buy small quantities of iron for delivery this side of June 30. The effect of these inquiries and the manifest necessity for buying for early delivery has stiffened the market, if it needed any strength. It is known that a number of furnaces have it in their power to make the necessary accommodation and the presumption is that the sales will be made at strong premium prices. It is evident, however, that the importers will have a finger in this pie. Prices are inclined to move upward, except for bessemer. Quotations for Middlesboro on dock are today, $22; basic, $25; forge, $23.50; No. 2 X, $25.

Steel Billets—Quotations for steel billets range from $32 to $33, although business has been done as low as $31.50.

Bar—The heavy ordering that has been the rule for so long past has made consumers of bar iron feel pretty safe. The iron stores throughout all of this territory are stocking up with iron and are buying liberally.

Pipes and Tubes—The demand for merchant pipe is showing evidence of strength. The mills are in sight of an enormous amount of business.

Plates—The extraordinary activity in the steel car plants is reflected in strong prices in iron and steel plates in this territory. Premium quotations are the rule.

Structural Material—The bulk of the business now coming here is for early delivery for buildings and small bridges.

Steel Rails—Most of the business is in light rails and trolley rails. Prices for light rails are strong.

Scrap—There is no perceptible difference; dealers say that they have more inquiry for steel scrap than anything else. Those kinds which are usually bought in small quantities, such as borings and turnings, can be had at slightly reduced quotations.

Pittsburg

April 9—There is no abatement in the urgent demands for deliveries in every line of finished iron and steel products, and the mills do not seem to be catching up on orders. New business is offered, but there is no possibility of getting deliveries inside of three months, and in some lines six months. The American Sheet and Tin Plate Company will not promise black sheets for five months and for galvanized sheets will not guarantee shipment inside of six months. Despite the urgent demand for steel rails the Carnegie Steel Company has again been forced to put its Ohio works at Youngstown on sheet-bars to assist the American company to operate its sheet plants more fully. This week 95 per cent. of the sheet mills and 84 per cent. of the tin-plate mills are running. It is expected that all of the sheet mills will be operating to capacity next week, and the McKeesport

and Monongahela tin-plate plants, which were damaged by the flood, are likely to resume. The scarcity of steel in this district is more acute than ever, and the prices quoted for the past month are merely nominal, as no sales of any consequence have been made.

Pig Iron—Since April 1 sales of pig iron have exceeded 60,000 tons. The bulk of it is for delivery in the second quarter, and the furnaces may have some difficulty in filling the contracts. As expected, the Carnegie Steel Company exercised its option on 14,000 tons of bessemer iron for May delivery, but will receive 4000 tons this month in addition to the 11,000 tons bought a few weeks ago. This iron will be supplied by the Bessemer Pig Iron Association, which also sold this week 10,000 tons for June delivery at $22, Valley furnaces; this practically puts the association out of the market for second-quarter delivery. Several sales of 1000-ton lots for early deliveries were made at $23. One large concern renewed its annual contract, involving 12,000 tons of bessemer, deliveries of 1000 tons a month, beginning April 1, subject to the ascertained monthly average. One lot of 1000 tons of bessemer for June delivery sold at $22.50. Sales for the third quarter were at $21, or $1 less than a large sale made the previous week, indicating that lower prices will prevail after July 1, unless there is a change in conditions. The sales consisted of two lots, one of 9000 tons, and the other of 1000 tons. Sales of 8000 tons of basic iron have been made during the week and include 2000 tons for second quarter at $22, and 6,000 tons for third quarter, at $21. Foundry iron is decidedly scarce for early delivery, and several 100-ton lots of No. 2 foundry sold at $25.25, Valley furnace, which is near the record price. The furnaces are well sold up on foundry iron for the rest of the year. The ascertained average of bessemer pig iron for March was $22.90, Pittsburg. This was 12c. above the February average, and 1½c. lower than the January average.

Steel—Open-hearth billets cannot be had at any price, and bessemer billets are quoted nominally at $30. Eastern mills are offering bessemer billets in this market at $31.50 delivered, but no transactions are known to have been made. Steel bars remain firm at 1.60c., and there will be no decline this year. Agricultural-implement makers have about given up the attempt to obtain a concession and one interest has placed a contract for 5000 tons for delivery in the third quarter at the full price. Tank plate remains firm at 1.70c.

Sheets—The mills are congested with business, and it will be several months before they will catch up on deliveries. No change in prices is likely to be made. Black sheets remain at 2.60c., and galvanized sheets at 3.75c. for No. 28 gage.

Ferro-Manganese—The market continues about the same, and for prompt delivery $75 to $76 is quoted.

Dusseldorf, Germany

The imports and exports of metallic ores in Germany for the 10 months, March-December, are given below, in metric tons; owing to tariff changes, the full year is not reported:

	Imports.	Exports.	Balance.
Gold ore	88	...	Imp. 88
Silver ore	1,777	1	Imp. 1,776
Copper ore	8,850	4,688	Imp. 4,142
Lead ore	65,224	1,579	Imp. 63,645
Tin ore	10,613	154	Imp. 10,459
Zinc ore	116,040	45,784	Imp. 116,256
Nickel ore	21,953	...	Imp. 21,953
Tungsten ore	1,645	52	Imp. 1,593
Chrome ore	15,667	24	Imp. 15,643
Manganese ore	303,180	2,002	Imp. 301,168
Iron ore	6,730,686	3,212,977	Imp. 3,517,689

Imports of pyrites were 512,663 tons, while exports were 29,673 tons. Imports of slag and slag products were 572,663 tons, the exports being 44,433 tons.

Metal Market

NEW YORK, April 10.

Gold and Silver Exports and Imports

At all United States Ports in February and year

Metal.	Exports.	Imports.	Excess.
Gold:			
Feb. 1907	$1,027,058	$ 3,275,933	Imp. $2,248,875
" 1906	8,486,330	2,079,680	Exp. 6,406,647
Year 1907	3,477,130	6,546,438	Imp. 3,069,308
" 1906	14,227,995	4,685,392	Exp. 9,542,603
Silver:			
Feb. 1907	4,223,970	3,693,061	Exp. 530,909
" 1906	6,435,129	4,480,449	" 1,954,680
Year 1907	8,990,935	7,350,102	" 2,640,633
" 1906	13,951,797	9,167,160	" 4,784,637

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Apr. 6 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 34,410	$1,557,969	$ 663,515	$ 40,610
1907	1,756,336	4,607,228	9,974,974	619,356
1906	3,192,425	3,300,918	19,237,977	535,687
1905	31,939,270	4,045,826	9,697,448	892,890

Imports of gold for the week were chiefly from Great Britain: of silver from South America. Exports of gold for the week were to the West Indies; of silver chiefly to London.

The joint statement of all the banks in the New York Clearing House for the week ending April 6 shows loans $1,062,688,800, an increase of $6,143,600; deposits, $1,036,713,100, an increase of $16,895,800, as compared with the previous week. Reserve accounts show:

	1907.	1907.
Specie	$171,788,000	$206,858,400
Legal tenders	76,841,700	71,661,500
Total cash	$248,209,700	$278,619,500
Surplus	...	$ 9,441,225
Deficit	$ 2,560,025	...

The surplus over legal requirements [illegible] pared with the previous week this year.

Specie holdings of the leading banks of the world, April 6, are reported as below, in dollars:

	Gold.	Silver.	Total.
Asset N. Y.	...	...	$ [illegible]
England	$171,[illegible]	...	171,[illegible]
France	[illegible]	$114,[illegible]	111,[illegible]
Germany	145,[illegible]	48,[illegible]	193,[illegible]
Spain	95,[illegible]	127,[illegible]	222,[illegible]
Netherlands	28,[illegible]	25,[illegible]	53,[illegible]
Belgium	16,[illegible]	8,[illegible]	24,[illegible]
Italy	161,[illegible]	25,[illegible]	187,[illegible]
Russia	532,[illegible]	25,[illegible]	557,[illegible]
Aust.-Hungary	225,[illegible]	61,[illegible]	287,[illegible]
Sweden	20,[illegible]	...	20,[illegible]

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to March 27:

	1906.	1906.	Changes.
India	£ 5,015,610	£ 3,850,410	D. £ 1,165,200
China	...	...	...
Straits	...	172,550	I. 172,550
Total	£ 5,015,610	£4,033,460	D. £ 982,150

Receipts for the week were £172,000 in bars and £14,000 in Mexican dollars from New York; £186,000 in all. Exports were £157,500 in bars and £102,500 in Mexican dollars; £260,000, all to India.

Indian exchange continues strong, and the Council bills offered in London were all taken at an average of 16.09d. per rupee. The demand for silver for India has been small.

On April 5 the United States Mint bought 200,000 oz. silver for coinage at 65.447c. per ounce, delivered at New Orleans. This is the lowest price reported on mint purchases this year.

The Treasury Department's estimate of the money in the United States on April 1, is as follows:

	In Treasury.	In Circul'n.
Gold coin and bullion in Treasury	$ 265,742,692	$ [illegible]
Gold certificates	42,018,390	610,173,479
Silver dollars	7,[illegible]	82,[illegible]
Silver certificates	4,[illegible]	406,[illegible]
Subsidiary silver	7,375,620	121,059,533
Treasury notes of 1890	10,259	6,271,741
U. S. notes	4,934,562	341,746,454
Nat. Bank notes	10,388,420	586,823,643
Total	$ [illegible]	$ [illegible]

Population of the United States April 1, 1907, estimated at 85,720,000; circulation per capita, $33.91. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the Treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the Treasury as assets of the Government does not include deposits of public money in national bank depositaries, to the credit of the treasurer of the United States, amounting to $154,092,962. The total amount in circulation was $15,678,646 more than on March 1; and $229,895,080 more than on April 1 last year.

Prices of Foreign Coins

	Unit	Value
[illegible]	Sovereign	$4.8651
[illegible]	£	4.8665
[illegible]	Mark	0.238
[illegible]	Mark	0.238
[illegible]	Franc	0.193
[illegible]	Franc	0.193
[illegible]	Franc	0.193
[illegible]	Franc	0.193
[illegible]	Peseta	0.193
[illegible]	Lira	0.193
[illegible]	Florin	0.402
[illegible]	Florin	0.402
[illegible]	Krone	0.268
[illegible]	Krone	0.268
[illegible]	Krone	0.268
[illegible]	Rouble	0.515
[illegible]	Milreis	1.08
[illegible]	Milreis	1.08
[illegible]	Milreis	1.08
[illegible]	Milreis	1.08
[illegible]	Peso	0.965
[illegible]	Peso	0.965
[illegible]	Peso	0.965

Missouri Ore Market

Joplin, Mo., April 6—The highest price paid for zinc was $53.50 per ton, on a basis of $50 per ton of 60 per cent. zinc, the ore assaying 63.50 per cent. zinc. Other grades ranged down to $48. The average price was $48.86.

The highest price reported paid for lead was $84 per ton, the price weakening at the close of the week, under a light demand, two buyers being out of the market. The average price was $80.

Following are the shipments of zinc from the various camps of the district for the week ending April 6:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,197,360	686,650	$107,309
Joplin	2,229,050	360,870	70,890
Alba-Neck City	1,848,980	.....	35,374
Galena-Empire	1,054,740	214,670	34,428
Duenweg	921,400	266,370	33,694
Prosperity	846,380	240,850	18,289
Badger	495,350	.....	12,929
Aurora	477,470	.....	8,909
Spurgeon	383,950	25,840	8,745
Granby	375,000	75,000	8,675
Carthage	246,430	17,450	6,675
Zincite	99,060	.....	2,427
Castle	61,560	.....	1,569
Carl Junction	63,700	.....	1,533
Baxter Springs	64,050	.....	1,527
Oronogo	54,670	.....	1,339
Short City	49,210	.....	1,156
Wentworth	46,350	.....	1,089
Totals	11,516,320	1,877,700	$356,547

14 weeks.....167,200,280 25,827,890 $5,054,660
Zinc value, the week, $281,394; 14 weeks, $3,980,114
Lead value, the week, 75,153; 14 weeks, 1,074,516

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.58	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	.....	April	75.13	.....
May	40.51	.....	May	78.40	.....
June	43.83	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	43.56	.....	August	75.36	.....
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.13	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

Platteville, Wis., April 6—The price of zinc ore remained the same as last week, ranging from $50 to $51 per ton for 60 per cent. ore. Just at this particular time this is a surprise, as it was thought the price would be off a little. The local situation has not been affected by any outside conditions, as far as can be determined.

The production of the entire district continues to hold its own, showing increases at some camps. The slight difference from previous week in the reported tonnage is due almost entirely to the inability to load all the ore produced; again, at several of the mines the concentrates are allowed to accumulate for roasting. Buyers buy all the ore offered, the producers in a majority of cases are just as anxious to sell. The highest price paid for zinc ore reported was $52.50.

The camps of the district loaded ore for the week ending April 6 as follows:

Camps.	Zinc.	Lead.	Sulphur.
Platteville	2,500	.....	.....
Cuba City	2,500	.....	.....
Linden	120,450	.....	.....
Benton	20,470	.....	.....
Highland	132,000	44,000	.....
Galena	130,000	.....	.....
Mineral Point	121,250	.....	.....
Livingston	100,000	.....	.....
Rewey	4,000	.....	.....
Total for week	1,141,170	44,000	.....
Year to April 6	22,936,949	1,032,500	143,160

Owing to the condition of the wires it was impossible to get the ore report from Hazel Green and Buncombe.

Chemicals

New York, April 10—Heller, Hirsch & Co., of New York, have given up the agency for the potash salts of the Kali syndicate and in the future will distribute the salts of the Sollstedt mines, Germany.

Copper Sulphate—The market is still steady and strong. There is no change in prices, and we continue to quote $7.50 per 100 lb. for carload lots, or over; $7.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Messrs. Mortimer & Wisner, of New York, give the following statistics of nitrate for the United States, as of date April 1, in long tons:

	1906.	1907.	Changes.
Stocks, Jan. 1	13,100	13,050	D. 50
Imports, 3 mos.	78,000	45,734	D. 32,866
Total	91,100	58,784	D. 32,316
Deliveries	82,000	54,863	D. 28,137
Stocks, April 1	8,800	4,875	D. 3,925
Afloat for U. S.	70,000	120,000	I. 50,000

The quantities afloat include all cargoes due to arrive by July 15 next

Phosphates—Exports of phosphate rock through the port of Savannah for the month of March are reported by Wm. Lang & Co. as follows: Holland, 4384 tons; Italy, 2988; Germany, 12,709; total, 20,081 tons.

Mining Stocks

New York, April 10—The general stock markets are still uncertain. For a few days there seemed to be a stronger tendency, but this was met by large offerings of stocks, and there was a general fall, although money was easy. The buying of stocks at the low prices for investment seems to have stopped for the time, and trading is largely professional. Amalgamated Copper touched $95¼; American Smelting common, $128½; Tennessee Copper, $39; United States Steel, $37½ for the common, and $101 for the preferred.

On the curb business was rather quiet, with the chief trading in the lower-priced stocks. The coppers generally showed a weaker tendency.

Boston

[illegible] weakness the middle of last week, mining shares show improvement, but the market has gotten into a period of dullness. The break in copper in London one day last week, followed by another sharp decline the following day, caused an unsettled feeling in stocks; but in most instances prices tonight are above those of a week back. Trinity furnished a sensation Wednesday by opening off $7 from the previous night's closing, at $20; it touched $19.50 a few moments later, but recovered to $23.25 the same day. No explanation was vouchsafed for this sharp break, and the only reason can have been the fact that T. W. Lawson, its president and main voucher, sailed for Europe last Saturday. Since then it has remained steady, closing at $21 tonight. Two curb stocks were placed in the unlisted department of the exchange Thursday, Balaklala and Greene-Cananea. The former had an active time, and rose to $12.50, although it was off to $10.75 today. Greene Cananea, from an opening at $16 on the exchange, rose to $17.62½, reacting to below $17 tonight.

The curb furnished a sensation in a company called the Boswyocolo Company, a security-holding Wyoming corporation, with $1,000,000 capital, par 10c., or 10,000,000 shares. Its president, Isaac Van Horn, saw fit to let the public get the stock through curb brokers only, and delegated one to supply all the wants. The first day's trading in it, Monday, April 5, was 1,172,400 shares, all at 10c., and the second totalled 233,270 shares at the same price. Amalgamated, in this market, after touching $90, spurted to $99, and closed at $96.25 tonight. There are not many in this city who believe that the rate will be increased at the regular quarterly meeting next week. Copper Range recovered from a low at $79.25 to $84, closing tonight $2 below the latter. North Butte fell $2.62½ to $87.87½, since recovering to $95, and closing tonight at $91.62½. Old Dominion fell $2.75 to $51, and spurted to $56.50, closing within $2 of this. There is little likelihood of an increase in the next Quincy dividend. The Boston Consolidated is said to be earning at the rate of $20,000 net per month on the present price of copper.

San Francisco

April 4—The San Francisco Mining Exchange was formally opened on Monday, April 1, with 126 members. It is understood that it is in active opposition to the San Francisco Stock and Exchange Board, although several are members of both organizations. It is the object of the new exchange to make itself the medium by which the speculator can safely buy

and sell and the capitalist invest his [illegible] and [illegible] ern Nevada with a certainty of good results. It is the intention of the exchange, as expressed by its president, Walter Turnbull, to list only such properties as are certain producers, or have undoubted prospects. The prices of mining stocks on the market were about the same in both the exchanges.

Colorado Springs

[illegible] the local mining market has been spotted this week. Prices have held steady, but the trading has been dull. The only stocks that have shown any indication of an advance are El Paso, Portland and Jennie Sample, and these advances were only fractional.

STOCK QUOTATIONS

NEW YORK	Apr. 9
Name of Comp.	Clg.
Alaska Mine	13½
Am. Nev. M. & I.	3
Am. Zinc	39½
Atlantic	7
Bonanza	1.65
British Col. Cop.	4
Buffalo Cobalt	2½
[illegible]	2
[illegible]	28½
[illegible]	5
Cobalt Contact	½
Colonial Silver	¾
Cum. Ely Mining	¾
Davis Daly	13
[illegible]	6
El Paso	5
[illegible]	1
[illegible]	1
Giroux Mines	9
Gold Hill	1¾
Granby, New	
[illegible]	1¾
[illegible]	1¾
Greenw'r & D.Val.	3¾
Guanajuato	4
[illegible]	230
[illegible]	
[illegible]	1
[illegible]	4
Mines Co. of Am.	1¾
Mitchell Mining	¾
[illegible]	11
[illegible]	4
[illegible]	1¾
Nipissing Mines	1¾
[illegible]	3
[illegible]	1
[illegible]	2
[illegible]	
[illegible]	
West Columbus	1

BOSTON	Apr. 9
Name of Comp.	Clg.
Adventure	4
Allouez	55
Am. Zinc	39½
Arcadian	7
Atlantic	1.65
Blackbird	20
Boston Con.	25
Calumet & Ariz.*	165
Calumet & Hecla*	
Centennial	33
Con. Mercur	37
Copper Range	82
Daly-West	16½
Franklin	17½
Greene—Can. cfts.	16½
Isle R. Cal	20
La Salle	16
Mass.	5
Michigan	14½
Mohawk	85
Mont. C. & C.(new)	2½
Nevada	14½
North Butte	31½
Old Colony	
Old Dominion	54½
Osceola	145
Parrot	24
Phoenix	
Quincy*	122½
Rhode Island	6¾
Santa Fe	3
Shannon	18
Tamarack*	110
Trinity	21
United Cop., com.	63½
U. S. Oil	10½
U. S. Smg. & Ref.	55½
U.S.Sm.& Re.,pd.*	44¾
Utah Copper	62
Victoria	8
Winona	8
Wolverine	160
Wyandotte	1

*Ex. Div. †Ex. Rights.

BOSTON CURB

Black Mt.	
Cananea Cent.	
East Butte	1½
[illegible]	1
[illegible]	1
[illegible]	1
[illegible]	1
Troy Man.	1¾

[illegible]	1	16	1	
[illegible]	0	3		
Camp Bird	1	4		
[illegible]	1	4		
[illegible]	1	4		
[illegible]	1	4		
[illegible]	1	4		
[illegible]	1	16	1	16¾
Ariz.Cop.,pfd.	4	15	4	
[illegible]	3	12		
[illegible]				
[illegible]				
[illegible]				
[illegible]				
[illegible]				
[illegible]				
[illegible]				

S. FRANCISCO	Apr. 3
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.50
Best & Belcher	1.40
Caledonia	.40
Challar	.13
Con. Cal. & Va.	1.25
Crown Point	.34
Exchequer	.85
Gould & Curry	.32
Hale & Norcross	.89
Mexican	.97
Ophir	2.50
Overman	.18
Potosi	.17
Savage	.99
Sierra Nevada	.72
Union	.68
Utah	.08
Yellow Jacket	.90
TONOPAH STOCKS	
Golden Anchor	.32
McNamara	.46
Montana-Ptts'x	.19
North Star	.35
Rescue	.14
GOLDF'D STOCKS	
Black Ants	.10
Blue Bull	.45
Columbia Mt	.88
Comb. Fr.	4.22
Conquerer	.19
Daisy	2.00
Florence	4.00
Frances-Mohawk	1.05
Goldfield Con.	8.00
Grandma	.27
Great Bend	1.06
Red Hill	.32
St. Ives	1.52
BULLFROG STOCKS	
Amethyst	.45
Bonnie Claire	.44
Mayflower Con.	.49
Montgomery Mt.	.29
Original	.18
MANHAT'N STOCKS	
Gold Wedge	.11
Manhattan Mg.	.14
Pine Nut	.20
Ruby Wonder	.32
Stray Dog	.29
Yellow Horse	.07

NEVADA (Weir Bros. & Co., New York)	Apr. 10
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	19.00
Tonopah Exten.	4.00
Montana Tonop'h	3.75
Belmont	4.75
Tonopah Midway	1.80
West End Con.	1.42
Jim Butler	1.13
GOLDF'D STOCKS	
Sandstorm	.74
Kendall	.44
Red Top	4.00
Jumbo	4.00
Goldfield Mining	1.50
Dia'dfield B. B. C.	.40
Atlanta	.75
Mohawk	16.00
Silver Pick	1.24
Laguna	1.80
BULLFROG STOCKS	
Mont. Shoshone C.	11.00
Tramps Con.	1.15
Gold Bar	1.20
Bullfrog Mining	.28
Bullfrog Nat. B.	.43
Homestake Con.	1.20
MANHAT'N STOCKS	
Manhattan Con.	.80
Manhat'n Dexter	.25
Jumping Jack	.17
Stray Dog	.30
Indian Camp	.16

COLO. SPRINGS	Apr. 6
Name of Comp.	Clg.
Acacia	10¼
Black Bell	
C. C. Con	5½
Dante	5¼
Doctor Jack Pot	
Elkton	56
El Paso	44½
Findlay	65½
Gold Dollar	
Gold Sovereign	7
Isabella	23½
Index	
Jennie Sample	8¾
Jerry Johnson	4½
Mary McKinney	
Pharmacist-L.	
Portland	1.18
Un. Gold Mines	7½
Vindicator	.90
Work	16½

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Smg. & Ref., com.	Apr. 15	$1.75	$875,000
Anaconda, Mont.	Apr. 18	1.75	2,100,000
Bunker Hill & Sullivan	Apr. 4	0.50	180,000
Central Coal & Coke	Apr. 15	1.50	76,875
Central Coal & Coke, pfd.	Apr. 15	1.25	23,438
Doe Run Lead, Mo.	Apr. 15	0.50	29,531
Esperanza, Mex.	Apr. 22	1.32	600,600
Inter. Nickel, pfd.	May 1	1.50	131,123
Nipissing, ont.	Apr. 20	0.15	180,000
Nova Scotia Steel & Coal	Apr. 15	0.50	74,655
Penna. Salt Mfg.	Apr. 15	3.00	180,000
Philadelphia Co.	May 1	0.75	434,296
Portland, Colo.	Apr. 15	0.04	120,000
Tenn. Coal, Iron & R.R.	May 1	1.00	225,536
Tenn. C. I. & R.R., pfd.	May 1	2.00	4,960
Tonopah Co., Nev.	Apr. 22	0.35	350,000
Tonopah Belmont	Apr. 1	0.10	129,501
United Copper	Apr. 20	1.75‡	787,500
U. S. Red. & Ref., com.	Apr. 15	0.87½	656,250
U. S. Red. & Ref., pfd.	Apr. 15	0.87½	656,250
U. S. Sm., Ref. & Mg.	Apr. 15	0.87½	656,250
U. S. Sm., Ref. & Mg., pfd.	Apr. 15	0.87½	656,250
Utah Con.	Apr. 15	1.50	450,000
Va.-Carolina Chem., pf.	Apr. 15	2.00	500,000
Vindicator Con., Colo.	Apr. 25	0.03	45,000
Vulcan Detinning, pfd.	Apr. 20	1.25	18,750

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Apr. 3	Apr. 24	$0.05
Jackpot, Nev.	Apr. 16	May 9	0.15
Caledonia, Nev.	Apr. 10	May 1	0.10
California, Cal.	Apr. 3	Apr. 26	0.05
Challar, Nev.	Apr. 22	May 16	0.10
Confidence	Apr. 23	May 14	0.20
Gould & Curry, Nev.	Apr. 10	May 1	0.10
Hale & Norcross, N.	Apr. 3	Apr. 30	0.15
Herkimer Gravel, C.	Mar. 29	Apr. 15	0.04
Liberal Smelting, N.	Mar. 29	Apr. 18	0.01
Mexican, Nev.	Apr. 3	Apr. 26	0.15
Naildriver, Utah	Mar. 30	Apr. 24	0.03
Oro Blanco, Cal.	Feb. 25	Apr. 22	0.08
Posey Canon, Cal.	Apr. 1	Apr. 15	0.01
St. Joe, Utah	Mar. 28	Apr. 16	0.02
Sage Hen, Nev.	Apr. 3	Apr. 26	0.05
Yellow Jacket, Nev.	Apr. 13	May 22	0.10

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.118	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.765		29.984	
May	66.976		30.968	
June	65.394		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.927		31.483	
October	69.523		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.541	81.111	106.594
April	18.375		18.688		84.793	
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.586		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.648	July	37.276	
February	36.403	42.102	August	40.606	
March	36.662	41.313	September	40.616	
April	38.900		October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.081	19.531
March	5.350	6.000	15.922	19.703
April	5.404		15.959	
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.526	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.078		5.901		25.781	
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.076	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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Methods of Working the Coal Seams of Ohio

In the Hocking Valley Field an Overlying Stratum of Quicksand Makes it Impossible to Rob Pillars and Permit Surface to Cave In

BY FLOYD W. PARSONS

The coal territory embraced in the State of Ohio last year produced upward of 30,000,000 tons of coal, ranking fourth among the bituminous coal-producing States. Almost the entire output from Ohio is mined in what is known as the Hocking Valley field, situated in the southeastern part of the State. The coal seams throughout this region rarely outcrop to the surface, so that most of the mines are worked by shafts. The workings are not particularly gaseous or wet, and since the coal has only a dip of 30 ft. to the mile in a direction approximately south 70 deg. east, the problems encountered are not difficult.

The Eclipse Mine No. 3

The operation of the Johnson Coal Mining Company, at Hocking, Athens county, Fig. 1, is one of the most successful mines in this district. The coal is here produced from the Hocking No. 6, or middle Kittanning seam, which at this point averages about 6 ft. in thickness. The seam carries two slate bands, the larger of which varies from 2 to 3 in. thick, while the thinner parting seldom shows more than one-half inch thickness.

FIG. 1. ECLIPSE MINE NO. 3, HOCKING, OHIO.

Method of Operation

The general system of development here carried on is shown in the accompanying map and follows closely the room and pillar system as usually worked. Three main parallel entries are driven from the bottom of the shaft to the boundary line; each entry is separated from the other by a 20-ft. pillar, while a 200-ft. pillar is preserved on each side. The cross entries which are driven to the face are 12 ft. wide and have a 20-ft. pillar separating them. The butt entries, from which the rooms are driven, are turned off the face entries at right angles; this method permits driving the rooms to the face of the coal, so that the seam is extracted with the least labor, and the product obtained in better sizes.

The butt entries are 500 ft. apart, while the face entries are turned off the main entry at 1500-ft. intervals. This allows 33 rooms on each butt entry and leaves a 100-ft. pillar between room No. 1 and the cross entry, and also a 100-ft. pillar between room 33 and the next face entry. Efforts are made to extract the maximum amount of coal on the advance, so that the rooms are driven 30 ft. wide, with a 10-ft. pillar between.

One important condition that must al-

collieries, is the peculiar nature of the overlying strata. The bottom of the seam is fire-clay, while the roof is formed of a sulphur rock of considerable strength. Above this layer of sulphur rock is a seam of coal varying from one inch to four feet in thickness, then comes the real top flint, and above this, a considerable stratum of quicksand. Experience in this field has shown that when robbing takes

FIG. 2. SINKING THE SHAFT AT THE NEW ECLIPSE MINE NO. 3, M.N.

place, this quicksand is most liable to come in and fill up the workings, causing great loss to the operators. Whether a method will be devised whereby the small pillars that are left can be robbed, remains for the future to determine.

The haulage on the main road at this mine is accomplished by one Jeffrey 10-ton motor, which pulls 15 cars, each weighing 2 tons 5 cwt. The motor haulway is laid with 35-lb. steel, while the butt and face entries have 16-pound rails. Wooden rails are used in all rooms. For the purpose of driving the machines, lighting the mine, and for haulage, 250 volts are carried underground. The entries being practically level, the trolley system of haulage is used with success. Under no circumstances are the miners permitted to shoot on the solid, and all undercuts are made with Jeffrey 7-ft. chain cutters.

[illegible]

For hoisting the coal, self-dumping cages are used, and the entire output is run over a 1¼-in. bar screen, being caught

[illegible]

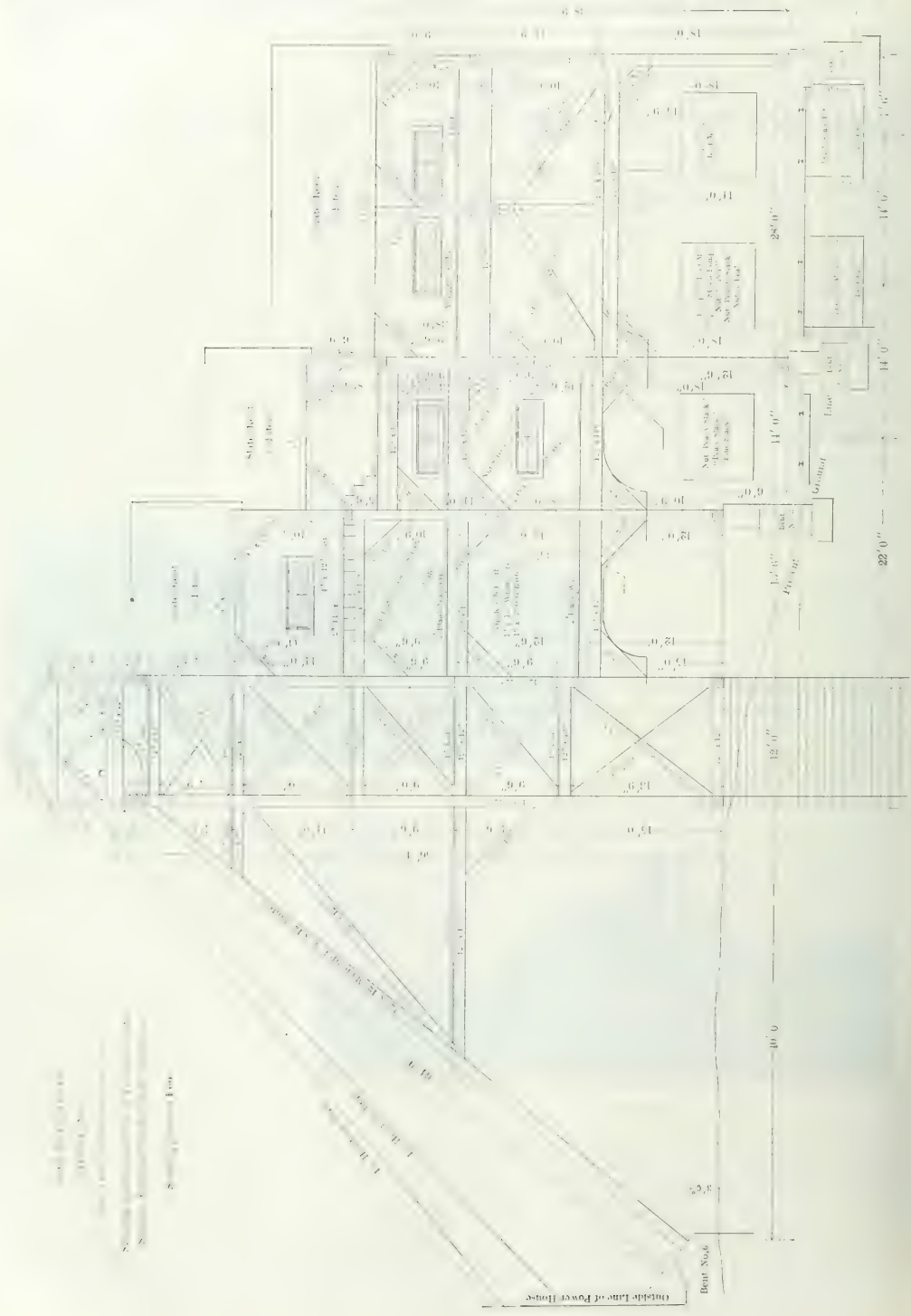

Double Line of Power Poles
Bent No. 6

FIG. 5. THE FIRST STEEL CONSTRUCTED COAL PLANT IN OHIO

screened lump. Since the framework supporting the screens is connected to the tipple structure, the entire building is subjected to considerable jarring when coal is being loaded.

For handling the water found in the mine, there has been installed one electric pump and two steam pumps. One of these latter pumps is used for hoisting, while the other is designed for gathering purposes. The gathering pump has a 5-in. main pipe along the entry and 2½-in. pipe in the rooms, while a 1½-in. pipe is run off from the room pipes when necessary.

The fan here installed is operated as a blower and was manufactured by the Buffalo Forge Company. The housing for the ventilator is entirely of steel so that the structure is absolutely fire-proof. At the present time, the fan is running 75 r.p.m. and sending about 47,000 cu.ft. of air into the mine per minute. The capacity of this fan is 100,000 cu.ft. per min., running at a speed of 150 revolutions per minute.

The shaft at this operation is 175 ft. deep and has three compartments. The approach to the shaft at the bottom is on a slight incline so that the cars will run to the cage by gravity. The track plan at the bottom is so arranged that all cars may be run on or off the cage from either side. Although the plan of development at this mine is of a higher standard than the system used at many of the mines in the district, there are one or two conditions which might be improved.

One point that deserves attention is permitting the intake airway near the foot of the down-cast to have a kink or corner in it, so that the air current is necessarily retarded and considerable friction produced, much to the detriment of the general system of ventilation. It is also true that the brattices in the mine were leaky, causing a large quantity of the air to short-circuit. These defects were evident to the management and have probably been rectified much to the betterment of the general operation.

New Pittsburg Coal Company

One of the largest operators in the Pittsburg Coal Company whose mine, No. 9, which has been recently opened, is considered the ideal operation of the field. This operation, the plan of which is shown in the accompanying cut, is six miles from Nelsonville, and is governed by conditions similar to those already spoken of in connection with the Eclipse No. 3 mine.

At this operation, the shaker screen is dispensed with, and in its place, gravity screens have been installed. The point at which the cages dump is about 45 ft. above the railroad, so that the screens have a sufficient slope to carry the coal by gravity. Gravity screens of this sort have not been generally installed at the coal mines in this country. However, the success that has attended their use at a few operations is likely to make them more popular.

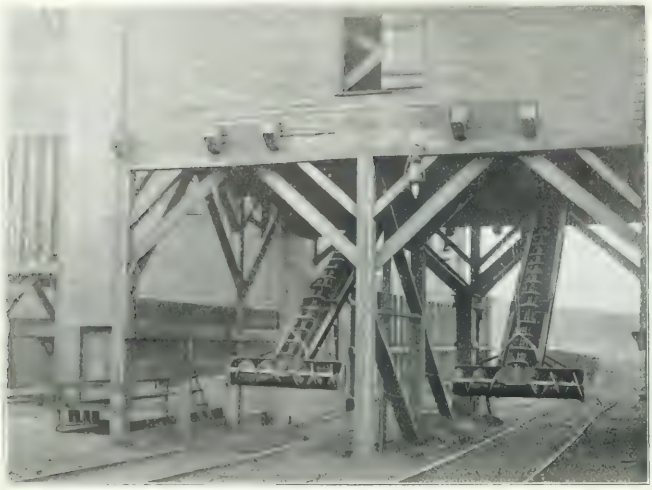
Method of Working

As is evident from the underground plan here shown, the system of development has been carefully laid out. Large circular pillars have been provided to protect the main shaft and the surface buildings adjacent. The stables have been carefully located so that the air that passes through them is immediately returned to the up-cast. For the purpose of development, the triple-entry system has been adopted, having the entries 12 ft. wide with a 42-ft. pillar separating them near the shaft, and a 30-ft. pillar between them at more distant points. On each side of these main entries, a 100-ft. barrier pillar is preserved, while all rooms are stopped before encroaching on the large pillar protecting the shaft.

Butt entries are driven every 500 ft. and have a 30-ft. pillar separating the butt entry and its air course. Face entries are turned off at intervals of 1400 ft. and are carefully protected on each side by 100-ft. pillars similar to those left to sustain the main entries. All entries and rooms are driven on centers, the latter being worked on the coal face and driven to meet. The

FIG. 4. TIPPLE AND POWER PLANT, NEW PITTSBURG NO. 9 MINE

FIG. 3. MINERS' HOUSES UNDER CONSTRUCTION



ARRANGEMENT FOR UNLOADING AND ELEVATING SLACK COAL FROM RAILROAD CARS

map of the mine here shown is so complete and the system outlined so ideal, that a careful study of it may result in profit.

Mining and Haulage

The coal seam at this operation varies from 6 to 8 ft. in thickness, and has the two small bands of slate previously mentioned in the description of the Eclipse mine. It is intended to work the top coal, of which about 18 in. is found at this property. All rooms and entries are machine driven, the general type being the Morgan-Gardner chain-cutter machine driven by electricity. The haulage at present is accomplished by mules, although in a few months it is expected to use horses in pulling the coal from the rooms, and have electric motors haul the cars along the main entry. It is interesting to note that throughout this Ohio field the general practice is to use horses instead of mules. The reasons given are that horses are more tractable and can pull heavier loads. Since the mines throughout the district are comparatively dry and the roads well ballasted and kept in good shape, the horses are not so likely to be affected with greasy hoofs and other diseases that occur when muddy, ill kept roadways are found.

The motor tracks are supplied with 35-lb. steel, and the mule tracks with 16-lb. rails; the rails in all the rooms are of wood and will be removed and used as often as possible.

As is the custom at the Eclipse mine, the coal will be hoisted by self-dumping cages and run over the gravity screens. Everything under 1¼ in. and over ¾ in. is called nut coal; all that product from ¾ in. to ½ in. is called pea coal, while the finer material that passes through a ½-in. screen is considered as slack.

tal tubular Borger Brothers' boilers, 72 in. by 18 ft. Each boiler is rated at 150 h.p. capacity. There are also three 150-kw. dynamos which are to furnish the power for haulage, lighting and machine mining. At present, the coal supplied to the boiler house and the ashes taken away are hauled with mules, but in the future it is expected to install mechanical conveyers to do this work. The feed water used in the boilers is heated by the exhaust steam and goes into the boilers at about 200 deg. temperature, which plan has met with success.

Surface Plant

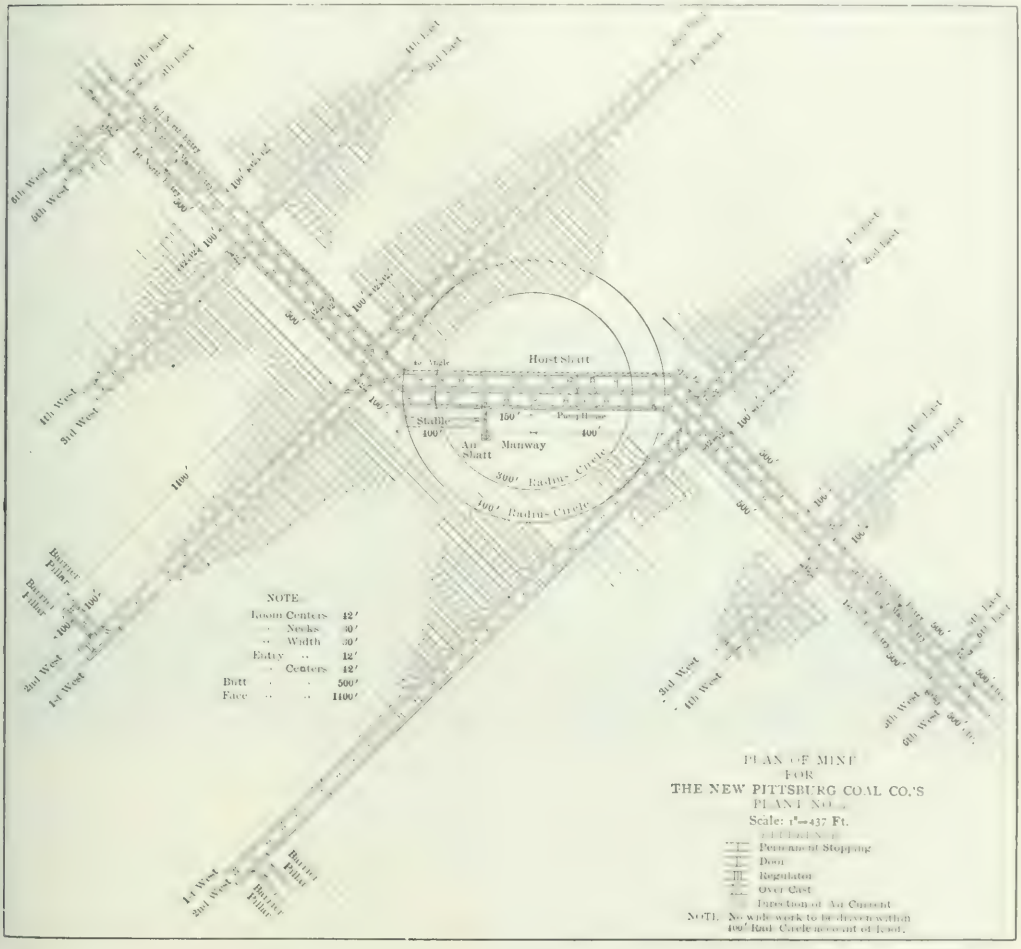
The new Pittsburg Coal Company in planning and building the houses and surface plant at its No. 9 mine has endeavored to use all that previous experience has taught them, in producing as nearly as possible an ideal operation.

Fig. 2 shows the head frame and general arrangement when the shaft was sinking, and other preliminary operations were going on. In Fig. 3, the miners' houses are shown when only about one-half completed, while the general company store may be seen in the background on the right. Fig. 4 shows the power plant and the tipple, when completed, and after operations were started. The large cut here produced shows a detailed side elevation of the tipple and gravity screens. All necessary details, including the sizes of timbers, chutes, etc., are included.

General State of the Industry

Coal mining in Ohio has rapidly advanced during the past few years and many experiments and much study have been devoted to the industry. The Sunday Creek Coal Company, which is probably the largest operator in the State, has been largely instrumental in developing the region to its present state of efficiency. Fig. 5 shows one of the first steel-constructed plants in any of the eastern fields. This operation, known as the Job mine, at Brush Fork, Ohio, is now nearly exhausted, and the only work carried on here at present is that of robbing the pillars. The mine was opened 24 years ago, although the steel construction has been in only about 12 years. In building this pioneer plant an effort was made to adopt mechanical stokers and have the storage bins over the boilers. All modern devices were supplied and no expense was spared to make the property one of the most modern mines in the country. During its best days the Job mine loaded about 3000 tons a day.

The Hocking coals are considered non-coking; there are, however, several washeries in the field that have been operated with success. Fig. 6 shows one unique arrangement for unloading slack coal from railroad cars and elevating it into



method of operation is to have a screw conveyer, which can be adjusted in hight, and have it deliver coal to a central point, where flight conveyers drag the coal up an incline and into the bins which feed the jigs.

The greater part of the Ohio coalfields is closely held by the large corporations, and what little coal is available sells for [illegible]. Much of the block

The California Mining Bureau

Special Correspondence

Dr. A. Hausmann has been appointed Field assistant of the California State Mining Bureau by State Mineralogist Aubury to examine and report on the Greenwater copper deposits in Inyo county. Maps are to be made and descriptions compiled. The Bureau issued a few years since a bulletin on the copper resources of California, but since that time many important fields have been developed, among which is Greenwater. A revised edition of that bulletin will be issued as soon as the additional facts are ascertained by the field assistants of the Bureau.

The State Mining Bureau has just issued a map of the forest reserves of California, compiled from data of the United States Forestry Service. Upon it are designated in colors established forest reserves, proposed forest reserves and national parks. It also indicates by the numbers the following established and proposed reserves: Monterey, San Luis Obispo, Pinnacles, Whitney Military Reservation, Stony creek, and the Lake Tahoe forest reserve. The total area of forest reserves in California is 19,035,810 acres. The following sections have the largest areas of forest reserves: Sierra, 5,049,934 acres; Santa Barbara, 1,981,323; Klamath, 1,896,313; Shasta, 1,377,126; Tahoe, 1,363,124; Trinity, 1,243,042; Lassen Peak, 897,115; San Bernardino, 737,120; San Jacinto, 668,160 acres.

PLAN OF THE ECLIPSE MINE NO. 3, JOHNSON COAL MINING COMPANY, HOCKING, OHIO

ing coal is worked under lease, the royal[illegible] per ton.

According to statistics presented by F. Z. Shellenberg before the Engineers' Society of Western Pennsylvania 67 per cent. of the accidents in Pennsylvania coal mines are due to falls of roofs and sides, while only 9 per cent. are due to gas and 4 per cent. to explosives.

Upper Burma is the only province of India which produces jadeite. In 1905 2685 cwt., valued at $1,227,370, were produced against 3778 cwt., $253,630, in 1904.

The Barytes Industry of the South

A Plant for Treating Barytes Need Not Be Expensive. A Common Error Has Been to Build Unnecessarily Costly Works

BY EDWARD K. JUDD

The entire barytes output of the United States at present comes from two distinct areas: Washington and adjacent counties of Missouri, lying southwest of St. Louis, form one area, while the other lies in the southern Appalachian mountain region, covering contiguous portions of Virginia, North Carolina and Tennessee. The latter yields to the former area in size of output for two reasons: Much of the Eastern product is inferior in quality to that of the Missouri district, while, at the same time, barytes mining, and particularly milling in the Eastern area have been prosecuted, in too many instances, without due regard to the big and little economies that are essential to the profitable working of such low-priced material.

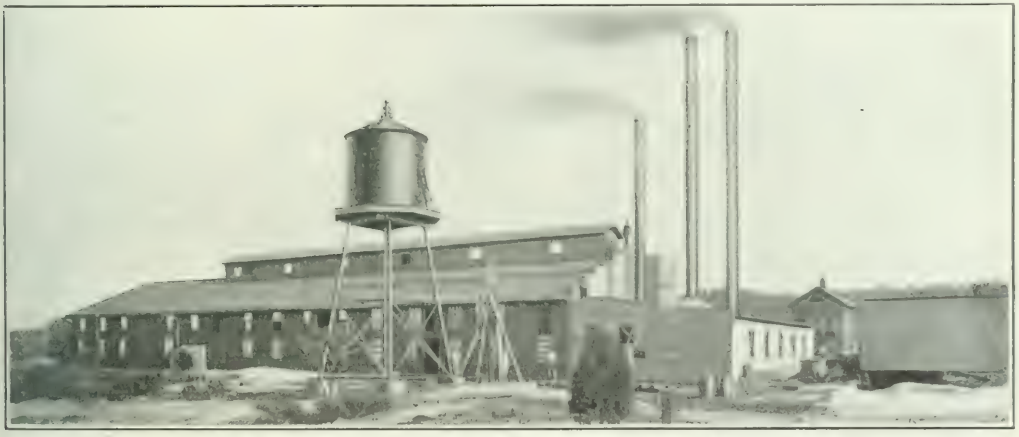
The most common error of judgment has been displayed in overestimating either the market for finished material, or the output of crude obtainable within easy distance of the manufacturing point. In some cases, as at Honaker, Va., and at Bristol, plants have been erected, at an expense out of all proportion to the condition of the market, when it was known, or could easily have been ascertained, that the only available supply of crude material would have to be obtained from other operators and brought in by a long railroad haul. This is, of course, a legitimate, and often necessary, procedure in the treatment of a crude material found only in small and widely scattered localities, but the plant for treating barytes need not be expensive, and today, the only manufacturers who are making a fair profit are those who are within wagon-hauling distance of their mines, or are able, by receiving and shipping their materials over the same railroad, to secure the most advantageous transportation rates.

The accompanying photograph shows the plant of the Commercial Mining and Milling Company at Knoxville, Tenn., one of the important producers in eastern Tennessee.

Barytes in Tennessee

Unlike the Virginia ores, which frequently occur in distinct veins of crystallized barytes, the Tennessee ores are found irregularly scattered through the residual clay left by decomposition of the Knox dolomite, which, in its upper portion, is known to carry barytes throughout much of its extent. The productive areas, as now developed, center around Sweetwater, on the Knoxville division of the Southern Railway, in southeastern Tennessee. The richest deposits are usually found on the summits of knobs and ridges, and consist of nothing but thick beds of stiff, red clay, carrying lumps and stringers of barytes, which follow no apparent rule as to position. The lumps vary from small nuggets to pieces of nearly one ton in weight, and extend from the surface down to the underlying dolomite. Bed rock has thus far been reached at only one point, where it was struck at a depth of 40 ft. below the summit of a gentle hill. The ore in some lumps has a translucent coarsely crystalline structure and in others a chalky appearance. In addition to a closely adhering coating of limonite on the outside, each lump is seamed with minute fissures, into which iron stains have penetrated. This objectionable feature of the ore is more pronounced in some deposits than in others, and its presence or absence is the predominating factor in determining the value of an ore. The factor next in importance is softness, and in this the Tennessee ores are about on equality with the notably soft Missouri ores. In some deposits the barytes is thickly incrusted with fluorspar, which is not a very troublesome element, and with brown hematite, which does give difficulty in subsequent treatment. Fragments of chert are a constant ingredient of the clay beds.

It has been suggested that, if the clay covering were removed and attention directed to the dolomite beneath, workable veins of pure white barytes, not contaminated by brown iron stains, would be found. While this view has never been disproved, it appears to be not well founded. As the clay has certainly been derived from the dolomite—traces of the original stratification are frequently visible in it—a certain amount of concentration of the resistant barytes has occurred, so that the clay probably carries a greater proportion of barytes than the original rock. Then the lateral distribution of the barytes lumps would argue in favor of a similar distribution in the rock, since this region is far removed from that



BARYTES MILL, THE COMMERCIAL MINING AND MILLING COMPANY, KNOXVILLE, TENN.

*Mining engineer, No. 35 Fulton street, New York.

affected by the glacial period. Finally, mining in clay is so much cheaper than work on the same scale in rock, that no attention need be wasted on this question as long as the clay deposits remain, and in spite of a lot of indiscriminate digging these have by no means yet been exhausted.

Mining

The working methods employed at the deposits are simple in the extreme. A cut, wide enough for a dump-cart, is driven into the slope of the hill until a satisfactorily rich spot is found. The clay banks are then dug down with pick and shovel, the lumps of barytes picked out and the refuse carted away and dumped. The lumps are spread on the ground, or on a board platform, and allowed to remain until sun and rain have loosened the adhering clay, when they are scratched over to remove most of the dirt, forked into wagons, and hauled to the railroad, or cleaning or grinding mill. In this way, about half the output is lost, for the soft barytes easily breaks away into fine pieces which go through the fork and stay on the dump. A recent run of dump material through a five-compartment jig revealed about 30 per cent. of barytes recoverable with this simple treatment. Water is scarce in this region; otherwise log-washers and simple jigs would probably be generally employed at the mines.

Barytes Cleaning

In the southeastern Tennessee district the plant of the William D. Gilman Company is the largest consumer of crude barytes, and its methods will here be described. The impurities in the ore coming to this plant are clay, fluorspar, chert brown hematite and limonite. The ore is unloaded from wagons to a platform and then passes through a Carterville jaw-crusher, where water is added to insure smooth flowing of the still sticky material. From the crusher the stream falls through a pair of geared rolls, 15-in. face, and is then elevated to the head end of a jig. This jig possesses no peculiar features. Its five cells are each 2½ ft. wide and 3 ft. long; the screens are of 6-mesh, iron-wire cloth, and are allowed to bed themselves. The coarse concentrates are drawn off through side discharges; one-half or more of the clean barytes goes into the hutch, owing to its softness, and is there recovered. In the tailings, fluorspar and chert pass off without the least difficulty, but the hard rinds of brown hematite, having a high density, remain obstinately in the concentrate. Magnetic separation has been suggested and experimented upon to a limited extent, thus far without results. This method would appear to be the rational solution, since the hematite readily breaks loose from the barytes, and a moderate heating would both decripitate the barytes and render the iron oxide magnetic. The brown stains of limonite are nearly all removed by the jigging, which rubs them off from their holding places; the completeness of their removal can be determined by the fineness of the crushing. The concentrates from this jig are shipped to other manufacturers for further treatment.

Barytes Roasting

This same plant is equipped for the roasting of barytes, which is the first step in the manufacture of barium salts. The barium sulphate is reduced to sulphide, this is dissolved in water, and from this solution any desired salt is precipitated, or recovered by concentration. In ore intended for this process, a higher proportion of impurity can be tolerated, since only the barium reduction product is soluble in water.

The crude ore is mixed, on the receiving platform, with coal, in the proportion of four of barytes to one of coal. The coal for this purpose should be low in ash, and not too volatile; the former qualification avoids the subsequent treatment of a mass of inert, though harmless, material, and the latter insures a more gradual and thorough reduction. The coal used here comes from La Follette, in the Jellico district of Tennessee, is guaranteed to have not over 3 per cent. ash, and costs $1.75 per ton delivered at Sweetwater. It is, if anything, rather too volatile, but this fault can be overcome by mixing it with hard coal, or coke.

The mixture is then put through a jaw-crusher, followed by a Sturtevant emery mill, and then elevated to a hopper over the center of a cylindrical, horizontal, revolving furnace, driven, through cog wheel and pinion, by a small independent engine. The furnace has an outside diameter of 12 ft., and a length of 18 ft., is supported on two tires resting on rollers, and is lined with two courses of fire-brick. A fire-box is at one end, and at the other the heat passes under boilers which supply power for the plant. This heat is amply sufficient to provide 125 h.p. The charging door is on the side of the cylinder, at its middle. A space is left underneath to receive the discharge.

The roaster is charged with 1.3 tons of mixture, every three hours, or eight times a day. In addition to the coal in the mixture, only 1.3 tons of coal are required per 24 hours, in the exterior fire-box. Carbonate begins to form as soon as the first sulphide appears, so that roasting must not be unduly protracted. The clinker from this furnace contains 65 to 68 per cent. of sulphide, soluble in water, and is sold on guarantee of over 60 per cent. solubility. Additional equipment is now being installed to leach this clinker, all of which has heretofore been shipped as made, and to manufacture barium salts. The carbonate in the furnace clinker, though insoluble in water, is easily dissolved in nitric or hydrochloric acid, and the corresponding salt recovered.

Barytes Bleaching

Of all the barytes products, the one now in greatest demand is No. 1 grade of ground barytes, which is of pure white color. The supply of ore, which, if ground without any other treatment, would yield No. 1 product, is, however, exceedingly limited, and resort is therefore had to a bleaching process, and even with this treatment, a superior grade of crude must be employed. The apparatus and methods used in this process have been recently described[1], and need not be here further referred to. The simplest method, as practised at the Lynchburg, Va., works belonging to Nulsen, Klein & Krausse, is to crush the ore to 1 in. or less, which is then put into a vat and treated with dilute sulphuric acid and steam for 12 hours. The solution of iron sulphate is drawn off and run to waste, while the cleaned ore is washed and then dried in a mechanical oven. With the particular ore now treated at this mill, which is a grayish, hard and finely crystallized barytes, no advantage is gained by leaching it for more than 12 hours. In regard to the size to which the material should be crushed before bleaching, it might be supposed that any crevice that would admit iron-bearing solutions would also permit the entrance of sulphuric acid to dissolve the iron, and this is generally found to be true. At the Point Mining and Milling Company's works, in Missouri, the ore is ground nearly or quite to its ultimate fineness before it is bleached, the high specific gravity of the barytes obviating most of the usual difficulties in the leaching of finely pulverized material.

Barytes Grinding

Whether required for the paint or the rubber trade, barytes must be finely ground, and for this purpose no machine has yet displaced the ancient buhr-stone. Disintegrators have been tried, but their best product, after repeated passes, falls far short of the required fineness. At the Lynchburg plant, the ore, after drying, is passed through as many as seven buhr-mills, one after the other. After the third mill, only an expert can distinguish the successive degrees of fineness. After the last mill is passed, the powder is bolted through cloth and shipped in bags and barrels. A sugar barrel holds 700 to 800 lb., while as much as 1100 lb. has been put into one cask.

The ores of the various districts vary greatly in softness and thus offer greater or less difficulty in grinding. The Missouri ores are probably the softest in this country, and not much inferior to those of Germany. The Tennessee ores are not much harder, but most of the Virginia product is difficult to grind.

The demand for barytes was never so vigorous as at present, and as but few grinders or other consumers operate their

[1] Engineering and Mining Journal, Mar. 9, 1905. *Engineering News*, Feb. 23, 1905.

own mines, the producers of crude borates hold the key to the situation, and will, in many cases, be justified in working their deposits on a larger and more elaborate scale.

The Manufacture of Hydrofluoric Acid

By Anson G. Betts*

No very useful literature on this subject exists to the best of my knowledge. Most chemists regard it as an extremely dangerous substance, and have presumably left it alone as much as possible. Yet hydrofluoric acid and fluorides have an extending use, for numerous purposes. Its preparation is easy, and safe if proper precautions are taken.

Samples of fluorspar may be tested by mixing say 50 grams with various proportions of 66 deg. sulphuric acid in small sheet-iron pans, and distilling under the hood. For preparation in small quantities for the laboratory, apparatus as shown in Fig. 1, gives good results if used out of doors. The retort is an ordinary cast-iron pot, perhaps one foot in diameter and 6 in. deep. The cover is made by filling with sand to near the top, leveling it off and pouring in about ½ in. of lead. The lead pipe is separate from the cover, and passes over to a lead hydrofluoric-acid bottle containing water. The water must not come as high as the end of the lead pipe.

During distillation, the bottle is sprayed with water from a hose to keep it cool. A charge of about 2 kg. of fluorspar and 2.5 kg. H_2SO_4, 66 deg. is stirred up in the pot. The fluorspar, for the most part, dissolves immediately on stirring in the sulphuric acid, without evolution of much fume, until heat is applied. The cover is put on and dry cement put over the joints as a lute, cement being suitable for this purpose.

The heating should be moderate at first to prevent too much frothing in the pot. Distillation takes 2 or 3 hours, and the end can be told by feeling of the lead pipe near the bottle, which is hot as long as acid is coming over. Very little loss is experienced and a yield of 80 per cent. or thereabout, is obtained.

Operation on Larger Scale

On a large scale, the application of the same principles is successful. The general arrangement is shown in Fig. 2, for which a few explanations are necessary. The pot may be cast about 8 ft. in diameter, 3 ft. deep at the center, and 1 in. thick, with a slightly curving bottom to prevent cracking. For the pot a cast-iron cover 1 in. thick is used, dipping into the annular trough around the pot, which contains strong sulphuric acid as a seal. All the other seals are made in the same way, but water may be used for the joints on the condensers where the temperature is not so high. Lead retorts, and lead covers for the retorts are useless.

FIG. 1. LABORATORY STILL FOR MAKING HYDROFLUORIC ACID

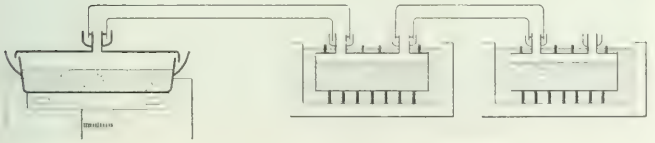


FIG. 2. PLANT FOR THE MANUFACTURE OF HYDROFLUORIC ACID

The condensers consist of a series of two or three lead boxes of about 1 cu.m. capacity, entirely submerged in a water tank and partially filled with water or dilute HF. Condensers should be made of heavy lead, supported by wooden pieces to which the lead is attached by means of lead straps burned on. The lead delivery pipes may be about 5 in. in diameter. The condensers have an overflow so that the acid never can rise to the end of the delivery pipe. If this happened, a partial vacuum might result, and draw water back into the pot, where it would probably cause an explosion.

The charge may consist of 1000 lb. of ground fluorspar and 1000 to 1200 lb. 66 deg. sulphuric acid. SiF_4 comes off first and deposits silica on the water in the first condenser, stopping absorption somewhat so that it is necessary to stir the water in the first condenser until most of the SiF_4 has come over. The pot may be charged in the morning and distillation finished by night. Coal is used for fuel, burned on a grate of about 3 sq.ft. The residue in the pot is comparatively hard, and, after cooling, is dug out with pick and shovel. The yield of acid calculated on the sulphuric acid used is approximately 80 to 90 per cent.

The cost of manufacture is not great, the principle items being the raw materials necessary. To produce 1 lb. anhydrous HF, about 2½ lb. of fluorspar and 3 lb. sulphuric acid are necessary. Fluorspar and sulphuric acid are worth about $10 to $15 a ton, making a cost for raw materials, exclusive of coal, of approximately 2¾ to 4⅛ cents per pound anhydrous HF.

Method of Analysis

The sample of acid is mixed with several times its bulk of nearly saturated and neutral potassium nitrate solution. This causes a precipitation of potassium fluosilicate in the solution. Phenolphthalein is used as indicator and the solution titrated with caustic soda in the cold. This gives the total of the HF and H_2SiF_6 present. The sample is then heated to boiling when it will be found that considerable more caustic soda may be run in to get another end point. In the first titration, the HF present and the HNO_3 liberated by the reaction of potassium nitrate and fluosilicic acid, are neutralized by the alkali. When titrated hot, the precipitated K_2SiF_6 is decomposed by the alkali. The following is the equation involved:

$$K_2SiF_6 + 4NaOH = 2KF + 4NaF + SiO_2 + 2H_2O$$

The rule for calculating is, 1 gram NaOH used in the second titration = 0.9 gr. H_2SiF_6 in the sample. For HF present divide the number of c.c. of NaOH used in the second titration by 2, and subtract the result from c.c. used in the first titration. The remainder shows the HF, 1 gram of NaOH equaling 0.5 gram HF.

Hydrofluoric acid has been shipped in beer barrels with rosin lining, which are entirely successful and last for some time and for long shipments; also in rectangular lead carboys. Its storage in lead is not very satisfactory on account of the corrosion of the lead. Probably the presence of sulphuric and fluosilicic acids has some effect in the corrosion.

I am indebted to Dr. William Valentine for some of my data.

*Consulting chemist, Troy, N. Y.

Traction-engine Haulage in Idaho

By Robert N. Bell *

Ore haulage by traction engine has recently been introduced in Idaho by a subsidiary company connected with the Gilmore Lead Mining Company, Limited, of Lemhi county. The Gilmore company has large deposits of high-grade lead carbonate ore and shipped 1500 tons of crude ore and concentrates containing 60 per cent. lead and 30 oz. silver during 1906.

The property is situated 85 miles from the railroad shipping point which is Dubois, a station on the Montana division of the Oregon Short Line, and the ore has been hauled by teams at a cost of $10 to $12 per ton. However, owing to the excessive demand for horseflesh, brought about by the extensive new irrigation works now in process of construction in the Snake River valley, the company has found it impossible to get sufficient teams to handle the output and during last summer a separate company was organized, known as the Dubois & Salmon Transportation Company, for the purpose of handling the output of this and other mines of the Gilmore district.

TRACTION ENGINE ORE TRAIN FORDING STREAM

The Equipment

This new company put a "Best" California traction train on the road, consisting of a traction engine of 110 h.p. and four steel wagons of 15 tons capacity each. The country between the Gilmore mine and the railroad shipping point, with a little bridging across creeks and irrigating ditches, is an ideal one for this service, consisting, as it does, of a flat valley bottom and desert plain, presenting an old lake bed surface of fine gravelly or gritty soil and small sage brush.

The train made four trips during the fall, during which the engine was put to a very severe test, and was made to ford the several streams on the route which muddied up the gear and caused considerable delay. The worst streams have since been bridged, and it is anticipated that the venture will prove a great success during the coming season, reduce the former cost of hauling the ore fully 50 per cent., and still show good earnings.

The trips already made with the road practically in its virgin condition, consumed four days' running time for each round trip, hauling a 40-ton load of ore out and a like amount of back freight in. The train travels night and day, using a large acetylene head-light. It requires a crew of three men on each shift; engineers receive $6, firemen $4, and swampers $3.50 per shift, and work twelve hours, the off shift sleeping in a wagon trailed behind the ore cars.

Costs

The engine uses, under present conditions, 4 tons of Wyoming coal in 24 hours, which costs $6 per ton, the coal being distributed in bins along the route on the back trip. Water is available at convenient intervals of not to exceed 15 miles, for which its tank capacity in the front of the first ore car, is good.

The nature of the roads is such that they never get very muddy, and as soon as the snow goes off in the spring, the ground rapidly dries and hauling can begin. There is one hill going to the mine from the valley three-fourths of a mile long and 10 per cent. grade. The engine handles one loaded car or the train of empties up this grade without any difficulty, and sets the cars at the loading bin one at a time on a 15 per cent. grade.

*State Mine Inspector, Boise, Idaho.

TRAIN OF CARRYING ORE FROM GILMAN CAMP, IDAHO

Petroleum in Illinois

By [illegible]*

The important oilfields now being developed in southeastern Illinois first attracted attention in 1865. At that time about a dozen wells were drilled within what is now knowun as the Casey district. These wells were drilled with little if any casing, and the water in the holes so held back the oil that the small showing discouraged the operators and the attempt was abandoned. In 1904 drilling in this territory was resumed, the work being taken up by J. J. Hoblitzell & Son, of Pittsburg. Small amounts of oil and some gas were found in April in the first hole drilled, and in October the second well came in as a 45-bbl. producer. Since

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For example, within the Casey district are the Westfield pool to the north, the Siggins to the northwest, and the Johnson township pool to the southeast. The general distribution of the productive territory is shown in the accompanying map. It may serve to orient this if it be noted that the field extends approximately from the St. Louis line of the Big Four Railway to the main line of the Baltimore & Ohio Southwestern. It is crossed also by the Pennsylvania, Illinois Central, and the Cincinnati, Hamilton & Dayton, while the Cairo line of the Big Four runs from

companies. In January the pipe line runs were 752,070.62 bbl., and in February the business of the Ohio Oil Company was

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	[illegible]
Gross stocks	2,756,740.10
[illegible]	[illegible]
[illegible]	1,013.57
[illegible]	[illegible]

It may be noted that the runs for February averaged 32,808 bbl. per day, 3066 bbl. in excess of the receipts from the Lima oil districts of northwestern Ohio and Indiana. The oil is now selling for 68c. and the pipe lines are not yet able to take all that is offered. With the opening of spring the second line to Bridgeport is to be connected up and other improvements made with a view to handling the product. In the meantime a refinery is being built at Alton, and small plants are said to be planned for near St. Louis, Mo., and at Robinson, just east of the field.

GILMAN CAMP, OHIO, SHOWING GRADE MET IN HAULING OIL

that time the development of the field has been rapid. The productive territory has expanded to the northwest and southeast, until it now stretches from Coles to Lawrence county. The principal production is from Clark, Cumberland, Crawford and Lawrence counties. The northern field, lying mainly in Clark, but including a portion of Cumberland county, is known usually as the Casey or shallow pool. The wells stretch from Westfield on the north to the south boundary of the county. The Crawford county pool crosses the entire county, and in Lawrence county productive wells have been found to a short distance south of Bridgeport. Commercially three districts are recognized, as is shown in the following table of wells producing on March 1, 1907:

*Director, Illinois Geological Survey, Urbana, Ill.

north to south, just east of the productive territory

Pipe Lines and Production

The field is now served by the pipe lines of the Ohio Oil Company. An 8-in. line extends from Bridgeport on the south to Martinsville, a second one being under construction. At Martinsville the lines from the Casey district are joined, and two 12-in. lines extend to Montpelier, Ind., where a connection is made with the main east-west lines of the Standard Oil Company.

Shipments began in June, 1905, with 5489 bbl. At the close of that year 156,502 bbl. had been sent out, tank cars being used. In 1906 the pipe lines were connected up and 4,626,835 bbl. were sent out. In addition, tank car shipments were made by the Sun, Pure and Cornplanter

Characteristics of the Field

In general the field includes few flowing wells and no gushers. The wells are usually shot and most of them must be pumped. They hold up under pumping extremely well so far, and in a particular case 2000 bbl. per acre have been won in six months, with the tract only about half drilled. In a number of cases the wells have furnished enough oil to pay for themselves by the time they were connected up. In Johnson township of Clark county the average initial production of six wells was 57 bbl., the range being from 15 to 200. In the Bridgeport pool the average of 17, including one dry hole, was 106 bbl., the maximum being in this case 245 bbl. Wells running as high as 1500 bbl. are found, and a number have run up to 1000.

An examination of the accompanying map will show certain striking features characteristic of the entire field. The most pronounced is its extreme irregularity. It is very "spotted," to use the local phrase. Strips and patches of barren and productive territory are interwoven in a very intricate manner. In many cases dry holes are drilled in territory completely surrounded by productive wells, and within 400 ft. of a good well one may prove entirely barren. The map also brings out the fact that the pools follow a general northwest, southeast line. This, when extended, touches the Princeton-Indiana field to the south and the well-known Lasalle anticline to the northwest. It seems reasonable to believe that it is related in some way to this structural feature: the more so, since field observations show that within the oil territory there is a slight doming of the beds along this line. A third characteristic, not shown by the map, is the erratic distribution of gas. In Lawrence county the wells so far opened show almost no gas. In

is found with the oil, not in general enough for pumping and drilling. In addition there are scattered gas wells which produce no oil. These wells have good pressure and volume, the latter running up to over 700,000 cu.ft. per day, but they seem to be short lived. Individual wells, when connected up and used, have lasted from a few days to three or six months. The gas is being used locally, but the present available supply does not encourage the laying of big gas mains.

Differences among the Districts

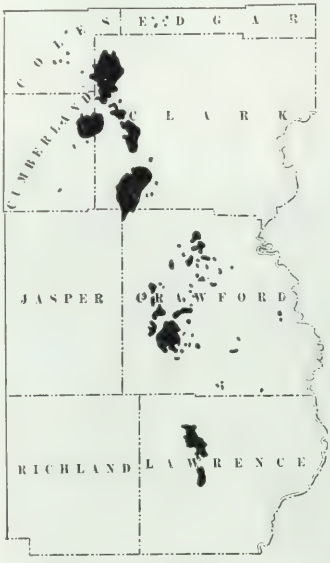
In certain particulars the three districts differ. The Casey district is shallow, the wells ranging from 325 to 400 ft. The productive horizon is in the Coal Measures, the "sand" being in part a dolomite, resembling the Trenton rock of Indiana in appearance, and in part a true sand. Owing to the shallow depth and consequent low cost of the wells (approximately $1500) this field has been very rapidly explored. The principal gas production is from Johnson township. The wells here supply Casey, Martinsville and Marshall. In Crawford county a deeper sand is found, the depth being approximately 900 ft. Gas is commonly found with the oil. The productive sand seems to be in the Chester formation, presumably representing the Birdsville horizon. It is often a sandy shale, and frequently consists of several beds of sand separated by shale. The Casey sand is thought to be recognized in several of the wells, approximately 240 ft. above the Crawford sand. It is not generally productive.

In Lawrence county three pools are recognized; the Lewis, Petty and Bridgeport. The first well was brought in about seven month ago, and there are now 160 wells producing. They range in depth from 1300 to 1450 ft., and the oil comes from a sand about 400 ft. below that of Crawford county. It is coarser grained, and so far is seemingly more regular. Of 40 wells drilled in the town of Bridgeport, only two proved dry. There is a strong salt water flow, and the oil pours out at the surface in a steady stream which is highly satisfactory.

Future Development

As may well be imagined the discovery of these oilfields has led to a large amount of wild-catting in other parts of the State. Oil was found some years ago near Litchfield, in Montgomery county, and gas has been known at Sparta in Randolph and at Pittsfield in Pike counties. All these areas are being redrilled. Within the year small amounts of oil have also been found at Tolono, in Champaign county, at Iola, in Clay county, and at various points in Jersey, Saline and other counties. Next summer there will undoubtedly be a large number of drills going in outside territory, and it is expected that several new pools will be discovered. Just at present attention is being concentrated on a small pool being developed near Duncanville, in eastern Crawford county, and another north of Mermon, in Sullivan county, Indiana.

The geology of this area is as yet too little understood to warrant any attempt at prediction. A preliminary report, giving conditions up to May, 1906, was prepared for the Illinois Geological Survey by Prof. W. S. Blatchley, and issued as



PETROLEUM FIELDS OF ILLINOIS

Bulletin No. 2. Further studies will be carried on in this field during the coming season.

The Michipicoten Iron Range

In the annual report of the Ontario Bureau of Mines for 1906, Dr. A. P. Coleman contributes a paper on the "Iron Ranges of Eastern Michipicoten." This deals principally with the region south and southeast of the Helen mine, and with some isolated bands of the formation to the north. Dr. Coleman notes the discovery of a range of considerable magnitude about two miles to the northwest of the Helen mine, in a locality which was supposed to have been carefully explored. This has been stripped and made accessible by Alois Goetz, who has taken a number of claims upon it. The range is known to extend 1¾ miles in a direction somewhat south of west and to have in places a width of 500 ft. with some schist intermingled. Part of the range rises with the usual steep ridges, but other parts are in low ground and more or less covered by drift. The formation includes quartzitic and also granular silica—often with magnetite enough to disturb the compass greatly—pyrites, porous black slate and schistose siderite, almost all the forms occurring at the Helen mine. All the features of the Helen mine seem to be repeated, except that the band is only about half as wide; but thus far no important mass of ore has been found. Two or three miles south of the Mission near the mouth of the Michipicoten river, a number of small areas of iron formation occur, on or near Bridget lake, the locations being generally spoken of as the Blackinton claims. A band in this locality may be followed for about 500 ft., but with very unequal width. It has been stripped at various points, showing in some cases black, cherty-looking material heavy with magnetite; in others sandy-looking rock with little ore. What is probably an extension of these bands of iron formation occurs about a mile west on the shore of Lake Superior. It is lean and sandy-looking. South of Bridget lake small outcrops occur at a number of points. To the west of lake Mijinnemungshing, in the extreme southern portion of the area explored, a number of claims have been located on iron formation. Inland from the shore of an exposed bay about two miles southeast of Cap Choyyé a small deposit of impure hematite occurs, but without the usual rocks of the iron formation. The ore is generally bright red hematite, or to a less extent black with no magnetite; but the amount to be seen is too small to give the deposit practical importance.

An interesting development of the iron formation just east of Lake Anjigomi has been stripped and exposed, disclosing coarsely banded silica with magnetite, thrown into sharp folds and associated with bands of green schist. There are three strips of iron formation with a total width of 27 ft.; on a hillside to the east the formation widens to about 60 ft. and the character of the formation changes, becoming heavy with magnetite. The richer parts of the iron formation seem heavy enough to form ore of fair quality. Other deposits are on the northeast side of Lake Mishewawa, two miles east of the same lake; and a series of outcrops near the High Falls of Michipicoten river. The latter band has an average width of a quarter of a mile, running across the country to the Magpie river. Some parts show little iron, while in others banded silica and carbonates are found. The paper also contains a description of the Helen mine and much detailed information regarding the pyrites deposits of the district explored.

Converters of the Washoe Smelting Works

The converter department of the Washoe smelting works described in a pamphlet prepared by members of the Anaconda Copper Mining Company staff has 11 converter stands. The converters used are the horizontal barrel type, 8 ft. in diameter and 12 ft. 6 in. long, and are operated hydraulically. The building is equipped with two 60-ton electric traveling cranes, one for handling converters, the other for handling slag and copper from the converters. There are also two 15-ton electric cranes in the casting department for general use.

The matte is brought from the blast furnaces and reverberatories to the charge cars and transferred to the storage bins for blast-furnace use.

The blister copper is poured into a sheet-steel clay-lined ladle and taken by the crane to a hydraulic cradle from which it is poured into the casting furnace.

The converters are lined in the main building, but the lining material is prepared in a separate building. The lining material is highly silicious ore, containing gold and silver, and slime from a settling pond is used as a binder. The material is crushed by a Blake crusher and fine rolls, sized by trommels and sent to the bins, which feed 4 Carlin 7-ft. grinding and mixing pans. Here it is ground and mixed to the proper consistency and then transferred to the converter where it is tamped around a steel form by a special Ingersoll-Sergeant tamping machine, 5-in.

CONVERTER DEPARTMENT, WASHOE SMELTING WORKS

floor, which is 23 ft. above the operating floor. The matte is poured from the ladle into a launder, the end section of which is pivoted so that it can be turned out of the way when the converter is filled. The converter is filled in a nearly vertical position with the air blast on. Seven tons or matte per charge are used whether the converter is freshly lined or not and the charge is finished to blister copper in the same converter.

The slag is poured into unlined cast-steel ladles and taken by the crane to a casting machine of the platform-conveyer type, having pressed-steel molds. This slag ladle is placed in a hydraulic cradle from which the slag is poured into the molds, chilled by sprays of water and conveyed to a steel bin outside of the building, from which it is loaded into railroad diameter and 20-in. stroke. This tamping machine is supported by a revolving jib crane, the vertical motion of which is controlled hydraulically. After lining, the converter is removed to the drying stand by the crane, where it is dried with coal and scrap wood.

Utah Consolidated Mining Company

This company owns a large property in the Bingham district in Utah, which it is working and developing on a large scale. Its latest report is for the year 1906. The general account shows: Capital stock, $1,500,000; accounts payable, $126,291; general reserve, $510,144; profit and loss surplus, $2,451,228; total liabilities, $4,587,-

[illegible] and stocks on hand, $2,076,084; cash, $43,-987; total assets, $4,587,603. There was no change in stock during the year.

The income account for the year is given as follows:

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[illegible]	[illegible]
[illegible]	[illegible]

Cyanide Practice at the Reliance Mill

The Plant at Nelson, B. C., Treated 50 Tons of Ore per Day and Employed the Hendryx Process, Agitation, Settling and Decantation

BY DOUGLAS LAY*

The process of slime treatment evolved at the Reliance Gold Mining and Milling Company's plant on 49 Creek, Nelson, B. C., possesses certain features of interest, inasmuch as it is the only plant of its kind in the Dominion.

[illegible] Reliance

The ore treated is a decomposed quartz containing a high percentage of hydrated iron oxide and from 5 to 25 per cent. iron pyrites, while the gold values average about $4 per ton. The ore is conveyed from the mine to the mill by a Riblet aërial tramway. From the lower terminal bin, the ore passes over a grizzly to a 9x15-in. Blake crusher. The undersize from the grizzly goes directly to the mill-feed bin, while the oversize after passing the cross-bar goes to geared rolls which are 14x36 in., and thence to the feed bin. The maximum size of ore in this bin is ¼ in.

From the feed bin, the ore is fed by an automatic feeder to a 6-ft. Chilean mill, Akron make, by which it is crushed to 60 mesh, in an alkaline cyanide solution of a strength of 0.02 per cent. KCy.

Arrangement of Plant

The pulp, in the proportion of 1 to 3 of solution, passes from the Chilean mill into settling tanks provided with pyramidal bottoms and central plug discharges. There are 10 of these settling tanks, each having a capacity of 6 tons of pulp. The greater part of the slimes settles in the first two tanks, the solution gradually getting clearer as it passes from tank to tank. Settlement of the slimes is aided: first, by the addition of slaked lime; second, by baffling boards, so disposed in the settling tanks as to prevent any direct flow from tank to tank, and third, by heating the solutions, which are kept at an average temperature of 70 deg. F.

The overflow from the last tank of the series is practically clear, but for additional clarification it is passed through two other tanks having a combined capacity of 32 tons. The clarified solutions then flow through electrical precipitation tanks of which there are three, each 35 ft. long, 5 ft. wide and 3 ft. deep, containing about 3500 sq.ft. of cathode surface. After precipitation the solution passes to a sump from which it is elevated by a centrifugal pump and returned to the storage tank above the Chilean mill.

When about 20 tons of slimes have accumulated in the settling tanks, the plugs are raised and the contents discharged by gravity into a 12-ft. Hendryx agitator. Charging the agitator with 20 tons slimes and 30 tons solution occupies about 7 minutes.

The Hendryx Process

Cyanide is added to bring up the strength of the solution to 0.05 per cent. KCy; an application of the Hendryx process then follows, which consists of filtering the solution during agitation and pumping to precipitation tanks, whence it flows back to the agitator. Within the agitator, suitably arranged, are 12 filtering cells, each cell consistly of a wooden frame 5x4 ft. by 2 in. and covered with canvas. The cells are connected by ¾-in. iron pipes and with the suction of a belt-driven triplex pump.

During agitation the gold values pass rapidly into solution, thus permitting the solution to be drawn through the filtering cells and pumped to the precipitation tanks at the rate of 3½ to 4 tons per hour. From the precipitation-tank sump, a solution, barren in gold, is admitted at the same rate to the agitator. The bulk of the solution in the agitator remains constant, and consequently the assay value of the solution gradually diminishes.

The physical character of the Reliance ore is such that a cake or coating about 6 in. thick forms on the filtering cells in about 2 hours. At the end of every 2 hours the cakes are "blown," i.e., broken up by reversal of the valves when the accumulations fall to the bottom of the agitator, and pumping is resumed.

During the early trials of the process some trouble was experienced at this stage of the operations. The cakes were so tough that when settled they did not break up, but choked the agitator. This difficulty was overcome by the introduction of water in jets projected upward from the bottom of the agitator. At the time of blowing, this water is admitted for a few minutes and rapid disintegration of the cakes results. After 12 hours' agitation, the contents of the agitator are discharged into a decanting tank and allowed to settle.

The clear solution is drawn from the top of the tank to a sump tank by means of a floating hose. From the sump tank the solutions are lifted by a centrifugal pump to the precipitation tanks. These are two decanting tanks, each having the capacity of an agitator charge, which allows 24 hours for the settlement of each charge, during which time clear solution is being drawn from the top. Tailing containing not less than 50 per cent. moisture is discharged from the decanters to the waste bank. During the discharge of the agitator the cakes are held on the filtering cells and vacuum is not cut until the agitator is empty, when the cakes are discharged directly to the waste bank.

The Hendryx process as applied at the Reliance mill has yielded good results. Apart from dissolving gold and silver the essential aim of the process may be said to be the reduction of decantation losses. The extent of these losses is governed by the value of the solution in precious metal when it leaves the agitator. The poorer the solution, the less will be the loss, since the tails, when discharged to the waste bank, carry with them a certain amount of this solution. An ideal state of things would of course be obtained were it possible to dissolve all the gold and recover it during the time of agitation, in which case, after agitation, we should have left barren tails and barren solution, i.e., barren in gold content. The only loss then incurred by decantation is in cyanide, which is a very small item with the weak solutions used in agitation.

The rate at which solution is filtered and precipitated will govern the assay value of the solution at the time of discharge of the agitator.

Rate of Filtration

The possible rate of filtration is dependent: first, to a certain extent, upon the capacity of the vacuum pump, and second, to a greater extent, upon the filtration area. Regardless of the capacity of the pump, only so much solution will filter through a given canvas area subjected to a given vacuum. Consequently, a point will be reached, when with any given filtering area no increase in pump capacity will yield a greater flow.

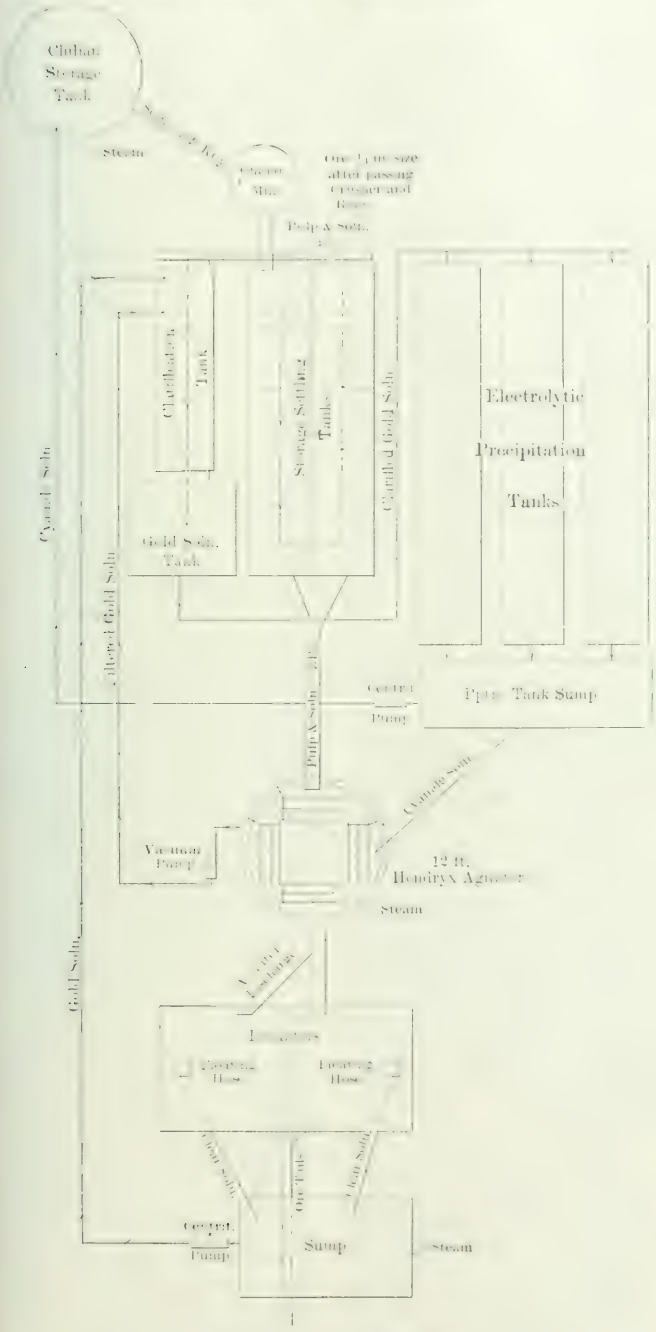
The filtering area is necessarily limited in an agitator, since sufficient space must be allowed between any two cells to permit the cakes to fall when blown. The more slimy an ore, the thicker the cakes will form; consequently the farther apart must the cells be placed and the smaller the possible filtering area. With the Reliance ore it is not possible to place cells

*Metallurgical chemist, Silverton, B. C.

closer than 18 in. from cell to cell. This gives a filtering area of 480 square feet.

PRECIPITATION

Maintaining a vacuum of 20 in. the solution is passed to the precipitation tanks at the rate of 4 tons per hour. With a sandy ore, of course, this rate might be very much increased.



FLOW SHEET, RELIANCE MILL, NELSON, B. C.

upon the adequacy of the precipitation facilities. It is absolutely essential that, whether electrical or zinc boxes are employed, they should be of such capacity that after one passage the solutions will flow back to the agitator carrying not more than a few cents per ton in precious-metal.

The longer the period of agitation, the longer the time afforded for the reduction in values of the solution.

The solution is heated in the agitator by a steam coil. Steam is also applied directly to the sump below the decanting tanks and in the Chilean mill storage tank. It is worthy of note that during the winter months the heating of the solutions renders the heating of the mill buildings in any other way unnecessary.

EXTRACTION OF THE GOLD

From this description it is evident that no amalgamation is employed at the Reliance mill. Preliminary tests on the ore have shown that about 40 to 50 per cent. of the gold is the so-called "free-milling" form, and when the plant was first operated, amalgamation was tried, but for various reasons it was subsequently abandoned. In the first place, no such recovery of free-milling gold as that indicated by the preliminary tests resulted. The gold ore was in such an extremely fine state of division that it dissolved almost immediately on coming in contact with the cyanide solution in the Chilean mill. In the second place, galvanic action between the Chilean mill mortar on the one hand and the amalgamated plates on the other took place, the cyanide solution being the exciting liquid, which resulted in the amalgamated plates becoming extremely hard, and passing somewhat rapidly into solution.

EXTRACTION

An extraction of about 85 per cent. of the gold is obtained by the treatment, about 40 per cent. passing into solution above the agitator, and the remainder during agitation. The consumption of cyanide, sodium cyanide being used, is about ¾ lb. per ton of ore treated, while the consumption of lime is 4 lb. per ton of ore. The mill is operated throughout by water power, the supply of water being ample for that purpose. The pressure is about 200 lb. per sq.in. at the nozzles of the Pelton wheels.

The present plant has a capacity of 50 tons per 24 hours, the agitator being charged twice daily. The operating costs, including labor, assaying, chemicals, lubricants, fuel for heating purposes and cost of marketing bullion, but exclusive of cost of management, amount to 65c. per ton.

According to the *Clay Worker*, March, 1907, 30 tons of magnesite brick per day are manufactured in the Transvaal from local deposits.

The Composition and Analysis of Zinc-lead Pigment

Zinc-lead pigment has generally been handled by the trade and by chemists as if it were a mixture of lead sulphate and zinc oxide. It is a chemical compound, a weak one, it is true, but nevertheless a chemical compound. The lead is present as a basic sulphate, and lead oxide; the zinc, as zinc oxide, and zinc sulphate. There is also a combination between the zinc oxide and the lead oxide, which is probably a zinc plumbate.

These facts can be readily proved by the following experiments: Mix in the proportions in which they are found in the pigment chemically pure zinc oxide, lead oxide and lead sulphate. Mix some of this compound with turpentine and place the mixture on a glass plate. It will have a decidedly red color. Place the remainder of the mixture in a crucible and heat to redness. When cool mix some of this compound with turpentine and place on the glass plate beside the first test. It will be more nearly white than the first. Mix a small quantity of lead oxide with a large proportion of lead sulphate, about 5 per cent. lead oxide and 95 per cent. lead sulphate. Put this through the same process, testing before and after heating. It will be found that although the color of the mixture is lighter after heating, there are specks of lead oxide, showing that all of the lead did not combine.

Mix about 5 per cent. of lead oxide and 95 per cent. zinc oxide and test in the same manner. The mixture will be decidedly lighter in color after heating, proving that there is a combination between the zinc oxide and the lead oxide.

These experiments must be performed carefully, for if the tests are heated to a temperature above redness, or are heated too long, they will be spoiled and no results will be obtained.

Sulphur dioxide is present in this pigment as a gas and probably also in the form of zinc sulphite and lead sulphite. In the process of manufacture zinc sulphate and sulphur dioxide are the compounds to be avoided. To do this both the bag room and furnace temperatures must be watched closely.

The assay of the pigment for sulphur dioxide, although a simple operation, is the most important determination in the laboratory of a zinc-lead pigment smelter, for the limit is 0.07 per cent. It is the custom to assay samples from the bag room at least once a day for sulphur dioxide, and the packout is assayed daily for zinc oxide, zinc sulphate, lead oxide, lead sulphate, sulphur dioxide and water.

The methods of assaying here described have been in use for some time and while not extremely accurate, they serve the purpose well. Results generally figure out within one-half of 1 per cent.

These methods of analyzing are in use in the laboratory of the Ozark Smelting and Mining Company:

Total zinc—Weigh 1 gram of pigment into a No. 3 beaker; add a little water and stir to make an emulsion. Add 15 c.c. of hydrochloric acid and stir until all the pigment is dissolved. Dilute to 200 c.c. with hot water and titrate with a standard solution of potassium ferrocyanide.

Zinc as sulphate—Weigh 10 grams of pigment into a No. 3 beaker and add 200 c.c. of hot water and boil for 5 minutes. Filter, wash out the beaker and allow the solution to drain through the filter, but do not wash. To the filtrate add 15 c.c. of hydrochloric acid and 10 c.c. of a standard solution of zinc, 1 c.c. of which equals 1 per cent. Titrate with a standard solution of potassium ferrocyanide, subtract the zinc added and divide by 10.

If the strength of the ferrocyanide solution is 1, and it took 12.2 c.c. to precipitate the zinc, then, $12.2 - 10 = 2.2$, and $2.2 \div 10 = 0.22$ per cent. zinc as sulphate.

Lead sulphate and lead oxide—The lead as sulphate and the lead as oxide are determined in the same portion of ore. Weigh 1 gram of pigment in a No. 2 beaker and add 50 c.c. of a 30 per cent. solution of acetic acid. Boil for 5 minutes, filter into a No. 3 beaker, allow to drain, but do not wash. Remove the filter from the funnel, open and wash the contents into the No. 2 beaker and add 25 c.c. ammonium acetate solution. (This solution is made by mixing one part of stronger ammonia with two parts 30 per cent. acetic acid. It should be acid.)

Place both beakers on the stove and boil. Rub down the sides of the No. 2 beaker and wash. Titrate with a standard solution of ammonium molybdate. This represents the lead as sulphate. Now to the completed assay add the filtrate and titrate again. The additional amount of solution represents the lead as oxide.

The strength of the ammonium molybdate solution being 1 per cent., and the first titration requiring 23.4 c.c., and the second, 36 c.c, then the lead present as sulphate is 23.4 per cent.; lead as oxide, 3.6 per cent.; and the total lead, 27 per cent.

Sulphur dioxide—The sulphur dioxide is determined by titrating with a solution of iodine. To make this solution, weigh into a No. 2 beaker, 0.397 gram resublimed iodine, add about 1 gram potassium iodide and 5 c.c. of water. Stir until dissolved. Each c.c. of this solution represents 0.0001 gram sulphur dioxide.

Weigh 1 gram of pigment into a No. 2 beaker, and add 100 c.c. of hot water and 5 c.c. of hydrochloric acid. To this add about 10 c.c. starch solution made by grinding in a mortar one gram wheat starch and 10 c.c. of cold water, and adding 100 c.c. boiling water. This solution should be made fresh every day.

Titrate until the blue color is permanent. The number of c.c. will give the per cent. of sulphur dioxide in hundredths. Suppose the burette read 6.4 c.c., then the sulphur dioxide would be 0.064 per cent.

Water is determined by weighing 10 grams of the pigment into a casserole and drying at about 110 deg. for one hour. It is then reweighed and the loss in weight divided by 10. Suppose the second weighing to be 9.955 grams; then, $10 - 9.995 = 0.045$, and $0.045 \div 10 = 0.0045$ gram or 0.45 per cent.

We now have the following data: Total zinc, 48.97 per cent.; zinc as oxide $48.97 - 0.22 = 48.75$ per cent.; lead as oxide, 3.60 per cent.; lead as sulphate, 23.40 per cent.; sulphur dioxide, 0.064 per cent.; water, 0.45 per cent.

Composition of Pigment

From the atomic and molecular weights of zinc, zinc oxide, lead, lead oxide, lead sulphate and sulphur dioxide the following composition is derived: Zinc oxide, 60.75 per cent.; zinc sulphate, 0.61; lead oxide, 3.87; lead sulphate, 34.25; sulphur dioxide, 0.064; water, 0.45 per cent.

Wages in Belgium

Consul-General H. W. Diederich, of Antwerp, reports on the rate of wages in Belgium. He gives some figures which are of interest in comparison with American conditions. The cheapness of labor in Belgium is the most important factor in making the industries of that country successful in competition with the world.

As an attempt to protect the laborer and establish something approaching a reasonable rate of wages, the town councils of Antwerp, Ghent, and Liège have authorized a minimum rate per hour to be paid to persons engaged by these municipalities in the various trades, of which 14 are shown in the following table:

Trade.	Antwerp. Cents.	Ghent. Cents.	Liège. Cents.
Blacksmiths	11	8	..
Boilermakers	..	7	9
Carpenters	9	8	8
Cement workers	..	..	..
Electricians	..	8	10
Glassworkers	..	..	8
Glaziers	9	..	..
Locksmiths	8	..	9
Masons	9	8	8
Painters	9	7	7
Plumbers	9	8	8
Printers	9	7	..
Roofers	9	7	8
Stonecutters	8½	..	8

The average price of Mesabi bessemer iron ores at Lake Erie ports in 1906 was $4 per ton. Expenses charged against this averaged as follows: Mining, 80c.; rail haul to shipping port, 80c.; lake freight, 75c.; taxes, 5.5c.; interest, 2c.; royalty, 26c.; total, $2.685. This leaves a balance of $1.315 per ton.

Hydraulic-ram Boring Apparatus

I. Erich and R. N. Hansing, of Nordhausen, have developed a method of boring to great depths, employing the hydraulic-ram principle. Instead of one falling block, they used a great number of single, common strikers (Fig. 1) which, being fastened in a slowly rotating case *G* (Fig. 3) and properly driven, perform the boring. The bottom is cleaned continually by rinsing. The rinsing water, conducted

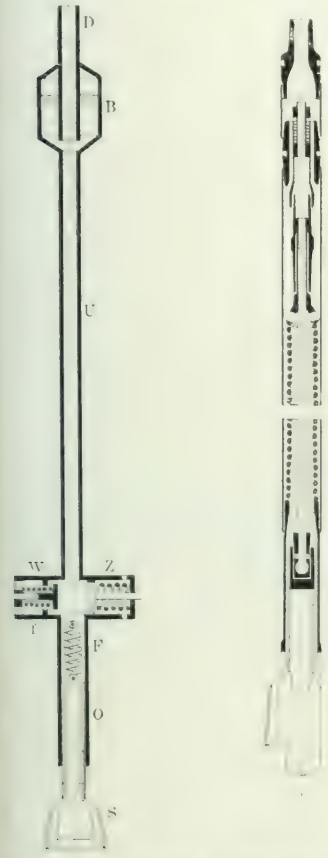


FIG. 1. GENERAL ARRANGEMENT OF APPARATUS.

through the hollow poles *H* (Fig. 3) flows through the kettle-like case *G*, along the bottom, and rises up the walls of the shaft. The narrowness of the cross-section at this point, caused by the presence of the incasement *G*, necessitates a proportionate increase in the rapidity of the water flow, and thus intensifies the rinsing. In consequence of the enlargement of the cross-section, the larger particles of the sediment accumulate in a sediment box *N* fixed

The advantages claimed for this system are said to be as follows: great safety of working, secured by the immobility of the poles; the possibility of increasing the mechanical effect of the striking apparatus; increasing the boring effect, and the application of efficacious rinsing, which hitherto was ineffectual in the other systems.

For driving the striking apparatus, the patent admits of the use of electricity, gas, compressed air, and pressing-water, but a closer examination shows the hydraulic motion of the single borers to be the only real practicable one.

The difficulty of constructing a powerful hydraulic motor for quickly succeeding blows lies, aside from the narrow dimensions of the bore-hole, the presence of sand in the water, and the arduous conditions of working, which exclude complicated constructions, in the nature of the force-transmitting medium, being heavy and almost incompressible. Every stoppage and every change in the direction of motion is necessarily followed by a more or less heavy shock of water in the pipes and in the motor, and this phenomenon, increasing in force with the rapidity of the motion, limits both the rapidity (therefore also the force) of the chisel stroke and the number of strokes which are possible with an ordinary hydraulic motor to about 150 or 200 per minute.

Ram Principle

In the boring ram under review an effective as well as a simple solution of the problem of hydraulic boring has been accomplished, making it possible to deliver with any desirable force 600, 1200 and more blows per minute. Since it is impossible to do away with the hydraulic shock, this has been turned to use. The boring ram is founded on the same principle as the familiar hydraulic ram used for raising water: the impact of a column of water stopped suddenly in its motion by the instantaneous closing of a valve which was previously open. Thus the pressure exercised by a pump does not act directly upon the chisel, but serves only to accelerate the motion of the column of water, which does not strike until the proper moment arrives, and then transmits its kinetic energy by elastic impact to the chisel.

Fig. 1 shows the arrangement of the apparatus. The water flows through the conduit pipe *D* and the air vessel *B* into the stroke tube *U*. At the end of this tube the conduit branches out. One of the outlets is closed by an automatic valve *W*, kept open by the spring *f*, the second by the piston and the buffer-spring *Z*, the third by the piston *O*, which serves at the same time as stem for the

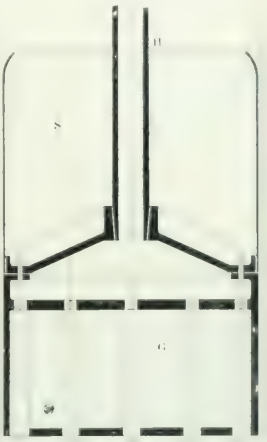


FIG. 2. [illegible]

The strong springs press with their upper ends against the piston (or stroke tube) against the piston. It is sufficient [illegible] any of the parts connected with the chisel, also the piston with its leather packing.

The screw-joints are conical, and the stroke tube, with thick walls composed of parts with conical screw-joints, has a total length of 10 to 20 meters.

When a stream of water is sent by the pump through the tubular poles, it will at first rush out freely through the open valve *W*. But when the stream has attained a certain velocity, it will exercise such a pressure on the valve-plate from above, that the elastic resistance of the spring will be overcome and the plate will be thrown with great force on its seat. This is the moment when the hydraulic shock (or jar) takes place; the column of water in the tube *U* having been in motion and now stopped suddenly, strikes the piston *O* and throws it violently against

*Abstract from an article by W. Wedski published in the German Engineering Company N. Hansen.

the bottom of the bore-hole. At the same time the buffer Z is compressed by the sudden increase of pressure. But when the kinetic energy of the column of water is exhausted by the work done, the reaction follows. The buffer Z, again expanding, throws back the column of water in U, whereby the pressure of the pump is neutralized for a moment in its effect on the valve. The spring takes advantage of this moment to tear off the valve-plate from its seat, thus reopening the outlet for the water, and the column U repeats the accelerated downward motion. At the same time the chisel, after having delivered the blow at the bottom, is raised by the spring F until the moment when the next water-shock drives it down.

In reality the buffer Z appears to be superfluous, for the specific elasticity of the water acts in its stead; the shutting of the valve causes a temporary compression of the column of water, by the increase of pressure accompanying the hydraulic shock, and afterward, by expanding again, a subsequent rebounding from the valve occurs. The instantaneous rarefaction taking place between the two masses thrown apart (chisel and column of water) effects the reopening of the valve each time.

Deep-boring Ram

In designing a deep-boring apparatus by aid of the principle of the hydraulic ram, its construction must be accommodated to the narrow dimensions of the bore-hole, with length unlimited. The water must flow out in the center, as near as possible to the bottom; the chisel must be easy to change; the whole apparatus must be solid, simple and easy to take to pieces.

These requirements are fulfilled by the construction shown in Fig. 2. The valve-seat is cylindrical, with a central bore and a row of parallel holes around it. These holes are, all together, shut (or opened) by a thin, elastic, steel-plate ring, the valve-plate, playing above them. The valve-spring works in a cylindric, widened groove of the valve-seat. Its effect can be strengthened or weakened at will by putting under it plate-steel rings of various thicknesses. A short central tube serves as a guide for the valve-plate, and two removable nuts on it form its upper stop.

When the valve is open the water flows through the row of holes, through the mantle-tube, and the bore-shoe to the chisel, rinses the chisel and the bottom, and rises in the bore-hole as rinsing water. When the valve is shut, the pressure of the water-shock spreads itself through the valve-guiding tube into the working cylinder, a tube of chilled steel, in which the piston is playing.

The chisel, constructed in this case as an eccentric step-chisel, is joined to the long piston rod, from which it is suspended by a ball and socket joint, to prevent it from shaking. Its cylindrical part is guided exactly by four ledges in the interior of the cast-steel bore-shoe. Its flat part plays in a slit of the bore-shoe; thus the motion of transposing is communicated from the poles to the chisel.

Shaft-boring Ram

Since the boring ram is the only hitherto known hydraulic striking apparatus suitable for working the group arrangement of shaft-boring apparatus, this hydraulic motion has been adopted for the construction of the new shaft-boring apparatus.

Fig. 4 represents such an apparatus in the form exhibited at the Liege Exhibition by the German Deep-boring Company, of Nordhausen.

The bore-hole, of 1.70 m. dia., is commanded by six chisels. The instruments which work on the periphery are inclined

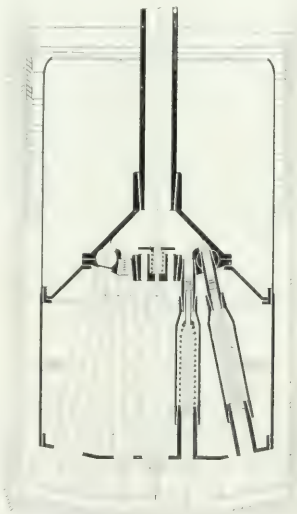


FIG. 4. CUTTERS IN POSITION, SHOWING CONSTRUCTION

somewhat toward the outside, thus neutralizing the detrimental consequences of the wear and tear of the border chisels and, on the contrary, giving to the apparatus the tendency of boring out a shaft of rather exaggerated width. If the border apparatus is placed on hinges, as shown, there is obtained a very effective enlargement of the walls in order to sink the shaft timbering.

Every chisel has its own back-lifting spring and its own piston. But the air-vessel, the striking tube and the valve are common to all instruments. The common hydraulic shock is distributed by channels to all working cylinders.

The greater the dimensions of the shaft to be bored, the greater must be the number of the single instruments used. They must be distributed in such a way, of course, as to give approximately equal shares of stone, to be bored out, to every edge.

The same principle, of a number of chisels worked by a common hydraulic shock, can be applied to the construction of a shaft-widening borer with laterally acting edges.

A New Cobalt District

Prof. Willet G. Miller, provincial geologist of Ontario, has made an inspection of the Montreal river district, including the new camp at Elk lake and the deposits north of Lady Evelyn lake, the latter lying in the Temagami forest reserve. His report largely confirms the statements made from time to time as regards the mining possibilities of the district. The area is roughly defined as lying approximately 25 miles west of Cobalt and extending from about 6 miles north of Lady Evelyn lake northward to Elk lake, which is a long, narrow expansion of the Montreal river. The discoveries examined by Professor Miller are not so wide as those which made Cobalt famous, but the conditions are very similar. The deposits carry cobalt bloom and smaltite, with native silver and other minerals. The deposits north of Lady Evelyn lake have so far been found in the diabase, and the prospectors find encouragement in the fact that several of the later rich discoveries in Cobalt have been in the same formation.

At Elk lake a good deal of development work has been done and the rush is increasing daily. Professor Miller regards these discoveries as confirmatory of the opinion expressed in his first report on Cobalt, and based on the similarity of geological conditions at Cobalt to those of the Port Arthur district, 500 miles distant, that deposits would be found to occur in the intervening district. There is a water route by the Montreal river, and when navigation opens steamers will run from Latchford. There are three navigable water stretches between that point and Elk lake, on each of which boats will be placed, transhipment being required at two portages. On the second stretch of water course is a branch leading to Lady Evelyn lake, where a steamer is ready to run. The Timiskaming & Northern Ontario Railway is building a branch to Charlton, 18 miles from Elk lake, and if circumstances justify it this will be extended to the new camp. Another water route reaches Lady Evelyn lake from Temagami station, upon which steamboats may run.

The Pan Russian Gold and Platinum Congress, which met at St. Petersburg, Feb. 27, passed a resolution asking the Government to prolong by 10 years until 1919) the duty free admission into Russia of foreign machinery for use on the Ural and Siberian gold fields.

Mining in the Wonder District, Nevada

The First Claim in the District Was Located in April, 1906. Now There Are Four Towns and a Number of Producing Mines

BY EDWARD R. ZALINSKI

Wonder, the most southerly camp in southwest Nevada, lies 18 miles northeast of Fairview. The stage leaves Fairview at 7:30 in the morning, and arrives in Wonder at about 11 o'clock. The fare is $5 going and $3 for the return trip. The road leads northeast and passes Chalk mountain about 6 miles from town. Some silver-lead prospects which have long been known, and which were recently sold, are located on the east side of the mountain. Ore from here in the Comstock days, was hauled to Virginia City and there treated.

The road is up-grade through a small cañon, with andesite flows on each side and four blocks wide, and every block on Main street was sold within a few days. The present price of business lots is from $300 to $600, and for residence lots from $150 to $300.

The town now has a population of over 400. It has a post office, four general stores, three restaurants, two assay offices, two surveyors' offices, a district recorder, and two notaries public, while numerous tents and rooming houses, a lumber yard, a barber shop, a corral, a drug store, saloons, etc., are on the ground. A telephone line connects with Fairview and Hazen, but there is at present no direct telegraph.

price is $30 to $40. Planed lumber, 4x4 in., for claim posts, is worth $80 per 1000 ft. in Wonder. Mining supplies are about 30 per cent. higher than on the railroad, and water costs $5 per bbl. Miners' wages are $5 throughout the camp, and board and room can be obtained for $2.50 per day.

Location of Townsite

The Stevens townsite joins Wonder on the north, while other townsites have been laid out in the neighborhood of the mines. Hercules is 2 miles northwest of Wonder. Red Top is 3½ miles west, Victor 4 miles northwest, and Kingston

MAIN STREET AND POST OFFICE, WONDER

LA PLATA MOUNTAINS AND WASP CLAIMS, WONDER

About 1½ miles from Wonder the road to Hercules branches to the left, and Wonder mountain can be seen in the distance.

Location

The town is located on nearly level ground in a sheltered position between the main range on the east and Wonder mountain on the north. It is on the gentle slope which leads toward Hercules cañon, at an altitude of about 5700 ft.

The first claim location was made by J. L. Stroud in April, 1906, on what is now known as the Jack Pot group. The rush from Fairview began May 28, ground was taken up in all directions, and at the present time about 1200 claims have been recorded.

On May 30 the town site was located, and surveyed a few days later. The town as originally laid out was nine blocks long

Water costs $5 per bbl., and is hauled from Horse creek about 6 miles to the northwest. A pipe line from Bench creek 6½ miles away, has been surveyed, and trenches for about 3 miles have been dug. There is a fall of more than 700 ft.

Freight Charges

All freight is hauled by teams from Hazen via Fairview at a cost of 2 to 2½c. per lb. From Fallon the rate is 2c. per lb. A new road is now being built from Fallon through Stillwater and Mountain Wells. It will be 45 miles to the Kingston townsite, and 50 miles to Wonder, and will save one day on the trip. This route is much easier than via Fairview. It is likely that this road will reduce the freight rates and give a quicker mail service.

Lumber in Fairview costs about $60 per 1000 ft. Delivered in Wonder it costs $72, while at Fallon, only 54 miles away, the

is on the main Stillwater road, about ¾ mile north of Victor. The estimated population of the district Jan. 1 was: Wonder, 300; Hercules, 100; Kingston, 10; Victor, 25; total, 435.

Geology

The general geology of Wonder is similar to that of Fairview. The country rock is andesite, and there appear to be two generations, an older andesite, in which the ore was deposited, and a later intrusion which, in some cases, has cut off this ore. Here, as at Fairview, later rhyolite dikes have cut the andesite, and it is along these contacts with the rhyolite hanging wall that some of the most important orebodies have been developed.

Nothing has yet been done to show whether the rhyolite dikes are older than the second andesite or not. It is probable that fissuring and ore deposition accompanied the rhyolite intrusions, and

*Mining engineer, University Club, Salt Lake City, Utah.

that this was followed by the later andesite. The andesite on the south slope of Wonder mountain has inclosed in it numerous rough angular fragments of a dark shale. Shale in all probability underlies the andesite, and these fragments were brought up near the point of eruption. These shale fragments were also noted in various other portions of the district.

Mineralization

The main ore-bearing fissures strike nearly east and west and dip to the north. The magnetic variation at Wonder is 17 deg. 30 min. east. Directions here mentioned are magnetic north. The mineralized territory covers an area about 4 miles square and shipping ore has been opened in many places. On the western portion of the mineralized area the strike of principal mineral-bearing fissures is about north 80 to 85 deg. east, and on the east side it is a little north of west.

outcrops for 10 to 15 ft., with 1.5 to 2 ft. of good ore at the surface.

The vein does not cross the dike on the south side and no trace of it can be found north of the gulch. There is nothing to show the strike on the surface, as the outcrop is now covered by the dump. This dump will assay $20 to $40 to the ton. The ore is quartz carrying silver sulphide and horn silver. Sulphide occurs disseminated through the quartz, and the horn silver in scales along the cracks and seams. Some ruby silver occurs. The ore averages more than $200 per ton. From the development work, with a shaft only 35 ft. deep, more than 60 tons of ore was sacked, assaying more than $350. The ore is sorted and screened and the fines sacked separately. Drifting was begun in both directions at the 50-ft. level.

A drift northeast of the shaft cuts a vein striking north 45 deg. west and dipping 70 deg. northeast. This vein is 1 to 1.5 ft. wide and carries good values in

more nearly parallel ledges occur and silver sulphide can be found along the strike over a distance of 300 to 400 ft. A tunnel is being driven east from the Hercules cañon to tap the veins at a depth of about 200 feet.

Nevada Wonder

This discovery was made May 28, 1906, and is the first of importance in the district. Six claims are included in the group. The Nevada Wonder, Nevada Wonder Nos. 1 and 2, Ruby, Ruby Nos. 1 and 2. The Nevada Wonder and Ruby take in Wonder mountain, and the summit of the ridge, while the other claims lie on the north and south side lines. The Hidden Treasure and Last Chance groups, join the Nevada Wonder on the northwest and southeast.

The first large transaction of the district was the sale of the Nevada Wonder for $300,000, by the original owners. The property was bought by J. B. Daniels for

ON THE GILKERSON LEASES, WONDER

VICTOR AND KINGSTON TOWNSITES, DIXIE VALLEY

The chief value is in silver, with from one-fifth to one-eighth in gold. Silver sulphide and horn silver are the chief silver minerals. The sulphides often come directly on the outcrops. The gold is mostly free-milling in quartz veins, though values also occur along fissure zones in silicified andesite. Pyrite occurs, but it is not plentiful, and hematite and limonite frequently stain the ore.

Claims in the District

The Jack Pot was the first location in the district and was discovered in April. Active development began in August. The property comprises 165 acres and includes the Jack Pot, Hercules Nos. 2 and 3, Jack Rabbit, Hill Top, Lizard, Beauty and Worm claims, and the Grandview and Hill Top fractions, 2½ miles northwest of Wonder and about ½ mile northwest of Hercules. The development consists of a prospect shaft 4x7 ft. and about 50 ft. deep on the Jack Pot claim, sunk on a vein 2 ft. wide at the bottom. The ledge white quartz. This is evidently a branch vein and joins the main vein at a point a short distance north of the shaft.

The Vulture Claims

Adjoining the Jack Pot on the west is the property of the Vulture Mining Company. It is located at the mouth of Jack Pot gulch, and claims are being worked on both sides. Ore is being sacked on the Grandview claim and also on the Extension. On the latter a ledge and vein on the ridge strikes north 80 deg. east, and the vein dips first south, and then to the north.

The veins are quartz, 1 to 3 ft. wide, in andesite, and run nearly parallel with the gulch. Andesite is often silicified along the vein, but in other places fresh and sharp to the edges of the vein. As a rule fissures and parting planes parallel to the veins occur. There is some chloride staining. Along the outcrop the quartz shows black grains of silver sulphide, and occasionally some horn silver. Three or

Philadelphia interests, and incorporated under the name of the Nevada Wonder Mining Company.

The development consists of a tunnel driven 110 ft. south and cuts the vein at a depth of about 60 ft. This is entirely in granular and altered rhyolite. The vein is about 4 ft. wide, and a winze is sunk 100 ft. on it, dipping to the north. The vein at this point will average $400 in gold and silver. The ledge here is soft and granular and contains free gold, silver sulphides, and horn silver.

Spider and Wasp Claims

This group is situated on the northern slope of the Wonder range, overlooking the Dixie valley, about four miles northwest of the town of Wonder and about ¾ of a mile south of the Kingston townsite. The claims are on the western part of the mineralized area so now known, and are reached by the new road from Fallon to Wonder by way of Stillwater and Kingston. The townsite of Victor is located

north of the Wasp claim. The group consists of the Last Chance, Tonopah, Spider, Wasp, and Long Nell claims.

The apparent strike of the ledge from the outcrop is northwest, but the true strike is nearly east and west. The ledge dips to the north, and difference of elevation in the west and east ends causes a migration of the outcrop. The company's main tunnel is driven 40 ft. in the ledge near the discovery on the Wasp claim and cuts the ledge below the ridge cropping. Specimens show a silicified andesite and quartz gangue carrying silver sulphides and chlorides. Assays have run as high as $1200. The claims have been subdivided into 23 leases.

Leases at Wonder

Among the most prominent of these leases is the Toohey lease No. 13. This is situated at about the center of the Tonopah claim, on the highest part of the ridge west of main road. An open cut on the outcrop exposes a quartz vein 3 to 5 ft. wide with well defined foot and hanging. The strike is north 80 deg. east and the ledge dips 52 deg. north. The ore is similar to that of the Nevada Hills and Jack Pot claims, and from the open cut, approximately 10x8x6 ft., 10 to 12 tons of $200-ore were produced. A tunnel is being driven west of this open cut in a small gulch, and has cut the vein and ore at a depth of about 60 feet.

Gilkerson's leases Nos. 14 and 15 join the Toohey lease on the east. The altitude of the lease is 4700 ft., Wonder is 5700 ft. and Kingston 4300 ft. The shaft is 45 ft. east of Toohey's open cut and has exposed 3 ft. of ore.

Quartz ore 5 ft. below the surface assayed $182 per ton, gold and silver including 0.7 oz. gold. A sample of quartz taken 6 ft. below the surface across 5 ft. of ore parallel to the vein, assayed 4.42 oz. gold and 918.6 oz. silver. This was a picked sample but looked no better than much of the ore in sight.

There are other interesting properties both with and without development. The groups which I have named are typical of Wonder, and illustrate the known occurrence of ore in the district.

The Calumet & Arizona

This company owns a large copper property in the Bisbee district, in Arizona. Its report is for the year 1906. The capital stock authorized is 250,000 shares of $10 each; of which 200,000 have been issued. The financial statement shows cash and copper, $3,725,493; ore at smelter, $242,171; supplies at mine and smelter, $499,667; Warren stock, $25,500; accounts receivable, $431,996; total assets, $4,924,827. Accounts and bills payable were $258,694, leaving a surplus of $4,666,133.

The net earnings last year, after deducting all working and general expenses, were $4,827,873; from this there were paid dividends amounting to $2,600,000, leaving a balance of $2,227,873. Adding the surplus brought forward from previous year, $2,438,200, made a total of $4,666,133, as above.

The production statement is as follows:

	1905.	1906.	Changes.
Gold and silver value	$158,843	$238,464	+ $79,621
Copper lb.	32,772,298	37,470,284	+ 4,697,986
Av. receipt per lb.	14.96c	17.96c	+ 4.00c

The report says that the average number of men employed was 976; of these 587 were employed at the mine, and 389 at the smelter. Payments on options secured for the company, including a mine in Arizona now being unwatered for examination, will, if all the properties are purchased, aggregate $1,575,000. The payments can be spread over some time.

The total amount of development work during the year amounted to 14,818 ft. More ore has actually developed during 1906 than during any one year since the ore was first found on the property, and there is more ore actually in sight than at any time in the history of the property, with a large amount of favorable ground which development work has not reached at all. As much ore has been developed on the Irish Mag during the year as has been taken out. The development work has extended largely the limits of the known orebodies on the Senator claims, and two or three additional orebodies have been found on these claims.

The North Star Mines Company

This company owns a gold-mining property in Nevada county, California, which it has worked with profit for a number of years. Its latest report is for the year 1906. The capital stock is $2,500,000. The ore mined and milled during the year was 84,672 tons.

The revenue statement for the year may be given as follows:

	Amount.	Per ton.
Ore milled, 84,672 tons	$826,326	$9.76
Interest	19,181	0.23
Total receipts	$845,507	$9.99
Mining expenses	$240,256	$2.84
Milling, etc.	123,647	1.46
General expenses, taxes, etc.	28,542	0.34
Development and improvement	150,384	1.78
Miscellaneous	3,596	0.04
Total	$546,425	$6.46
Net earnings	$299,082	$3.53

From these net earnings dividends of $250,000, or 10 per cent., were paid, leaving a surplus of $49,082. Adding $545,795 brought forward from 1905, made a total surplus at the end of the year of $594,877; of which $454,914 was in cash, $119,689 in bills receivable, and $20,274 in supplies at mine.

In 22 years, 1884-1906, the mine has produced $7,447,940 from 487,703 tons of ore, an average of $15.33 per ton, and has paid $1,280,989 in dividends, besides paying $1,016,400 for development, $735,628 for improvements, new mills, etc., and $387,985 for additional property.

The report says: "The actually available profit realized during the past year has been derived wholly from the deeper workings, between the bottom of the old upper mine, and the 4000-ft level, operated through the central vertical shaft. During 1906 these workings produced 62,780 tons of ore, yielding $653,295, or an average of $10.40 per ton, at an operating cost of $263,213, or $4.19 per ton, and a resulting profit of $390,082, or an average of $6.21 per ton. Additional outlays for development work and prospecting, during the year, in the lower mine amounted to $75,768, or $1.21 per ton, making for operation and development together a cost per ton of $5.40, and leaving a realized profit of $5 per ton (little less than one-half the realized value) of the ore produced from the central shaft workings. The results of the past year again realize and confirm the expectations indicated in previous years, that, under present conditions of operating capacity and the now visible or probable ore supply, above the 4000 ft. level, we may long continue to produce ore yielding $9 to $10 per ton, of which one-third to one-half may be net profit, available for dividends.

"The outlays for development, during 1906, amounting altogether to $122,822, were made partly in the upper workings, as already noted, and partly in the lower North Star mine. The most important work in this direction has been the sinking of the main inclined shaft to the depth of 700 ft. below the 4000-ft. level, measured on the dip of the vein, beginning at the bottom of the central vertical shaft, at the 4000-ft. level, and following downward on the lode. A very good formation, regular in course and dip, has been found all the way, showing a large, well-defined vein of low-grade, but apparently profitable, milling ore. Stations have been made at the 4400 and 4700 levels and drifting is in progress, following the vein in both directions along its course, with favorable indications but not yet sufficiently extended to fully determine the value of the ore or the productive capacity of the ground. These workings will be continued both in length and greater depth during the current year, having constantly in view the deeper development of the mine to the limit of profitable operation, in the distant future.

"The outlays for improvements, $27,562, were mainly for the completion of the cyanide plant at the Central mill, besides other smaller items for the electric railway, new assay office, etc. The present conditions of the company's property and business are generally satisfactory and encouraging for the future."

The United Engineering Societies Building

The Structure Contains Offices, Libraries and Lecture Rooms for Use of American Societies of Mining, Mechanical and Electrical Engineers

A CARNEGIE GIFT TO ENGINEERS

The project of bringing together in one building, with proper facilities for offices, library, auditorium, meeting rooms, etc., the various engineering societies that make their headquarters in New York City had long been a topic of conversation among engineers, when Mr. Andrew Carnegie's attention was called to the fact that the Engineers' Club had just secured land for a new house in West Fortieth street, opposite the new Public Library. This was in February, 1903. The locality appealed to him as highly suitable, and on Feb. 14 he wrote a brief letter, saying:

"It will give me great pleasure to give, say, $1,000,000 to erect a suitable union building for you all, as the same may be needed."

One year later, when the plans and estimates showed that a larger sum would probably be required to carry out the work on an adequate basis, Mr. Carnegie in a further letter, addressed to the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers, and the Engineers' Club, increased his sum to $1,500,000 in their joint behalf.

The only limitation to the gift was that it should be devoted to the erection of a building, the bodies interested buying the land. At the outset it was proposed to put up one building on Fortieth street, but it was finally decided to erect two separate buildings, one for the club on Fortieth street and one for the three professional societies on Thirty-ninth street.

The Holding Corporation

Each of the bodies named in the gift appointed three of its members to form a joint conference committee of twelve, whose duty it should be to accept the gift and erect the buildings, and that committee has remained in active existence up to the moment of the dedication of the Engineering Societies' Building. It comprised the following: American Society of Mechanical Engineers—C. W. Hunt, J. M. Dodge, F. R. Hutton; American Institute of Mining Engineers—R. W. Raymond, A. Lead Ledoux, C. Kirchoff, T. Dwight; American Institute of Electrical Engineers—C. F. Scott, C. W. Rice, T. C. Martin; Engineers' Club—W. H. Fletcher, J. C. Kafer, W. A. Redding. In organizing for its work this body made Mr. Scott chairman, Professor Hutton secretary and Mr. Kafer treasurer. Various changes occurred in the personnel of the committee from time to time.

One of the most important duties of the committee was the division of the gift in proportion to the requirements and objects of the two buildings. The delicate task was accomplished by allotting $1,050,000 to the Engineering Societies' buildings and $450,000 to the club building.

UNITED ENGINEERING SOCIETIES BUILDING.

The site acquired for the Engineering Societies' building is on West Thirty-ninth street, north side, between Fifth and Sixth avenues. The frontage covers five city lots, the total front being 125 ft. This land has been bought with money advanced by Mr. Carnegie through R. A. Franks to the three engineering societies at 4 per cent. interest, the cost being $502,000, one-third of the amount being payable by each society.

Before undertaking the work connected with the building, it was found necessary to organize a holding corporation to administer the endowment and property for the founder societies jointly and in common. A corporation was formed by special charter in the State of New York, in May, 1904, called the United Engineering Society, to act as the trustee for the three founder societies, and its nine trustees are

chosen periodically three each by the councils of the electrical, mechanical and mining engineers, to control the building and regulate its finances. The title of the land rests also in this body corporate. The first president of the United Engineering Society was A. R. Ledoux, who was succeeded by the present incumbent of the office, E. E. Olcott.

The contract for the construction of the building was executed with Wells Brothers Company on July 17, 1905. The cornerstone of the building was laid in the eastern wall by Mrs. Andrew Carnegie, on May 8, 1906. The time of completion was fixed for November 15, 1906. Offices were ready for occupancy on Dec. 15, 1906; some were in use before the end of the year, and the entire building, though not quite finished, was ready for use Jan. 1, 1907.

THE AUDITORIUM FROM THE PLATFORM

The Building

The frontage of the building is 115 ft., and the depth is 90 ft. The building laws of the City of New York require that only 85 per cent. of the lot area shall be occupied by the structure on it. Advantage has been taken of this limitation to give the building a monumental appearance. It is designed in the French style and rises 13½ stories above the sidewalk to a hight of 218 ft. 6½ in. The exterior is built of limestone up to the auditorium floor, and of gray mottled brick and terra cotta above; the whole having a cheerful cream tint on all four sides. As the lower portion is devoted to auditoriums, the middle section to offices, and the upper part to the library, an effort has been made to accentuate these three separate parts of the building. There are 46 concrete piers in the foundation going down to solid rock. Two of these piers sustain a load of 3,000,000 lb. each, and the steel columns at these two points weigh 1000 lb. to the foot. The steel plate girders in the ceilings of the main auditorium weigh 48 tons each, and the steel lattice truss on the sixth floor weighs 64 tons. The total weight of steel employed in building construction is 2650 tons.

Access to the building is gained by the central entrance on the street level to the first floor, by the western side door leading to the elevators, and by the broad driveway which encircles it completely. There are three elevator riseways in the main elevator shaft, faced with an iron grill lined with wire glass. On each side of this shaft wide stairways rise to the sixth floor of the building, and one leads thence to the library floor. At the first floor, a rear door communicates across the ten-foot areaway, in the open, with the café of the club-house, and on the ninth floor, a flying covered bridge connects with the breakfast room on the tenth floor of the club.

The Interior

The first floor is laid with Tennessee marble tile, having a border in design of colored marble. The central court or main foyer is marked by twelve large columns of Swiss Cipolin marble. A short low flight of steps leads from the foyer to the elevators, and at will a metal grille is thrown across the steps so as to restrict or direct travel. Gold ornament is used sparingly for architectural accentuation, and the wood work is in dark oak. Large chairs and lounges in red leather furnish the foyer, and similar furniture is used in the writing room, smoking room, reception room and administration room, which also contains three telephone booths associated with the "private exchange" system. On the foyer walls, facing toward the main entrance, are two large bronze tablets, one bearing a relief portrait of Mr. Carnegie and the words of his second terse letter of gift of $1,500,000, and the other a statement to the effect that the land was given by members and friends of the three founder societies.

Immediately above the first floor is the coat room, laid out on a sectional plan so that several lines of persons may be accommodated at once on entering or leaving.

The main auditorium extends up through two floors, and with its gallery will seat about 1000 persons. The requirements of this chamber were unusual and difficult of definition. It had to be arranged primarily for the general meeting of the societies, at which the speaking is from the floor as well as from the platform, and at which diagrams, illustra-

stage is the starting point both for the seating arrangements and for the acoustic and optical necessities. Hence the platform is notably small for so large a hall, accommodating few persons, while any speaker in the audience is easily within range of observation by everybody.

On both the parterre and the gallery floors, at the sides, the auditorium is surrounded by corridors, rendering access to every point easy, and permitting ready withdrawal for conversation, committees, etc. The corridors assist also in maintaining quiet within the hall. There is also a stereopticon equipped with connections for moving pictures.

and of smaller dimensions than those on the floor below.

Offices of the Societies

The seventh and eighth floors of the building have been reserved for the associate societies that have engineering or some department of science as their principal object. For these organizations the building affords office areas of varying size, from one room up, with the common facilities of the lecture rooms, library, and other accessories. Among these societies may be enumerated the Society of Naval Architects and Marine Engineers, the Society of Heating and Ventilating Engineers, the National Electric Light Association, the Society of Chemical Engineers, the New York Electrical Society, the Association of Edison Illuminating companies, the American Street and Interurban Railway Association.

Each of the three founder societies occupies a floor laid out in accordance with its own plans. The American Institute of Mining Engineers has the ninth floor, the American Institute of Electrical Engineers has the tenth floor, and the American Society of Mechanical Engineers has the eleventh floor. These floors are all devoted to administrative and executive work, and the libraries of the three societies have been concentrated in the two top floors of the building.

A crowning detail in the plan of the building has been the reservation of the twelfth and thirteenth floors for the libraries of the three founder societies and of such other collections of engineering literature as may be added. The twelfth floor, below the library proper has been devoted to the book stacks, but at the present time the main library is also equipped with one tier of stacks, with provision for a gallery tier later. The founder societies entertain the ambition of creating and maintaining the finest collection of engineering literature in the world, supplemented by the current periodicals, and all the patents relating to invention in the arts and sciences. Provision is being made for special research accommodation, working alcoves, photographic reproduction, drawing and similar library work. Commanding magnificent views of Great-

The Library

The next two floors above the main auditorium are devoted entirely to lecture rooms, of which there are seven. Two assembly rooms occupy the larger part of the fifth floor in such a manner that they can be used independently, or one may be made auxiliary to the other. Two smaller rooms on this floor can be also used separately or as annexes for reception or conversational purposes, and provision is made with steam tables, etc., for the service necessary for luncheons or light refreshments. All these rooms are agreeably finished in soft light tints and have facilities for water, air, electric connections, etc., for demonstrations and experiments.

The sixth floor is also divided into lecture rooms, planned somewhat differently,

er New York and vicinity in every direction, the library is retired, quiet, free from noise and dust, an ideal haunt of the student and man of research; while open at all times to any reader. In view of the proximity of the new public library, the Engineering Societies Building, with its unequalled collection of scientific and industrial data becomes at once a vital and important center of the highest value for the diffusion of useful knowledge.

Alloys of 50 per cent. iron, nickel or manganese with 50 per cent. aluminum have been found to disintegrate after a comparatively short time, says *Brass World*, March, 1907, but if the mixture is not half and half this does not occur.

Dedication of the Engineering Societies Building

The dedicatory exercises of the building presented to the engineering societies by Andrew Carnegie were held in the auditorium of the building, Tuesday, April 16, at 3 p.m. Charles W. Hunt, past president of the American Society of Mechanical Engineers, presided. Rev. Edward Everett Hale led in prayer. Communications from President Roosevelt, President Diaz, of Mexico, and the Governor General of Canada, were read, and a letter from Charles H. Haswell, the veteran engineer, now 97 years of age, expressed his regret at not being able to attend the meeting.

Charles F. Scott reviewed the history of the building, from the conception of the idea to its final completion.

E. E. Olcott, as president of the United Engineering Society, and representative of the founder societies, formally accepted the building, and received the key from the chairman.

Andrew Carnegie, the donor of the funds which made the building a possibility, received an ovation, all present rising from their seats to greet him as he arose to speak. Mr. Carnegie spoke of the pleasure it gave him to make such a structure possible. He pointed out the advantage enjoyed by American engineers, above all others, in having the ability and the inclination to coöperate. He said that this was the keynote of universal brotherhood, and the aim of the peace congress, in session in another building in the city.

President Arthur T. Hadley, of Yale University, closed with an address on "The Professional Ideals of the Twentieth Century." "It is not the works that men do," he said, "but the men that do them that really count, and the best way to honor one's deeds is to provide that one's children shall do still greater deeds. The engineering professions are becoming more universally recognized, and are taking their proper place in the world. This building would have been impossible in the eighteenth century for then only the arts and theology were honored."

In the evening a reception by the societies committee was held in the auditorium and each of the founder societies received in their respective rooms. Refreshments were served in the large rooms on the fifth floor. The number present at the reception is variously estimated to have been between 1000 and 2000 persons, among whom were many mining engineers.

The regular sessions of the meeting of the A. I. M. E. were held in the new building, the dedicatory exercises being preliminary to the New York 1907 meeting of that association.

Tennessee Copper Company

The report of the Tennessee Copper Company at Copperhill, Tenn., for the calender year 1906, states that development at the company's three mines consisted of 30 ft. of shaft sinking, 787 ft. of drifts and crosscuts, 224 ft. of raises and winzes and 4613 ft. of diamond drilling.

The total ore extracted was 303,741 tons, of which 362,900 tons were smelted, producing 11,319,591 lb. fine copper in bessemer pig which was equivalent to 31.19 lb. per ton of ore smelted. Sales of copper realized $1,739,446.

Operating costs, based on the treatment of 362,900 tons of ore were as follows:

	Ore Per Ton	Copper Per lb
Mines development	$0.1067	0.343c
Mining, hoisting, etc	0.7845	2.512c
Crushing and sorting	0.0263	0.225c
Railway	0.1289	0.458c
Blast furnace	1.1861	1.765c
Engineering and laboratory	0.0579	0.118c
General	0.1387	0.445c
Converting	0.2733	0.876c
	$3.0320	9.724c
Adjustment of ore account	0.0013	0.004c
Cost of fine copper in pig	$3.0307	9.720c
Freight, insurance and selling		0.68
Taxes and all other expenses		0.51
Total cost per lb copper		10.91

The profit for the year after deducting $106,000 for depreciation of plants was $824,231. The sum of $516,360 was spent for new construction, consisting of sulphuric-acid plant ($192,295), enlargement of smelter ($200,000), and the balance for dwelling and other houses and for equipping a quartz quarry.

The charge smelted for the year consisted of:

Ore	362,900	tons
Converter slag	23,260	"
Blast furnace by-products	25,897	"
Custom ore	5,862	"
Quartz flux	68,151	"
Limestone flux	193	"
Flue matte and custom	97,914	"
Total	584,747	"
Coke used	82,729	"

An average of 1277 workmen was employed at the Tennessee plant.

The Broken Hill Proprietary Company, Ltd.

In the report of the Broken Hill Proprietary Company, Ltd., of New South Wales, for the half-year ending Nov. 30, 1906, the statements are given in great detail and are condensed as follows: Gross profits, £345,622; depreciation on plants, £31,337; net profit for half-year, £314,285. £22,387 was expended for construction of light and power plants.

The assets, consisting of cash, bullion and other convertible stocks, amount to £614,682, including reserve and insurance funds. Two dividends of 1s. 6d., and two bonuses of 1s. per share, amounting to £240,000, were distributed during the half-year. The profit for the same period showed an increase of £81,952 over that of the preceding six months, and the profit per ton of ore increased from £1 0s. 2d. to £1 1s. 1d.

The spelter plant was completed, but numerous modifications have since been made.

The refinery treated 1135 tons of bullion per week, resulting in 28,409 tons of soft lead, 283 tons antimonial lead, 911 oz. gold, and 1,904,977 oz. fine silver.

The zinc plant treated 400,112 tons of tailings, producing 109,468 tons of concentrate.

The total quantity of ore smelted in the furnaces was 93,471 tons. Five roasters treated 51,984 tons of material, including 45,154 tons converted by the Huntington-Heberlein process. During the half-year 5381 tons of concentrate from the mine were handled direct at the smelters without roasting.

The various departments of the plant report favorable progress through the period under review.

North American Mines Exhibition

An exhibition of mines and minerals was opened at the Grand Central Palace, Monday, April 15, which is to last two weeks. The exhibit, under the auspices of the North American Mines Exhibition Company, consists of ores from Nevada, California, and other mining districts, but few of the well known producing mines are represented, with the exception of some of the Cobalt properties. In this section some interesting samples of mass silver and vein matter are shown. Mining machinery and appliances are not much shown, and the visitor gets little insight into mining and milling methods.

Stock brokerage houses are well represented and quotations are recorded on a large board. The prospective purchaser can be accommodated if he desires to buy stock in one of several hundred stocks quoted. An assay office occupies one of the sections, and accurate assays of ores are made "while you wait."

In the center of the hall a panoramic representation of the Nevada gold fields, from the discovery to the present day, is shown.

Umpire Analyses

H. Fresenius (*Zeit fur anal. Chem.* XLV, 103) in regard to the differences between chemists, suggests that the interested chemists and umpire should exchange samples and continue analyses even after the business side has been settled. Thus the cause of variations may often be found with a consequent advantage to analysts in general.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

The average cost per mule per day in a mine is about $1.20 or 15c. per hour for an 8-hour day.

There are 400 square miles of anthracite coal measures in the central part of Rhode Island and eastern part of Massachusetts. The fuel is of highly metamorphosed varieties or graphite coal. It requires a high temperature under a heavy draft to burn it, and was worked as early as 1808, however, the mines were never on a paying basis.

The Lehigh Coal and Navigation Company has started a system of gravity tunnels to drain mine water, in the Panther Creek valley. The main tunnel and the drainage gangways call for 78,000 ft. of gangways—a total of nearly 14 miles. The estimated cost is about $700,000. It has been figured that after the completion of the drainage tunnel the saving by this means alone will be about $150,000 per year.

The mine operators in the Schuylkill region are alarmed about the spread of tuberculosis among the mules, the estimated value of which in that territory is more than a quarter of a million dollars. The disease has made considerable headway among the animals lately. The owners have appealed to the State for aid in fighting the infection. It is said that the mules have contracted the disease from cows which have been slaughtered in that section of the State by the authorities during the last three or four years.

The head sheaves most generally used in the coalfields have cast-iron rims and hubs and wrought-iron spokes. They are lighter and stronger than those made of cast iron entirely. The diameter of a head sheave depends on the size of rope, load to be lifted and the length of rope. For a 1½-in. rope the diameter should be at least 7 ft. 6 in. The groove in the sheave should be lined with wood so that the wear on the rope may be reduced to a minimum. The spokes should be staggered in the hub.

In mining coal measures separated by a stratum less than 50 ft. it is the practice in the anthracite field to use the "chamber-over-chamber" system, that is, the pillars in the lower vein should be left directly under the pillars in the upper vein; sometimes it is customary to leave every tenth room untouched so as to leave a reserved pillar for further protection from caves and squeezes. When ready for drawing the pillars it has been the practice to commence robbing the upper vein first; it is, however, much better to use the "pillar-over-pillar" system of robbing.

All self-acting planes should be provided with an angle of inertia at the head, that is, an inclination having a greater grade at the top than the plane itself; so that the trip will start with a momentum, which, in turn, will start the empty trip up the plane. The reverse should be the case at the bottom of the plane, so that when the loaded trip reaches the foot, the speed will be retarded by the decreased grade. For an engine plane, the engine may be located at the head or foot, and the grade of the plane should be uniform from top to bottom.

The success of a coal mine depends largely upon an efficient underground haulage system, regardless of whether the roads are inclined or level. It has been found by practice that the minimum grade for a slope or plane is 5 per cent. when the length is not over 600 ft., so that three loaded cars descending from the head of the plane will pull up three empties. When the length of the plane is more than 600 ft. and less than 2500 ft. the grade should be increased by 1 per cent. for every 300 ft. over 600 ft. That is, a 900-ft. plane should have at least a 6 per cent. grade.

It has been found in practice that the speed of flow in the main compressed air line should not exceed 30 ft. per second. If the velocity exceeds 30 ft., the plant is not running on an economical basis, and the percentage loss will increase with the increase of the velocity. From 4 to 6-in. main lines are sufficient for ordinary practice in mines; a 4-in. line will deliver 480 cu.ft. of free air per minute, compressed to 85 lb., with a loss of 2 to 3 lb. for a line less than 3000 ft. This volume of air is sufficient to run four 3-in. drills. The line may be of cast or wrought iron. Wrought-iron pipes are usually connected by sleeve couplings. An inspection of the main should be made now and then and if the pipe leaks, it must be repaired at once as an air leak is more expensive than a steam leak.

In preparing anthracite coal in the breaker the lump coal is first crushed by rollers. The manner of feeding the rollers is very important, depending entirely on their diameter and revolutions per minute. For example: If the diameter of the rollers is 30 in., and r.p.m., 120, then the speed of the crushing surfaces of the rollers is nearly 15.8 ft. per second. Now, in order to obtain the maximum percentage of prepared sizes, the coal when it touches the rollers, should have a velocity of 15.8 ft. per sec. In order for the coal to attain this speed by the time it comes in contact with the rollers, it must fall through a space of 4 ft. from rest. The lump of coal will be broken unnecessarily if its speed is greater or less than 15.8 ft. per second, provided that the revolutions per minute of the rollers remain the same.

Tests have been made recently at the Trotter plant of the H. C. Frick Coke Company of a new miners' lamp. It has been patented by H. H. Huttle, of New Jersey. The inventor claims that it is safe in any mine of gaseous nature. At the Trotter mine, 50 lamps were put on trial. The lamp weighs 5¼ lb., and is not intended to hook on the miner's cap. It has a large metal hook which is designed to catch on the mine wall or rib, and the heavy glass sighted toward the face where the miner is working. By two sockets the lamps are charged from a 110-volt dynamo, which is located in a separate room, especially provided for keeping lamps after every working day. The charge in the lamp will last for eight hours, while the cost of each lamp is about $15. The results of various tests show that the apparatus is safe in gassy mines.

It has been found by practice that in burning small sizes of anthracite, the ashes produced when a steam jet system is used contain more unconsumed carbon than when produced by the fan-blast method; in the latter system, the rate of combustion per square foot per hour is greater than with the steam jet. It was found that, when a bed of coal was ignited and burned out without disturbance, the percentage of carbon in the ashes was much less than when coal was successively added to the burning bed. In practice, however, it is impossible to burn out sufficiently before adding fresh coal. The introduction of steam into the ash pit naturally decreases the tendency of the fuel to clinker on the grate in comparison with the fan-blast or natural draft. The higher percentage of carbon in the ash is due to the fact that when the fuel gets red hot, it acts almost like dry sand and works its way into the ash pit. Although the fan-blast produces the best ash and gives a more rapid rate of combustion of the fuel, yet, in some cases it is more advantageous to use the steam jet on account of the clinkering. The combustion of the fuel is more perfect when the coal is undisturbed while burning.

Metallics

The black coloration of blende is not necessarily an indication of high content in combined iron; for example, some of the blende of Wisconsin is black, but is low in combined iron. Blendes which are black in color and of brilliant luster are apt to be high in combined iron, but not always.

Raises should whenever practicable be started from an off-set from the drift. There is always quite a little loose rock, etc., falling down a raise, which litters up the track when the raise is started without an off-set. A floor should always be laid at the bottom of a man-way, so that this dirt can be quickly and easily cleaned up.

Liquid carbon dioxide resembles liquid cyanogen in possessing only a small solvent power, and, in this respect, differs sharply from liquefied sulphur dioxide and ammonia, which are good solvents for inorganic salts, and from liquefied hydrochloric, hydrobromic and hydriodic acids, and hydrogen sulphide, in which many organic substances are easily soluble.

Many experienced drill sharpeners gage the bits by eye only. All drill sharpeners, no matter how expert, should be made to use a gage in sharpening the steel. There is nothing more aggravating than wasting time in a hunt for a drill to follow one with a small bit. Many foremen are extremely careless in regard to the steel which they furnish to their miners.

At some convenient place in a stope where square-set timbering is used, an ample place should be provided for storing a good supply of wedges, blocks, and planks for flooring. Much time is lost by men hunting for blocks, wedges, etc. There is no better time to put in a floor in square-set mining than to lag with planks the set as soon as it is put in. The planks should therefore be kept in some handy place.

Most miners are inclined to drop tools where they use them last. A timber truck is used to run in timbers, lagging or what not. Instead of being returned to the station, it is left where last used. A jack-screw may be used to jack back some drift-post after the lagging has been eased. Instead of being returned to the storehouse or to the station, its proper place, it is left where last used. Much time is idled away in hunting for mislaid tools. All such haphazard work increases the expense of mining.

Rock drills driven by air are necessary in mining operations and will remain so probably for years to come. For hard rock-boring there is no machine so universally used, and consequently, as it is improbable that they can quickly be displaced by other classes of borers, every attention should be given to studying means of improving the present methods connected with their use. This is the more important inasmuch as in the utilization of power at the drill bit, the rock-drill is one of the most inefficient of common machines.

The presence of tin in certain samples of zinc ore from the Slocan, British Columbia, is noteworthy, although it is not greatly to be marveled at, in view of the close association of the veins of the Slocan with granitic rocks, which are especially kindly to the formation of tin minerals. Traces of tin occur in the base bullion (lead) produced at the Trail smeltery, B. C., and it is to be remarked that galena ores from the Slocan, obtained from the same veins as the zinc ore are extensively smelted at that works. The occurrence of tin in zinc ore is unusual, but not extraordinary. Crystals of cassiterite have been isolated in the blende mined at Freiberg, Saxony, and spelter produced there has shown an appreciable percentage of tin, while tin has been detected in some of the old brands of spelter made in New Jersey.

The zinc smelters of Holland, Belgium, and the west of Germany receive their ore supplies through the ports of Hamburg, Rotterdam and Antwerp, but chiefly through Antwerp. These smelters have been for many years dependent upon foreign mines for nearly their entire supply of raw material. The system of receiving these supplies has therefore become well organized through long experience. This organization has made Antwerp the favorite port of entry. There are at that port convenient docks for unloading and trans-shipping the ores; agencies for the sampling of the ores as received; brokerage houses for the consummation of transactions in custom lots; and public assay offices for the determinative work that may be required. Antwerp is, moreover, conveniently situated with respect to the principal smelters of Holland, Belgium and the Rhine, has excellent railway connections, and also is the terminus of an extensive canal system, by which cheap transportation to the works can be secured.

A big proportion of the cost of mining at most mines is that of tramming. Especially is this so when men are used to "mule." This is frequently due to poor tracks. Drifts should be kept scrupulously clean. A good employment for an old or a crippled miner is in keeping drifts clean and ditches clear of débris. Wrecks on the main line are expensive underground as well as above ground; besides, the cleaner the track, the more a trammer can run. It is cheaper in the long run to use a 16-lb. rail than a 12-lb. rail; generally too light a rail is used underground. A grade frequently used in laying tracks is from ½ to ¾ in. per rod. Most upsets in tramming occur at turn-sheets. Therefore turn-sheets should be avoided, if possible. When they are used, the drift for at least 5 ft. on each side of the turn-sheet should have a good plank floor. This allows the "wreck" to be easily and quickly cleaned up. When no such floor is laid, the trammer, being in a hurry, shovels only what he has to and tries to "lose" the rest. As a result the drift is left very dirty and another wreck is unavoidable.

Many a foreman has given the following advice to some young miner that he liked: "Keep your place neat and your tools picked up. It makes the work easier for you and—we don't expect so much work from such a miner." Miners are notorious for the slovenly condition in which they keep their working places. A foreman should insist upon a reasonable exercise of orderliness, for it is quite as easy to keep tools in order as to scatter them everywhere. In square-set mining this is easily accomplished by requiring the men to keep such articles as tamping sticks, scrapers, etc., lying upon nails driven into the cap or tie. Axes should be hung from two nails driven into the post. The saw should be hung up; it remains sharp longer. Valves of machines, where machine drills are used, should be hung upon a nail when not in use. In short, everything that can be reasonably cared for in that way should have its nail and should be kept there. As the miners work ahead the nails can either be driven into the posts or, better still, drawn by means of a spike-puller, which is a very handy tool to have in a stope. The spike-puller is only a bent piece of hard steel with a split at the end to catch the nail.

The zinc smelters of the United States are divided into two groups, viz. (1) those which make high-grade spelter from special ores, this group including the New Jersey Zinc Company, and the Bertha Mineral Company, producing at Bethlehem and Palmerton, Penn., and Pulaski, Va., spelter from the remarkably pure ore of New Jersey; and (2) those which make spelter from Western ores. The Western spelter up to about 1901 was made almost entirely from ore mined in Wisconsin and the Joplin district of Missouri-Kansas, and was marketed chiefly under the name of "prime Western." Certain smelters, purchasing selected ores, made superior brands. Since 1901, the quantity of ore from west of the Rocky mountains has attained large proportions, and the "prime Western spelter" now produced is largely derived from that class of ore. Many of the smelters separate the first draw of metal, which, being distilled at the lowest temperature of the operation, is lower in certain impurities (especially lead) than the second and third draws, and market it as "special." The major part of the Western spelter is produced, however, as ordinary brands, and the prices for ore are based on the prices of good ordinary brands of spelter.

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Production of Copper in the United States in 1906

The production of copper in the United States in 1906 was 917,620,000 lb. In our preliminary statistics, published Jan. 5, 1907, we reported 915,000,000 lb. Our final figures differ from the preliminary by less than 0.3 per cent. They show an increase over 1905 of only 4.8 per cent. The details of the production, in comparison with the figures for 1904 and 1905, are given in the following table:

PRODUCTION OF COPPER IN THE UNITED STATES
(In pounds)

State.	1904.	1905.	1906.
Alaska	2,043,586	4,703,600	8,700,000
Arizona	191,602,958	222,866,024	263,200,000
California	29,974,154	16,687,489	24,421,000
Colorado	9,401,913	9,854,176	9,565,000
Idaho	5,422,007	6,500,000	9,493,000
Michigan	208,329,248	218,999,753	224,071,000
Montana	298,314,804	319,179,885	299,850,000
New Mexico	5,368,666	5,638,842	6,262,000
South and East	16,211,086	14,907,982	18,821,000
Utah	47,062,889	51,950,789	49,712,000
Wyoming	3,565,629	2,393,201	146,000
Other States	1,418,065	1,550,000	(a)3,379,000
Total	817,715,005	875,541,741	917,620,000

(a) This figure includes 400,000 lb. of copper produced in the form of bluestone, and also considerable copper which belongs not to other States," but to those above enumerated, to which, however, it cannot be accurately allocated.

Our statistics are based on reports of the copper content of blister copper, except that a comparatively small part of the total production, which could not be conveniently reported in that way, was reported as refined copper, allocated according to the States of origin. This introduces a little disuniformity into the statistics, but such discrepancies as there may be on that account are immaterial. In view of the incorporation of this refined copper in the total, instead of the copper content of blister, from which it was derived, the copper in by-product sulphate corresponding with it, has been included in the grand total. The Michigan production, of course, is reported entirely as refined copper.

The computation of the production of copper on the basis of the copper content of blister produced gives the production in the nearest practicable way to its origin, and permits a classification among the States of origin with a degree of accuracy that no other method of collecting the statistics affords. However, even on this basis, it is impossible to make an absolutely accurate allocation. The blister copper basis is not the proper one upon which to reckon consumption, because this copper is several months in transit and process of refining before it is put in final marketable form, and the time is variable. Thus, in 1906, the time of transit was longer than ordinarily, because of the congestion in railway traffic during the latter portion of the year. Moreover, the fine copper content of the blister copper produced does not represent exactly what finally is delivered in marketable form, because there is a loss in refining, which on the grand total of so large an output as the American amounts to a considerable figure. We have not made any allowance for such loss, because it has not been done in previous years, and it has been considered desirable to leave the statistics for 1906 in a form directly comparable with those for 1905.

The reasons for the changes in the production of the various States have been discussed in previous articles, so that it is unnecessary to enter further into that subject at the present time. The only explanations that are required refer to the statistics for Alaska, Utah, and "Other States." Alaska did not produce so much copper in 1906 as is credited in the above table, but the smelters produced that quantity of copper from Alaska ore, a considerable part of which was mined in 1905. The decrease in the production of Utah, which is shown in the above table, is statistical rather than real. It is explainable by a more complete distribution of the product of the smelters in Utah than was made in the previous year. These smelters receive a great deal of ore from other States, especially California and Idaho. In 1905 those States received credit for less than their whole production, while Utah received credit for more. As a matter of fact, the copper production of Utah increased in 1906, but a considerable portion of its ore was not smelted, going into the stock of raw material of the Garfield Smelting Company, whose plant was put in operation during the year. Our statistics being based on blister copper production, the copper content of this material was not included. Approximately the same quantity will remain in stock so long as the smeltery is in operation, and when the latter ceases operation, its copper content will appear in the production for that year. Under the caption of "Other States," is included the production of Nevada, Washington, Oregon, South Dakota, and Texas, together with an allowance of 400,000 lb. of copper in by-product sulphate, for the reason explained above, and together with further quantities of copper which were actually produced, but could not possibly

is distributed according to the States of origin.

The above statistics are based on reports received from every producer in the United States, among which all duplications have been carefully eliminated. In entering the totals for the several States, the nearest thousand has been used, in order to have round figures in each case.

Production of Lead in 1906

The production of refined lead in 1906 was 415,656 short tons. This report is based upon returns received from all of the refiners, with the exception of one small concern, whose production is estimated on the basis of its known receipts of ore. In our issue of Jan. 5, 1907, we reported the total production as 412,042 tons, our final figure being a little less than 1 per cent. higher than the preliminary. The details of the production are given in the following table:

PRODUCTION OF LEAD IN THE UNITED STATES
(In tons of 2000 lb.)

Class	1905	1906
Desilverized, domestic	305,665	220,095
Antimonial, domestic	8,456	7,434
Southeast Missouri	81,219	100,492
Southwest Missouri	21,324	16,528
Miscellaneous	3,080	980
Total domestic	419,744	345,529
Desilverized, foreign	80,501	65,441
Antimonial, foreign	2,736	4,686
Total foreign	83,237	70,127
Grand total	502,981	415,656
Total, antimonial	11,186	10,120
Total, soft	202,023	118,000
Total, desilverized	289,169	287,536

It is to be distinctly noted that the above statistics represent the production of refined lead. The lead-smelting industry is so complex that it is impossible to make an accurate distribution among the States. A fairly close separation can be made, however, between the lead of domestic origin and that of foreign origin, because the latter is dutiable. Even under that circumstance, however, the separation is not precise, because the Government assesses duty on only 90 per cent. of the work-lead and lead content of ore imported, allowing 10 per cent. for loss in smelting and refining; but the actual loss in those processes is not so large as that, wherefore the smelters and refiners make a certain gain on their imports, which they are able to market as domestic lead. The statistics reported above are accurate so far as they represent the quantity of lead actually produced in final marketable form. They include a small quantity of old lead which comes back to certain of the refiners for reconversion into refined lead.

As to the classification in the above table, it is to be further noted that it is to a large extent conventional. The quantities credited to Southeast and Southwest Missouri represent the lead actually smelted in those districts, not the ore production of the districts. The smelters of Southeast Missouri obtain considerable lead ore from the Joplin district, and also obtain small quantities from outside of Missouri. A considerable portion of the lead produced in the Southeast Missouri district (in which we include the two large smelters in Illinois, near St. Louis) is desilverized, which is done, however, rather to improve the quality of the lead than to extract the small quantity of silver, which it contains. The lead entered as "desilverized" in the above table is only the product of the high-grade argentiferous work-lead of the Far West.

Hydrographic Surveys and Mining

That the hydrographic division of the Geological Survey can and does perform an important service to the mining industry is shown by the contents of a bulletin, No. 196 of the series of water supply and irrigation papers, just issued, describing the work done on "Stream-flow in Alaska."

The work was confined to the Nome region of the Seward peninsula, and was undertaken in order to obtain information regarding the amount of water available for the development of placer mines and possible water power. Stream-flow data were collected at 45 stations, and the conditions affecting the water supply were carefully studied. Owing to the great value of the water for use on the gold-bearing gravel deposits, little attention was given the water power possibilities, but enough information was obtained to show the value of a number of sites which might be used with advantage.

Many promising placer projects have failed for the want of just such information as that made available in this bulletin. Accurate knowledge regarding the quantity of water which may be brought to bear upon a gravel deposit should obviously always be taken into account before beginning the construction of ditches and the purchase of machinery. These investigations of the Geological Survey reduce the amount of necessary preliminary work required of the placer engineer.

California Counties for Nevada

The residents of Inyo, Mono and Alpine counties wish to be separated from California, and to be joined to Nevada, and have petitioned their legislature to that effect. These counties lie in the mountainous region of eastern California opposite the southern end of Nevada, and the people are convinced that a fair share of the remarkable prosperity of that portion of the neighboring State would descend upon them if the border line were removed.

The petitioners claim that under the present conditions the promising mining properties in their territory are not receiving the attention that would come to them were they situated in Nevada, and that nature intended the counties in question to be a part of that State. The counties are remote from the business center of California, and the lines of travel to San Francisco and Sacramento lie through Nevada.

The natural configuration of the country, and the direction of the lines of travel are better reasons for seeking the change than the prosperity of Nevada's mines. The three discontented counties may some day get up a boom of their own in which Nevada will have no share.

THIS HAS BEEN A GREAT WEEK for the American Institute of Mining Engineers and especially for its distinguished member, Andrew Carnegie. The society has formally entered into possession of its beautiful and commodious quarters in the building erected for its use and that of the sister societies, and Mr. Carnegie has had the supreme satisfaction of taking part in the dedication of that building, his gift to the most practical and most scientific of all professions. Never has a like opportunity been offered and never has an opportunity been utilized more intelligently and more fully. As an example of engineering, the adaptation of means to an end, the building will serve as an object lesson for years to come, and as a center for the development and encouragement of the most advanced thought, it is likely to play its part in the achievements of the future.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Readers Too Busy to Read, Should Clip

In the JOURNAL of March 2 there is an article on "Readers Who Will Not Read." Too few mining men realize the advantage and great value of clippings, systematically filed, on subjects relating to their particular line of work. It is a great aid to intelligent and profitable reading and keeps one abreast of the times.

A CONCENTRATED LIBRARY

I have been clipping for about four years, and I have found that it has been of greater value to me in many ways than I thought it would be. It makes in time one of the best possible reference libraries with the advantage that it can be kept up to date, by throwing out articles which time proves to be valueless, besides being very flexible and occupying a small space. It is of special interest since it contains a great diversity of opinion, and experiences from all quarters of the globe.

My clippings have not yet grown unwieldy, and I take them with me wherever I go, in my valise. They are good companions, for when I get hung up in some out of the way place, I take them out, and forget that I have no daily papers. For the average mining man, whose office is usually under his hat, clipping is just the thing, for he has no place for keeping complete files of periodicals where he can reach them when he needs them most.

It often happens that I have no time to read an article carefully at once, but I can always cut it out and file it later, if upon reading it proves to be something that I want. It is impossible for the average man to remember clearly what he reads on technical subjects, more especially if it happens to be something which at the moment he has no particular need of. This is another reason for clipping. Clipping tends to make a person careful in reading articles for he is always on the hunt, after he gets the habit, for new opinions and experiences, and at the same time he does not want to clip articles that are of doubtful or only momentary value. It teaches him to weigh each article carefully.

METHOD OF FILING

It has occurred to me that someone might get up a system of envelope filing which would help by its simplicity to interest more men in keeping clippings. I use ordinary, large legal envelopes, marking them "A1," "A2," "B1," "B2," as the case may be, with the subject written out below, as a heading. This is followed by a list of articles contained in the envelope, numbered 1, 2, 3, etc. Sometimes I also note some point in the article, together with its title, which I may particularly wish to remember.

Each clipping is marked with the envelope number followed by its own individual number. When a subject runs over into a second envelope this second one is marked with an additional letter, thus "A1a," the first clipping being "A1a-1." In the case of two articles on one clipping, it is filed under the more important head and correspondingly marked, while on the envelope covering the less important article, this article is duly noted as if contained in the envelope, and in addition "See A1-1," referring to the envelope and article number under which the clipping is actually filed.

I would not exchange my clippings for the value of the periodicals used during the four years. I can never tell when they are going to help me out. This idea of filing I owe to an article in the JOURNAL, which appeared about three years ago, and for which I have many times given thanks. G. B. LEVINGS.

Ahuatlan, Mexico, April 5, 1907.

Mine Explosions and Atmospheric Pressure

I read in the JOURNAL of March 2, an article dealing with the effect of low barometric pressure on mine gases. After reading this discussion, I secured some data with reference to some explosions in Alabama and asked the Weather Bureau observer, W. F. Lehman, of Birmingham, for the figures of barometric pressure and relative humidity of the atmosphere. I inclose his reply.

You will note that on Feb. 20, 1905, at 4 p.m. the barometric pressure in that vicinity was 30.21 in, and the relative humidity 100 per cent. On that date the explosion at the Virginia mine occurred, and proved to be the most disastrous mine accident in the history of Alabama.

In getting up your statistics on this matter allow me to suggest that you consider both the temperature and relative humidity of the air. In my opinion it will be found that most of these explosions have happened when the atmosphere was at or near its point of saturation.

J. M. GRAY.
Chief Mine Inspector.

Birmingham, Ala., Apr. 7, 1907.

Mr. J. M. Gray.

Dear sir: In answer to your letter of April 2, I send you the following extracts from the records kept at this office:

Feb. 12, 1902, was a fair and cool day. No records of the barometric pressure on that date are available at present, but the low temperature on it and the previous day shows conclusively that the pressure was considerably above the normal, and the preceding period of fair weather and prevailing northerly winds indicate general dry conditions for that date.

Jan. 8, 1903. Such records as are available for this date show that the day was fair, cool, and comparatively dry with the barometer reading about 30.08 in. in the late afternoon.

Feb. 26, 1904, 10 p.m.—Barometer 30 in.; relative humidity about 78 per cent.

Feb. 20, 1905, 4 p.m.—Barometer, 30.21 in.; relative humidity, 100 per cent.

Feb. 27, 1906, 4 p.m.—Barometer, 30.19 in.; relative humidity, about 45 per cent.

W. F. LEHMAN, Observer.

Birmingham, Ala., April 6, 1907.

After receiving the above letter from Chief Inspector Gray, we investigated the atmospheric conditions prevailing in Alabama previous to the time of the Virginia mine explosion. The results of this investigation, shown in the following figures, is in a way confirmatory of the connection between the Virginia explosion and the fall in barometric pressure. Although the explosion occurred at a period of comparatively high barometer, it happened nevertheless at the lowest point in the fluctuations. The readings were as follows:

Feb. 18, 1905, 8 a.m., 30.48; 8 p.m., 30.46
Feb. 19, 1905, 8 a.m., 30.46; 8 p.m., 30.38
Feb. 20, 1905, 8 a.m., 30.22
Feb. 20, 1905, 4 p.m., 30.21 (explosion)
Feb. 20, 1905, 8 p.m., 30.22
Feb. 21, 1905, 8 a.m., 30.24; 8 p.m., 30.25

Mine Explosions and Atmospheric Pressure

It has been proved that atmospheric influence is one of the important factors that enters into the conditions leading up to disastrous explosions in gaseous mines. The discussions along these lines in the JOURNAL in recent issues are very timely and deserve the thoughtful consideration of the mining fraternity.

There are several causes which might produce a mine explosion, such as a person neglecting to close a door after passing through it, the unexpected obstruction of an air course by a fall of roof or the tapping of a strong feeder of gas. An explosion from any of these causes is local in its effect, only one section or split being likely to suffer, but an explosion in which atmospheric conditions enter, is general in its effects and as a consequence the whole mine suffers.

In view of these facts, and that a drop in the reading of the barometer gives timely notice to the official in charge of a gaseous mine of approaching danger; or that there is to be given off an extra amount of gas, would it not be a good idea to have a barometer stationed at each mine in a convenient place, where the officials might take observations at any time, and a record of readings kept at the colliery?

I have in mind several instances at a gaseous mine where I found it necessary to withdraw the men at short notice on account of sudden atmospheric changes, being guided purely from observations of the weather and a careful watch over the air currents with a "Davey" lamp; but how much better would it be if an accurate barometer were stationed at our mines where the officials might take observations at any time.

A barometer is just as necessary to the officials of a gaseous mine as the thermometer is to a physician to determine the condition of the human body. Some of the European mining laws require a barometer at gaseous mines. Evidently this law is the result of careful research on the part of the leading mining men. They realized that it indicated danger, and that it was just as important as the "Red Light" is in railroading.

It is to be hoped that these discussions will continue and result in an agitation that will cause barometers to be placed at all mines.

L. M. Evans.

Scranton, Penn., March 27.

The Use of Slag Blocks

In the Journal of March 23 is an interesting article by Herbert Lang in which he proposes to cast slag into prismatic blocks and to use these blocks in the mines, adjacent to the smelting plant, in place of timbers.

Whether such blocks will be used or not will depend upon many factors which I shall not discuss here. For one thing, it is very probable that when the mine and the smelter are in juxtaposition, the ground is so rough that the slag can perhaps be more advantageously used for grading purposes, whereby more room is obtained for the various buildings required by the growth of the plant, as, for example, at Globe, Arizona, than for use in the mine. In such a case some other material, probably concrete, will in the future be used underground, especially in constructing stations.

Slag cast in various shapes has, for a long time, been used for construction purposes at the surface, for instance in Mansfeld, Germany. In Bisbee, Arizona, houses were constructed years ago of blocks of slag. When in Peru about three years ago, I noticed that at the Casa Palca smelter, in the Andes at about 1300 ft. altitude, on the Oroya railroad and between Lima and Cerro de Pasco, such blocks were used in constructing buildings. They were found to be a very satisfactory substitute for stone and timber.

Wood is extremely scarce at this place and dried llama dung is the fuel used by most of the people. At all times of day one can see a number of Indians congregated around the dumps cooking their food in the hot shells from the slag pots and in the hot pots themselves.

J. Morgan Clements.

New York, April 13, 1907.

Zinc Smelters in the United States

Please give me the names of all the zinc smelters in the United States.

Geo. F. Peart.

Candela, Coahuila, Mexico, April 1, 1907.

The smelters now operating in the United States are the following: Grasselli Chemical Company, Cleveland, O., Clarksburg, W. Va.; Matthiessen & Hegeler Zinc Company, Lasalle, Ill.; Illinois Zinc Company, Peru, Ill.; Sandoval Zinc Company, Sandoval, Ill.; Mineral Point Zinc Company, Mineral Point, Wis.,[1] North Chicago, Ill., Depue, Ill.; Hegeler Bros., Danville, Ill.; Edgar Zinc Company, St. Louis, Mo., Cherryvale, Kan.; Lanyon Zinc Company, Iola, Kan. (3 works); United Zinc and Chemical Company, Iola, Kan.; Cockerill Zinc Company, Iola, Kan. (2 works), Altoona, Kan.; American Zinc, Lead and Smelting Company, Caney, Kan., Dearing, Kan.; Lanyon-Star Smelting Company, Bartlesville, I. T.; Pittsburg Zinc Company, Pittsburg, Kan.; Cockerill Zinc Company, Pittsburg, Kan., Nevada, Mo., Rich Hill, Mo.; Granby Mining and Smelting Company, Neodesha, Kan.; United States Zinc Company, Pueblo, Colo.; New Jersey Zinc Company, Bethlehem, Penn.[2], Palmerton, Penn.[2]; Bertha Mineral Company, Pulaski, Va.; Ozark Smelting and Mining Company, Joplin, Mo., Coffeyville, Kan.

[1]Produces zinc oxide.
[2]Produces both spelter and zinc oxide.

The *Mining Journal*, London, states that the dividends paid by the gold mining companies in Western Australia during 1906 amounted to £1,992,063, making a total of £15,974,880 to the end of the year.

The Assay of Silver Bullion by Volhard's Method

The general practice in using Volhard's method for the estimation of silver in silver bullion is to follow the principle of the Gay-Lussac method, by precipitating most of the silver with a measured quantity of normal solution, and then making successive additions of deci-normal solution until the reaction is completed. The end point is indicated by the red color of the ferric thiocyanate formed. E. A. Smith, Trans. I. M. M., Jan. 12, 1907, describes a modification of the Volhard method whereby the end point is determined with greater certainty and accuracy. His practice is to add sufficient ammonium thiocyanate to the check assay to intensify the red color of the ferric thiocyanate, and to use this color as a standard of comparison.

The normal ammonium thiocyanate is prepared of such strength that 100 c.c. is equivalent to about 1.0003 to 1.0005 grams of silver. To standardize the normal solution, 1 gram of pure silver is dissolved in 10 c.c. of dilute nitric acid (sp. gr. 1.2) in a 250-c.c. Gay-Lussac bottle and heated in a water bath until all traces of nitrous acid are expelled. The solution is then diluted with 50 c.c. of the indicator (50 c.c. contains 2 c.c. of a saturated solution of ferric alum decolorized with nitric acid) and 100 c.c. of normal thiocyanate added to it from a pipette. The bottle is then stoppered and well shaken for two minutes, and allowed to settle leaving a perfectly clear red colored solution. The addition of 0.5 c.c. deci-normal silver nitrate solution should render the solution colorless, if not, the normal solution should be so adjusted as to secure this result. The color obtained is used as a standard of comparison and all assays worked to it.

In assaying silver bullion, such an amount is taken as to contain about 1 gram of silver. The bullion is dissolved and treated like the proof. Then deci-normal thiocyanate is added drop by drop, with a thorough shaking after each addition, until the color corresponds exactly to that of the proof. The addition of 1 drop (0.05 c.c. equivalent to 0.05 mg. of silver) makes a perceptible difference in the color.

The comparison of the assays with the check is best made by placing the bottles on a shelf with a back of opal glass, and facing the direct light from a window. In some cases it is advisable to filter and then compare the solutions. When copper is present the strength of the normal thiocyanate should be increased, and an approximate amount of copper added to the proof to correspond to that present in the bullion. The usual volumetric precautions should be followed, and the bottles should be shaken at once after the addition of the normal thiocyanate.

New Publications

REPORT OF THE STATE GEOLOGIST, WYOMING. By Henry C. Beeler. Preliminary Report; Pp. 45; 6x9 in., paper. Cheyenne, 1906.

[illegible] AS A CALCULATING MACHINE. By Albert Fair. Pp. 81; illustrated, 5x7½ in.; cloth, 50c. New York, 1906: Industrial Publication Company.

RICHARDS' SYNOPSIS OF MINERAL CHARACTERS. A useful and handy little book, presented in a form which is very convenient to the traveler and the prospector.

LES RICHESSES MINERALES DE L'ALGERIE ET DE LA TUNISIE. By Paul F. Chalon. Pp. 99; illustrated, 5½x9 in.; paper; 4 fr. 50. Paris, 1907: H. Dunod et E. Pinat.

[illegible] AND ANSWERS FROM THE GAS [illegible] Pp. 274, illustrated 5x7 in.; cloth, $1.50. Cincinnati, O., 1907: Gas Engine Publishing Company.

Contents: Theory of design. Mechanical design. Marine design. Automobile questions. Producer gas questions. General questions. Trouble inquiries.

NEW ZEALAND. PAPERS AND REPORTS RELATING TO MINING, COMPRISING STATEMENT BY THE MINISTER OF MINES, REPORT ON THE GOLDFIELDS, REPORT ON COAL MINES, AND STATE COAL MINES. Pp. 243; illustrated, 8½x14 in.; board covers. Wellington. 1906: John Mackay, Government Printer.

JOURNAL OF THE IRON AND STEEL INSTITUTE. Vol. LXXI, Nos. III and IV, 1906. Containing the Minutes of Proceedings of the London Meeting, July, 1906, and Papers Presented. Edited by Bennet H. Brough, secretary. Two volumes. Pp. 1015; illustrated. 5½x8½ in.; cloth, $6 per volume. London, 1906: E. & F. N. Spon.

ANALYSES OF BRITISH COALS AND COKE AND THE CHARACTERISTICS OF THE CHIEF COAL SEAMS WORKED IN THE BRITISH ISLES, Compiled by A. Greenwell and J. V. Elsden, with an Introduction, "The Classification of Coals and the Interpretation of Analyses, by Clarence A. Seyler." Pp. 455; 1 map, 7½x9½ in.; cloth, 5s. London, 1907: The Chichester Press.

HANDBOOK OF METALLURGY. Vol. II. By Dr. Carl Schnabel. Translated by Prof. Henry Louis. Second Edition. Pp. 867; illustrated. 6x9 in.; cloth. 21s. London, 1907: Macmillan & Co., Ltd.

This is the second edition of the second volume of the translation by Professor Louis, of Doctor Schnabel's well known work, which has become one of the classics of metallurgical literature. It is no [illegible] the best of the general metallurgies, because in fact there is no other of modern character. For this reason a revision which brings it up to date will be heartily welcomed. The second edition of the first volume, which treats of copper, lead, gold and silver, was published in 1905. The present volume treats of zinc, cadmium, mercury, bismuth, tin, antimony, arsenic, nickel, cobalt, and aluminum. It has been largely extended beyond the limits of the first edition, and has been made as modern as the editorial and mechanical restrictions permit a work of such magnitude to be.

TRANSACTIONS OF THE AMERICAN ELECTROCHEMICAL SOCIETY, VOLUME X. TENTH GENERAL MEETING, NEW YORK, OCTOBER 8 AND 9, 1906. Pp. 132; illustrated. 5½x9 in.; cloth. Philadelphia, 1906: American Electrochemical Society.

Contents. Proceedings of Tenth General meeting. Directory of members. Formula for the E. M. F. of a Helmholtz concentration cell, Henry S. Carhart. Visible Migration of particles between electrodes, Carl Hering. Some small laboratory appliances for electric fusion work, S. S. Sadtler. Copper cathodes in nitric acid, J. W. Turrentine. An aluminum and magnesium cell, G. H. Cole and H. T. Barnes. Melting points of some cryolite-alumina mixtures, F. R. Pyne. Some factors affecting distribution, H. E. Patten. Ultra-violet light in the laboratory and in practice, Charles Baskerville. Pyrometers, theoretically and practically considered, with remarks on the definition of temperatures, E. F. Roeber. A thermo-electric pyrometer for general industrial applications, F. F. Schuetz. The Heraeus "Le Chatelier Pyrometer," Richard Moldenke. Discussion on pyrometry, R. S. Whipple. Discussion on special forms of pyrometers, R. P. Brown. Communicated discussion descriptive of the Price pyrometer, Electric Dental Supply Company. The Decker primary battery, F. B. Crocker.

Coal Mining in Ohio During 1906 *

BY GEO. HARRISON†

Although there was a cessation of work in the mining industry of three months, and in some districts exceeding that time, during the year 1906, due to a strike inaugurated by the United Mine Workers for a restoration of the 1903 scale, the coal tonnage of the State was not materially affected—in fact, there was an increased tonnage of 1,378 838 tons, the entire production of the State totaling [illegible] 1905.

* Advance [illegible]
† [illegible] Inspector, Columbus, Ohio.

Increases in 18 counties amounted to 2,596,030 tons, and the losses in 11 counties, 1,217,192 tons. The total number of persons employed in the industry in both pick and machine mines was 46,501, an increase of 2308 persons.

The total pick tonnage was 6,500,263 tons, or 23.9 per cent. of the entire production of the State, produced by 9836 pick miners, 1988 inside day hands and 1304 outside day hands. Average time worked in pick mines was 176 days. The average production of lump coal produced by pick miners for the year was 451 tons per man, or 3 tons for each man per day.

The number of tons of machine-mined coal was 20,713,232 tons, or 76.1 per cent. of the entire production of the State, produced by 2895 runners, 20,905 drillers, loaders and shooters, and 6282 inside day men and 3291 outside day men. The average time worked in machine mines was 173 days. The average number of tons of lump coal mined by machine runners for the year was 5120, and per runner per day, 29.6 tons; the average tons of lump coal produced by drillers, shooters and loaders for the year was 709 tons, and per loader per day, 4.1 tons. The number of mining machines in use in machine mines was 1266, while 275 motors were employed.

Belmont county showed the largest production, 4,467,295 tons, an increase of 595,449; Athens second, 4,370,912 tons, an increase of 522,472 tons; Guernsey county, 3,348,934 tons, an increase of 452,178 tons; Jefferson county, 2,998,476 tons, a loss of 339,323 tons; Perry, 2,609,701 tons, an increase of 210,131; Hocking county, 1,553,507 tons, a loss of 142,256; Jackson county, 1,452,176 tons, a loss of 435,728 tons; and Tuscarawas county, 1,429,565 tons, a gain of 68,171 tons.

There was one life lost for every 214,279 tons of coal mined, whereas in 1905 it was 226,628 tons, showing the increased danger to which the miner of the present day is subjected, and the necessity for new mining legislation in order to properly protect those who work underground. There was one life lost for every 366 persons employed.

The average number tons run-of-mine coal produced by pick miners for the year was 661 tons, and per man per day, 3.8 tons; the pick tonnage decreased 324,862 tons; the average number tons run-of-mine coal produced by machine runners for the year was 7155 tons, and per runner per day, 41.4 tons; the average tons run-of-mine coal mined by the drillers, loaders and shooters for the year was 991 tons, and per day, 5.7 tons. The machine coal increased 1,703,700 tons.

One thousand six hundred and seventy-seven visits were made to the mines in the State by the chief and district mine inspectors.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. L. Tilton, of Apex, Colo., is making a business visit to Kansas City.

George W. Mabee, Jr., of Manhattan, Nev., has been making a visit to Colorado points.

J. C. Haas, of Spokane, Wash., has been examining properties in the Cobalt district in Ontario.

E. W. North, of Omaha Neb., has been in Gilpin county, Colo., on a visit to mining interests.

Dr. C. B. Gibson, of Chicago, is looking after mining interests in Gilpin county, Colorado.

F. A. Webster, of Empire, Colo., has gone to Webster, Colo., to make an examination of mining property.

J. M. Thexton, of Idaho Springs, Colo., has gone to Hillsboro, N. M., to superintend the erection of a reduction plant.

Dr. R. W. Raymond has returned to New York from a trip to the West Indies, taken for the benefit of his health.

William O'Connor, of Terre Haute, has been appointed deputy mine inspector for Indiana by State Inspector James Epperson.

Eugene Coste, of Toronto, Ont., is supervising oil-boring operations in Saskatchewan and Alberta, in western Canada.

A. G. Brownlee, of the Stanley Consolidated Mines Company, of Idaho Springs, Colo., has returned from a trip to Europe.

David Ellis, of the Pittsburg Consolidated Mines Company at Idaho Springs, Colo., has returned from a business visit to Pittsburg.

H. F. Riebling has completed the examination of one of the Greene properties in Chihuahua, Mexico, and has returned to Colorado Springs.

W. F. Hogan, manager of the Gunnell Mines and Milling Company at Central City, Colo., is making a business visit to Boston and other eastern points.

James A. McCracken, of the Copper Jim Mining Company operating near Tolland, Colo., has returned from a visit to Georgia and other Southern States.

George MacDonald has resigned his position as superintendent of the McKinley-Darragh mine, at Cobalt, Ont. E. C. Readers succeeds him as superintendent.

W. E. Defty, for two years past general manager of the Compañia Mina Juarez, at Caborca, Sonora, Mexico, has resigned that position to become consulting engineer for the company.

N. Lilienberg, Philadelphia, metallurgical engineer and representative of Swedish iron and steel manufacturers in this country, sailed April 11 for an extended sojourn in Sweden.

E. T. Murphy has resigned from the B. F. Sturtevant Company's New York branch to accept a position with the Buffalo Forge Company, operating from its branch office in New York.

Virgil H. Hewes, of New York, was recently at the Pacific Coal Company's colliery at Bankhead, Alberta, Canada, in connection with the installation there of a fine coal-briquetting plant.

D. F. Morgan, chemist at Star Furnace, Jackson, Ohio, will enter the service of the Jackson Iron and Steel Company on May 1, and will be in charge of the new furnace that company is building at Jackson.

Frederick Keffer, the president of the Canadian Mining Institute, and engineer in charge of the British Columbia Copper Company's mines, has returned to Greenwood, B. C., from a visit to Toronto and New York.

F. H. Daniels, chief engineer of the American Steel and Wire Company, has returned to this country after an absence of several months in Europe, where he has made a tour of industrial plants to look over recent improvements.

Dr. Otto Wuth, of Pittsburg, Penn., on account of ill health, has turned over his laboratory equipment, and the good will of his business as assayer and metallurgist, to the well-known firm of Crowell & Murray, Cleveland, Ohio.

Colonel Parrott, consulting mining engineer, of Johannesburg, South Africa, will be in London about the end of April on professional business. His address is care London & Paris Exchange Ltd., Moorgate street London, E. C.

William S. Johnson, for the past 12 years assistant engineer of the Masachusetts State Board of Health, has opened an office at 101 Tremont street, Boston, for the practice of civil engineering. Special attention will be given to water supply and sewerage.

F. F. Sharpless spent March in the Telluride district in Colorado and then made a short visit to the copper camps of Routt county. He is now in Oaxaca, Mexico, whence he will return to Denver about May 1 and to New York about the middle of the month.

Lorain F. Loree has been chosen president of the Delaware & Hudson Company, in place of David Willcox, resigned. He has been president of the Baltimore & Ohio and the Chicago, Rock Island & Pacific, and is a railroad man of much experience, but not a coal man.

W. M. Brewer lately made a trip from Victoria, B. C., to one of the Queen Charlotte islands in northern British Columbia. The production of copper ore there has been commenced by a Japanese company, of developing into a valuable mine.

[illegible] W. Watson, professor of geology in the Virginia Polytechnic Institute, has accepted the professorship of economic geology in the University of Virginia, at Charlottesville. Professor Watson will enter upon his duties at the university at the beginning of the next session.

F. Cushing Moore has resigned his position as chief engineer of the Federal Mining and Smelting Company and has resumed the practice of his profession in Wallace, Idaho. He will devote considerable attention to examining and reporting on mining properties, supervising the installation of mining machinery and general consulting work.

David Willcox has resigned his position as president of the Delaware & Hudson Company, on account of ill health. He had been connected with the company for many years, serving as its general counsel, and later as president. He was thoroughly acquainted with the anthracite trade, and was prominent in all matters connected therewith.

Thomas Kiddie, who succeeds Paul Johnson as manager of the Alaska Smelting and Smelting Company's smelter at Hadley, Prince of Wales Island, Alaska, has gone north to take over charge of the works and to ascertain what changes will be necessary for the installation of the Kiddie hot-blast system, described in the JOURNAL of Sept. 29 last.

Capt. T. H. Trethewey has retired from the management of La Plata mines, British Columbia. He will remain on the board, however. He has other mining interests that require his personal attention. He is succeeded by his son, W. J. Trethewey, who assumed charge April 1. The mine is producing and making regular shipments to the Trail smelter.

Obituary

Epes Choate, engineer in the mechanical department of the Cananea Consolidated Copper Company, was killed, March 22, in Cananea by falling into the flywheel of an engine, where he was terribly mangled.

Ruben Hockwell died in Mexico City of pneumonia, Feb. 24, at the age of 64 years. Mr. Hockwell was a mining engineer, born in Devonshire, England, but had lived the last 23 years in Mexico. [illegible] Mexico preparatory to returning with his wife to reside permanently in his native country when he was taken sick

John A. Kebler, general manager of the coal-operating department of the Colorado Fuel and Iron Company, died suddenly at Trinidad, April 12, from ptomaine poisoning. When visiting the com-

[illegible] was taken violently ill. He rallied, however, and a day or two later was reported out of danger. Mr. Kebler was about 45 years of age and was appointed a year ago.

Dr. W. H. Drummond, of Montreal, died at Cobalt, Ont., April 6, aged 53 years. He was born in Ireland, but came to Canada as a boy. Educated as a physician, he gave much time to literature. When the Cobalt excitement began he went into that country, where he was one of the pioneers, and with his brothers Thomas J. and George E. Drummond, of Montreal, owned and operated the Drummond mine, which was one of the earliest discoveries. Dr. Drummond had been in failing health for some time, but left Montreal for Cobalt shortly before his death on account of the breaking out of smallpox among the miners. He had a widespread literary reputation as the author of French Canadian dialect poems and other works on the Quebec "habitant." He was a man of great personal charm and his early death will be regretted by many friends.

Societies and Technical Schools

Engineers' Club of Philadelphia—At the regular March meeting Professor Alleman read an interesting paper, describing the present methods of treating timber to preserve it from decay. He gives statistics of cost, tending to show where results would justify the treatment. The paper was discussed by a number of members.

Industrial

The Crocker-Wheeler Company, Ampere, N. J., has opened a branch office in Birmingham, Ala., in charge of B. A. Schroder.

The offices of the Lackawanna Steel Company, in New York, have been removed to the new United States Express building, No. 2 Rector street.

The American Steel and Wire Company, will build a wire mill at Newburg, Ohio, this summer near the Emma furnace. The plant will employ 1000 men and will have a capacity of 600 tons a day. A site has been purchased and the ground will be broken immediately.

The Cleveland Car Company, West Park, O., is increasing its plant extensively, owing to the rapid increase in work, and in construction of heavy industrial cars which it is making a specialty of in connection with the lighter work. The company expects by May to be in position to take on extra work, owing to this increase.

Otto Herrmann & Co., public accountants and auditors, have opened offices at Iron Mountain, Mich., and are prepared to undertake regular or occasional audits and examinations of the books and records of mining and smelting companies; also to devise office systems especially adapted to mining or metallurgical operations, to install cost systems, to make periodical examinations or for any expert service.

G. F. Ehrenzeller announces that he has removed his main office from New York to the Pennsylvania building, Chestnut and Fifteenth streets, Philadelphia. He continues to represent Beer, Sondheimer & Co., of Frankfurt-a.-M. and London, exclusively for all their interests in material of all descriptions with the iron, steel and kindred trades on the continent of North America. The material includes pig iron, ferromanganese, spiegeleisen, ores, metals and all descriptions of ferroalloys, and other raw material.

On May 1 the Chicago branch of the Niles-Bement-Pond Company will occupy new offices on the sixth floor of the new Commercial National Bank building, Clark and Adams street, Chicago. The Pratt & Whitney Company will abandon its show room and offices on South Canal street, and will combine its machinery sales department with that of the Niles-Bement-Pond Company. George F. Mills, who has for several years looked after the interests of these companies in the Chicago territory, will continue as manager of the Chicago offices.

The Davis Trap Rock Quarry Company has under construction a new trap-rock crushing plant at a quarry recently opened at Green Lane, Montgomery county, Penn. The equipment for the present comprises a No. 3 Gates breaker, three 9x15-in. Blake crushers, one 60-ft. Gates elevator, and one 48x20 Gates screen, all built by the Allis-Chalmers Company, of Milwaukee. The capacity of this plant when completed, and in full operation, will reach 600 tons daily of crushed trap rock, screened into railway ballast and commercial sizes for concrete use.

A decision was recently handed down by the United States Circuit Court of Appeals for the Ninth Circuit in favor of the Abner Doble Company in the Dodd bucket case, which was carried to the higher court by the appellant, the Pelton Water Wheel Company. This case was brought, in 1902, in the United States Circuit Court, the complainant alleged infringement of the Dodd water wheel bucket, patented June 23, 1891, and afterward asigned to the Pelton Water Wheel Company. Judge Morrow handed down his decision on Nov. 20, 1905, holding that the Doble bucket was not an infringement, as alleged, and dismissed the complaint. The appellate court now affirms Judge Morrow's decision.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Stephens-Adamson Mfg. Company, Aurora, Ill. "Conveying and Transmission." Pp. 48; illustrated; paper; 6x9 in. February, 1907.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin 1418. Allis-Chalmers Steel Ventilating Fans. Pp. 12, illustrated, paper, 8x10½ in.; Sept. 1906.

The Denver Fire Clay Company, Denver, Colo. Bulletin No. 19. The Case Laboratory Crusher. Bulletin No. 23. Case Gasoline Furnaces. Bulletin No. 24. Assay Utensils. Pp. 4, illustrated, paper, 3½x6 inches.

G. E. Witt Company, 1165 Howard street, San Francisco, California. Catalog No. 6. Little Giant Crude Oil Burners, Pump Governors, Reducing Valves, Oil Plants and Machinery. Pp. 39, illustrated, paper, 5x7 in. 1907.

American Concentrator Company, Joplin, Mo. Bulletin No. 10. N. C. Crushing and Screening Machinery. Pp. 20. Bulletin No. 11. N. C. Differential Motion Jigs. Pp. 20. Bulletin No 13. N. C. Coal Washing Machinery. Pp. 28. Knowles New Century Magnetic Separator. Pp. 12. All illustrated; paper; 1x10 in. 1907.

Fort Wayne Electric Works, Fort Wayne, Ind. Bulletin No. 1087. Standard Direct-Current Switchboard Panels. Pp. 12, Nov. 1, 1906. Bulletin No. 1089. Standard Alternating Current Switchboard Panels for Single Phase Circuits. Pp. 11, Jan. 1, 1907. Bulletin No. 1090. Series A. C. Arc-Lighting System. Pp. 20, Jan. 10, 1907. Index to Bulletins Nos. 1001 to 1089. Pp. 4, Jan. 1, 1907. All illustrated; paper; 8x10½ in. Instruction Book No. 3024. Fort Wayne Series A. C. Arc Systems. Pp. 31; illustrated; indexed; paper; 4½x7 in.; November, 1906.

Construction News

Pine Creek District, Colorado—The Ingram Mining Company intends to put up machinery and a stamp mill. Ira Pollard, Apex, Colo., is manager.

Georgetown, Colorado—The Cashier company proposes to erect a 25-ton concentrating plant soon. L. G. Shepard, Georgetown, Colo., is manager.

Loomis, Washington—The Copper World Mining Company will install a hoisting plant as soon as the snow is off Palmer mountain. Address at Loomis.

Gregory District, Colorado—The Colorado & Southern Mining Company intends to install an air-compressor plant. W. L. Shull, Central City, Colo., is manager; main office being in Cooper Building, Denver, Colorado.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

April 11. Since the breaking of the recent storm most of the water and electric power plants have been put in order again and the mines started up. The miners were laid off meantime. The rains and snows have been very heavy in the mountain counties and the snow has piled deep and hard, insuring a bountiful supply of water for mining the coming summer. Land slides have done some damage and many mines have been flooded, so that nothing but pumping could be done. In some cases the pumps have been lost, entailing much trouble and ultimate expense. A number of miners and prospectors in the upper country were cut off from supplies and hemmed in by snow, but few fatalities have been reported. So much surface water has got into the mines that it will be some months before the larger ones will see the bottom of their shafts. In the smaller camps in the high mountains they have been cut off from all communication, and the mail has had to be carried in by men on snowshoes.

The Pennsylvania Oil Company of Lompoc, Santa Barbara county, has contracted to sell to the Union Oil Company 500,000 bbl. of oil for $270,000, or 54c. a bbl. This price is higher than any contract ever made in the district, it is believed. The Pennsylvania has strong new wells in the Lompoc section. The Standard is pressing hard for lands in the field between Santa Inez and Lompoc, and its agents have been after options for months.

The first shipment of pipe for the new line of the Standard Oil Company to the oilfields of the Midway and McKittrick districts has been received at Bakersfield. The building of the line 68 miles in length, is the result of the contract recently signed by the independent producers of the Midway fields by which the Standard Company obtains the oil of the district for 30c. a barrel. By contract, the line must be ready to handle the Midway Oil in six months. An 8-in. pipe will be used, and pumping stations will be established at McKittrick and Midway.

E. B. Maginnis, L. F. Maginnis, and J. O'Leary have brought a suit against the Yellow Aster Mining Company for damages to the amount of $150,000 for ore alleged to have been taken from the mining claims of the plaintiffs through the underground workings of the defendant. The plaintiffs are the owners of the Rustler and San Diego mining claims, and the defendant is the owner of the Yellow Aster, the Trilby, the Olympus, the Wedge, the Rand and the Bonanza Fraction claims, all of which are in the Rand mining district near Randsburg, Kern county, and adjoin the claims of the plaintiffs. The plaintiffs claim that the Yellow Aster workings extend beyond the boundary lines of the Rustler and San Diego claims and that the Yellow Aster Company has removed ore from the latter claims to the value of $50,000. The plaintiffs ask for an injunction to prevent further removal of ore, for the privilege of entering the Yellow Aster tunnels with surveyors to ascertain whether their contention is correct, and for the damages as stated.

Furnace No. 1 of the Mountain Copper Company at Keswick, Shasta county, has been blown in after about two years idleness. Ore from the Iron Mountain mine will be treated, until the branch railroad to the Hornet mine, owned by the same company, is finished. The furnace will treat 150 to 175 tons daily and the surplus will be shipped to the other reduction works of the company near Martinez on the upper part of San Francisco bay. For the present the fluxing ore will come from the mines in Shasta, Texas Springs, Rock Creek and Flat Creek districts; in the districts are many small quartz properties which can now be again worked, for the quartz mine owner gets virtually 90 per cent. of the assay value and has no expense in building or maintaining reduction works. While the smelter was inactive the mines between Lower Springs district and Keswick were obliged to close down, but work has now been resumed upon them all. The Gold Leaf is the largest producer, except the Brackett. An electric plant has been put in and an electric hoist installed. An aërial tram is also being built. The largest amount of high-grade ore has come from the Brackett, the shipments averaging $90 per ton. At the White Oak a steam hoist has been installed. The Milton and Simmon mines are both producing. The Capitol and Garracht mines are also again in operation. The chain of producing mines is some five miles in length, and there are many smaller ones. These mines can either ship to Keswick or to the Mammoth smelter at Kennett, the tariff sheet for ores being the same at both places.

Salt Lake City

The option held by Frank J. Hagenbarth, of Salt Lake, on the Ludwig copper mine, at Yerington, Nev., has been surrendered. It is probable that the property will now be purchased by the Nevada-Douglas Copper Company.

Eastern parties connected with the Continental Alta Mines & Smelters have been here during the past week investigating the project of building a railroad into the camp of Alta. It is proposed to construct a standard gage line as far as Wasatch, to which point it is proposed to deliver ore by means of an aërial tramway about five miles in length.

It is the intention of the State to probe further into the railroad and coal situation in Utah, and before adjournment the Senate appointed a commission with power to conduct hearings during the legislative recess.

President John Dern, of the Consolidated Mercur, has issued a circular to shareholders, in which the passing of the usual quarterly dividend is explained. The company was compelled to close down wholly or partially during the winter, by the coal shortage, and for that reason was unable to earn enough to meet the dividend requirement.

The Cluster Mining Company, of Bingham, has been made defendant in a suit to settle the question of apex over the First Extension Yosemite West lode mining claim. The Bingham Consolidated Mining Company, and others, are plaintiffs.

Scranton

April 15—A campaign is to be organized by the United Mine Workers, beginning in Scranton, to bring back into the fold the thousands of members who have left the organization. It is estimated that fully two-thirds of the men are now outside the union, so that its financial affairs are in a serious condition. President John Mitchell and the ablest national organizers will have charge of the campaign.

Quite a sensation has been caused in Pennsylvania by the lower branch of the legislature passing a bill which will prohibit any person under 21 years of age working in or around a coal mine. The measure was first introduced at the instance of the labor representatives, who are very strong in this session, but little attention was given it. The provisions are so drastic that it will throw thousands of young men out of employment. Recently, however, Representative Garner, the leader of the labor element, asked that the bill be passed on second reading, and so persistent was the fight, that before the members in general realized

it, the labor men had secured sufficient support to pass the measure. There will be a strenuous opposition in the senate.

The officials in charge of the miners' relief association among the employees of the Hillside Coal and Iron Company, and the Pennsylvania Coal Company, are more than pleased with the success of the movement thus far. There are 1200 employees of the Pennsylvania on the membership roll, and 1110 employees of the Hillside company.

Since the mine inspectors of the anthracite field went to Harrisburg to oppose the bill making mine foremen eligible for mine inspectors, without passing the usual examination, more opposition has developed to the measure. It is contended that the bill would be in violation of the constitution of Pennsylvania inasmuch as it would make a favored class of the mine foremen while it would compel all other applicants to pass the required examination. There is a growing sentiment that the matter of appointing mine inspectors should be taken entirely out of the political field.

Fire destroyed the boiler house of the J. S. Wentz Coal Company at Hazel Brook. Fortunately the breaker adjacent was saved.

Mine Inspector Martin McLaughlin has ordered a portion of the mine workings in the water level of the Susquehanna Coal Company to be closed, in the Hickory Swamp colliery, as there was no outlet for the miners in the event of a squeeze.

The State house of representatives has passed the eight-hour bill for the anthracite mines and its advocates are sanguine that it will be passed by the senate.

The lead mines at Almedia, near Bloomsburg, are to be reopened by Allentown capitalists.

A 14-ft. vein of coal has been struck in the tunnel being driven from No. 4 slope in the Gama vein to the new Buck Mountain vein recently sunk.

The Lehigh Valley Company has notified its tenants of an increase of 25 per cent. in ground rents. This was done because the assessments were increased from $500 to $2000 an acre.

The Conciliation Board, at its last meeting, was deadlocked over the question as to whether it had the right to make rates and define the conditions of employment at collieries where a uniform rate does not exist. The question will be referred to the umpire.

In the grievance of the miners employed at the Dickson colliery, of the Delaware & Hudson, the umpire found in favor of the company. The men claimed that the rate for taking down sandstone roof had been decreased 55c. a yard. The umpire upheld the contention of the company that the conditions were new, and that a new contract had been made.

Toronto, Ont.

April 10—The details of the provincial mining tax have been announced in the Ontario Legislature. A tax of 3 per cent. will be imposed on the profits of all mines yielding over $10,000 in profits per year, those below that figure being exempt. It was originally intended that this tax should be imposed on a sliding scale, the percentage increasing with the amount of the profits; but, owing to the strong protests of the mining men, this plan was dropped and the flat rate substituted. A rebate of the tax will be given on iron ores when the same are smelted in Canada. Natural gas will be taxed 2c. per 1000 ft., 90 per cent. of the tax to be remitted where the gas is used in Ontario. An acreage tax of 2c. per acre is imposed on all mining locations in unorganized territory.

An important change has been made by the Canadian government in the regulations respecting the acquiring of coal areas in the West, with a view of preventing their alienation into absolute control of private parties, and to securing prompt development of the areas opened up. The previous regulations allowed purchasers to buy surface rights at $3 per acre and coal rights at $7 per acre, under which conditions large areas were bought up, and held for speculation. It is believed, however, that as much coal-bearing land still remains under government control in Alberta, Saskatchewan and the Peace River district as has been alienated. Hereafter 21-year leases only will be granted, the areas being of limited extent at a yearly rental to be fixed, probably at $1 per acre.

W. G. Trethewey has purchased the small smelter at Hamilton, which was used for some time by the North American Cobalt Refining Company for experimental work, but abandoned in favor of another site at Thorold. Mr. Trethewey has withdrawn from the North American company, and the Trethewey ore will now go to Hamilton for treatment.

Cobalt, Ont.

The number of claims taken up in the Larder Lake area is stated at about 3000, covering some 120,000 acres. The population is increasing at a rapid rate, and building is being pushed ahead to accommodate the influx.

A new goldfield is being worked in the Abitibi country some 70 miles north of Englehart, a station on the Timiskaming Railway, where Dan Mosher and Capt. F. W. Coates have staked over 20 claims and have had a gang of men at work for some months. There are several shafts sunk and the quartz, in addition to silver and copper shows gold values. A number of prospectors are working in the neighborhood.

London

April 4—The shareholders in Stratton's Independence have received the welcome news this week that Philip Argall has reported favorably on the prospects of utilizing the large amounts of low-grade ore on the dumps, and in the mine. His cabled report states that the ore on the dump averages $3.50, of which he estimates that he can extract by cyaniding about 70 per cent., or say $2.50, at an expense of $1.50 per ton. In order to obtain these results it is necessary to mill 10,000 tons a month, and the plant required will cost about $200,000. Mr. Argall has not so far attempted to make any estimate as to the amount of ore on the dump or in the mine, but judging by the previous reports of engineers and officials of the company there must be five or ten years' supply of ore on the dump, and an indefinite amount of ore in the mine. This latter will be probably of higher grade than that on the dump, or, at least, a good deal of it will be, and it should repay the extra cost of $1 or so in delivering it to the surface. The company has a large reserve of undivided profit in hand, and can pay for the new plant without calling on the shareholders for any assessment. The estimated income from the treatment of these low-grade ores on the dump will not be a big one, considering the capital of the company, but should be enough to pay 10 per cent. on the present price of the stock. The present quotation is 4s. for the £1 shares.

The financial results of the Rio Tinto company for 1906 reflect the high price of copper. The ordinary dividend worked out therefore at 110 per cent., as compared with 80 in 1905 and 70 in 1903 and 1904. The market in Rio Tinto shares has been a sheer gamble for months past. A year ago, it will be remembered, the directors fixed £63 as the price of the new £5 shares created for the purpose of extinguishing the debentures. This price did not remain for long, as quotations gradually went up and a month ago the figures were well above £100. The price is now about £85. In many quarters it was supposed that the distribution would be greater than 110 per cent., which may partly account for the big rise in quotations. In other quarters the rumor that the output was to be greatly augmented gave a fillip to the quotation. The Rio Tinto never tells what it is doing or what it intends to do until it thinks fit to do so, so I cannot say whether these rumors have any basis of fact. It is difficult to believe that such a policy can be carried out, at any rate for the present, because the shortness of water supply at the mines in Spain is even now crippling the operations of the company to some extent. When the water difficulty is overcome, if it ever is, it is likely enough that the board will extend the output.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

CLEBURNE COUNTY

Mica Company—This company has bought a tract near Heflin, and is preparing to mine mica and put it in condition for market. E. H. Fisher is manager.

Tallapoosa Placers—Philadelphia parties have bought a large tract along the Tallapoosa river, near Hightower. They intend to work the property for placer gold.

Alaska

JUNEAU DISTRICT

Alaska Mexican—This company is installing a new hoist, with the intention of sinking the main shaft to greater depth.

Eagle River—This mine has started up, under charge of B. Thane as superintendent.

Mills Mine—This property, on Chicagoff island, has been sold to C. D. Lane, of San Francisco.

Rubicon—This company is making arrangements to start active work on its property in Silver Bow basin.

Arizona

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports the output of its mines at Clifton in March at 1372 short tons of ore.

PIMA COUNTY

Imperial Mines—This company has shipped ore from its property at Silver Bell. Work has been going on for some time, and an orebody of good size has been developed, running well in copper. There is also a body of low-grade ore, which is to be concentrated before shipping. E. C. Kenney, of Cleveland, Ohio, is president, and Percy Williams, of Tucson, Arizona, is manager.

Paymaster—This mine, near Silver Bell, is being opened up again, and promises well. Near the surface it was worked as a silver-lead property, but copper ore is developing as depth is attained. It is expected that shipments will soon be begun. Luke Corda is in charge of the work at the mine for Percy Williams, consulting engineer.

YAVAPAI COUNTY

The Prescott city council has granted to Detroit parties a lease of 80 acres of the city ranch, on condition that the lessees build and operate a smelter upon the leased premises, the company to begin the erection of the proposed smelter within six months, and to be ready to smelt ore in one year. The site carries with it sufficient water to supply a 1000-ton plant. From a canvass of a part of the mine-owners and operators whose properties lie south of Prescott, 400 tons per day is assured, and it is confidently stated by the promoters that within six months they can secure 1000 tons per day. This point is desirable for a smelter, as the county produces many kinds of ore and Prescott is the central point. Fluxes can be easily secured almost on the ground, and silica within a short distance.

De Soto—This mine, at Middleton, is shipping three cars of copper ore each day to the smelting plant at Humboldt, besides shipping three cars to its mill, also at Humboldt.

Rigby Reduction Plant—This plant, after undergoing many changes, will again start in a few days.

California

AMADOR COUNTY

Copper—The copper mine at Fink's ranch owned by Johnson Bros., has been bonded to parties connected with the Selby Smelting Company, who will prospect it.

EL DORADO COUNTY

Eureka Slate Company—The aërial cable which carries slate from the quarry is to be extended two miles further to the railroad line, making 4½ miles in all.

INYO COUNTY

Borax—W. P. Lass is developing two claims of colemanite in the Funeral range, 7 miles northeast of Greenwater. A 5-ft. ledge has been found.

Queen—The reported strike in the Queen shaft of the Greenwater & Death Valley Company has been confirmed, and is considered as evidence that the copper ore continues with depth.

KERN COUNTY

Copper—H. Phillips and the Hart Brothers have discovered high-grade copper ore in Caliente cañon, not far from the old Amalie mine, and 50 claims have been located in the vicinity during the past month. Los Angeles men have become interested in the claims.

California-Mohawk Mining Company—This company owns eight claims in Valley View mountain district, and development is being done by both shafts and tunnels. A mill is to be installed shortly.

MONO COUNTY

Masonic District—There are now 150 men at work in this district and several properties have changed ownership. On the Calivada an air compressor and machine drills have been ordered. On the Pittsburg Extension, Myrtle and Julia, and Pittsburg Liberty considerable development work is in progress. For the Masonic Gold Mountain a hoist has been ordered, and it is expected that a 20-stamp custom mill will soon be installed in the camp.

NEVADA COUNTY

Meadow Lake District—Frank Du Bois, of San Francisco, has sold to W. A. Jackson, of Los Angeles, Cal., his interest in the Nevada Queen, Ethel, Molybdenum and Nevada Queen Extension mines in this district. He has also transferred to the same party a one-half interest in the Copper Queen and Summit Copper claim in the same district.

PLACER COUNTY

Crater—This mine at Ophir is under bond to W. P. Hammon, of Oroville, who is grading for a power plant to pump it out.

Iron Mine—L. C. Trent has men sinking a shaft at the mine and is putting in a steam hoist.

PLUMAS COUNTY

Indian Valley—Superintendent Franz now has 20 men at work making preliminary arrangements for starting the 3000-ft. tunnel to tap the body of ore which was worked at the upper levels of this mine at Greenville.

Plumas Mining Company—This newly organized company owns the following claims near Johnsville: Grizzly Bear, Rozie, Squirrel Creek, St. Joseph, and Eureka, all near the Plumas-Eureka mine. A 10-stamp water-power mill is to be erected at once.

SAN BERNARDINO COUNTY

Gold Dollar Extension—This company is working an extension of the property of the California Hills Company in the Gold Bend district, Sunrise mountains, 20 miles south from Needles and west of the Colorado river. The company has 130 acres and claims 3000 ft. of the vein running through the California Hills Gold

Dollar claim. The two companies are controlled largely by the same people and Superintendent H. M. Phinney has charge of both.

SIERRA COUNTY

Imperial Mining Company—In addition to the big strike of free-milling gold ore recently made in this mine on the north slope of the Middle Yuba river, there is reported a very important find of arsenical sulphurets.

SISKIYOU COUNTY

Elliott Creek—On this creek, 5 miles northwest of Garrison Springs, two prospectors have found a 4-ft. ledge of high-grade gold ore.

TRINITY COUNTY

Golden Jubilee—At this mine, Trinity Center, Wm. Chapman, the superintendent, has 30 men on the roll, and has put in 10 more stamps.

Trinity Gold Placer Syndicate—Superintendent Louis Maitland is putting on more men at this mine in Copper creek, 15 miles from Carrville.

TUOLUMNE COUNTY

Harvard—About 75 men are now at work and 40 stamps of the mill are in action.

Colorado

CLEAR CREEK COUNTY

Board of Mines and Trade—The new officers elected at Silver Plume are as follows: President, C. S. Desch; vice-president, W. H. Stephens; secretary, W. J. Guard; treasurer, A. B. Clark.

Uncle Jack Mining Company—Denver and Eastern people are interested in the incorporation of this company, having taken over the Abeel property at Empire, with W. R. Jones, of Empire, Colo., as manager.

Ramsdell Mining and Milling Company—A contract has been given to Hendrie & Bolthoff, of Denver, at $22,000, for the erection of a 75-ton mill. G. W. Teagarden, Georgetown, Colo., is manager.

GILPIN COUNTY

Dirigo—Louisville, Ky., people are reported in the purchase of the Dirigo group in Hawkeye district, deeds being filed this week showing a consideration of $20,000. The company intends to enlarge the mill capacity this spring, as well as put in an aërial tramway from tunnel to mill. G. H. Elling, Denver, Colo., is manager.

Faraday—Chicago people are interested and during the past week ore has been uncovered in the shaft which carries high gold, silver and copper values. C. B. Gibson, Central City, Colo., is manager.

Gilpin County Chamber of Commerce—The directors have elected the following officers: President, W. C. Matthews, Central City; first vice-president, Thomas Dunstone; second vice-president, H. C. Bolsinger; secretary, Percy R. Alsdorf, Central City; treasurer, Walter A. Funk.

Gold Run—Hirsch & Co., of New York, who are interested in the operations on this group near the head of South Boulder creek, are reported intending the installation of an air-compressor plant at an early date. G. Mosch, Tolland, Colo., is superintendent.

Gregory-Buell Consolidated—It is reported that the existing difficulties between stockholders have been settled and that as soon as certain matters can be adjusted operations will be resumed again, possibly under new management.

Receipts of Machinery—A Rand-Ingersoll air compressor for the Gold Collar in Enreka district; a Rand compressor for the Aztec in Central City district; a Rand Quartz Valley district; duplex pump for Frue vanner by W. Hearne & Co., in Quartz Valley district, duplex pump for the Champion near Rollinsville.

LAKE COUNTY—LEADVILLE

Big Evans Gulch—During the week L. R. Johnson, mayor of Boulder, Colo., succeeded in securing a lease on the Bevis, Hidden Treasure, Sovereign, and Fairmount claims, south of the Mammoth, and will start to sink a shaft on the latter claim before the middle of the month; the shaft will go down 400 ft. when it is expected the blue lime will be caught. A. V. Bohn, before May, will resume operations on the Pawnolas group to the west of the Mammoth, and will sink the main shaft deeper. The unwatering of the Mammoth shaft is progressing favorably, and the water is now down to 600 ft.; by the middle of the month the bottom of the shaft should be reached. Further up the gulch, at the Boulder shaft, the water has been lowered to 385 ft., where a winch is being installed to lower a sinker which will continue the unwatering of the shaft until the bottom is reached. The producing properties in the section—the New Monarch Mining Company, Little Ellen, Silent Friend, Izaard—are shipping the usual quota of ore.

Cleveland—The lessees on this property, California gulch, are driving a tunnel and recently opened a body of ore that runs ½ oz. gold, 4 per cent. copper and 12 oz. silver per ton; a shipment will be sent to the smelter soon. When the lessees started to drive the tunnel it was with the intention of opening a body of zinc ore some distance in the hill, so the striking of this copper orebody was a surprise.

Forepaugh—At this mine, East Fryer hill, the lessees have succeeded in controlling the water, and are now shipping 30 tons of silicious ore daily, netting in the neighborhood of $30 per ton; the ore comes from one of the lower levels. Adjoining territory has been secured by the lessees and will be worked from the Forepaugh shaft.

Hibschle Shaft—This property, head of East Seventh street, is coming to the front as one of the heaviest producers in the down-town section. Several years ago the property was worked for the iron ore it contained in the upper contact, and when exhausted it was the prevalent idea that the mine was played out. Several months ago W. H. Covey secured a lease on the ground and sunk the shaft another 200 ft., making it 440 ft. deep; he then drifted west to the Elk fault, crossed it and on the other side opened a body of iron and lead ore, from which he is today shipping 80 tons regularly.

Iowa Gulch—Major A. V. Bohn has succeeded in organizing a company to operate the Aurora group, embracing 60 acres of ground. The claims are on the divide between Iowa and Empire gulches and adjoin the Helena and Ready Cash, both shippers. The property has been worked off and on for a number of years, but never systematically, and during that time three tunnels were driven into the hill, the lower one a distance of 700 ft. It is the intention of the new company to drive this tunnel another 400 ft. into the hill, which will give a depth of 600 ft. from the surface; it will drain the hill and permit the company to prospect the territory. The officials of the Aurora Mining Company are: A. V. Bohn, president and manager; Roy H. Bent, Antwerp, N. Y., vice-president; George McAllister, Antwerp, N. Y., treasurer; A. S. Sharp, Leadville, secretary.

Iron Silver Mining Company—The properties belonging to this company are shipping 10,000 tons of ore monthly, the bulk of it coming from the Moyer and Tucson. At the latter nothing but development work is being carried on, and from this work 50 tons daily are being shipped. The ore is a lead, copper, iron and zinc sulphide.

O'Donovan Rossa—The work of retimbering and enlarging this shaft, South Carbonate hill, has been completed, and sinking it to the 600-ft. station will commence at once.

Progressive Shaft—Work has been resumed on this property, North Fryer hill, by lessees, and two carloads of a good grade of lead ore are being shipped monthly; the work is being carried on at the lower levels, 350 ft. from the old Robert E. Lee.

ROUTT COUNTY

Copper Claims—Canadian people are interested in the purchase of a group of copper mines on Yarwell mountain, near Steamboat Springs, the consideration being reported as $60,000, on which two substantial payments have already been made. Incorporation papers have been filed of the Yarwell Mountain Copper Company.

Copper Ridge—Incorporation papers showing capital stock of $30,000 have been filed; company owns a group of mines on Copper ridge. Bert Goldsworthy, Steamboat Springs, Colo., is manager. Company plans for installation of machinery for deeper operations.

Greenville Mining and Milling Company—Articles of incorporation have been filed. Charles Franz, of Greenville, has been appointed manager, and developments are to be carried out, with installation of machinery within a reasonable date.

Michigan

Houghton County—Copper

Osceola—The Federal court has granted the preliminary injunction restraining the Calumet & Hecla from voting the stock which it owns in this company, except for the purpose of further adjourning the annual meeting.

Keweenaw County—Copper

La Salle—This Calumet & Hecla property is putting a station at the first level.

Ontonagon County—Copper

Everything points to the coming summer as one of great activity on the south range, and some very fine prospects will likely be opened on the Baltic lode. The four producing mines—Mass, Michigan, Adventure and Victoria—are making arrangements to do a great deal of exploration work as soon as the weather will permit, with a view of opening up on that lode.

Indiana—This property has recently been taken over by new hands. R. G. Pryor is president; R. M. Edwards, secretary, together with J. H. Rice, Dean Robinson and Frank McM. Stanton. The Indiana property, comprising 1280 acres, is about a mile north of the Lake Copper Company's properties, is in sections 21, 27 and 28; town 51, range 37. The property is in the zone of the Baltic lode, and has two shafts down about 180 ft. each.

Lake Copper Company—This company will soon increase its force and start sinking on the Baltic lode which was shown up on the property by diamond-drill cores.

Michigan—This company is going to install a complete electrical equipment to operate the stamp mills at Keweenaw Bay.

Nonesuch—The Calumet & Hecla has ordered all work stopped on this property.

Iron—Menominee Range

Pickands, Mather & Co. have completed arrangements for some substantial improvements to be made at the Baltic and Caspian mines, in the Stambaugh district during the present season. Contracts have been let for the installation of complete electric underground haulage systems at both properties. The power will be furnished by two engines, which also will supply the current for an electric lighting plant on surface. Plans have been received for a new engine-house, 40 x90 ft., on the foundations, at the Baltic. At the Caspian an engine-house 50x50 ft. in size, is now nearing completion. Work on a large new shaft-house at the Baltic will commence soon. An ore crusher is also to be erected at this property. It is the expectation that the output from these properties will be considerably increased this season.

Cleveland-Cliffs—This company has placed an order for a 60-drill Sullivan air compressor for its new Maas mine, at Negaunee. The machine will be of the Corliss cross-compound, condensing, two-stage type, with large receiver intercooler. The steam cylinders will be 24x46 in. in diameter, with a 48-in. stroke, and the air cylinders 40 and 24x48 in., with a displacement capacity of 4000 cu.ft. of free air per minute at 60 r.p.m., or nearly 5000 ft. at 70 r.p.m. The compressor will be built at the Chicago works of the Sullivan Machinery Company.

Missouri

Jasper County

Continental Lead & Zinc Company—This company has for years been one of the largest holders of mining properties in the Joplin end of the district, but last year became interested in the Webb City-Carterville district by purchasing the old Perry land, which has not been a very heavy producer in recent years. This company is developing the lower run of ore and is erecting a 300-ton concentrating plant, in which it will introduce an innovation to this district in the manner of hoisting. The mill is to be equipped with self-dumping skips instead of the regulation tub or can and cable. With this improvement it will be possible to hoist 1000 tons a shift whereas 300 tons is a good record under the old system. A hopper will be installed in the ground to feed the skips.

Tenderfoot—This old mine, between Prosperity and Duenweg, is producing ore and for the first time in its long career is a paying proposition. The Tenderfoot shaft was originally put down by Lord Hill, an Englishman who came to Webb City in 1890 and invested in several different ventures, but the panic of 1893 caught him hard and he lost everything. In 1901 Geo. M. Coburn, of Joplin, and a number of other parties secured a lease on 20 acres of the land on which the Tenderfoot was located from the owner, L. H. Baker, of St. Louis. They did some mining at that time but as the water was very strong and ore was selling at $20 per ton they could not make it pay. Recently they renewed operations and unwatered the lease, having discovered that the surrounding mines had greatly lowered the water and the past two weeks they have been outputting at the rate of 25 tons of zinc ore per week. They are mining and milling 80 to 90 tons of dirt per shift, from the 200-ft. level at a cost of 65c. per ton, employing but nine men in the ground.

Alpha—This company, at Spring City, south of Joplin, has for several months been outputting 50 to 60 tons of zinc ore and 10 to 12 tons of lead ore per week. The property is owned by Judge Pfost and others of Kansas City. They have been operating on the 100-ft. level, carrying a 7 ft. drift, 5 ft. of which is a sheet formation, and rich. These ore deposits are like troughs between ribs of flint, the ore vein being a conglomerate of lime, zinc and lead ore. The Alpha vein lies in a draw but keeps its level into the side hills.

Rob Roy—Burt Lyon has been drilling the south 40 acres of this tract and has developed something new for the district. Lime was encountered at 18 ft. below the surface and continued to 98 ft. when the drill went into a bed of silicate which proved to be over 40 ft. in thickness. If mineral at all is found under lime in this district it is zinc and lead, but this finding of silicate is a new record in this section.

Center Creek—John R. Holmes and John C. Cape have secured a lease on the Center Creek Mining Company's lease of some old ground that was worked out on the upper levels. They have moved a mill from one of their properties in Joplin to the lease and enlarged and remodeled it. Last week they made their first turn-in, amounting to 84,240 lb. zinc ore.

Labor Conditions—The labor conditions were never better in this district than at the present time. The cry is for more laborers, as many of the mine owners claim they cannot get enough men. The wages were never as high as at the present; $18 to 20 per week is made by the men in any class of work in the mines.

Montana

Butte District

Amalgamated—Development has been resumed in all of the mines of the company and friendly interests, and will undoubtedly continue without further interruption, for the various labor unions, which caused a stoppage of this work Feb. 26, by demanding an increase in wages, have accepted the offer of the company managers and signed contracts in which they agree not to make further trouble for five years. Under the present schedule, miners will receive $4 a day so long as copper remains as high as 18c. per lb.; shaft and winze men will receive $4.50. The work resumed includes sinking the West Colusa, Badger State and Greenleaf shafts of the Boston & Mon-

Ore shipments from the companies' mines were heavy during March, the average [illegible] second class. Total shipments from Butte to this plant averaged 10,000 tons a day, the remainder having been made by North Butte, Coalition and smaller companies and individuals. Boston & Montana sent an average of 3,200 tons a day to Great Falls, 930 being first class.

Butte Coalition—This company is producing between 1300 and 1400 tons of ore a day, 900 of which are coming from the Rarus. It is again driving the tunnel from the surface of the Tramway to connect with the Rarus shaft and is opening new bodies of ore in the Minnie Healey. Its Corra mine is practically non-productive, but is undergoing development.

[illegible] more than 900 ft. deep and will be taken to the 1500. It passed through a vein of mineralized material at the 900. The width is not known, for it more than filled the shaft from north to south. An assay of the rock showed a value of 0.7 per cent. of copper, 0.8 oz. silver and 40c. gold.

[illegible] that caused a suspension of work in the lower levels of this property recently has been overcome, and development is progressing as before. Shipments average 200 tons a day. Report says that the Basin concentrator, an asset of United Copper, which was closed shortly after the Amalgamated bought the Heinze interests, will be remodeled, with a view of taking care of La France ore and ore which the Davis-Daly expects to strike within the next few months.

North Butte—The company is maintaining its heavy shipments, which aggregate between 1400 and 1500 tons a day. This is about the limit of the hoisting plant. It is finishing a large station at the 1800-ft. level of the main shaft and extending a crosscut north of the 1600 of the Jessie. Sinking in the Berlin shaft, with which this opening will connect, will be begun in a short time.

Nevada

The strike of the miners has been finally settled. The terms of the settlement have not been made public, but it is understood that the Western Federation of Miners carried its point and was recognized.

Ivanpah—A new hoist has arrived at the mine, and will be placed in position without delay in order that this shaft may be [illegible] showing in several parts of the workings.

Gibraltar—Development operations are being carried on in the lower levels. Good ore is showing, and a lot of specimen ore has been sacked for shipment to Salt Lake.

Little Ruth—A promising strike has been made in this property, which is situated on the northeast slope of Quartzite mountain, and about half a mile east of the Mayflower mine.

Nye County—Kawich

The snow has melted from the greater portion of the Kawich ranges, and a number of prospectors have started out to work these claims. Some recent assays of ore from the Stirling group, situated between Eden and Gold Reed, averaged $235 per ton. This group will be vigorously developed during the summer. The Nevada Mines Company is preparing to operate its Kawich mines on a larger scale.

Nye County—Tonopah

Gipsy Queen—The crosscut running north of the 400-ft. level is out 150 ft. The east drift, on the same level, is out 30 ft., and its face for a width of 6 ft. is in ore. A well-defined ledge 4 ft. in width, is also showing in the west drift from the 400-ft. level.

West End Consolidated—The principal work on this property is centered in the sinking of the two new shafts. The new working shaft has attained a depth of 60 ft., while the prospecting shaft, 600 ft. west of the working shaft, has been sunk 95 ft. Prospecting operations in the mine are confined to the locality of the big ore-body on the 400-ft. level, 300 ft. west of the shaft. A large shipment of high-grade ore has been sacked and is awaiting transportation to San Francisco.

Tonopah Extension—The shaft has reached a depth of 975 ft., and arrangements have been completed for sending it down to 1500 ft. Developing operations are mainly on the 400-ft. level, where there is a rich pay-shoot, situated 1300 ft. west of the shaft. The ore in this shoot is from 6 to 10 ft. in width, and averages from $100 to $150 per ton. The whole ledge is 42 ft. in width, and carries ore of milling grade throughout. At present it pays to work the ore in the rich shoot only.

New Mexico

Sandoval County

The Jura-Trias company, with headquarters at Albuquerque, is in financial difficulty, and a receiver has recently been appointed. The mines near Nacimiento, in Triassic sandstone, have been shut down for some time, as the experiment of smelting the silicious ore alone was unsuccessful, and the long distance from the railroad rendered shipment to a custom smelter unprofitable.

Socorro County

A new concentrator is being erected at the Kelly mine, and the railroad switch is being extended from below Kelly to the plant. The Graphic company has been experimenting with concentration, but has not yet definitely decided to build a mill. The South Juanita is being worked by leasers. The Jacobsen interest have not yet begun work on the Juanita and Companion claims, and will probably forfeit the bonus paid for the leases.

Oregon

Baker County

Baker Copper Belt—The opening of the south end of the Baker copper belt by the building of the line from Huntington down Snake river to Iron Dike, is creating much activity among all the copper camps along the river on both sides. The railroad will furnish an outlet for the Seven Devils mines, in Idaho, as well as the Iron Dike and other Oregon mines, which have remained dormant for years awaiting transportation.

Poorman—Workmen in this copper mine, now being developed on Goose creek, about 28 miles east of Baker City, have just opened a new body of ore, and have encountered sulphides.

Dixie Meadows—This mine and the Standard mine, on the Quartzburg camp, forty miles southwest of Baker City, are reported to have been bonded to an agent of Senator Clark, of Montana.

Lane County

Combination—This mine, in the Bohemia district, is showing up well under the management of Sherman Clark who, with his brother, R. H. Clark, has a bond on the property. This mine is developed by about 500 ft. of tunnels. The working tunnel is a crosscut, which is in 400 ft. and has cut the ledge. This ore carries much silver, also some gold. The owners expect to install machinery for the reduction of the ores, but the character of the plant has not been determined as yet. Mine is near Mineral.

Pennsylvania

Anthracite Coal

Lehigh Coal and Navigation—This company will establish the headquarters of the new president, W. A. Lathrop, in Lansford instead of Philadelphia, as heretofore.

Lehigh Valley Coal Company—This company will install a compressed-air service in the Baltimore and Red Ash veins of the Maxwell colliery No. 29 at Ashley, and, as a result, about one-half of the mules now in those veins will be dispensed with. The construction work is already under way, and pipe-lines to con-

[illegible] the compressed air [illegible]. The compressing station is a brick building [illegible] installed. Two larger compressors will be added to the service.

G. B. Markle & Co.—This firm has awarded a big stripping contract to F. H. Cuyle, at Harleigh; it will include the exposition of a large portion of the old Harleigh tract. The stripping will be about 600 ft. in width.

South Dakota

LAWRENCE COUNTY

Mogul—The annual report of this company, issued March 30 from the office at Pittsburg, describes the new 300-ton wet cyanide mill completed during the last year. Only 1200 tons of ore had been treated when the mill closed on account of the strike, so it was not possible to speak definitely of its success. The annual meeting will be held at Pittsburg on May 6.

Rocky Ford Oil Region—A new oil company has just been organized composed of Deadwood, Kansas, Colorado, and Manitoba men. The property adjoins that of the Wyoming-Rochford. It is expected that drilling rig will be on the ground and at work in not less than sixty days.

PENNINGTON COUNTY

Keystone Holy-Terror—The proceeding against W. F. Collins by this company to secure possession of the books and papers, was decided in favor of the company. A meeting of the stockholders will soon be called and arrangements completed for the securing of large financial interests for the company. The company will then pump out the Holy Terror, enlarge the mill and commence to operate the property on a large scale.

Bullion—A 60-day option has been given on this property to A. R. Roosevelt, of New York, representing eastern parties.

Crown—This property, in the Hornelblende district, has been sold to eastern parties who have organized a stock company. James McNickle, the former owner, accepted stock in the company as part payment. This is a free milling property.

Utah

[illegible] COUNTY

Utah Mine—The management of this property at Fish Springs will shortly undertake the re-timbering of the shaft which was destroyed by fire several months ago. Much difficulty has been experienced in extinguishing the blaze on the lower levels, it being necessary to haul water a distance of 2 miles. Since the disaster the company has maintained shipments and dividends by extracting ore by a horse whim from another shaft.

[illegible] have completed the preliminary work at the site of the smelter to be erected in the Tintic district.

Tintic Ore Shipments—Shipments last week amounted to 141 carloads, the contributing mines and amounts being: Ajax, 4; Beck Tunnel, 7; Black Jack, 2; Bullion Beck, 3; Carisa, 1; Centennial Eureka, 51; Engle & Blue Bell, 3; Eureka Hill, 5; Gemini, 10; Godiva, 2; Grand Central, 6; Lower Mammoth, 4; Mammoth, 12; May Day, 4; Scranton, 5; Swansea, 6; South Swansea, 3; Tintic Iron, 5; Victoria, 3; Yankee Consolidated, 3; LaClede, 2 cars.

Eureka Swansea—This company, which recently underwent a change of management, will shortly begin development.

SALT LAKE COUNTY

New England Gold and Copper—The management has been greatly handicapped in getting out ore shipments on account of the railroad company failing to deliver cars. It has also been difficult to get teams to convey ore to the loading station. About eight cars of concentrate are being turned out from the mill monthly.

Bingham Mary—Ore shipments will be begun shortly. The principal developments are now being carried on on the 500-ft. level.

Wisconsin

ZINC DISTRICT

Liverpool Mining Company—This company, at Mineral Point, has been up against a hard proposition ever since it started up. The lead and jack being found disseminated in the same rock, there was considerable difficulty in the process of jigging used. It is now proposed to throw out the present jig and install the standard system which has given such highly satisfactory results; as yet nothing definite has been done. An employee of the company was recently sent to investigate the dry process but reported that it is his opinion that it is not applicable to the Wisconsin ores. The reported big strike at this mine, should it prove to be half as big as at first expected, means a great deal to the stockholders, as well as to the district in general, for it proves that the zinc ore lies at greater depth in the Mineral Point camp than at first supposed.

Canada

ALBERTA

American-Canadian Company—A large shipment of boring machinery, comprising a 40-h.p. boiler, 30-h.p. engine and 3000 ft. of drilling cable, is on the way. This will enable the company to sink to a depth of 3000 ft. The company will begin development at Egg lake, but has secured leases covering an area of 30,000 acres in the neighborhood.

[illegible] Vey, manager at Lingan, announces that a seam of coal 6 ft. thick has been located at the proposed site of the company's new colliery. This will mean the building of a new town and the construction of 6 miles of railway.

ONTARIO—MANITOU LAKE

Victory Gold Mine—A plant, comprising two 50-h.p. boilers, a six-drill compressor and a Lidgerwood hoist, has been ordered and is now on the way to this property. On their arrival development work will be resumed.

Vermilion River Development Company—This company is engaged in dredging the Vermilion river for gold about 20 miles north of Sudbury, and has lately put in a quantity of machinery. It is also working the shore gravel and is meeting with encouraging success.

[illegible]

Mikado—This mine is to be re-opened, having recently changed hands. Robert H. Ahn, of Toronto, is superintending preliminary operations.

Africa

TRANSVAAL

In February the total number of stamps at work in the Transvaal was 8475, an increase of 25 over January. The number at work on the Rand was 8140, an increase of 20 stamps over January.

For the first time in many months the Simmer & Jack mine in February took second place on the list, the premier position being held by the Robinson, which turned out 21,514 oz. The production of the Simmer & Jack was 21,000 oz. As the Simmer & Jack is run by coolies, the Chinese holidays interfered somewhat with the running time. The Robinson is a Kafir mine, and therefore did not hang up during the Chinese new year.

Asia

INDIA—MYSORE

Kolar Goldfield—The gold production in March was 44,602 oz. bullion; an increase of 1378 oz. over February, but a decrease of 4438 oz. from March, 1906. For the three months ending March 31, the total was 150,590 oz. bullion in 1906, and 133,836 oz. in 1907; a decrease of 16,754 oz. The bullion reported this year was equal to 120,452 oz. fine gold, or $2,489,743 in value.

New Zealand

The Mines Department reports the exports of gold for December and the year as below, in bullion ounces:

[illegible]

The bullion reported for the year 1906 was equal to 493,000 oz. fine gold, or $10,190,489 in value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

[illegible] 17. Coal trade in the West is in fair condition, but there seems to be some tendency to over-production. The Lake trade is just opening, and promises to take an unusually large quantity of coal. The railroads are in better shape than for months past, and coal is moving freely. The demand for steam coal is good, but supplies are excessive for the time.

In the East there is nothing new. The usual spring activity is apparent, but there has been no special incident.

The lower house of the Pennsylvania legislature has passed the bill imposing a tax of 3c. per ton on anthracite coal sold. The clause providing for a tax of 1c. per ton on bituminous coal was voted out of the bill.

The retirement of David Willcox from the presidency of the Delaware & Hudson removes a prominent figure in the anthracite trade from active work. Mr. Willcox was general counsel for the company before he became its president, and was thoroughly familiar with the past history and present conditions of the trade; moreover, he was an able lawyer and pleader, and a fluent writer. He appeared on many occasions as the spokesman for the anthracite companies, and wrote pamphlets, magazine articles, etc., which were widely read, and made his name generally known to the public.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to April 6 were as follows, in short tons:

			Changes.
[illegible]	[illegible]	[illegible]	I. 66,837
[illegible]	[illegible]	[illegible]	I. 22,382
[illegible]	[illegible]	[illegible]	I. 291,166
Total	[illegible]	[illegible]	I. 66,122

For the first time this year an increase is shown in coal as well as in coke.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to April 13 were 299,091 tons.

Coal receipts at Boston for the three months ended March 31 are reported by the Chamber of Commerce as follows:

	1906.	1907.	Changes.
[illegible]	[illegible]	[illegible]	I. 133,750
[illegible]	[illegible]	[illegible]	D. 139,338
Total domestic	1,135,228	1,129,640	D. 5,588
[illegible]	[illegible]	[illegible]	D. [illegible]
[illegible]	[illegible]	[illegible]	D. 97,494

The foreign coal is chiefly from Nova Scotia, though a little comes from Great Britain.

Coal shipments over the Southern Railway in January were: Tennessee district, 118,778; Alabama district, 227,065; total, 345,843 short tons

The coal and coke tonnage of the Baltimore & Ohio Railroad for the two months ended Feb. 28 was, in short tons:

	1906.	1907.	Changes.
Anthracite	177,942	286,292	I. 28,270
Bituminous	1,365,707	4,121,526	D. 141,181
Coke	1,003,509	1,907	D. 21,602
Total	5,447,148	5,360,635	D. 137,513

The total decrease this year was 2.5 per cent.

Coal and coke shipments over the Norfolk & Western Railway for the two months ended Feb. 28 were, in short tons:

	Coal.	Coke.	Total.
To Line points	1,503,632	403,046	1,906,678
To Tidewater	283,584	28,077	311,661
Total	1,787,216	431,123	2,218,339
Total, 1906	1,842,911	428,994	2,271,905

This shows a decrease of 2.4 per cent. in the total this year.

The coal and coke traffic of various lines in western Pennsylvania for the two months ended Feb. 28 is reported as follows:

	Coal. 1906.	Coal. 1907.	Coke. 1906.	Coke. 1907.
Beech Crk. Div., N. Y. Cent.	1,552,160	1,180,537	16,829	13,785
Buffalo, Roch. & Pitts.	1,158,351	1,077,233	114,541	107,107
Pittsburg & L. Erie	1,960,023	1,561,237	775,310	890,193

These returns show generally a decrease in shipments.

The coal tonnage of the roads in the Ohio Coal Traffic Association for the two months ended Feb. 28 was, in short tons:

	1906.	1907.
Hocking Valley	702,363	614,098
Toledo & Ohio Central	334,004	304,182
Baltimore & Ohio	418,142	433,859
Wheeling & Lake Erie	575,022	565,742
Cleveland, Lorain & Wheeling	471,996	443,264
Zanesville & Western	226,052	228,806
Toledo Division, Penna. Co.	369,869	182,034
Lake Erie, Alliance & Wh'lng.	210,317	205,593
Marietta, Col. & Cleve.	[illegible]	2,067
Total, net tons	3,448,215	3,219,356

The total shows a decrease of 128,860 tons, or 3.8 per cent., this year.

Coal receipts at St. Louis for the two months ended Feb. 28 were 1,516,005 short tons in 1906, and 1,403,830 tons in 1907; a decrease of 112,175 tons, or 8 per cent.

New York

ANTHRACITE

April 17—The hard-coal market shows considerable strength and deliveries are coming forward as well as was expected. All-rail trade is receiving as much coal as can be taken care of. Small steam sizes are still scarce, but producers report that they are slowly catching up with the demand, but are not seeking new orders for these classes. Prices remain the same, as follows: Broken, $4.25; egg, stove and chestnut, $4.50; buckwheat No. 1, $2.50; pea, $3; rice, $1.85; barley, $1.50, all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade is dull and approaches a mid-summer condition for current business; prices are low and at the present moment there is considerable coal at New York tidewater points awaiting purchasers. This has produced a depressing effect, some of the lower grades of steam coal having been offered as low as $2.40, f.o.b. New York harbor shipping ports, with few takers. We hear of some producers of the better grades of coal curtailing shipments.

Season contract business is taking fair shipments and in this class there are but small stocks of coal on hand, especially in the far East. Contracts themselves seem to be well closed up for the coming season.

Trade in the far East is calling for fair amounts of coal, but lack of vessels is interfering with the forward movement. Along the Sound trade is dull, owing to the taking on of anthracite at April prices. New York harbor trade is quiet; little coal is offered, and there are but few takers; better grades of steam coal are quoted at $2.50@2.60. All-rail trade outside of contract business is taking little coal; the price seems to be about $1, f.o.b. mines. Transportation from mines to tide is about as scheduled but is a little irregular; car supply is generally up to demands.

In the coastwise market vessels are scarce and in demand from the lower ports; vessels in New York harbor are seeking business. We quote current rates of freight from Philadelphia to Boston, Salem and Portland, $1.10 and discharge; to the Sound, $1; to Lynn, Newburyport, Saco, and Gardiner, $1.25, and towage where usual; to Portsmouth, $1.30@1.35; to Bath, $1.15; to Bangor $1.35 per ton.

Birmingham

April 15—The production of coal in Alabama is greater right now than it has ever been in the history of the industry. Assistant State Mine Inspector James

Hillhouse, who has just returned from a trip through the coal districts, announces that the production in 1907 will be from one to two million tons greater than it was in 1906.

At the annual meeting of the Sayre Mining and Manufacturing Company, A. M. Cleaver, of South Bethlehem, Penn., was elected president; J. H. Adams, of Birmingham, vice-president, treasurer and general manager; James Weisel, Birmingham, secretary and assistant treasurer; Edwin Thomas and W. A. Lathrop, of Pennsylvania, directors. The company will increase its operations, opening new mines and constructing additional coke ovens.

Coke is in strong demand, with good prices prevailing. Some of the furnace companies are able to sell their surplus coke on the open market.

Labor is still in demand, and all applicants for positions and work are being accommodated at the collieries throughout the State.

Chicago

April 15—Sales of both bituminous and anthracite coal have been somewhat increased by the cold weather of the last week and local trade is in better condition because of a comparatively small amount of demurrage coal on tracks. Prices, especially of prepared sizes of bituminous, are stronger and in some cases accumulated stocks have been used up with profit.

Illinois and Indiana coals are selling at $2.15@2.50 for lump and egg, $1.70@2.20 for run-of-mine, and $1.25@1.75 for screenings.

Anthracite is in better demand because of the weather and the difficulty of getting forward promptly all-rail consignments.

Eastern coals are quiet. Smokeless and Hocking are firmer, the supply being barely up to the demand. Smokeless brings $3.35 for New River and Pocahontas run-of-mine, and Hocking $3.15 for lump. Youghiogheny is a light seller, with three-quarter at $3.10. Pittsburg No. 8 is somewhat scarce and $2.85 is paid.

Cleveland

The coal market remains steady. Receipts in the city during the week past have been well regulated. Stocks are piling up, however, owing to the fact that the cold snap has deferred the opening of navigation. The Hanna and Gilchrist fleets are all loaded and will start as soon as the ice is out of the breakwater and the Soo is reported clear. The 100 boats that put in the winter here are expected to be all loaded this week, ready for clearance as soon as the lake is in shape.

Pittsburg

April 16—The market is stronger and prices have advanced about 5c. a ton, the minimum price for run-of-mine coal being $1.20 f.o.b. mine. A number of contracts have been made at $1.25. Another rise in the rivers is expected in a few days. The Monogahela River Consolidated Coal and Coke Company this week sent out a large tow of coal to the Midland Steel Company, whose plant is located about 25 miles down the Ohio river. The company has a long-term contract to supply the steel works with 250,000 tons annually. All the mines in the district are in satisfactory operation and there is a good car supply. Some heavy shipments are being made to lake ports for the northwestern trade.

Connellsville Coke—There was a further decline in spot coke prices during the week. Sales of furnace coke were made at $2.70@2.80 and foundry at $3.40@3.50. For deliveries through the last half prices are about 25c. higher. The *Courier* gives the production in the Connellsville region at 284,963 tons and in the lower region at 131,807 tons, a total for both regions of 416,770 tons. The shipments aggregated 14,168 cars, distributed as follows: To Pittsburg, 4541 cars; to points west of Connellsville, 8788 cars; to points east of Connellsville, 839 cars.

Foreign Coal Trade

April 17—Shipments of coal from Nova Scotia mines for the two months ended Feb. 28 are reported as follows, by companies:

	1907	1906	Changes	
Dominion	[illegible]	[illegible]	I.	[illegible]
N. S. Steel	[illegible]	[illegible]	I.	[illegible]
Cumberland	[illegible]	[illegible]	I.	[illegible]
Acadia	[illegible]	[illegible]	I.	[illegible]
Intercolonial	[illegible]	[illegible]	I.	[illegible]
Inverness	[illegible]	[illegible]	I.	[illegible]
Total	[illegible]	[illegible]	I.	[illegible]

The decrease this year was mainly in the shipments by the Dominion and the Cumberland companies.

The coal production of France for the full year is reported as follows, in metric tons:

	1905.	1906.	Changes.
Coal	[illegible]	[illegible]	I. [illegible]
Lignite	[illegible]	[illegible]	I. [illegible]
Total	35,927,704	34,313,645	D. 1,614,059

The total decrease was 4.5 per cent. The heaviest loss was 2,016,039 tons in the Nord and Pas-de-Calais, which produce about 60 per cent. of the total.

Exports of coal from Germany for the two months were as follows:

	1907.	1906.	Changes.	
Coal	3,765,488	3,144,419	D.	621,069
Brown coal	3,364	2,696	D.	668
Total	[illegible]	[illegible]	I.	[illegible]

Exports of coke for the two months in 1907 were 583,940 tons; of briquets, 192,765 tons; of peat briquets, 1147 tons. Included in the coke exports were 295 tons to the United States.

Coal production in Germany for the two months ended Feb. 28 is reported as follows, in metric tons:

	1907.	1906.	Changes.	
Coal	[illegible]	[illegible]	I.	[illegible]
Brown coal	[illegible]	[illegible]	I.	[illegible]
Total	[illegible]	[illegible]	I.	[illegible]
Coke made	[illegible]	[illegible]	I.	[illegible]
Briquets made	[illegible]	[illegible]	I.	[illegible]

Production continues to show a good increase this year, as it did nearly all through last year. The larger part of the briquets is made from brown coal or lignite.

Imports of coal in Germany for the two months ended Feb. 28 were, in metric tons:

	1907.	1906.	Changes.	
Coal	[illegible]	[illegible]	I.	[illegible]
Brown coal	[illegible]	[illegible]	I.	[illegible]
Total	[illegible]	[illegible]	I.	[illegible]

Imports of coke for the two months in 1907 were 52,250 tons; of briquets, 22,347 tons; of peat briquets, 1917 tons.

The coal bunkered, or supplied to steamships engaged in foreign trade, at United States ports for the two months ended Feb. 28 was 910,037 tons. Adding this to the exports previously reported makes a total of 2,359,489 tons sold for consumption beyond the limits of the United States.

Iron Trade Review

New York, April 17—The recent activity in bessemer pig has been supplemented in the past week by some heavy buying of foundry iron, several large concerns having been in the market for supplies for the second half of the year. There has also been more buying of finished material, notably of structural steel. While some railroad orders are held back, building operations seem to be going on actively, and there is less of the hesitancy to order manifest than was the case early in the month.

Open-hearth Steel—The American Iron and Steel Association reports the production of open-hearth steel in the United States for the past year as below, in long tons:

	1906.	1905.	Changes.	
Acid	[illegible]	[illegible]	I.	[illegible]
Basic	[illegible]	[illegible]	I.	[illegible]
Total	[illegible]	[illegible]	I.	[illegible]

The total increase was 22.2 per cent.; the gain in acid steel being 14.4, and in basic 23.5 per cent. The proportion of basic steel to the total rose from 87.1 in 1905, to 87.9 per cent. last year. Included in the total for 1906 are 713,157 tons of direct castings.

Pig Iron Production—On April 1 there were 313 coke and anthracite furnaces reported in blast, their aggregate weekly capacity being 497,500 tons. This is 13,500 tons less than the total reported on March 1. Taking the estimate of the *Iron Age* for the coke and anthracite stacks, and adding an allowance for the charcoal furnaces, the production of pig iron in March was, approximately, 2,300,500 tons; for the three months ended March 31 it was 6,579,100 tons. Of this 4,150,000 tons, or

panies.

Baltimore

casks. Receipts of iron ore for the week were 5350 tons from Cuba, 6600 tons from Spain, and 7700 tons from Beni-saf, Algeria; a total of 19,050 tons. Other receipts included 2910 tons copper ore from Cuba.

Included in the exports were 2457 tons steel rails, and 142 tons splice-bars to Mexico.

Birmingham

bama for delivery during the last quarter of the year are quite numerous. Spot iron in any quantity is still out of the question. What little can be obtained readily brings $22@23 per ton, No. 2 foundry. Fourth-quarter iron is strong at $18.50@19, No. 2 foundry. The railroads continue to supply cars with which to move the product. The production in Alabama is still off, with no prospects of an immediate improvement. Furnace repairing is being pushed, but the work is slow.

Development in the iron-ore mines, both brown and red ore, is still very active and the preparations started a short time since to increase the raw material will soon be bearing fruit.

Among others visiting the Birmingham district during the past week was M. Asabuki, a Japanese representative of a large commission house with office in New York. He visited the steel and iron plants of the Tennessee Coal, Iron and Railroad Company, in the Birmingham district.

Chicago

April 15.—The iron market continues firm but quiet. There are no indications of a speedy change one way or the other. Contracts are not for large amounts, nor are they numerous, on second-half business. Southern runs $18.50@19, Birmingham, making the Chicago quotations $22.75@23.35. For the months of April, May and June, Southern runs $21.50@22, Birmingham, or $25.85@26.35 Chicago. Northern is scarce for early deliveries and brings about $26.50. Lake Superior charcoal is in good demand at $26.50@27.

Sales of iron and steel products are good. The reconstruction of the Chicago street railways will use much material, particularly rails. Structural material is

Cleveland

April 16.—The local iron market shows little change this week. Spot shipments are still in strong demand and $26.25 is r Northern No. 1 foundry. Bessemer is quoted at $24.85 by a large producer. The Cleveland Furnace Company is still out of blast and will not be running until next week. Most business is for last-half delivery, with prices quoted as follows: Bessemer, $21.85; No. 1 foundry, $22.50; No. 2 foundry, $22; No. 3 foundry, $21.50; No. 2 Southern, $22.85; gray forge, $20@20.50.

A fair demand exists for coke, with a normal supply on track here. Prices are without change from last week. An important deal has just been completed by which F. M. Osborne, of this city, and J. R. Nutt, secretary of the Citizens Savings and Trust Company, have financed the Tower Hill Connellsville Coke Company, owning 2000 acres of coking coal in West Virginia. A mortgage has been filed with the Citizens Savings and Trust Company and $2,500,000 five per cent. bonds will immediately be issued.

Philadelphia

April 17.—So far as the pig iron market in this territory is concerned there have been few heavy transactions and the best information available does not point to any material increase in demand. There are a few large consumers who would buy liberally for third- and fourth-quarter deliveries, if what they regard as sufficient inducement were offered; but they will not move out of their tracks while iron remains at its present quotation for late delivery. There is a little unsettled feeling on account of reported large transactions in outside territory involving concessions in prices. So far as the smaller class of buyers is concerned, prices are firm, demand is moderate, consumption is heavy and a larger demand is probable during the early summer on account of the new work now in sight. Quotations are wabbling slightly; basic iron is not selling; buyers are looking abroad for iron for summer delivery, but may not be obliged to purchase there if domestic conditions work out as they think they will. Quotations for early delivery are: Middlesboro on dock $21.50; basic nominally $24; mill iron $22.50@23; No. 2 foundry $24.50.

Scrap—The scrap dealers have succeeded in lately accumulating a great deal of stock. No. 1 steel scrap is wanted at about $18.50; railroad scrap is pretty well cleaned up and some dealers hold at $21. No. 1 yard scrap is in fair supply at $18.50 per ton.

Pittsburg

April 16—There is no material change in the iron and steel markets. Despite the crowded condition of the mills, new business is still being booked in all of the finished lines. Although records of production are being broken at most of the plants in this district, unfilled orders are greater than ever. It was learned today that the National Tube Company, which recently withdrew quotations, cannot promise deliveries on new business before Oct. 1. It is still receiving orders for various tonnages subject to the new prices to be named on June 1, and for deliveries whenever they can be made. The spread between steel and wrought-iron pipe has increased, and sales of iron pipe this week were at from $12 to $14 a ton higher than the maximum price quoted by the Youngstown Sheet and Tube Company, the leading independent producer, for steel pipe. There has been no change in sheets. The American Sheet and Tin Plate Company has not been able to catch up on deliveries, and is still about six months behind. The American Bridge Company closed about 100,000 tons of structural material last week, over 20,000 tons being placed in this district. One large steel interest is sold up for eight months on merchant steel bars, and during the week was forced to reject a large tonnage offered on which a premium would have been paid.

Pig Iron—In addition to the sales of bessemer pig iron recorded last week for delivery in the second quarter, contracts aggregating about 15,000 tons were closed at prices ranging from $22.50 to $23, Valley furnaces. Later in the week two large steel interests entered the market for the second half. The reports of the purchases at first made public were greatly exaggerated, the purpose evidently being to stimulate the market. Instead of sales aggregating 250,000 tons, the exact total was 192,000 tons. Of this tonnage the Bessemer Pig Iron Association sold 120,000, and the United Iron and Steel Company, which took over the properties of the Cherry Valley Iron Company, 12,000 tons, to the Youngstown Sheet and Tube Company. The Cambria Steel Company bought 60,000 tons from W. P. Snyder & Co., the price to be on the ascertained monthly average. The other sales were at $21, Valley furnaces, and it is reported, but not officially, that this rate is guaranteed against a decline. This week some important inquiries have been received for late delivery, and several additional sales may be recorded before the end of the week. The demand for spot foundry iron is more active, and No. 2 foundry continues to be held firmly at $25@25.50, Valley furnaces. Gray forge also is in greater demand, and the price is a trifle higher, the minimum being $21.85, Pittsburg.

Steel—Billets continue scarce and quotations of $30.50 for bessemer, and $31.50 for open-hearth are nominal. Steel-bar contracts that expired on April 1 are being renewed at 1.60c. The regular mill price for plates remains at 1.70c., but premiums are paid for early delivery.

Sheets—The situation is about the same as a week ago. Mills cannot promise deliveries inside of five or six months. Prices are unchanged at 2.60c. for black and 3.75c. for galvanized sheets No. 28 gage.

Ferro Manganese—The market is weaker and for prompt delivery $72 to $73 is quoted.

By Telegraph

Pittsburg, April 17—Sales are reported of 5000 tons basic and 2500 tons bessemer pig, fourth-quarter delivery, at $21, Valley, to a consumer who recently covered for third quarter at the same price.

London

April 8—The British Iron Trade Association reports the production of steel in Great Britain for the past year as below, in long tons:

	1905.	1906.	Changes.
Bessemer	1,974,210	1,907,338	D. 66,872
Open-hearth	3,838,072	4,554,936	I. 716,864
Total	5,812,282	6,462,274	I. 649,992

The decrease in bessemer was 3.4 per cent.; but the gain in open-hearth was 18.7 per cent., making an increase of 11.2 per cent. in the total make. The proportion of open-hearth steel to the total rose from 66 per cent. in 1905 to 70.5 in 1906. The ratio of steel to pig iron was 63.7 last year. There was an average of 56 converters and 419 open-hearth furnaces at work in 1906; showing average yearly outputs of 34,060 tons per converter and 10,871 tons per furnace.

The division of steel made by the acid and basic processes was as follows in 1906:

	Acid.	Basic.	Total.
Bessemer	1,507,149	400,189	1,907,338
Open-hearth	1,878,091	1,176,245	4,554,936
Total	1,385,240	1,776,434	6,462,274
Total, 1905	4,439,067	1,373,215	5,812,282

The proportion of acid steel to the total was 76.4 per cent., in 1905; falling to 72.5 per cent. last year.

The production of finished steel forms is not completely given; so far as the figures go, the forms in which the steel was sold in 1906 were as follows:

	Open-hearth.	Bessemer.	Total.
Blooms and billets	498,656	277,845	776,501
Rails	94,626	854,740	949,366
Bars	939,087	242,706	1,181,793
Plates and sheets	1,734,446	.....	1,734,446
Structural shapes	198,389	.....	198,389
Merchant steel	.....	82,246	82,246
Total	3,465,204	1,457,537	4,922,741

The balance of the ingots is accounted for by loss in manufacture, and by production of tires, forgings, and some other forms not reported.

Dusseldorf, Germany

April 6—The German Iron and Steel Union reports the production of steel in Germany for the full year as follows, in metric tons:

	Acid.	Basic.	Total.
Converter	407,688	6,772,804	7,180,492
Open-hearth	230,668	3,534,612	3,765,280
Special steels	77,596	111,717	189,313
Total	715,952	10,419,133	11,135,085
Total, 1906	655,495	9,411,068	10,066,563

The increase in acid steel was 60,457 tons; in basic steel, 1,008,075 tons; total gain, 1,068,532 tons, or 10.6 per cent. Of the total steel made 93.6 per cent. was basic, and 6.4 per cent. acid. Converter steel was 64.5 per cent. of the total; open-hearth, 33.8; special steel, 1.7 per cent. Germany retains its strong preference for the basic converter. The ratio of steel to pig-iron production was 89.2 last year.

The output of the German blast furnaces in February was 978,[illegible] tons of pig iron, being 83,961 tons less than in January. This was due to the shorter month; the daily average was 34,263 tons in January and 34,935 tons in February, showing an increase of 672 tons. For the two months ended Feb. 28 the total was as follows, in metric tons:

	Tons.	Per Ct.	Tons.	Per Ct.
Foundry iron	829,218	16.5	443,605	16.5
Forge iron	146,129	7.0	132,552	6.5
Steel pig	154,068	7.9	161,238	7.9
Bessemer pig	72,889	3.7	77,568	3.8
Thomas pig	1,264,400	64.6	1,325,500	65.0
Total	1,956,895	100.0	2,040,343	100.0

The increase in foundry iron was 14,387 tons; in steel pig, 7170; in bessemer pig, 4669; in Thomas pig, 60,990 tons. There was a decrease of 3768 tons in forge iron, leaving the total gain 83,448 tons, or 4.3 per cent.

Metal Market

NEW YORK, April 17

Gold and Silver Exports and Imports

At all United States Ports in March and year:

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1907	$2,126,173	$ 5,007,319	Imp. $2,881,146
" 1906	5,918,627	5,630,685	Exp. 287,932
Year 1907	5,703,304	11,607,691	Imp. 5,904,387
" 1906	20,146,622	10,316,087	Exp. 9,830,535
Silver:			
Mar. 1907	5,058,461	3,936,139	Exp. 1,122,322
" 1906	5,213,811	3,509,838	" 1,703,973
Year 1907	14,669,396	11,315,168	" 3,354,228
" 1906	19,165,508	12,676,998	" 6,488,610

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Apr. 13 and years from Jan. 1:

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	.....	$ 141,577	$ 872,445	$ 34,829
1907	$1,756,336	5,039,785	10,847,419	634,182
1906	3,674,526	4,315,183	20,278,173	577,740
1905	31,950,770	4,184,040	10,037,698	1,114,675

Exports of silver for the week were to London. There were no exports of gold. Imports of gold for the week were from France and the West Indies; of silver from the West Indies and Mexico.

The foreign trade of the United States for the three months ended March 31 is valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.
Exports, merchandise	$457,870,316	$511,504,255
Imports	324,351,981	382,917,669
Excess, exports	$133,518,337	$128,586,596
Add excess of exports, silver		14,228
Total		$128,600,824
Deduct excess of imports, gold		264,387
Total export balance		$128,036,437

The gold and silver movement in detail will be found in the table at the head of this column.

The joint statement of all the banks in the New York Clearing House for the week ending April 13 shows loans $1,099,657,100, an increase of $30,968,300; deposits, $1,081,661,900, an increase of $44,948,800, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie	$1[illegible],501,000	$212,966,300
Legal tenders	77,[illegible],300	28,302,100
Total cash	$2[illegible],227,300	$241,268,400
Surplus	$ 4,772,590	$ 15,852,925

The surplus over legal requirements shows an increase of $6,411,700, as compared with the previous week this year.

Specie holdings of the leading banks of the world, April 13, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass't New York	.....	.....	$212,966,300
England	$177,283,220	.....	177,283,220
France	516,835,100	$195,437,760	712,272,860
Germany	153,865,000	51,270,000	205,135,000
Spain	77,235,000	125,450,000	202,685,000
Netherlands	25,740,500	28,140,000	53,880,500
Belgium	16,750,000	8,375,000	25,125,000
Italy	161,675,000	25,480,000	187,161,000
Russia	597,635,000	29,440,000	627,076,000
Aust.-Hungary	225,860,000	61,920,000	287,780,000
Sweden	20,765,000	.....	20,765,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to April 4:

	1906.	1907.	Changes.
India	£ 5,371,960	£4,043,558	D. £ 1,328,402
China	.....	.....	.....
Straits	.....	172,550	I. 172,550
Total	£ 5,371,960	£4,216,108	D. £ 1,155,852

Receipts for the week were £3000 from the West Indies and £116,000 from New York; £119,000 in all. Exports were £136,148, all to India.

Indian exchange continues steady, all the Council bills offered in London being taken at an average of 16.09d. per rupee. There have been lighter shipments of silver to India. Sales of silver in London on Chinese account continue to be made.

The movement of gold and silver in France for the two months ended Feb. 28 is reported as follows:

Gold.	1906.	1907.
Imports	Fr. 94,316,000	Fr. 22,794,000
Exports	7,476,000	35,923,000
Excess	I. Fr. 86,840,000	E. Fr. 12,529,000
Silver:		
Imports	[illegible]	[illegible]
Exports	[illegible]	[illegible]
Excess	E. Fr. 4,127,000	I. Fr. 12,705,000

Imports of nickel and copper coins were 17,000 fr. in 1906, and 19,000 fr. in 1907. Exports were 65,000 fr. in 1906, and 11,000 fr. in 1907. The gold exports this year exceeded the imports, an unusual condition.

Prices of Foreign Coins

	Bid.	Asked.

SILVER AND STERLING EXCHANGE.

	Silver.							
	4.85¾	65⅝		15	4.85¾			80⅛
12								
				17				

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

	Copper.			Tin.	Lead.	Spelter.	
April	Lake, per lb.	Electrolytic, per lb.	London, Std. per ton.	New York, per lb.	London, per ton.	New York, per lb.	London, per lb.
	cts.	cts.	£ s. d.	cts.	£ s. d.	cts.	£ s. d.
11				40½	6.00	6.65 @6.75	6.50 @6.60
12				40	6.00	6.65 @6.75	6.50 @6.60
15				40½	6.00	6.65 @6.75	6.50 @6.60
16				40¾	6.00	6.65 @6.75	6.50 @6.60
17				40½	6.00	6.65 @6.75	6.50 @6.60

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The London prices are recommended by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotation on spelter are for ordinary western brands; special brands command a premium.

Copper—The situation reported in our last week's issue as being brought about by the disparity between the foreign and domestic markets is still the dominant influence. Business was stagnant up to the beginning of this week, but the lower prices established have at last attracted some buyers and fair-sized quantities have changed hands during the last few days. With this development of business, and the improvement in London, there is a stronger tone, though the market is still rather uncertain, and with peculiar features. In Lake there has been but little business and the situation remains unchanged. The interests which have been holding out for 25c. for electrolytic are as firm as ever in their position, and one sale of some size is reported to have been made at that price, but others have offered and made sales at the same time at 24c., and even lower. However, at the close the market displays a firmer tendency, and we quote as the average 25@25½c. for Lake, 24@24¼c. for electrolytic, and 22½@23c. for casting.

After declining to about £94 from the high prices which ruled at the close of last week, the London market has gradually advanced from day to day under an aggressive buying movement, and closes firm at £98 12s. 6d. for both spot and three months'.

Statistics for the first half of the current month show a decrease in the visible supplies of 1200 tons.

Refined and manufactured sorts we quote: English tough, £108@109; best selected, £109@110; strong sheets, £118.

Exports of copper from New York and Philadelphia for the week were 1061 long tons. Our special correspondent reports the exports from Baltimore at 938 long tons fine copper. The Baltimore exports also included 168,470 lb. copper sulphate.

Imports and exports of copper in Germany for the two months ended Feb. 28 were, in metric tons:

	1906.	1907.	Changes.
Imports	22,770	17,294	D. 5,476
Exports	2,509	1,250	D. 1,259
Net imports	20,261	16,044	D. 4,217

This shows a decrease of 20.8 per cent. in the net imports this year.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—There has been no decided tendency to the market, London having fluctuated within narrow limits, the close being £185 2s. 6d. for spot, £183 2s. 6d. for three months'. Business here is still of hand-to-mouth proportions, transactions taking place at about 40¼c.

Exports of tin from the Straits for the month of January were, in long tons:

	1906.	1907.	Changes.
United States	2,150	1,272	D. 878
Great Britain	3,196	2,867	D. 329
Other Europe	715	525	D. 190
China and India	75	195	I. 121
Total	6,075	4,869	D. 1,206

A considerable part of the shipments to Great Britain is of metal in transit to the United States.

Lead—The market is unchanged at 6c., New York.

The London market has been very firm and a great scarcity is reported in spot supplies. The close is higher at £20 2s. 6d. for Spanish lead, £20 5s. for English lead.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull but steady, at 5.92½c. for all grades.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 6, that the price of lead has been 91.50 reales per quintal, silver being paid for at 13.75 reales per ounce; exchange, 27.91 pesetas to £1. The price, on current exchange, is equal to £18 7s. per long ton, f.o.b. Cartagena. Exports for the week were 600 tons desilverized, and 1146 tons argentiferous lead to Great Britain; 198 tons argentiferous and 942 tons desilverized lead to Marseilles; 2886 tons in all.

Spelter—Consumers, being well supplied, have been holding off in view of the declining tendency of the market. Near-by deliveries are holding their own, while futures are being pressed for sale at quite a discount. The market closes easy at 6.65@6.75, New York; 6.50@6.60, St. Louis.

The London market is also somewhat weaker, and prices have declined at the close to £25 10s. for good ordinaries, £25 15s. for specials.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Zinc Dust—Paul Speier reports that the latest quotations, for prompt delivery, in lots of 10 tons or over, is 50.25@50.50 marks per 100 kg.—equal to 5.44 per lb.—packing included, f.o.b. Stettin, Germany.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 6 that the market remains quiet. Shipments for the week were 1300 tons blende to Stettin; 6085 tons blende and calamine to Antwerp; 8285 tons in all.

Antimony—The market is dull and uninteresting. Quotations are: Cookson's, 24@25c.; Hallett's, 21¾@22½c.; ordinaries, 21½@22c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is $32@32.50 per ounce for ordinary metal; $35 for hard. Scrap is quoted at $25 per ounce.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Aluminum—All price lists on this metal have been withdrawn. Most of the business at present is in deliveries on contract, and the metal is only to be had for early delivery from second hands. Prices are entirely nominal, at 48@50c. per lb.

for No. 1 ingots, and 17c. for No. 2 metal.

Cadmium—Paul Speier writes, from Breslau, Germany: Demand has been good recently. The current quotation for cadmium metal, 99.5 per cent. pure, is 12.75@13.25 marks per kilogram, average $1.40 per lb.—packing included, f.o.b. Hamburg.

New York Metal Exchange—The following standing committees have been appointed for the ensuing year: Executive, B. Hochschild, H. W. Hendricks, William Jay Ives; finance, B. Hochschild, George W. Jaques, G. E. Behr; law, William Jay Ives, G. E. Behr, Robert L. Crooke; floor, J. H. Lang, George W. Jaques, C. Mayer; warehouse, G. E. Behr, C. H. Bolles, Jr., J. H. Lang, Robert Gentle, Henry I. Stetler; trade, B. Hochschild, L. Nachmann, E. A. Caswell, L. Vogelstein, C. Mayer; pig iron, B. Nicoll, James E. Pope, A. A. Fowler; pig tin, J. H. Lang, E. A. Caswell, P. Koning; copper, B. Hochschild, L. Vogelstein, John R. Stanton; lead, R. L. Crooke, E. A. Caswell, J. H. Lang; spelter, G. E. Behr, J. Langeloth, L. Vogelstein; quotations, B. Hochschild, L. Vogelstein, P. Koning, J. H. Lang, Edwin Groves.

Wisconsin Ore Market

Platteville, Wis., April 13—According to the view of many of the producers here the buyers are pursuing the only policy possible when all the local conditions are taken into consideration. Sixty per cent. ore sold off a little from last week, although in some cases a higher price was paid. Nearly all interested in zinc mining are formulating their plans along broader lines than formerly, thus showing confidence in the future of the district. Particular attention is being paid to the improvement of roads, so as to facilitate hauling to shipping points.

Medium- and low-grade ores continue in strong demand and nearly all the surplus has been loaded and shipped. Lead is steady, with practically no change in price reported, the same being true with dry bone and sulphur.

The shipment for the district, by camps, for the week were as follows, in pounds:

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	142,850		
Hazel Green	1,000,000		
Bell City	234,490		
Cuba City	75,840	50,000	
Bewey	60,000		
Livingston	60,000		
Glidden	80,000		
Mineral Point	47,640		
Harker	64,980		
Highland	142,000	41,450	
Linden	170,190		
Total for week	2,087,990	91,450	
Year to April 13	25,034,479	1,132,190	143,160

The Buncombe-Hazel Green camp has taken the lead in the way of production, this being due to the starting up of two new plants.

Missouri Ore Market

Joplin, Mo., April 13—The highest price paid for zinc was $53 per ton, on an assay basis of $48@50 per ton of 60 per cent. zinc, averaging $48.06 per ton. The highest price for lead was $82 per ton, with an average of $79.88. Compared with a year ago both zinc and lead are $4 per ton higher.

More active competition during the two past weeks has caused the purchase of all but approximately 2000 tons of the reserve stock of zinc in the bins. Buyers report the market easy, indicating that sellers are accepting offers freely. There is no disposition to curb prices, but producers are a unit in expecting a reaction that will send ore prices higher than any point reached this year.

Following are the shipments of zinc and lead from the various camps of the district for the week ending today:

	Zinc, lb.	Lead, lb.	Value.
Joplin	8,041,860	376,510	$91,109
Webb City-Carterville	2,371,820	74,110	89,861
Galena-Empire	1,346,670	178,240	40,122
Badger	1,088,070	11,590	28,758
Alba-Neck City	886,500	8,420	21,718
Duenweg	383,200	183,290	15,581
Prosperity	480,120	28,000	15,200
Spurgeon	435,920	158,610	14,473
Granby	595,000	61,000	12,500
Oronogo	478,670		10,787
Baxter Springs	196,100	88,910	8,262
Aurora	194,820	17,880	7,863
Springfield	126,500		3,019
Sherwood	55,030	12,070	1,802
Zincite	60,390	2,910	1,781
Carl Junction	54,480	5,880	1,542
Peoria	65,840		1,324
Cave Springs	51,590		1,264
Short City	51,000		1,224
Sarcoxie	44,110		1,038
Totals	11,895,860	2,091,030	$369,448
15 weeks	179,496,140	27,918,920	$5,424,108

Zinc value, the week, $285,629; 15 weeks, $4,296,[illegible]
Lead value, the week, 83,519; 15 weeks, 1,158,065

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.00	83.53
February	47.37	47.11	February	72.50	84.58
March	42.68	48.66	March	75.00	82.75
April	44.63		April	75.13	
May	40.51		May	78.40	
June	43.83		June	80.00	
July	44.25		July	74.31	
August	43.56		August	80.00	
September	42.58		September	79.64	
October	41.55		October	80.00	
November	44.44		November	81.98	
December	43.68		December	81.89	
Year	43.24		Year	77.40	

Chemicals

New York, April 17—The chemical trade is generally active; demand for alkalies and bleach is good and prices firm.

Copper Sulphate—Demand is fully up to supply. There is no change in prices, and we continue to quote $7.50 per 100 lb. for carload lots, or over; $7.75 per 100 lb. for smaller parcels.

Nitrate of Soda—There is rather a shortage of supplies, while the demand continues good. Spot prices are quoted at $2.70 per 100 lb., with 96 per cent. for all positions of 1907 at $2.50. The price for 95 per cent. salts is $2.45, for both [illegible]

Mining Stocks

New York, April 17—The stock markets generally are still heavy, with business dragging on small fluctuations, and a downward tendency. Outside buying is not much in evidence. The curb market, in which most mining stocks are sold, was a little better than the exchange, and showed a fair amount of trading, with little loss in prices.

Boston

April 16—Mining stocks closed with a good tone tonight, although they are considerably below the level of a week ago. It is hardly expected that any increase in the Amalgamated dividend will take place and even then this stock, as well as many others, are selling at near a 10 per cent. basis.

Amalgamated, during the week, broke $6.37½ to $89.87½, with recovery to $93.50 tonight. Copper Range slid back $3.25 to $78.75, but is above $81 tonight. This company announces that it will increase its capital 15,000 shares May 1, to an even 400,000 shares, using 10,000 shares of the increase to acquire the Globe mining property, now under option, adjoining the Champion on the north. North Butte went off $6.75 to $85.50, recovering but $1 of the decline. The annual report was somewhat disappointing, showing an extraordinary expense for the year ended March 31. Net earnings were $3,637,209, equal to but $9 per share. Total expenditures were $3,081,513, with an output of 32,865,907 lb. of copper, at a cost of 9.4c. per pound. New properties have been acquired, which explains partially the increase in operating cost. Butte Coalition fell from $27 to $24.87½, with less than $1 recovery.

Calumet & Hecla touched $800, which is 20 per cent. below the price touched in the boom, when it sold for $1,000 per share. Old Dominion has shown rapid gyrations within short periods, the price varying from $55 to close to $50, with the final tonight $53.50. Net earnings of the New Jersey company for March are reported as over $250,000. This company will soon be free from debt. Osceola broke $8 to to $133. The annual meeting, adjourned until today, has again been postponed until May 6. It now looks as if the Calumet & Hecla people, through the court ruling, might be able to elect their board at that time.

The Tamarack Mining Company will consider the sale of 5906 acres of timber land at its annual meeting May 2. In ad-

Colorado Springs

exchange has been decidedly dull during the week, and prices have been noticeably off color. Elkton has shown some activity which was caused by the buyers taking advantage of the sharp decline in the price of this stock. The balance of the list has been weak. Although work on the drainage tunnel is progressing, it seems to have no effect on the stock market.

STOCK QUOTATIONS

NEW YORK	Apr. 16
Name of Comp.	Clg.
Alaska Mine	1
Am. Nev. M. & M. Co.	⅛
Amalgamated	9⅛
Amalgamated Copper	61
Buffalo Cobalt	2⅜
Butte Coalition*	25
Butte Cop. & Zinc	5⅛
Colonial Silver	11
Cum. Ely Mining	8⅞
Davis Daly	12
El Rayo	6
Furnace Creek	1
Greene Cananea	65
Guggenheim Exp.	2
Mackay	1
McKinley Dar.	1⅜
Mines Co.	4
Mitchell Mining	⅜
Nev. Utah M. & S.	4
Nipissing Mines	12⅜
Old Hundred	32
Union Copper	61⅞
West Columbus	11
Am. Agri. Chem.	
Am. Sm. & Ref., pf.	100
Bethlehem Steel	
Federal M. & S., pf.	39
Inter. Salt	15⅞
National Lead	9⅛
National Lead, pf.	99
Pittsburg Coal	5⅜
Republic I. & S.	22⅝
U. S. Red. & Ref.	14
Va. I. Coal & Coke	30

BOSTON	Apr. 16
Name of Comp.	Clg.
Adventure	
Allouez	61
Am. Zinc	39
Arcadian	6
Atlantic	13
Bingham	17½
Boston Con.	24
Calumet & Ariz.*	156
Calumet & Hecla*	820
Centennial	30
Con. Mercur	
Copper Range	81½
Daly-West	16
Franklin	10½
Giroux Consolidated	16
Isle Royal	17¼
La Salle	16
Mass.	
Michigan	14⅜
Mohawk	56
Montana Ore Purch.	
Nevada	
North Butte	86⅞
Old Colony	
Old Dominion	53⅛
Osceola	
Parrot	21
Phoenix	1⅛
Quincy	118
Rhode Island	
Santa Fe	4
Shannon	17
Tamarack*	106
Trinity	20½
United Cop. Com.	60
U. S. Oil	10½
U. S. Smg. & Ref.	55⅜
U. S. Smg. & Ref. pf.	44
Utah Copper	61⅜
Victoria	5⅞
Washington	
Winona	8
Wolverine	140
Arnold Rts.	
Ex Int. Ex. Rights	

BOSTON CURB	
Black Mt.	
Cananea Cent.	27
East Butte	10⅛
Stratton's Ind.	6
Camp Bird	7
Tonopah Ext.	2⅛
Tonopah Min.	10
Goldfield Con.	8
Jumbo Ext.	1
Jumbo Mining	1
Mont. Shoshone	2
Nevada Hills	3½
Rescue	1⅛
Shawmut	3⅛
Superior & Pitts.	14⅜
Troy Man.	2

S. FRANCISCO	Apr. 10
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	15
Best & Belcher	1.40
Caledonia	47
Challenge	12
Con. Cal. & Va.	1.10
Crown Point	34
Exchequer	80
Gould & Curry	39
Hale & Norcross	87
Mexican	97
Ophir	2.45
Overman	18
Potosi	13
Savage	99
Sierra Nevada	64
Union	65
Utah	06
Yellow Jacket	
TONOPAH STOCKS	
Golden Anchor	35
McNamara	49
Montana-Pitts.ex.	20
North Star	30
Rescue	17
GOLDFIELD STOCKS	
Black Ants	12
Blue Bull	47
Columbia Mt.	94
Comb. Frac.	4 90
Conqueror	22
Daisy	2.35
Florence	5.50
Frances-Mohawk	1.10
Goldfield Con.	8.62
Grandma	28
Great Bend	1.12
Red Hills	43
St. Ives	1.50
BULLFROG STOCKS	
Amethyst	49
Bonnie Claire	45
Mayflower Con.	4.4
Montgomery Mt.	25
Original	15
MANHAT'N STOCKS	
Gold Wedge	10
Manhattan Mg	13
Pine Nut	19
Ruby Wonder Con.	
Stray Dog	30
Yellow Horse	09

NEVADA (Weir Bros. & Co., New York)	Apr. 17
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	18.12½
Tonopah Exten.	3.75
Montana Tonopah	3.65
Belmont	4.50
Tonopah Midway	1.78
West End Con.	1.30
Jim Butler	1.25
GOLDFIELD STOCKS	
Sandstorm	.70
Kendall	.39
Red Top	4.00
Jumbo	4.00
Goldfield Mining	1.50
Dia'dfield B. B. C.	.38
Atlanta	.70
Mohawk	16.00
Silver Pick	1.25
Laguna	1.75
BULLFROG STOCKS	
Mont. Shoshone C.	10.25
Tramps Con.	1.12
Gold Bar	1.10
Bullfrog Mining	.28
Bullfrog Nat. B.	.41
Homestake Con.	1.20
MANHAT'N STOCKS	
Manhattan Con.	.75
Manhat'n Dexter	.24
Jumping Jack	.17
Stray Dog	.27
Indian Camp	.15

COLO. SPRINGS	Apr. 13
Name of Comp.	Clg.
Acacia	9
Black Bell	
C. C. Con.	5½
Dante	
Doctor Jack Pot	7
Elkton	58
El Paso	42½
Findlay	65½
Gold Dollar	7½
Gold Sovereign	6½
Isabella	24
Jennie Sample	7½
Jerry Johnson	
Mary McKinney	
Pharmacist	
Portland	1.16
Un. Gold Mines	8
Vindicator	90
Work	18

New Dividends

Company.	Payable.	Rate.	Amt.
Esperanza, Mex.	Apr. 25	$1.32	$300,600
Homestake S. Dak.	Apr. 25	0.50	100,200
Inter. Nickel, pfd.	May 1	1.50	131,123
Mary McKinney, Colo.	Apr. 25	0.03	39,128
Mines Co. of America	Apr. 26	0.02	40,000
Nipissing, Ont.	Apr. 20	0.15	180,000
N. Y. & Hon. Rosario	June 20	0.10	15,000
Philadelphia Co.	May 1	0.75	434,296
Tenn. Coal, Iron & R.R.	May 1	1.00	225,536
Tenn. C. I. & R.R., pfd.	May 1	2.00	4,960
Tonopah Co., Nev.	Apr. 22	0.35	350,000
United Copper	Apr. 29	1.75½	787,500
United Zinc	Apr. 15	0.50	9,778
U.S. Cast Iron Pipe & Fdy.	June 1	1.00	150,000
U.S. C. I. Pipe & Fdy. pfd.	June 1	1.75	262,500
Vindicator Con. Colo.	Apr. 25	0.03	45,000
Vulcan Detinning, pfd.	Apr. 20	1.25	18,750

Assessments

Company.	Delinq.	Sale.	Amt.
Alpha, Nev.	Apr. 3	Apr. 24	$0.05
Andes, Nev.	Mar. 25	Apr. 30	0.10
Belcher, Nev.	Apr. 16	May 9	0.15
Caledonia, Nev.	Apr. 10	May 1	0.10
California, Cal.	Apr. 4	Apr. 20	0.05
Challar, Nev.	Apr. 22	May 16	0.10
Comet, Nev.	Apr. 24	May 14	0.20
Gould & Curry, Nev.	Apr. 10	May 1	0.10
Hale & Norcross, N.	Apr. 3	Apr. 30	0.15
Harkimer Gravel, C.	Mar. 29	Apr. 15	0.04
Mexican, Nev.	Apr. 3	Apr. 25	0.15
Naildriver, Utah	Mar. 30	Apr. 24	0.03
Oro Blanco, Cal.	Feb. 25	Apr. 22	0.03
Sag Basher	Apr. 2	Apr. 29	0.05
Silver Cycle, Nev.	Apr. 3	May 8	0.10
Yellow Jacket, Nev.	Apr. 13	May 22	0.10

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.765		29.984	
May	66.976		30.968	
June	65.394		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.927		31.483	
October	69.623		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.863	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375		18.688		84.703	
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.606	
March	36.662	41.313	September	40.516	
April	38.900		October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350	6.000	15.922	19.703
April	5.685		15.959	
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.525	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.226	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.078		5.941		25.781	
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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The Bonanza Silver Mines of Cobalt, Ontario

The Veins Are Small but Remarkably Rich. The Shipments for the Year 1905 Contained an Average of Nearly 4 per cent. Silver

BY W. SPENCER HUTCHINSON*

The ores of the Cobalt district are remarkable for their cobalt and nickel contents, and for their high proportion of silver. The report of the Ontario Bureau of Mines records the shipments for 1905. They were 2144 tons, with an average assay in silver of 3.90 per cent., equivalent to 1139 oz. per ton; cobalt, 5.5 per cent.; nickel, 3.49 per cent. It is estimated that the output for 1906 was 5000 tons, with an average assay of 1100 oz. of silver per ton. Some of the ore is much richer than this, at least one carload assayed as high as 7000 oz. of silver per ton.

MCKINLEY DARRAGH MINE, LAKE COBALT IN THE FOREGROUND

Discovery and Exploration

The first discoveries were made during the building of the railroad in the summer of 1903, and the first ore was shipped in 1904. The development of the district has been retarded by natural conditions. It is a rocky glaciated country, and although there is little soil the surface is covered with timber, moss and glacial drift. The first discoveries were made in rocky cliffs, where little clearing or excavating was required. Other exploring has necessitated much work, and while deposits of glacial drift are not extensive and are usually shallow, a great amount of trenching has been necessary. On the Nipissing property, several acres were washed off last summer by hydraulic piping with water pumped from the adjoining lake. Work of this sort is suspended during the winter. Snow falls early, and the winter is long and cold. This does not interfere with the operation of the mines, which are prepared for it, but all prospecting is stopped.

Discoveries of rich silver ores are so far confined to a limited area, and although the country was overrun with prospectors during the summer of 1906, few discoveries were made which add to the known extent of the rich area. It is remarkable to note that there are veins which seem to be identical in appearance, containing the same heavy cobalt and nickel minerals, which are almost barren of silver. Thus ore shipped by the Nipissing mine from the Old Cobalt vein, assayed less than 5 oz. per ton in silver. Within the limits of the rich area, however, probably 90 per cent. of the veins so far discovered have been rich in silver, while outside that area, although explorations have extended many miles, and similar cobalt-bearing veins have been found, at least 90 per cent. of the discoveries show low silver averages.

The veins are small, from a knife-blade crevice to a width of 2 ft. The gangue rock is calcite, which is often small in amount in the rich veins, where the filling is chiefly, smaltite or niccolite. The silver is mostly native, but argentite, dyscrasite and some other silver minerals are also found. The common base metal sulphides, pyrite, chalcopyrite, blende and galena, are rarely found or are altogether wanting; the absence of pyrites is particularly notable.

The rocks around the [illegible]

stones, in diabase, and in the Huronian formation. It is in the latter that many of the rich silver veins have been found. The Huronian formation is chiefly a conglomerate or agglomerate, containing pebbles and boulders of moderate size, distributed pretty evenly. It is a very hard compact rock, which breaks irrespective of the original structure, and no instance was noted where fresh breaks follow the surface of pebbles or boulders. This rock has a well developed joint structure, exposed most completely in the railroad rock cuts. It consists of two crossing systems of joints, both dipping steeply. These joints have characteristic curved or warped surfaces. The rock is

*Mining engineer, 101 Milk street, Boston, Mass.

[illegible] LAKE

VEIN NO 19, NIPISSING MINE

altered on the joints with the formation of a thin scale of dark green mineral probably of the chlorite group.

It would be interesting and important if we could arrive at definite conclusions in regard to the probable distribution of the silver in depth, particularly as it is affected by secondary enrichment. Without doubt weathering and leaching of the veins have been of very limited effect since the period of glaciation. At a number of places veins have been exposed on the rounded glaciated rock surfaces where the minerals seem to be no more affected by weathering than the hard conglomerate itself, in which the veins show as a shining metallic streak. Such exposures can still be seen on the Lawson and La Rose claims.

Alteration of Minerals

In other places the calcite is leached out of the vein to a depth of several feet and stains of cobalt bloom appear on the vein walls and in the adjoining crevices of the country rock. There are striking exceptions to these conditions, notably in the Nipissing property in vein No. 8 and in the southwest end of No. 49, where oxidization of the vein minerals is considerable, and cobalt bloom occurs in large amount. The bonanza ore in vein No. 49 shows leached cobalt minerals with argentite scattered through it which has every appearance of secondary origin. That this has formed subsequent to the glacial period seems improbable, in view of the limited alteration at other points, as already described. This suggests the possibility that the rich orebodies now under development at various points at the surface, and at moderate depth, may be a part of a zone of secondary enrichment resulting from weathering and metamorphism related to the surface which existed prior to the glacial period. If so, the corresponding zone of weathering has been completely removed at most points, but its lower parts are still remaining at a few points where it extended lower, or where the glaciers cut less deep.

Character of Veins

The Huronian conglomerate is a rock such as the prospector describes as "tight" or "hungry," and would generally be considered "an unfavorable formation." Doubtless the district was thus regarded by some of the earlier visitors. Development has, however, demonstrated that some of the veins fill fissures with well defined free walls with slickensides and other features generally believed to accompany fissure veins. These veins rarely follow a straight course for any distance, but curve erratically, sometimes following the joint structure of the country rock, with a resulting wavy effect in the vein.

Smaller and less important veins are found filling some of the joints of the conglomerate. These are usually small, but filled with vein matter, sometimes a sheet of native silver. Some of these seem to be branches of neighboring veins, but the actual connection is not always evident. In some cases the wall rocks are mineralized and native silver is found in the cracks and joints for a distance varying from a few inches up to three or four feet, in such amount that the whole is shipped

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Thomas F. Cole, president of the Oliver Iron Company, estimates that at least $25,000,000 have been spent in diamond drilling for iron ore on the Minnesota ranges.

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CONIAGAS MINE

NIPISSING ORE IN SACKS AND BARRELS

Petroleum and Natural Gas in Ontario

The production of petroleum and natural gas in Ontario, and the conditions and recent development of the fields, are the subjects of a paper by Eugene Coste in the report of the Ontario Bureau of Mines, just issued. The production of both oil and gas showed a marked increase in 1906, recent fields becoming considerably enlarged and more productive. In the case of oil the Leamington field of Essex county, and the Moore field of Lambton county, account for most of the increase, while the gain in natural-gas production is due to the opening of new pools in Welland and Haldimand counties, from which several cities are now supplied. From the figures supplied by a number of logs of deep wells, which are given, Mr. Coste draws the conclusion that, from Osprey township, in Grey county, to Petrolia, in Lambton county, the strata dip more or less uniformly in a southwesterly direction; but continuing further in the same direction, they again rise more or less gradually. It is thereby demonstrated that the Lambton county oilfields are really in the bottom of a broad deep syncline, instead of being on the Cincinnati anticline, as is often contended. New records of the wells in the Niagara peninsula adduced, as well as others previously published, show that the strata of that peninsula have a more or less constant dip to the south-southeast. As the gasfields of Welland and Haldimand counties are on the flank of that long slope which continues to the south across Lake Erie into New York and Pennsylvania and also to the north across Lake Ontario, it is to be seen that the famous anticlinal theory of oil and gas production is far from being supported by the facts either in the gasfield of the Niagara peninsula or in the oilfields of Lambton county. Disturbances and faults exist in these fields, sometimes bringing up the strata locally in blocks, terraces or sharp folds, but the more or less broad anticlines which the supporters of the theory of the organic origin of oil and gas regard as necessary to the large accumulation of those products are conspicuously absent.

Another result of the drilling recorded in the logs is that both oil and gas have been found in the lower part of the Trenton and right on the top of the Archean formation, which cannot be explained by any other view of the origin of oil and gas than that of volcanic emanations from below, as held by the French school of geology. The practical bearing of this conclusion upon the oil and gas industry is important. In planning future developments in Ontario it is of consequence to know that oil and gas may be looked for in large quantities just as well under the Petrolia oil rock—the Corniferous limestone—as in or above it; and therefore drilling along the fissured oil-belts which traverse Ontario, in exactly the same manner as they traverse Pennsylvania, Ohio and Indiana, will develop similar fields of oil and gas. In support of his conclusion Mr. Coste adduces the facts that in the Leamington oilfield the oil comes from the Guelph limestone, a stratum 1500 ft. below the Corniferous, and that the gasfields of Welland and Haldimand derive their supplies from the Clinton, Medina and Trenton, which are still lower strata.

VEIN NO. 27, NIPISSING MINE

Economy of Gas Power Plants for Collieries

Electric Distribution of Power from a Central Gas-engine Installation Using Waste Gases and Culm Offers Many Advantages

BY FRANZ ERICH JUNGE*

The remarkable and unprecedented development of economic methods of power generation which has been inaugurated in Germany within the last ten years has benefited the iron industry of that country in a measure superior to that exercised on any other branch of production. It has rendered the relation of power production to power consumption, through the preclusion of additional expenditures for costly boiler coal, more economical, and through the judicious utilization of the available gases and other waste within and outside the works, greatly more profitable.

The simple consideration that a saving of only 1 per cent. in self cost of production may amount to an increase of 10 per cent. and more in net profits secured from the sale of the finished goods has been confirmed time and again in the German iron industry. The economic husbanding of available gases has reduced the price per ton of pig iron smelted by from 50c. to $1.25, according to the use or salability of the surplus power, and the price per ton of finished goods turned out by from $3 to $4, according to locality. These figures prove better than can any technical argumentation that the economies to be derived from the application of gas power in the iron industry cannot, indeed, be set aside as a negligible quantity.

Value of Furnace Gases

To point out that the difference in quality of effluent gases from European and American furnaces, which is due to a material difference in temperature of blast, ore analysis, speed of driving, etc., is sufficient to warrant any hesitation, on the part of American iron masters, to follow the example set by the Germans and to utilize these gases directly in gas engines instead of under boilers and in steam engines, means to completely misunderstand the action of the blast furnace as a producer of gas. At the same time it means to underestimate the efficacy of, or the effect which the cleaning process exercises on those characteristics of blast-furnace gas that make it an ideal means for directly converting the kinetic coke energy into either blowing work or electrical power.

Even the extraordinarily poor gases which emanate from the furnaces of copper smelting plants, the calorific value of which does not exceed 400 calories per cu.m., or 45 B.t.u. per cu.ft., are now utilized for the generation of power, the most notable plant of this kind being that of the Mansfeld Copper Company, of Eisleben, Germany, where the available furnace gases are used in Koerting gas engines.

Gas Power in Coal-mining Pursuits

While the paramount importance which these achievements possess in the field of industrial economics is gradually being realized by the metallurgical engineers of all progressive countries, the effect of the application of gas power on the economics of coal-mining pursuits is apparently not yet so well understood and appreciated. It is the object of this study to analyze the possibilities and limitations which confront us when attempting to abandon, in the coal and coke-making industries, the traditional modes of steam-power generation in favor of what is deemed, under certain conditions, the most efficient method of production so far devised, namely, gas-engine driven central station and electric drive all over the works. Conditions differ materially from those which obtain in iron and steel smelting plants in that the factor of power demand within the plant (coal mine and coke-oven works combined) is much less predominant unless such obstacles as excessive depth of shaft, or abundant water influx require an abnormal amount of power for hoisting and pumping. Yet even when the power factor is only a small item in the total operating expenses it must be remembered that every cent saved through economic power generation and transmission in the production of one ton of coal will yield tenfold and more in net profits returned from its sale. The judicious selection of the most economical system to be adopted is, undoubtedly, a complexer problem in colliery work, and especially in such as form side branches of existing plants, than it is elsewhere, on account of the great variety of power sources that are available.

In collieries having coke ovens attached to the mines, which are to transform a certain percentage, usually one-fourth to one-third in European practice, of the annual coal output into coke, there are the following sources of energy which can be used for the generation of power:*

(1) Waste Heat from Non-by-product Retort Coke Ovens

The burnt coke-oven gases when leaving the flues have a temperature of some 1100 deg. C. (2000 deg. F.) which may be used for steam raising. Assuming that an average of 10 kg. (22 lb.) of steam are required per kw. hour, then 10 kg. of coal (22 lb.) charged into the coke oven will give 1 kw. hour.

It can be taken that, approximately, one-sixth of the value of the coal is thus regained through the sensible heat of the gases which are generated and burnt in this type of oven. The best figure so far recorded is an evaporation of 1.4 kg. (3 lb.) of water per 1 kg. of wet coal charged in the retort. This type of coke oven is now being superseded by ovens of superior construction.

(2) Coke-oven Gas for Use under Boilers or in Gas Engines

When burnt under steam boilers in connection with reciprocating-piston steam engines or turbines, an average of 3 cu.m. (106 cu.ft.) of gas (having a heat value of from 2700 to 5750 calories, 300 to 650 B.t.u. per cu.ft.) will be required per kw. hour. When used in gas engines one-third of this amount, viz., 1 cu.m. (35.3 cu.ft.) is consumed per kw. hour. The best result so far attained in Germany is 1 brake horse-power, requiring 2000 calories (7800 B.t.u.), corresponding to 12 cu.ft. of 640 B.t.u. coke-oven gas.

The quantity of surplus gas available per ton of coal, that is, the amount not used for heating the retorts, depends on the grade of coal, on the moisture con tents, and on the type of oven. With the non-regeneration by-product type the av erage is 60 to 70 cu.m. per ton (212 to 247 cu.ft.). On account of the elimination of the by-products in the recovery plant the total power developed by the sensible heat of the burnt gases leaving the oven and the inherent heat of the surplus gases is usually less than what is obtained under 1, namely, 0.9 kg. (2 lb.) of water evaporated per kg. of coal. Of this amount two-thirds is due, approximately, to the sensible heat of burnt gases and one-third to the inherent heat of the sur plus gases. It is difficult to define this ratio exactly.

With the latest regeneration type of by-product oven only the inherent heat energy of the surplus gases is utilized, but their quantity is larger, 140 cm. (4942 cu. ft.) are recorded in Europe, while with the rich American coals up to 5500 cu.ft have been attained in United Otto ovens.

(3) Waste Steam

Through the application of condensing engines this item has recently been much

*The data advanced in the following are based on European and principally on German conditions.

reduced. Especially engines which do continuous service, such as compressors and fans for mine ventilation, can thereby be operated more economically, while with the hoisting engines and others that operate intermittently the saving in steam is less pronounced.

The recent combination of hoisting engines with Rateau steam accumulators or regenerators and low-pressure or exhaust-steam turbines coupled with electric generators gives additional power without added heat cost, the gain being approximately 1 kw. hour from 20 kg. (44 lb.) of waste steam. It is known that steam hoisting engines, with their extremely fluctuating demand for steam, are very wasteful in consumption. The average results show from 50 to 60 kg. (110 to 132 lb.) of steam per shaft horse-power per hour and more. But as low as 29 kg. (64 lb.) have been recorded on German mines, the engines being of modern type and working with an improved admission-governing device.

It has also been found that for hoisting engines, working with full admission and short expansion, condensing does not pay, whereas with engines having an ample range of expansion the connection with a central condensing plant is an advantage. The addition of waste-steam turbines and Rateau accumulators will increase the economic efficiency of the first named type of engines more than it will the latter. In some cases the increased capital outlay will annul the gain in steam economy entirely.

The question is again strictly one of local conditions. By far the best plan for a new steam plant to be erected would obviously be to eliminate central condensation entirely and to install low-pressure steam turbines instead. This is a feasible proposition, provided that the turbines can fully utilize the available steam, and that there is a field for the surplus energy thus gained either within the colliery or outside. We shall enlarge upon this subject further on.

(4) Inferior Grades of Coal and Mine Culm

The relatively better grades can either be burnt under boilers for steam raising or be directly gasified in producers. The generation of steam power requires, with coal-fired boilers, in the neighborhood of 1.5 kg. (3.3 lb.) of coal of 6000 cal. (10,800 B.t.u. per lb.) per kw. per hour. With gas-fired boilers, the gas being made in producers, the same amount and more and often less is used, depending on the character of the particular coal used.

The generation of gas power in gas producers and gas engines requires only 0.75 kg. (1.6 lb.) per kw. per hour, and usually less.

Mine culm is now in almost all collieries stored in huge piles, which occupy an enormous space. With limited floor area, as obtains, for example, in narrow valleys or creeks, it is necessary that the culm be removed from time to time. Under especially unfavorable territorial conditions this may require the building of tunnels, railways, etc. Therefore it is obviously a great improvement to dispose of culm banks by direct gasification of the material in producers, gaining, beside an enormous amount of surplus power at no added heat cost, a welcome reduction in weight and volume of waste that has to be handled, thereby reducing the item of labor which must be expended for that purpose correspondingly. In Germany several collieries are equipped with culm producers, which usually serve as an auxiliary or reserve to other sources of gas generation.

(5) Electric Current

Collieries having no coke-oven plant connected with the mines may use, for producing motive power, electric current from neighboring or distant central stations. This most modern, convenient and economical form of application eliminates the special power-house with its prime movers, generator equipment and reserves, each mine having but a transformer substation from which the various motors for hoisting, pumping, ventilation, etc., are driven.

Old established mines have, of course, all their individual power plants, most of them being laid out as steam-driven electric stations with scattered steam drive of the larger machines. So, electric distribution is only possible when branching out or when opening up new coal-fields. Usually the mine which has the best coal for coking purposes will have a central station equipped with gas-engine driven alternators, the potential of which is to depend on the dimensions of the coal-fields or on the radius of the particular distribution sphere available. The other shafts or places of usage receive their required electric current, according to their respective momentary demands, without having to pay the capital and depreciation charges for special power plants, at the same time having the guarantee of continuous supply and ample reserve.

For equalizing load fluctuations such as occur especially in hoisting service, Siemens-Ilgner fly-wheel sets, which employ the inertia, or, better, the power-accumulating capacity of very heavy fly-wheels, have given great satisfaction in German practice.

(6) Other Fuels

When coal oil or its derivatives are available at low cost a very economical source of power generation is offered by the direct combustion of these fuels in Diesel oil engines.

The use, in colliery work, of oil and natural gas transmitted from a distance may seem paradoxical at first sight. But the question is entirely one of local conditions and load factor. The possibility offered by the application of gas or oil power, of immediate starting, the absence of steam boilers and pipings with their condensation losses, the reduction and practical elimination of stand-by losses, and other factors besides, are to be considered.

No general formula can be laid down, and each problem must be treated separately. Soundness of judgment is the only rule to guide one. Compressed gas and oil fuels may be used either for driving the prime movers in the central station, and having pure electric drive all over the works, or for operating the scattered engines at their respective places of usage. The greater possibility of breakdown, the higher class of attendance required, and the inabilty to carry heavy overloads are some of the drawbacks militating against the latter application and favoring centralization.

Altogether, the combinations designated under 6 are more of a speculative than of a practical nature. Yet they may occur and should therefore be considered in a discussion of this character.

Amount of Power Available

Just how much of the power derived from one or more of the above named sources of energy will be consumed within the plant is entirely a matter of local conditions. None of the data advanced on this subject can be generalized. At best they may serve to give an approximation

FIG. 1. EFFECT OF ADDING EXHAUST TURBINES

FIG. 2. EFFECT OF ADDING EXHAUST TURBINES

power available for outside purposes depends on the coal coked, and the quantity of the coke output, on the type of oven and on the demand for power for operating the machinery within the works.

As an average example of German practice can be taken a colliery in the Ruhr district having an annual coal output of 600,000 tons, of which one-fourth is coked. From waste heat and waste gases a continuous capacity of 3000 h.p. is obtained, of which as much as 2500 h.p., or 83 per cent., and sometimes more, are consumed within the works.

Dr. Hoffman, of Bochum, in commenting on this new system in a paper read before the Verein Deutscher Ingenieure at Berlin, gives the following figures on the performances of compound engines versus such exhausting into low-pressure turbines: With 1.2 atmospheres (17.6 lb. per sq.in.) admission pressure and 90 per cent. vacuum, low pressure cylinders of several hundred horse-power capacity consume approximately 24 kg. (53 lb.) of steam per kw. hour. Low-pressure turbines of over 1000-h.p. capacity, on the other hand, working under the same conditions, give a guaranteed consumption of 18 kg. (40 lb.) of steam per kw. hour.

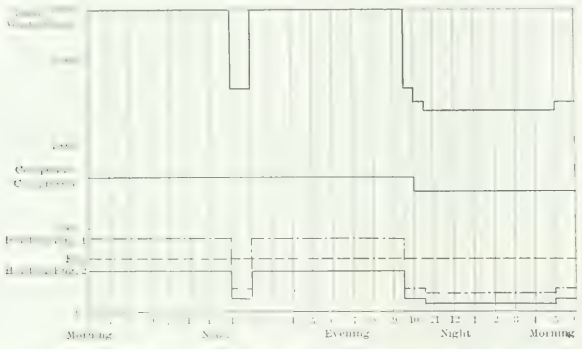


FIG. 3. RELATION OF WASTE STEAM TO POWER REQUIREMENT

The growing introduction of the regeneration type of Otto by-product ovens tends to increase the amount of surplus power available for outside distribution or sale. The largest German colliery, "Rheinpreussen," will shortly have an annual output of 3,000,000 tons, of which one-third is coked. A very conservative estimate shows that 17,000 h.p. can be generated continuously from the coke-oven gases in gas engines. Owing to the small depth of shafts and little water influx, only 58 per cent., viz., 10,000 h.p., will be consumed within the works, the rest being available for outside uses.

The item of surplus power is, with the rich American coals, when coked in the latest type of United Otto by-product oven, even much greater and gas power seems therefore the only legitimate mode of generation prescribed.

Turbines

In order to be able to intelligently discuss the prospects of gas-power application in colliery work, it is necessary to get quite clear as to the possibilities and limitations which confront us in the application of central or direct steam drive, especially since the low efficiency of old-fashioned engines has been greatly improved by the introduction as well of modern condensing steam engines as of the low pressure exhaust or waste-steam turbines.

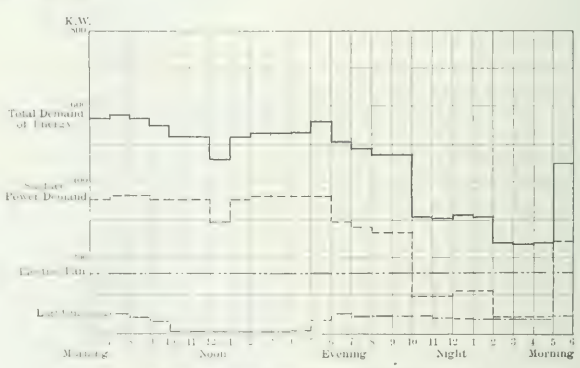


FIG. 4. POWER REQUIREMENT CORRESPONDING TO FIG. 3

Not included are losses due to condensation in the pipings.

Up to the end of 1906 ten plants of the low-pressure turbine type, aggregating an output of 8000 h.p., had been installed in German collieries. The accompanying Figs. 1 and 2 show the improvements that may be effected from the application of low-pressure turbines, with good and with bad engines respectively. Area *I* represents the gain that can be made by condensing, area *II* is the surplus gain effected through the turbines, and area *III* represents the loss which is unavoidable, notwithstanding the new improvement.

It is seen that low-pressure steam turbines can improve considerably on the low efficiency of bad engines, but they can never make good engines out of them. Figs. 3 and 4 show the relation of waste steam available to electric energy required in the Alma mine, which is a branch of the Gelsenkirchener Bergwerks Gesellschaft, having an annual coal output of 600,000 tons.

Since the exclusive adoption of gas power, which means having coke-oven gas engines in the central station, gas producers as a reserve, and employing electric drive for all machinery throughout the plant, eliminates the use of steam boilers entirely, the above reference to the position which the low-pressure and waste-steam turbines occupy at this date in the steam-power problem of collieries will be all that is necessary to say on the subject.

Distribution of Power within the Plant

Before discussing the merits of electric centralization and pointing out the relative advantages and drawbacks of the three principal types of prime movers, piston steam engines, turbines, and gas engines, which may be employed in the power-house of a combined coal mine and coke-oven plant, it may be well to analyze the distribution of uses to which the power derived from the various sources can most advantageously be put within the domain of the works.

Since it has been recognized that a judicious administration must aim toward the utilization of all available waste or low-grade fuel that is produced within the plant before having recourse to costly boiler coal for generating power, the most natural way, in works that coke a sufficient quantity of rich coal, is undoubtedly to use the available coke-oven gases either under boilers or directly in gas engines. The power thus liberated should preferably be consumed at once in the different departments of application: hoisting, pumping, compressing, washing,

duced.

Intermittent Power

Since ... ovens and therefore the generation of power is a continuous process, a combination of this character would only be feasible if we had an ideal plant-load factor, viz., if the utilization coefficient was 1. Unfortunately this is not the case as can readily be seen from Fig. 4. Few of the engines are in continuous operation during the 24 hours of a daily run or during 32 or 36 hours, which constitute the coking period of modern ovens. Among these are the prime movers in the electric central station and the fans for mine ventilation. Sometimes, depending on local conditions, drainage pumps and compressors must also do continuous service.

So it is natural that one will try to connect these continuous users to the continuous sources of power, viz., to the coke-oven gas driven part of the power plant, while such intermittent working machinery as the large hoisting engines will be connected to the other part of the power station, which derives the dynamic medium from either gas producers and engines, or gas-fired boilers and engines.

Though it is possible to store surplus coke-oven gas during periods of low demand in holders, or to accumulate it in form of electrical energy in storage batteries, it is obvious that these provisions mean an increased capital outlay and fixed charges for additional apparatus and ground area, an item which is considerable when the storage capacity shall be large enough to be of real value as a reserve; when employing producers fired with culm or other waste or even coal fired boilers, then the consumption of power and the expenditures for fuel can be more nearly balanced.

The modern coke oven, owing to its capability of subdivision and reliability, is an ideal apparatus or source for the continuous generation of gas, and needs practically no reserves in contradistinction to the blast furnace, when either a coefficient of safety must be introduced in the disposal of the gas, or else a bank of gas producers should be available as a reserve. This leads us to the discussion of another question of vital interest, viz.:

Gas Producer versus Steam Boiler

The effect or importance which the load ... possess in the columns of steam power-plant economics is generally known. It is now also a matter of universal concession that gas producers and engines are greatly more adapted for intermittent working than are steam boilers and engines. The amount of fuel required to keep the gas producer in such a state that it can be put into full work at a few minutes' notice is a mere fraction of the ... with their fires banked.

Where sudden increases in load may occur at any time and full steam pressure must be kept up, the stand-by fuel losses amount, even in the best regulated boiler plants, to 30 per cent. and more of the full load-running fuel, while certain types of producers will stand with air-admission doors almost closed, for one and more days in a condition of preparedness for instant operation, requiring but a few buckets of coal to replenish the fuel bed, and a motor-driven fan which will quicken the fire to full heat within a few minutes after giving the starting signal.

For this reason producers are admirably adapted to serve either as the principal source of gas generation or as a reserve; for example, in blast-furnace work and in the natural-gas region. Their economy of operation is due notably to the fact that such low grades of coal as "culm" may be used as fuel, which cannot at all be utilized under boilers; also to the peculiarity mentioned that they will retain their high efficiency on low outputs; and, finally, to their ample overload capacity combined with the desirable feature that, when properly subdivided into separate units or retorts, and embodying means separate from the engine to automatically vary their output according to the momentary demand, they will stand all the strain exercised upon them by a very fluctuating plant load.

All these advantages of superior economy and simpler operation are now so well known that together with the low initial cost and upkeep, absence of danger from explosion, elimination of smoke nuisance, etc., they are bound to impress themselves favorably on the mind and purse of the intelligent user of power. The ultimate adoption of the suction type of producer has also eliminated the bulky, inefficient and costly gas holder, at the same time obviating the use of special coal-fired boilers for producing the steam that is required in the gas-generating process, and which is now gained from the waste heat of the producer gas. The employment of electrically driven fans, which are automatically regulated from the central station according to the load, for doing the suction work instead of steam ejectors ,has made the engine practically independent of the gasification process, and has increased its capacity in a ratio corresponding to the difference of admission pressures of the dynamic media at the intake.

Electric Centralization

In the majority of cases the power system in combined coal mines and coke-oven plants consists of a central boiler plant which supplies steam to a small electric lighting and power station and to the various large and small engines which are scattered over the plant and serve to ... the ... pumping ... compressing, etc., machinery directly. We shall refer to this form of application as direct steam drive. When gas power became a claimant for recognition in this field and when it was found desirable to generate all the required power from the available gas or waste without added heat cost, the conversion of energy in gas prime movers and the distribution of these engines along the different places of usage seemed the more desirable.

Provided that modern regenerative by-product ovens constitute the coking plant, this system of direct gas drive has even now many points to commend it. In the meantime, however, the situation has assumed a greatly different aspect since, through the rapid development of the electrical industry, and that of the steam turbine and large gas engine, the generation and transmission of electric current, at least within moderate ranges, has become so reliable and economical that we are getting more and more inclined to adopt either one of the two methods: steam-turbine driven central station or gas-engine driven central station and electric drive all over the works.

Red Hematite for Metallic Paint

Hematite suitable for making red paint occurs in certain localities in northwest Georgia and southeast Tennessee, according to E. F. Burchard, of the U. S. Geological Survey, in the forthcoming volume "Contributions to Economic Geology, 1906."

In these localities the Clinton, oolitic, hematite ore occurs in beds too thin to be profitably mined as iron ore under present conditions. As it contains an unusually high percentage of ferric oxide with but little silica and alumina and practically no lime, it is suitable for red and brown paints.

The deposits are too limited and too thin to warrant the expensive equipment necessary for iron mining but the ore is sufficiently valuable as a paint material to bear the cost of mining by hand and hauling in wagons to the railroad.

The ore is ground by paint mills at Chattanooga, a part going to Birmingham firms. The paints made are the reds and dark browns, and a considerable quantity of the ground oxide is sold for coloring sand, lime bricks, and mortars for pressed brick work.

The paint-ore beds at Wildwood and at Estelle, Ga., are near Lookout mountain, the formation consists of about 600 feet of calcareous and sandy shale with some beds of blue limestone, sandstone, and fossiliferous hematite.

The red paint ore produced in Tennessee comes mainly from White Oak mountain and a smaller ridge lying to the east of it. The mines are all within four

The Elmore Vacuum Flotation Process

The British patent 17,816, of 1904, granted to F. E. Elmore, of London, describes a modification of the Delprat and Potter processes for floating metallic sulphides by immersing them in acid solution and so separating them from the gangue. The modification consists in carrying on the process under a vacuum. By this means far more bubbles of gas are generated per pound of acid used, that is to say, the gas given off expands greatly in the partial vacuum formed.

The following is the specification:

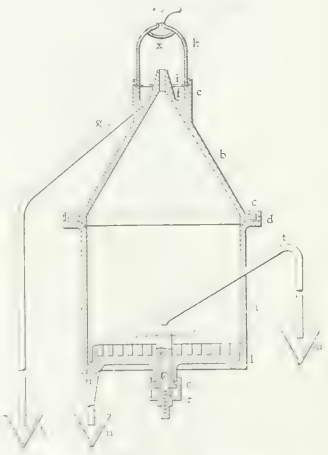
"Processes of separation have been devised which depend upon the circumstances that under certain conditions some of the particles of a finely divided mixture rise or float in a liquid while others sink therein. Among artificial conditions for bringing about such a separation is mixing a pulp of the finely divided material with an immiscible liquid such as tar or oil, with soap or the like, or with an alkali, an acid, air or a gas, or with any of the aforesaid substances in conjunction with each other.

"By the present invention all such processes are improved, more particularly in the respect that a smaller proportion of the added substance, such as oil or acid, may be used, by conducting them wholly or in part under a reduced pressure. For instance, a vacuum or partial vacuum may be maintained in the separating vessel or chamber. The accompanying drawing illustrates in vertical section a suitable form of apparatus; *a* is a vat (constructed of a suitable material to withstand any chemical action of the contained liquid) whose conical cover *b* rests on a washer *c* supported by the flange *d* on the vat. The summit of the cone is perforated and has a flange *e* which forms a circular channel *f* around the summit wherefrom is an escape pipe *g* dipping at its lower end into the vat *h*. A shoulder on the flange *e* receives a washer *i* on which rests a [illegible]

"At the bottom of the vat *a* is a circumferential channel *l* having an escape pipe *m* the lower end of which dips into a vat *n*. Through a stuffing box *o* at the center of the bottom passes a shaft *p* carrying a pulley *r* and a rake of suitable material *s* which is revolved by the pulley in any suitable manner. The teeth of this rake extend to within a short distance of the bottom of the vat, with the exception of the two end teeth which extend to within a short distance of the bottom of the circumferential channel *l*.

"The pipe *t* the lower end of which dips into a vat *u* delivers pulp above the rake at a greater rate than the escape pipe *m* can carry it away so that a part of the liquid escapes through the summit of the cone into the channel *f* and away by the pipe *g*. The cover *k* is fitted with a baffle plate *x* to prevent splashes being carried into the pipe *v* which is connected to an exhauster or air pump. If the vats *h* and *n* be filled with water and the vat *u* be filled with the pulp to be treated together with the separating medium and a suction be applied through pipe *v* the vat *a* will be filled from vat *u* the relative hights of the vats *h n u* and *a* having been properly adjusted to secure this. The pipes *g m* and *t* may be fitted with cocks or valves for regulating the flow or the lengths of the respective pipes may be made adjustable. By means of the air pump or exhauster a suitable minus pressure is maintained in the vat *a* and a continuous passage through vat *a* of material to be treated is secured by proper regulation.

"As the particles to be separated pass through vat *a* some of them settle on the bottom and are transferred by rake *s* to



ELMORE VACUUM CONCENTRATOR

trough *l* and thence by pipe *m* to vat *n*. Other of the particles ascend in vat *a* and pass away with more or less of the liquid through the perforation in the summit of the conical cover *b* thence to the channel *f* and by pipe *g* to vat *h*."

The specification, though not very clear, points to the fact that, by means of the suction of the air pump and the arrangement of the feed pipe and two discharge pipes, the process can be made continuous and automatic. If we take the patent as applied to the Potter & Delprat processes, the amount of acid or acid sulphate used for generating gas by its action on the carbonate of zinc or calcareous matter in the ore will be decreased inversely in proportion to the amount of vacuum used. This should lead to economy of materials used, and should reduce the many disadvantages arising from the use of strong solutions.

The vacuum would also make use of air and gas ordinarily in solution in water, and probably water vapor would also be given off. By aid of these other sources of bubbles, the amount of acid used would be reduced still further.

A report from the manufacturers of the machine gives the results of the first 5-ft. diameter vacuum concentrator in operation, treating low-grade copper ore from an old mine dump in Cornwall. The ore treated assayed 0.54 per cent. Cu; the tailings produced contained 0.11 per cent. Cu, and the concentrates, 9 per cent. Cu.

The capacity of the machine, so far as ascertained, seems to be about 35 to 40 tons of crude ore per 24 hours. The crushing mill used in the test consists of a stone breaker and 10 head of 1000-lb. Californian stamps. The speed is 160 drops per minute, and the screens are of 20 mesh. The battery pulp passes directly from the stamps through a thickening tank to the mixer and is not subjected to any sizing or other preliminary treatment.

Judging by the very low tailings values, it seems probable that the machine would give good results, even with a more liberal feed.

The percentage of concentrates recovered does not seem to influence the working of the machine. A test with zinkiferous tailings from Broken Hill, which has very heavy gangue of garnets and rhodonite and assays 17 per cent. zinc (as blende) yielded about 40 per cent. of the concentrates, and the machine appeared to have as high a capacity as on the low-grade copper ore.

Gypsum in California

There are four gypsum mills in California, according to F. L. Hess, of the U. S. Geological Survey. One is at Amboy, one at Los Angeles, and two at Palmdale. Of those at Palmdale one is still in process of construction.

The product of these mills is consumed in the State and is used mostly for wall plaster, a smaller amount being ground for fertilizer. Usually gypsum runs from 54 to 90 per cent. pure, but deposits occur in the form of alabaster which are very pure and are suitable for the manufacture of plaster of paris; they are far from railroads and so at present are unavailable.

The deposit at Amboy is found in the middle of the Mojave desert, along the tracks of the Santa Fe Railroad. The plant is situated near the bed of an old lake, around the edge of which the gypsum has been deposited.

Plaster usually sets in about 5 minutes and because of this a retarder, often consisting of slaughter-house refuse, dried and powdered, is used, which delays the setting from 50 minutes to 2 hours. There is nothing peculiar about the California gypsum as distinguished from that of other localities. Oil is used as fuel in the gypsum mills of California.

Electrolysis of Gold from Cyanide Solutions

At Reliance Mill, Nelson, B. C., a Solution Temperature of 70 deg. F. Was Employed and High Alkalinity. Precipitation Was Complete

BY DOUGLAS LAY

The method of recovering gold and silver from cyanide solutions, by precipitation on filiform zinc, has for many years held its own, and is the method still in vogue at the great majority of cyanide plants. Electrical precipitation, introduced by Siemens & Halske, though not of such wide application, undoubtedly possesses advantages over zinc precipitation, when the cyanide solutions are very weak, or when they contain an undue proportion of base metals. Briefly, the process consists in the electrolysis of cyanide solutions, by the suitable disposition of electrodes within the solution, whereby the precious metals are deposited upon the cathodes, or negative electrodes, which are usually of lead.

An account of a method of electrical precipitation at the Reliance mill, near Nelson, B. C., for the design and installation of which I am responsible, may be of interest. The solutions generated during the process of milling amount to 150 tons per 24 hours. Consequently, the precipitation facilities have to cope with that rate of flow. It is essential that the solutions prior to the passage through the electrical precipitation tanks be clear, that is, free as far as possible from matter in suspension. It is not the purpose of this article to describe the means by which settlement of slime is effected in this particular case.

Precipitation Tanks

The precipitation tanks are three in number, each 35 ft. long, 5 ft. wide and 3 ft. deep in the clear, and each contains 3500 sq.ft. of cathode surface. The tanks are placed side by side, the rate of flow of the solution through each tank being 50 tons per 24 hours, or approximately 2 tons per hour. With that rate of flow all the precious metals in the solution are precipitated in one passage through the tanks.

After passing through the precipitation tanks the solution flows into a sump, whence it is elevated by a centrifugal pump to a storage tank ready for another charge of ore. The solutions have an average strength of .01 per cent. KCy.

The anodes are of No. 10 sheet iron 5 ft. 1 in.x2 ft. 8 in. They fit into saw cuts in the sides and bottom of the tank. To promote thorough circulation, alternate anodes are raised 1½ in. above the level of the solution, the remaining anodes being fitted into the bottom of the tank. Each alternate pair of anodes, therefore, forms a water-tight compartment, the flow being *over* one anode, and under the next. The distance between the anodes is 3 in. The anodes are inclosed in cheese-cloth to prevent any chance of short-circuiting from possible contact with the cathodes.

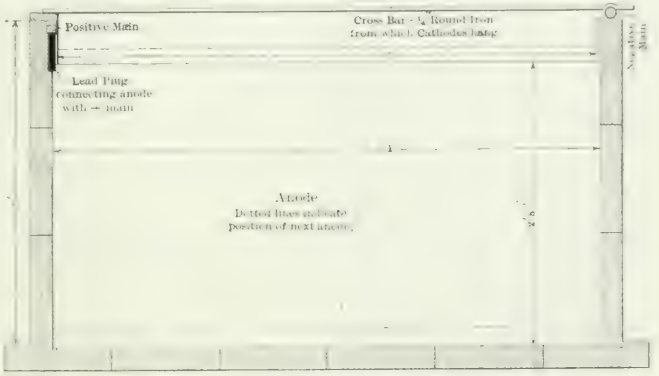
Connections

The electrodes are connected in multiple, the positive main wire running along one side of the tank, and the negative main along the other. The anodes and exposed connections, below the level of the solution are gradually eaten away, if exposed to the action of the current, consequently, these connections must be thoroughly protected. The following simple and efficient manner of connection was devised to this end. The main positive wire, to which each anode is connected, is carried along the top of one side of the tank in a plough-way or groove. The anodes project ½ in. into the sides of the tank, being fitted into saw-cuts. From the bottom of the plough-way in the side of the tank, carrying the positive main, ½ in. holes are drilled to the anodes, and connection established by filling the holes with molten lead, the saw cut above the tops of the anodes being luted with cement. On the side of the tank is tacked a strip of wood ½x3 in., which prevents oxidation of the main wire. On this strip rests one end of each of the cross-bars, which carry the cathodes.

Cathodes

The cathodes are of sheet lead, of approximately the same area as the anodes. They are suspended from cross-bars midway between the anodes. The cross-bars are of ¼ in. round iron, and are supported by the sides of the track, one end resting on the main negative wire. For convenience in handling, each cathode is divided into three portions, each of which weighs about 7 lb. and is suspended from the cross-bar by two strips of roofing tin. The gold and silver are precipitated on the cathodes as a bright coherent metallic deposit.

The cathode sheets are made at the Trail smelter by a patent process, the cost of making them being merely nominal, one man turning out about 500 per shift. They are loaned to the mining company by the smelter, and after immersion in the precipitation tanks for one month, are returned to the smelter, the latter purchasing the gold and silver on a base bullion basis.



CROSS SECTION, PRECIPITATION TANK

[illegible]

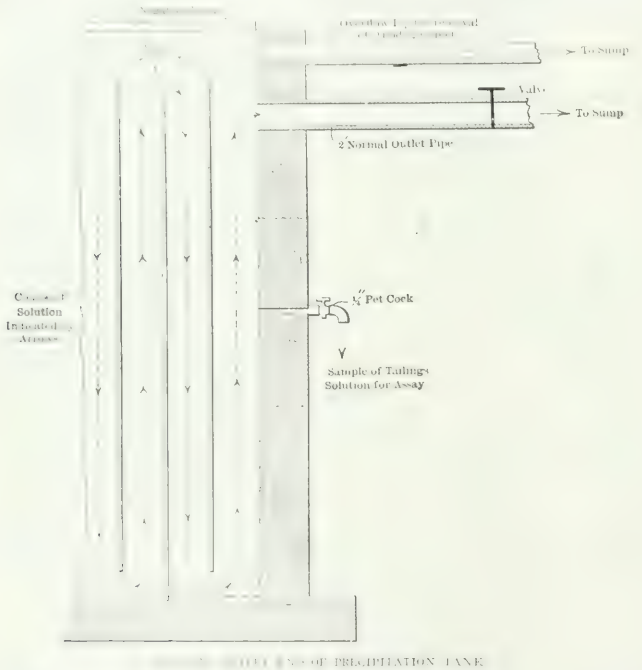
Only a very weak current is needed for precipitation, the pressure being from 4 to 5 volts, and the current density 0.02 to 0.03 ampere per sq.ft. of cathode surface. The anodes are slowly oxidized and eaten away by the action of the current. The anode oxidation product is largely composed of ferric hydrate which rises to the surface of the solution.

The removal of this oxidation product is readily effected by the following means: The normal level of the solution in the

Note—The system here described was in use until the Reliance mill ceased operations several months ago.

*Metallurgical chemist, Silverton, B. C.

which extend to the bottom of the tank. Every alternate anode being 1½ in. above this level, the floating anode product is caught by these projecting plates. The normal outlet pipe is fitted with a valve, and is of course placed at the normal level of the solution. Above the level of those anodes which are raised 1½ in. above the normal solution level, the tank has at its outlet end an overflow or outlet lip. By closing the valve on the normal outlet pipe, the level of the solution can be raised above the projecting anodes, and there is then a direct flow throughout the tank carrying away the floating anode product over the outlet lip into the sump tank.



[illegible] OF PRECIPITATION TANK.

This operation occupies only 2 or 3 min. and the only labor entailed is that of closing and opening a valve. It is done once a shift.

Efficient sampling of the solutions is effected as follows: At the inlet end of the tank, below the level of the solution is a ¼-in. pet cock, which is opened very slightly so that there is a constant drip into a suitable receptacle. An assay of this sample will give the average value of the solution before precipitation during any given period. A similar device at the point where the solution leaves the tank samples the solution after precipitation.

The following considerations are of the utmost importance in the successful application of the process:

It must not be expected that the deposition of gold and silver will be in exact accord with the theoretical principles set forth in text-books on the subject of electrolysis. In practice we are dealing with conditions widely different from those contemplated in a text-book exposition of the laws governing electro-deposition.

In practice we have an exceedingly dilute electrolyte containing an extremely small percentage of precious metals to be deposited. Consequently much of the energy of the current is wasted in the decomposition of water. Two factors of the utmost practical importance confine the current within very narrow limits. These factors are, first, the life of the anodes, and, second, the nature of the deposited metal. The wear of the anodes is the only serious item in the cost of the process. That wear is directly dependent upon the current density employed. The greater the current density, the faster the wear, and consequently the greater the cost of the process. To attempt a rapid deposition of gold by the employment of a high-current density is quite out of the question.

In regard to the nature of the deposited metal, it is essential that the precipitated metal should adhere very firmly to the cathode, so that there can be no chance of mechanical loss by rubbing off the deposit. This firmness of deposit is obtained by employing a low voltage and low current density. It is not advisable to carry a voltage of less than 3, however, as with a very low voltage there is a tendency to precipitate *oxides* of the precious metals, which come down on the cathode as a jet-black deposit, which can be readily rubbed off and might be a source of serious loss.

Apart from the two foregoing reasons, which render the use of a weak current imperative, there is in my experience a tendency on the part of the current to precipitate on the cathode certain of the saline consituents of the electrolyte in the form of a scale. This is hardly perceptible with the weak current used, and does not interfere with the precipitation of the gold and silver; but the tendency increases with the curent density. With a current density of 1 amp. per sq.ft. of cathode surface, the effects are abundantly manifest, and the receptive qualities of the cathode for a metallic deposit are very seriously impaired.

Increase of efficiency of precipitation will not be gained by increase of current, but by *increase of electrode area.* For instance, the practice at the Reliance mill is to carry a current density of about 0.02 ot 3.03 amp. per sq.ft. of cathode surface. Increasing this current fivefold was not found to enhance precipitation at all. Given a certain rate of flow of solution, and a certain cathode area, a certain *percentage* of the precious metals will be precipitated. Provided that the rate of flow remains constant, the percentage precipitation will be independent of the amount of gold or silver present in the solution.

For example, given that a solution before precipitation assays $1.50 per ton in gold, and assuming that a given cathode area results in a precipitation of 80 per cent., so that the solution after precipitation assays 30c. per ton, if a solution assaying 30c. per ton before precipitation were passed through the same cathode area at *the same rate* the extraction would still be 80 per cent., and the solution leaving the tank would assay 6c. per ton.

Ratio of Precipitation

It is practically correct to state that the percentage precipitation is a function of the *rate* of *flow* of solution, and of the *cathode area,* and is *not* a function of the amount of gold present in the solution, or of the current.

To the metallurgist confronted with the most practical aspect of the matter, namely, the precipitation facilities necessary in any given cyanide plant, the following formula may be of use. It is the result of much experimental work.

Let R = rate of flow of solution through the precipitation tank, expressed in *tons per hour.*

Let K = the cathode area necessary to secure practically complete precipitation of the precious metals, expressed in *square feet.*

Then the following equation will hold:

$$K = 1750 \cdot R$$

The equation holds, provided that: first, the electrodes are connected in multiple; second, the electrodes are of equal area;

and there the distance between the anode and the cathode is [illegible].

In calculating the value of A in this equation, it must be borne in mind that deposition takes place on both sides of the cathode; therefore A equals the sum of the areas of both sides of the cathodes.

Effect of Current on Cyanide Solution

The precipitation of the precious metals goes on quite independently of the strength of the cyanide solution. The question of the effect of the current on the cyanide solution is important. In the absence of sufficient protective alkali, there is an appreciable destruction of free cyanide. In my experience solutions containing just a trace of protective alkali lose about 30 per cent. of their free cyanide strength in passing over 3500 sq.ft. of anode and cathode area. On the other hand solutions containing a protective alkalinity of 0.03 per cent. CaO suffer no apparent loss of free cyanide.

Another reason for maintaining a high alkalinity is to retard the formation of Prussian blue. The latter results from the reaction of oxide of iron, formed by the action of the current on the anodes, with any ferrocyanide present in the solution. Prussian blue being soluble in caustic alkali, will not form, or, at any rate, not to anything like the same extent, if the solution is rendered sufficiently alkaline before passing through the precipitation tanks. Moreover, the anode product is then principally ferric hydrate, which rises to the surface of the solution, and may be readily disposed of, in the manner described. Should Prussian blue be formed its removal is more difficult, as it is of greater density than the solution, and accumulates at the bottom of the anode compartments.

There is always a loss of alkalinity in the passage of the solution through the precipitation tanks due to the reaction of Prussian blue with the alkali. The extent of this loss will be governed by the electrode area, and the current carried. By determining the protective alkalinity existing in the solution before and after precipitation, the exact consumption of alkali, due to any given electrode area and current may be determined.

When the solution in a precipitation tank is at rest, that is, when no flow is taking place, evidences of electrolytic action appear uniform throughout the tank; but when there is a continual flow of solution through the tank, the normal condition of things, there is no marked outward evidence of electrolysis at the inlet end of the tank, although deposition takes place on the cathodes. Outward signs of electrolytic action become more and more marked toward the outlet, where they reach a maximum. This is the reverse of what happens in the case of zinc precipitation, and is presumably due to the solution becoming more and more ionized as it passes through the tank.

Surfaces of Cathodes

It is essential that the surfaces of the cathodes be free from any trace of grease or oxide. At the Reliance mill the practice is to dip the lead sheets momentarily in a slightly acid solution of zinc chloride, before placing them in the precipitation tank.

The anodes and cathodes should be of similar shape and of the same area. Nothing will be gained by having the cathode of greater area than the anode, since deposition on the cathode is confined to an area similar and equal to that of the anode.

The solutions at the Reliance mill are maintained at an average temperature of 70 deg. F.

In the application of electrical precipitation at the Reliance mill, the following features were rendered strikingly evident: Precipitation is practically complete. Tailings solutions assay from a trace to a few cents per ton in gold. All assays of solutions for gold were made by the evaporation method, 10 assay tons being taken for the assay. The amount of attention required is very small. A "clean-up" can be effected easily. Cathode sheets may be removed at any time, and replaced by fresh ones, without interruption of the process.

The fair terms offered the mining company by the smelting works at Trail, in the matter of lending the cathode sheets contributed largely to the financial success of the process.

Detection of Willemite by Phosphorescence

By [illegible]

That the interesting laboratory phenomenon of today may become the valued engineering asset of tomorrow has recently received demonstration in a new quarter. It has been known for some time that specimens of certain minerals from particular localities, among them diamond, kunzite, fluorite and willemite, show, when illuminated by ultra-violet light, a marked phosphorescence; but it has remained for George C. Stone, chief engineer of the New Jersey Zinc Company, to apply this physical fact to the practical working of his concentrating plant.

Franklin Furnace, N.J., is noted for the wide variety of its minerals, but the bulk of the zinc ore is a granular mixture of franklinite, zinkite and willemite, the principal gangue minerals being calcite and garnet. The ore first goes under a magnetic separator, the first pole of which removes most of the franklinite, while the second attracts the garnets and the remainder of the franklinite, leaving a mixture of zinkite, willemite and calcite to be separated by subsequent wet processes. The zinkite gives no trouble, but the willemite, having a comparatively light weight, tends more strongly to pass off in the tailings. The amount of its presence in the tailings has been a matter of considerable uncertainty, since the willemite has no striking characteristics to distinguish it from calcite, especially in the sand tailing of a fine jig or a table. The duskiness of the average jigging room, too, adds to the unreliability of a visual inspection. The detection of willemite in the mill tailings has now become the easiest part of the operation, thanks to this peculiar behavior of the mineral under ultra-violet light.

The apparatus is simple. Two heavy, half-round copper bars, insulated from each other, are held together at one end by a porcelain tube, which serves as a handle and as a container for resistance coils. The other ends are separated by a space of 3 in., making a thing much like a large tuning fork, about a foot long. Each prong is drilled, not far from its end, and a wrought-iron screw, provided with a milled head, is inserted through each, the points of the two screws abutting near the middle. The handle ends of the copper bars are connected with the two wires of an ordinary 110-volt electric-lighting circuit.

When the current is turned on, an arc forms between the iron poles, the light of which is rich in actinic, or ultra-violet rays. If this arc is then brought to shine upon a crushed ore containing willemite, the fragments of this mineral will glow brightly with an apple-green luminosity, standing out sharply by contrast with the fragments of the inert materials. Some specimens of the Franklin Furnace willemite are so violently affected by the phosphorescenece that they continue to glow for some moments after the excitation has ceased.

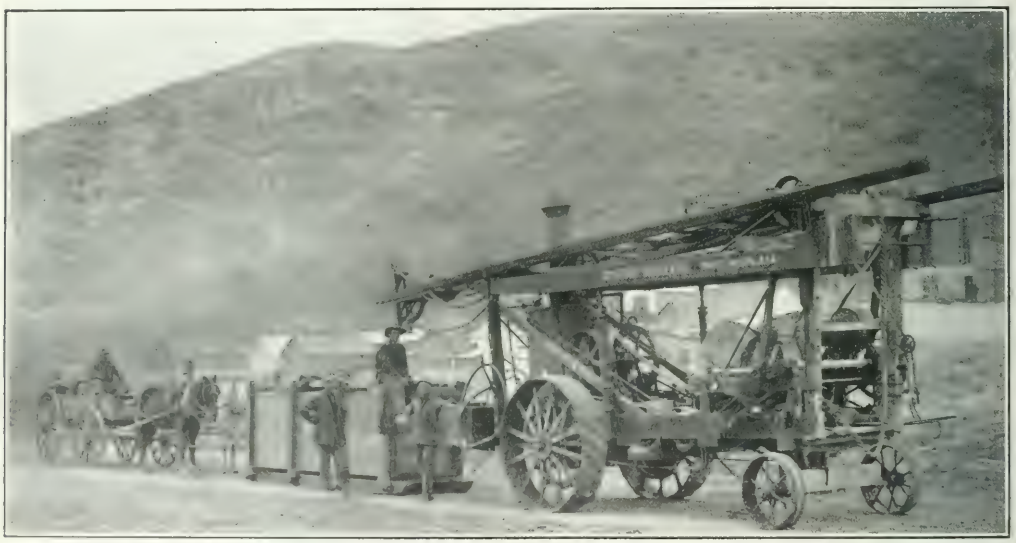
This detector has revealed some unsuspected features of milling operation. It was generally supposed at Franklin Furnace that the coarse jigs were less efficient in saving willemite than the fine, whereas the tailings from the fine jigs are now seen to be the richer in willemite, and the system of crushing and sizing has been modified accordingly. The darkness of the jigging room is now an advantage instead of a drawback, so far as concerns the detection of losses, since it aids the luminosity of the zinc material. It is possible not only to detect the presence of willemite in a tailing, but to gain a close idea as to its amount, so distinctly can the mineral be seen by this means. Indeed, as a control over the tailings, this method of inspection is even more serviceable than a chemical analysis, since some of the tailing minerals, whose rejection is eminently desirable, contain zinc. They do not, however, respond to the ultra-violet light.

*Mining engineer, [illegible], New York.

Prospecting with Keystone Drill for Copper Ore in the Ely Nevada District

By C. E. Hart

The ore deposits of the Ely district are extremely favorable for locating and developing with a churn drill. They consist of large irregular bodies of sulphide ore, with an average of about 2 per cent. copper and a little gold. Having had an extended experience with these drills in the Joplin district, where the lead and zinc deposits occur in a similar form, I was requested by the Ely Central Copper Company to ship two No. 3 Keystone drills to Ely and place them in operation.



KEYSTONE DRILL IN TRAVELING RIG.

The order for these machines included an equipment of tools and spare parts, as also a complete outfit of fishing tools to recover any lost in drilling.

The drills arrived at Cherry creek, the terminus of the railroad, on July 29, 1906, and were taken overland to Ely, a distance of about 60 miles. In moving the machines the greatest trouble was experienced in keeping them supplied with water, and this finally necesitated the use of teams for the last part of the distance.

As these drills are operated by steam, the question of water supply was a serious one. The few shafts that have been sunk to the water level had but a small flow, and there are very few springs in the district. A temporary supply was secured from the pipe line of the Nevada Consolidated Copper Company, and later a complete gasolene pumping plant was installed in a hole that had a fair flow of water at a depth of 65 ft. The drills required an average of 8 bbl. of water for each shift of eight hours, and an average of ¾ cord of wood for the same time, the wood being soft white pine and cedar.

The drills were set up and started on the Webber claim of the company on Aug. 17. The first hole was completed to a depth of 308 ft. on Sept. 9. The drills were operated a part of these 23 days on 10-hour shifts and a part of the time on 8-hour shifts. Including all the time expended on the hole, the average number of feet drilled per shift was 13.3. The average depth drilled per shift while the drill was actually in operation was 19.5. In drilling about 5000 ft. we later found the average, including all the time lost in moving and erection at a new location, to be about one foot per hour.

The greatest amount of drilling done on one shift was 54 ft. in 9 hours. This was entirely in rhyolite, a formation that is ideal for this sort of work. It drills very easily and is homogeneous enough to retain its shape without caving. The porphyry is too soft to stand up under the wash of the water in the hole and caves badly. The limestone formation is almost always tilted enough to make the drilling of a straight hole a very difficult matter. In these last two formations it is necessary to keep the hole carefully cased off.

As it happens the easy ground to drill, rhyolite, has never been known to carry anything of value, and so far the limestone has shown but few traces of ore. The orebodies developed are entirely in the porphyry formation. Some of the holes have penetrated the rhyolite and gone into the porphyry below, but they have without exception shown material of little value.

Expense and Weather

In January and February the cost of everything is at least a third more than during more favorable months. Portable houses have been erected around the drills and the men work regardless of the weather, but the cost of all supplies and outside labor are much higher in the winter.

In wet weather there are practically no roads and then teams must be used to help the traction gears move the rigs. In the summer it costs about $60 to move from one location to another; in winter the cost is increased to $150 to $200. All this adds to the cost per foot.

When the first two No. 3 machines were ordered, a maximum depth of 350 ft. was expected to be sufficient, but it was found advisable to go to greater depth, and three additional machines were ordered. These are of the same type, but two sizes larger, known as No. 5. The No. 3 drill weighs about 5000 lb. less than the larger machine, but it is too light for the rough work and a greater depth than 400 ft. These rigs are equipped with traction gears and cog hoists.

After watching the operation of these machines, twelve others of the same type have been purchased for development work on neighboring properties; it is more than probable that at least twenty of these drills will be in operation in the Ely camp during the coming summer.

As the value of the drilling depends en-

tirely upon the accuracy of the sampling. [illegible] after the drill is in the ore bearing formation, is put in large iron wash tubs. The water is then evaporated off, by means of a slow fire and after the contents are thoroughly dried the sample is crushed fine, quartered, and an assay sample of about 10 lb. is sent to the chemist.

The sulphide ore is found at a depth of about 80 ft., and extends down to 200 and 300 feet.

Costs

The costs of two holes, one drilled in September and the other in February are given in a table at the end of this article. The first hole had all weather conditions in its favor, in the second case the conditions were unfavorable; the first is in rhyolite, the second in porphyry. Twenty holes were put down for this company with a total drilled depth of 3294 ft. These holes were drilled in September, October and November, and the costs were much less than for the same work in the winter time. It is calculated that the items of maintainance and depreciation shall be large enough to write off the first cost in four years.

COST OF DRILLING. FIRST HOLE.

NUMBER OF DAYS, AUG. 17 SEPT. 9, 23 DAYS.

SIX DAYS, 10-HOUR SHIFTS.	
One drill man at $125 per month...	$24.18
One drill helper at $100 per month	19.32
SEVENTEEN DAYS, 8 HOUR SHIFTS.	
One drill man at $125 per month...	68.51
One drill helper at $100 per month	25.76
One drill helper at $120 per month	36.00
Fuel, ¾ cords per shift @ $4.50 per cord	77.51
Water, 8 bbls. per shift at $6.50 per day	100.75
Oil, 1 gal. engine, 1 gal. cylinder...	2.20
Blacksmith coal, 200 lb. at .85¢ per 100	5.40
Miscellaneous charges..	162.65
	$534.48
Average cost per foot for 308 feet.	$1.73 5

SECOND HOLE.

NUMBER OF DAYS, FEB. 6, MAR. 7, 29 DAYS.

Three drill men at $4 per shift.....	$107.50
Three helpers at $3.25 per shift....	108.80
Superintendence	86.40
Blacksmith coal	8.80
Oil, engine and cylinder	3.18
Water	72.10
Wood	72.10
Maintenance, depreciation	14.33
	$478.31
Average cost per foot for 160 ft.	$2.98.

Six days time was lost on the second hole while waiting for casing. The porphyry caved badly preventing the gaining of greater depth. More than one third of the total time was taken up in casing the hole.

The British House of Commons, on March 22, by 150 to 110 votes, rejected the bill purposing to introduce the metric system into Great Britain. Lloyd-George, president of the Board of Trade, in behalf of the Government, said the adoption of the system would be a dangerous and costly experiment by which Great Britain would lose the advantage which she now possesses in foreign markets over her metric system competitors.

Treatment of Tonopah Ore

In 1905 the Montana-Tonopah Mining Company forwarded trial shipments of ore to various metallurgical establishments in California and other Western States with the view of arriving at the most suitable method of treatment of Tonopah ore which is a dry auriferous-silver ore. The results were not very satisfactory, so Francis L. Bosqui, the well-known cyanide expert of San Francisco, was called upon for advice. According to a recent statement issued by the company, Mr. Bosqui has reported as follows:

"In the early part of 1906 I directed a series of milling and cyaniding tests on a carload of average milling ore from the Montana-Tonopah mine. These tests were made in San Francisco, and were completed at the time of the fire; but all records of this work were destroyed. The average extraction obtained by concentration and cyaniding was 87 per cent. Later in the year I supervised another series of tests in Denver on a carload of similar ore and confirmed the results obtained in the San Francisco tests, obtaining the same average extraction, and, by renewing solutions during agitation in the cyanide work, obtained a recovery of over 90 per cent. I doubt, however, if the latter result could be attained in actual milling without prohibitive cost per ton, and consider that an extraction ranging between 85 per cent. and 90 per cent. is the best that can reasonably be expected from the mill.

"On the basis of these experiments a 40-stamp mill was designed in the fall of the year, and the orders for machinery and supplies placed. The process decided upon is as follows: Crushing to ¾-in. ring in a series of Gates gyratory crushers, using one No. 5 and two No. 3 machines. The ore is elevated to the mill bins on a belt conveyer, whence it passes to eight batteries of five stamps each, provided with 12-mesh wire screens. It is expected that the service of these stamps will be between 150 and 200 tons in 24 hours. The product from these stamps is classified, the coarse material passing to eight Wilfley tables, while the slimes and fines go to two Dorr classifiers which precede the tube mills. The tails from the Wilfleys also go to these classifiers, whence the coarse product goes to the tube mills for regrinding. It is proposed to grind to 150 mesh in these mills, of which there are two, each 5x22 ft. The reground product from the tube mills joins the overflow from the Dorr machines, and the whole product then passes to two large cone classifiers. The underflow from these cones goes to 16 Frue vanners and the overflow joins the stream of tailings from the vanners and runs to the settling tanks in the cyanide plant. From the settlers the pulp is taken as required to the agitators, of which there are six of the Hendryx type. After agitation in a cyanide solution the pulp is drawn off to a large reservoir, where it is stored for filtering by means of the Butters vacuum filtering process. The gold- and silver-bearing solutions recovered from the Butters filter will be precipitated on zinc-dust in the Merril precipitation press, which has been so successfully used at the Homestake mine.

"All lumber and equipment for the mill were promptly delivered, but the work has been seriously delayed by several consecutive weeks of bad weather, during which time work had to be suspended. Lately, however, good progress has been made. Under favorable conditions this mill would have been finished about April 15, but it is doubtful now if it will be ready much before June 15.

"This mill will be thoroughly modern in all respects and embody the latest practice both in milling and cyaniding. Owing to uncertain labor conditions, as well as the high cost of labor in the Nevada fields, it was difficult to estimate the total cost of labor on the mill. Moreover, the working drawings were not completed until some time after the order for the bulk of the machinery had been placed; and consequently it was impossible to submit an accurate estimate of the cost of the mill, which would include the building proper, shafting, belting, piping, etc., and many other details which developed in the course of working up the drawings. The first provisional estimate placed the probable cost at $150,000, but the mill will cost in the neighborhood of $200,000 when completed."

In addition to the above mill the Tonopah Mining Company is erecting a 100-stamp mill at Miller's Siding, 17 miles west of Tonopah. At present 60 stamps are in operation and the returns are reported to be satisfactory. Another unit of 20 stamps is nearing completion and in the course of a few weeks the mill will be operating 70 stamps with a capacity of 400 tons daily.

In addition to the above mills the Tonopah Mining Company is also operating a small plant in Tonopah, known as the Midway mill.

The *Revista Minera* states that an amalgamation of the San Miguel Copper Company, Huelva Copper and Sulphur mines, Peña Copper Company, and San Platon Company, in the province of Huelva, Spain, is under consideration. The scheme emanates from the Compagnie Auxiliaire des Mines and the Metallgesellschaft of Frankfort. Negotiations are not yet concluded, but it seems certain that the San Miguel and Peña companies will be amalgamated under direction of the Compagnie des Mines d' Or at de l'Afrique du Sud.

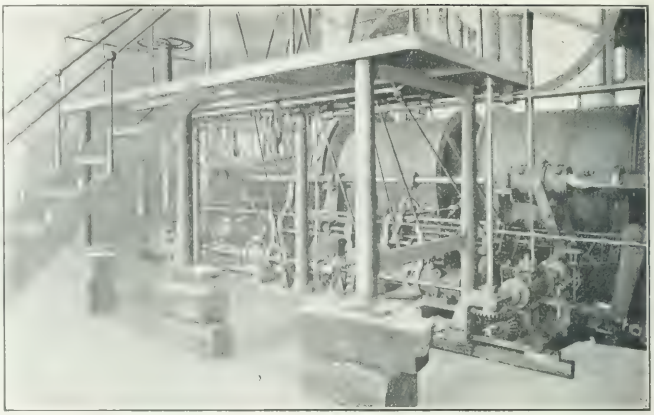
The Sullivan-Corliss Hoisting Engine

The Hancock Consolidated Copper Company has recently ordered from the Sullivan Machinery Company, of Chicago, a hoisting engine to be used for sinking the principal shaft at its mines, Hancock, Mich., and for permanent service, after the shaft is completed to its final depth of 4000 ft. The hoist will be of the first motion, heavy duty, Corliss type, with engines 24 in. in diameter by 48 in. stroke, and will have two loose drums 8 ft. in diameter by 9 ft. long, driven by band friction clutches, and designed for hoisting in balance. The drums will be grooved for 1¼-in. steel rope, and the maximum hoisting speed under full load will be 3500 ft. per min. The clutches and band brakes will be steam operated, with automatic compressed-air substitution in case the steam pressure falls below a given point, owing to accident or for other reasons.

The hoist will be fitted with the Sullivan patented automatic throttle-closing device and interlocking automatic stop. The steam will be automatically shut off at a fixed distance from the top of the shaft, allowing the engineer to bring the cage to a stop at the desired point, by use of the brake. In case the engineer, for any reason, fails to set the brakes, they will be set automatically at the proper point, to prevent an overwind.

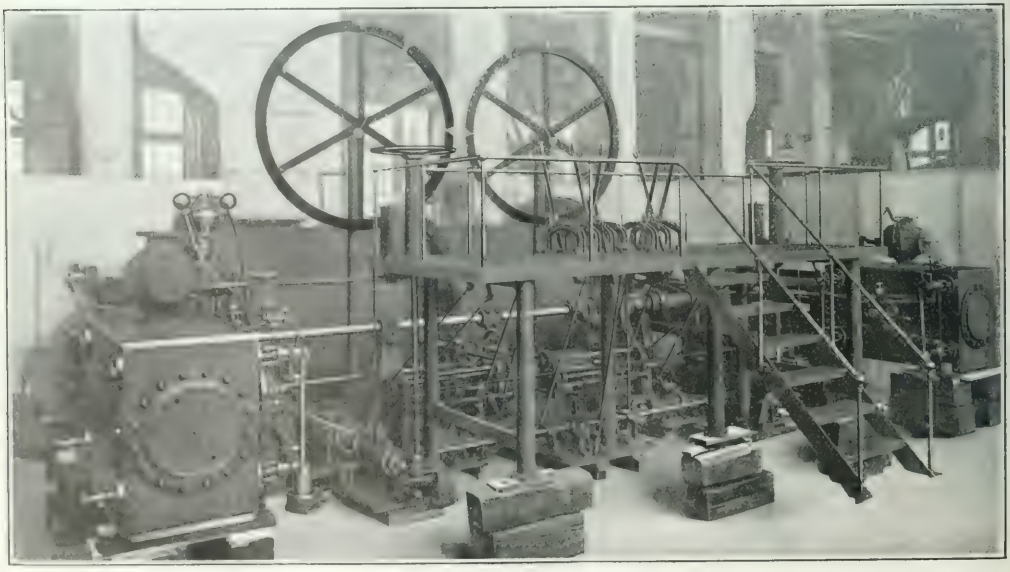
The throttle-closing device consists of a traveler on a spiral screw. This traveler is connected to [illegible] son with the drum. When it reaches a certain point in its travel, it automatically throws a lever which shuts off the steam. The brakes are set in a similar manner, in case the engineer fails to apply them in season to stop the hoist at the dump. When this occurs, a dog is released which locks the mechanism so that steam cannot be admitted until the engines are reversed, and the engineer leaves the platform and replaces the dog by hand.

As to the practical efficiency of the automatic-stop mechanism it is said that the manager of one of the large mines in the Lake Superior iron region, where it has been in use for some time, has such confidence in it that when he has visitors at his mine he instructs the engineer to start the hoist under full working conditions, then calls him off the platform and lets the hoist do the rest.



SULLIVAN HOISTING ENGINE, AUTOMATIC-STOP MECHANISM

According to the *Electrical Review* investigation has shown that various alloys of manganese, copper and aluminum possess magnetic properties, although they contain no metal of the so called magnetic group. These alloys have upset the theory of magnetism formerly held. The most promising view now is that magnetism is a molecular property, a property of groups of atoms or groups of molecules rather than of single atoms alone.



SULLIVAN CORLISS HOISTING ENGINE

Reverberatory Smelting Furnaces of the Washoe Plant

The reverberatory furnaces of the Washoe works, described by members of the Anaconda Copper Mining Company [illegible] number. They are coal-fired and the hearth dimensions are 19 ft. in width and from 102 to 116 ft. in length, with a grate area of 8x16 ft. and a smelting capacity of 300 tons per 24 hours, on natural draft.

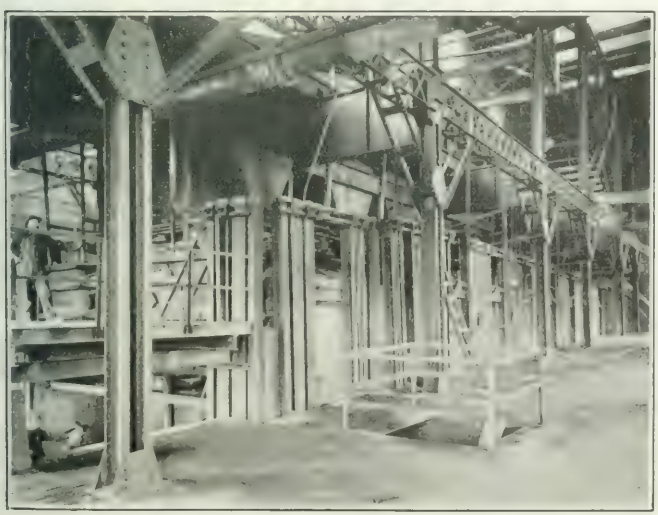
The fuel used is Diamondville coal, shipped from the mines in Wyoming, owned by the Washoe Copper Company. The coal is dumped into hoppers that have four points of discharge directly over the fire-box. It is the custom here to charge the furnaces from the first two hoppers next to the bridge-wall of the furnace and to use charges weighing about 15 tons.

The flame, after leaving the furnace, passes through two 375-h.p. Stirling boilers, in tandem, which reduce the temperature of gases going to the main flue to about 600 deg. F. By this means 600 h.p. are obtained from each furnace from the waste heat.

The slag is skimmed from the reverberatories twice in 8 hours; it is allowed to accumulate until its depth is from 3 to 4 in. above the skimming plate in the front of the furnace and then skimmed into a stream of slum water, which granulates and sluices it through a cast-iron-lined launder to the slag dump. By allowing the slag to accumulate in the furnace in this manner it is possible to skim the furnace very rapidly, as much as 60 tons of slag being removed in 20 minutes. By this method the actual use of a rabble to pull the slag is avoided, the rabble being used to keep the bay clear of floating pieces of unfused silica and to prevent the flow from being more rapid than the water can handle properly.

The matte is kept down some distance [illegible] the skimming plate [illegible] possible to pull out any of the matte, thus avoiding explosions. The matte is tapped from the side of the furnace, through copper tap-hole plates, and run through cast-iron launders, lined with silicious material, to hot-metal ladles of 10-ton capacity and taken to the converters. The brick used in the reverberatories are manufactured by the brick department of the company, located in Anaconda. The silica brick of that portion of the roof immediately over the fire-box and for a distance of 30 ft. from the fire-box lasts nine months and more. The remaining part of the roofs is still in good shape, having been in operation for two years. The brick are 15x6x3 in. It is the practice to clay, or fettle, the bridge-wall and sides where needed every 30 days. The bridge-wall plate is kept cool with a circulation of air by a pipe connection to the main flue.

SKIMMING REVERBERATORY FURNACE, WASHOE SMELTING WORKS



REVERBERATORY FURNACE, WASHOE SMELTING WORKS

"Bort" Diamonds may Enter Duty Free

The Court of General Appraisers has decided that "bort" diamonds are entitled to enter, duty free, into the United States. The case decided was that of the General Electric Company, which had protested against a duty of 10 per cent. on the ground that the diamonds were for industrial purposes and not for jewelry. Importers contended that, although the stones were diamonds, cut but not set, they were a particular kind of diamonds known at "bort" and as such, were entitled to free entry under paragraph 545.

It is understood that a case will shortly be heard involving the proper classification of miner's diamonds which, under the peculiar phraseology of paragraph 545 would seem to be excluded if cut, split or otherwise advanced in value or condition.

Up to April 1, 1906, there were in German mines and metallurgical works 391 gas-engine plants, with a total capacity of 416,000 h.p., the largest capacity of a single gas engine being 5000 horse-power.

Mining in the Cumberland Gap Coalfield

This Kentucky District Promises to Become an Active Competitor in Supplying the Markets of the Southern States

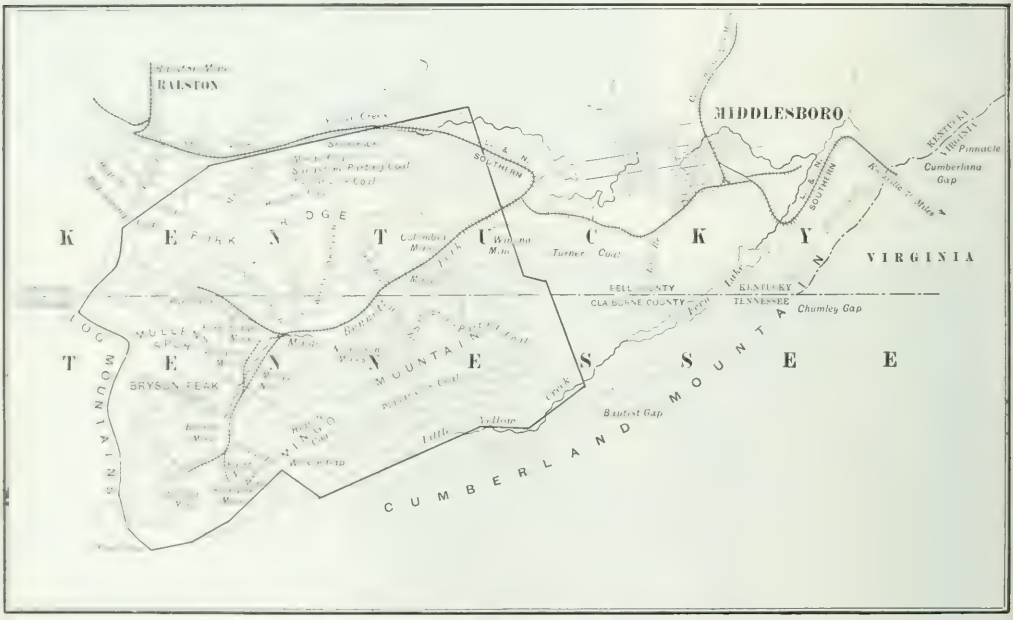
BY JOHN LEGGETT PULTZ*

The Cumberland Gap coalfield lies in the central portion of the Appalachian coal basin in the southeast corner of Kentucky and in Claiborne and Campbell counties, Tenn. It is a long, narrow basin varying from 15 to 20 miles in width, and extending in a northeast-southwest direction for a distance of about 90 miles along the eastern portion of the Appalachian coal basin. The field includes a deeply dissected region, made up of ravines and steep ridges, which attain hights of 3000 ft. in the vicinity of Cumberland Gap.

Louisville & Nashville railroads, penetrate into the heart of the coal measures. Delevopment of the district began with the completion of the railroads in 1892. The mines are tributary to Louisville and Cincinnati by the Cumberland Valley branch of the Louisville & Nashville Railroad, and to Knoxville by the Southern Railway.

Geological Sequence

The coals of the Cumberland Gap field belong to the Pennsylvania series. There



MAP OF BENNETT FORK DISTRICT, CUMBERLAND GAP COALFIELD, KENTUCKY

Transportation Facilities

Owing to restricted transportation facilities, mining development has been mostly confined to that portion of the field lying about two miles west of Middlesboro, Kentucky. The district in which active mining operations have been carried on may be defined as comprising Mingo Mountain, Bryson Mountain, and Fork Ridge. This district is made accessible by way of Bennett and Stony Forks along the deep ravines of which the railroads operated jointly by the Southern, and

are six or seven workable seams of coal, which underlie considerable areas in the district just defined. The condensed section, Fig. 1, shows the principal seams and the intervals between them.

GEOLOGICAL SEQUENCE OF THE SEAMS.

Red Spring coal	5 ft.
Interval	440 ft.
Lower Hignite coal	5 ft.
Interval	300 ft.
Klondike Coal	5 ft.
Interval	50 ft.
Poplar Lick coal	4 ft.
Interval	230 ft.
Sandstone Parting coal	4 ft.
Interval	285 ft.
Mingo coal	5 ft.
Interval	440 ft.
Upper Bennett Fork coal	4 ft.
Interval	8 to 16 ft.
Lower Bennett Fork coal	4 ft.
Interval	200 ft.
Turner coal	4 ft.

The Turner seams outcrop on the extreme eastern slopes of Mingo mountain, and a short distance west disappear beneath the surface. They are not seen again in the district, for they underlie the surface at considerable depth. These seams must therefore remain unknown quantities over the greater part of the district under discussion until careful drilling tests are made. The further exploitation of the Turner seams, however, would not be practical for some years to come as there is abundant coal in the numerous beds outcropping higher in the hills which are accessible and afford better opportunities for economic mining. The only place where this coal is worked is at the Turner mine, about one mile southeast of Middlesboro.

The Bennett Fork seams lie about 200 ft. above the horizon of the Turner coal. They occur near the base of Fork Ridge and Mingo mountain, outcropping along their eastern escarpments and extending

up Bennett fork and Stony fork until [illegible] enough to expose them.

The Mingo Seam

The Mingo seam lies about 440 ft. above the Upper Bennett Fork seam. This is the lowest coal geologically that has practically a continuous outcrop in the district. Until 1903, the Mingo seam supplied the greater part of the output of the operations tributary to Middlesboro. The seam has a large acreage in Fork Ridge, Log mountain, and Mingo mountain. The best development of this coal is in the central part of the district where it yields from 4 to 5 ft. of workable coal. It shows one persistent parting a little below the center which varies from 6 to 8 in. in the mine now working this seam and attains a thickness of several feet near the boundaries of the district.

In character, the Mingo coal is soft and in consequence, the percentage of lump coal is small unless great care is taken in mining it. It makes an excellent steam fuel. At the Mingo mine it is washed and converted into coke. This is the only coking plant in operation in the district. The volatile combustible matter in this coal is high, and it should therefore be a good gas producer. The accompanying analysis compares the Mingo coal and the famous coal of the gas coal zone of the Pittsburg seam, near Monongahela City, Penn.

ANALYSES OF TYPICAL COALS.

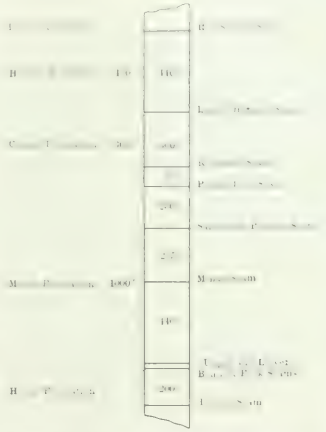
	Mingo Seam.				Pittsburg Seam.	
Moisture	4.40	0.12	3.11	0.91	1.225	1.280
Volatile Matter	32.80	37.88	32.65	34.24	34.369	38.105
Fixed Carbon	56.60	58.00	59.83	58.07	56.95	54.383
Ash	6.20	4.00	4.41	6.78	6.132	5.440
Sulphur		0.824	0.824	0.750	1.076	0.792

The Pittsburg seam at the locality mentioned has the reputation of being one of the highest grade gas coals in the country. The Mingo seam will probably not stand transportation as well as the Pennsylvania coal, but in other respects the analyses show it compares favorably in character with that of the Pittsburg seam. The low sulphur content in the Mingo seam is an important advantage in the manufacture of gas.

The Mingo seam is very soft and in consequence practically all the coal is mined by the pick without explosives. It is customary to mine first in the several inches of the soft seam or dirt band which occurs near the center. The dirt band is very soft and is mined rapidly. It is first dug out and thrown back behind the miners where it will not be mixed with the coal. The top coal is then easily picked down, or falls of its own weight as is often the case, and afterward the bottom coal is taken up by picks or wedges. If the seam is mined with care, there should be a fair proportion of lump coal.

The Sandstone-Parting coal is the next seam above the Mingo which is now being worked in the district. This is the middle coal seam on Mingo mountain coming about half way between the Poplar Lick and the Mingo coals. The seam ranges from 3 ft. to over 5 ft. in thickness and is characterized by a thin sandstone parting the position of which varies in different parts of the field. In Mingo mountain there are three partings, two near the top and one near the bottom. In some localities these partings might make it impracticable to mine the entire seam.

The Sandstone-Parting seam is harder than the other coals mined in the district and should yield a larger percentage of lump than the Mingo seam. It is an excellent domestic and steam coal, low in sulphur, high in fixed carbon, and a fuel



SECTION SHOWING GEOLOGICAL SEQUENCE IN CUMBERLAND GAP REGION

ratio of 1.7. The ash content is probably somewhat higher than in the Mingo coal. The specific gravity of this seam is higher than that of the Mingo seam. As the miner is paid by the car and the mining rate is the same for the two seams, the initial cost of the Sandstone-Parting coal is somewhat below that of the Mingo seam.

It has been customary to shoot the seam in the solid or mine the coal on the mining seam near the top and afterward shoot. The former method shoots the coal to pieces and requires a large amount of powder which means a smaller profit to the miner. This seam is well adapted to electric chain machines which necessitate a good roof so that the rooms can be driven wide while the hardness of the coal makes it unsuitable for pick mining. The present mining rate for this seam is 40c. per ton for coal shot in the solid. The rate for machine coal is 30c. per ton. The pick rate for entry coal is 82c. per ton on a basis of $1.25 per yard and 40c. per ton for the three tons of coal to each yard. The cost of entry coal by machine mining on a basis of 32c. per ton would be 77c. It will therefore be seen that under favorable conditions of machine mining there should be a higher economic efficiency by the reduction in the initial cost of both room and entry coal.

The Poplar Lick seam occurs about 250 ft. above the Sandstone-Parting coal and is held in Fork Ridge, Mingo mountain, and Log mountain but does not underlie as large an area because of its higher elevation. The Poplar Lick is considered as a 4-ft. seam on Stony fork and generally workable and from 3 ft. to 4 ft. in thickness on Bennett fork.

Other Seams

The Klondike seam lies about 55 ft. vertically above Poplar Lick coal. It outcrops continuously in Fork Ridge, Mingo, and Log mountain as is the case with the coals between it and the Bennett Fork seams. It varies from 4 ft. to 6 ft. in thickness with a probable average of 4 ft. on Bennett fork and less than 4 ft. on Stony fork.

The bulk of the Hignite seams lie in Log mountain and Fork ridge, for there is only an isolated round top which holds this coal on Mingo mountain. The Lower Hignite coal ranges from 41 in. to 69 in. in thickness.

This seam is worked at the No. 3 mine of the Nicholson Coal Company. The coal is practically all shot in the solid. Rooms are driven 22 ft. in width and 250 ft. in length and the pillars are 23 ft. The Lower Hignite coal has been developed at few localities in the district. It possesses the qualities of a good fuel but its hight above the valley floor and its comparatively small area has made it of less importance than some of the lower seams.

The Upper Hignite seam has not been opened up sufficiently to prove its workable thickness in the Bennett Fork district.

The Red Spring coal underlies such a small area in Log mountain that with respect to the district under discussion it cannot be considered as having any important economic value.

The seams occurring within the district have each in turn been described. There are six or seven workable seams, all of which can easily be mined either from Bennett or Stony forks. Roughly speaking, the entire district is probably underlaid by two seams of workable thickness while the coals above outcrop continuously in the three ridges comprising the property.

These coals are good for domestic and steam purposes, and one at least, the Mingo, is an excellent gas coal.

Principal Mines in the District

The following list gives the names of the principal mines in the district and their locations:

	Location
[illegible]	[illegible] of Middlesboro
[illegible]	Bennett Coal
Yellow Creek Coal..	" "
Columbia Coal.....	" "
Brickdale C. & C...	" "
Nicholson Coal....	" "
Mingo C. & C.....	" "
Sterling C. & C....	" "
Ralston Coal.....	" "
[illegible]	" "
[illegible]	" "
Reliance Coal.....	" "
Ford Ridge Coal...	" "
Edgewood C. & C...	Stony Fork
[illegible]	" "
[illegible]	" "
[illegible]	" "
Sagamore Coal....	" "

The mines have all been opened by drifts. In many cases, these occur high in the hills, and in consequence the coal must be taken down to the valley below along gravity planes or in retarding conveyors. At several operations, where the higher coals are worked, there are two planes, and the monitors on the upper plane dump into the monitors traveling on the lower plane.

In the case of the Nicholson mine, on Bennett fork, the mines are reached by two three-track gravity planes. The plane to the No. 2 mine is 2000 ft. in length, and the one from No. 2 to No. 3, or the upper mine, is 1500 ft. The coal from No. 3 is dumped into a bin at No. 2 mine tipple, where it is sent over a Jeffrey picking conveyer 60x4 ft., and into the seven-ton monitors running from the No. 2 mine to the railroad tipple in the valley below. The conveyor is operated by a 10-h.p. high-speed Atlas engine.

The Yellow Creek mine adjoins the Nicholson and the geological occurrence of the coal seams are similar. At this operation a four-track gravity plane extends from the valley to the No. 2 mine, a distance of about 1500 ft. In this case, however, the coal is brought from the upper to the lower mine by a retarding conveyer 600 ft. in length, operated by a motor. This conveyer saves much breaking of the coal, and in consequence a much larger percentage of lump reaches the tipple at the lower mine, where it falls into seven-ton monitors traveling on the lower gravity plane.

Methods of Mining

Farther up the valley the altitude of the seams above the creek decreases. At the Sterling mine, at the head of Bennett Fork, the gravity plane is 650 ft. in length.

At the Fork Ridge Coal Company, on Puncheon Creek branch of Bennett fork, the Mingo seam goes under water, and the mine has been opened up by a drift at a point to give sufficient tipple hight, and farther up the valley by a slope 175 ft. in length. At present the electric mine locomotives bring the coal trips to the foot of the slope, where an automatic double-track endless car haul conveys the cars to the slope mouth and across a trestle to the railroad tipple.

The method of mining employed is the room-and-pillar system. The coal at Sterling mine double main butt headings with 70-ft. centers is generally attached by parallel-face headings, with a 50-ft. pillar between them. At intervals of about 500 ft. cross headings are driven in opposite directions at right angles to the main heading, and the length of the rooms is consequently 250 ft. The width of the rooms and the size of the pillars vary in the different localities, and depend upon the conditions of the roof. At the Fork Ridge mine, one of the largest producers in the district, the rooms are driven with 40-ft. centers and 20-ft. pillars. The roof holds well, and props without cross-timbers are sufficient. No timbering is required in the main haulage roads at this locality.

Ventilation and Drainage

Ventilation is accomplished by furnaces in the newly opened mines, but in the larger workings exhaust fans are used. At the Sterling mine there is an 8-ft. disk fan driven by a 15-h.p. motor with automatic rheostat. A 7-ft. Stein fan operated by a 16-h.p. gasolene engine is in use at the Nicholson mine. The Fork Ridge operation has a 9-ft. Thayer exhaust fan with a capacity of 30,000 cu.ft., at 140 revolutions per minute.

The mines are generally self-draining, and little trouble is caused from water except during unusually wet periods. Both steam and electric pumps are in use to pump out local swamps underground. Two electric pumps are in use in the Sterling mine, one 3-h.p. pump, and the second a 15-h.p. centrifugal pump. The water that accumulates at the foot of the slope in the Fork Ridge mine is taken care of by two steam plunger pumps.

Haulage

Underground haulage is accomplished by mules and both steam and electric locomotives. The Sterling operation has an excellent electric equipment and there are two electric locomotives in use. In this mine the heavy motor roads are laid with 56-lb. rails and 30-lb. and 16-lb. iron is laid on the balance of the haulage roads. A system of block signals has been adopted along the main heading in order to insure safety and facilitate transportation. Specially constructed steam mine locomotives, similar to the ones in use in the anthracite district of Pennsylvania, run underground in the Nicholson mine. It is necessary to pump the water for these locomotives from the creek in the valley below and the vertical lift is probably over 600 ft. At the Yellow Creek mines, three seven-ton, 250-kw. locomotives operate on the main haulage roads. The Fork Ridge mine has an excellent haulage system. The grades are favorable and the alinement and construction such that trips can be run at full speed along the entire length of the main heading. Three 10-ton Jeffrey double end control locomotives are used underground and one Jeffrey gathering locomotive.

Power Plants

There is considerable variation in the power-plant equipments of the different mines; at many of the smaller and older mines, electricity has not been installed. Until recently electricity has been applied mostly to haulage. At the plant of the Sterling Coal and Coke Company electric chain machines have lately been put in use. The power plant at this mine consists of two 150-h.p. Atlas return tubular boilers, one 150-kw. Multiple Goodwin generator direct connected to an 18x19 in. McEwen engine. The voltage is 250. The Yellow Creek plant contains two Atlas boilers of 125 h.p. each, one McEwen engine, and one 150-kw. Goodman generator. The power equipment of the Fork Ridge mine consists of four Atlas boilers; two 250 h.p. and two 100 h.p. One 19x19-in. McEwen engine belt connected to a 150-kw. generator is used.

The Coal Markets

The greater part of output of the Middlesboro District is consumed by the railroads for steam coal. Up to the present time comparatively little domestic, gas, or steam coal for industrial purposes has been sold. In the open market, the Middlesboro coal should be an active competitor with the Big Stone Gap, the Jellico, and Coal Creek districts in northern Tennessee, western North Carolina, the northwestern half of South Carolina and northern Georgia. It would be in demand by gas companies in Kentucky, Tennessee, and points west.

In North Carolina and the northeastern portion of South Carolina the Middlesboro district and the three fields mentioned together with the coals of the Chattanooga districts will have to compete with the West Virginia fields. South, in Central Georgia and the lower portion of South Carolina the Birmingham coals will enter into competition.

As already stated, only a small amount of the total coal output of the district tributary to Middlesboro, is placed in the open market. With the rapid industrial development going on in the Carolinas and Georgia, there will be an increasing demand for domestic coal and steam coal for manufacturing purposes. The position of the Middlesboro district together with its excellent transportation facilities should make it an active competitor in their market.

During 1905 Brazil exported 9,762,038 pounds of monazite sands which ranged in thorium contents from 3 per cent. to 7 per cent.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

What is claimed to be a record day's winding of coal for any colliery in the United Kingdom was made on March 22, at the Bargoed colliery of the Towell-Duffryn Company. The quantity of coal raised during the working day was 3245 tons.

In the entire United Kingdom less than 3½ per cent. of the coal output in 1905 was produced by machines. The coal produced by these machines in 1904 was 5,744,044 tons, and in 1905 8,102,197 tons. There are 3,126 collieries in the United Kingdom, of which fewer than 10 per cent. use machines.

The steam consumption per i.h.p. in a good compound condensing horizontal engine driving a dynamo by means of ropes should be about 15 to 25 lb. per hour; if the steam consumption per e.h.p. comes to a high figure, such as 50 lb. per hour, it shows a great loss, and the object of the engineer should be to discover where this loss takes place.

Practical experience has shown that a range of beehive ovens will give off waste gas of greater heating power than a similar range of by-product ovens. One excellent authority states that sixty by-product ovens (30 ft. long by 6 ft. high by 2 ft. 6 in. wide) may be supposed capable of heating five 8-ft. boilers, the steam pressure being about 120 lb. per square inch.

The following is a table given by Professor Galloway, of South Wales, on tests made by a Davy safety-lamp for length of cap and percentage of gas:

Percentage of Gas in the Air	Length of Cap
2 per cent.	[illegible] in.
2½ per cent.	[illegible] in.
3½ per cent.	¾ in.
4 per cent.	[illegible] in.
5 per cent.	⅛ in.
5½ per cent.	2 in.
6¼ per cent.	3½ in.

Experiments have shown that as a general rule, Australian coals are not specially liable to spontaneous combustion, with the exception of those coals that are rich in iron pyrites. If the pyritous portion, commonly known as "brassy tops" is exposed to the weather, there is then a liability to spontaneous combustion, and it is important for the working of the coal, that these "brassy tops" be absolutely got rid of in a mine if air is admitted at all to the seam.

The advantages of using high-pressure steam are: First, a reduction in the size of the steam pipe and engine; second, more work is obtained from the same weight of steam. These economies are secured by a small increase in the amount of fuel used. It requires 966 B.t.u. to convert one pound of water at 212 deg. to steam at 212 deg. F. (atmospheric pressure); while to convert it to steam at 100 lb. per sq.in. absolute only requires an additional 35.3 British thermal units.

It has been proved by experiments and practice that carbon dioxide gas is a more powerful extinguisher of flame than nitrogen; this may be due to its density, for 58 per cent. of CO_2 will extinguish a hydrogen flame. In testing mine gases having a few per cent. of CO, as in mine fires, by Shaw's gas-testing machine, it has been found that the apparatus does not give correct results unless the CO_2 is previously removed by passing it through a strong solution of potassium hydroxide.

English scientists have recently been carrying on investigations into the matter of coal dust and its bearing on explosions. The experiments show that the only certain arrestment of a coal-dust explosion occurs when there is an excess of dust, which smothers the flame through lack of air to maintain combustion. The most favorable atmosphere to encourage the spread of an explosion is that which contains a maximum percentage of water vapor and a normal quantity of floating coal dust. Watering dusty "roads" is considered no deterrent.

India produced nearly 9,000,000 tons of coal during the year 1906. In mining this quantity of coal, there were 80,496 persons employed, which shows that the average production per employee was about 96 tons. The United States produces 529 tons per employee; the United Kingdom 279 tons, and Germany has an average output of 307 tons for each person employed. It is conservatively estimated that the coal measures of India have an area of 33,000 square miles, which places this country as the fourth largest coal-bearing country in the world.

It is now common practice at a number of collieries to use inferior fuel in the generation of steam. In accomplishing this result, the general method is to apply forced draft to the ordinary boiler, and either dispense entirely with grate bars or place them very close together. Although this scheme has met with considerable success, it is also attended by numerous difficulties. Owing to the fine nature of the fuel, a considerable proportion is blown into the chimney without being burned, and, as the combustible matter has a lower specific gravity than the refuse, the most valuable part of the fuel is wasted.

Blasting powder and dynamite such as are often used in coal mines frequently generate carbonic oxide, CO, which gas is one of the principal causes of coal-dust explosions. In some cases, as much as 30 per cent. of carbonic oxide is produced by blasting powder. In one instance an analysis of gases after an explosion of powder was made by Hall and Orsman as follows: Oxygen, 3.9 per cent.; nitrogen, 75.9 per cent.; carbon dioxide, 12.1 per cent.; carbonic oxide, CO, 8.1 per cent. For the men in the mines to inhale such gases is extremely dangerous; besides its presence tends to produce a dust explosion. It is therefore important that much care be exercised in selecting explosives for use in coal mines.

The relative merits of rope- or belt-drive depend principally upon circumstances and convenience. With a rope drive there is less liability of break-down; ropes break singly, while a broken belt might cause a serious accident. The speed of belts and ropes is governed by the tension put on them by centrifugal force, and should not be more than 4000 or 4500 ft. per min. The power which ropes will transmit depends upon their number and speed, and can be calculated as follows: Multiply the square of the diameter of rope in inches by the velocity in feet per minute and divide by 300; the result will be the power which may safely be transmitted by one rope. The number of ropes should be at least one more than actually required, so as to allow for changing.

One of the Pennsylvania mine inspectors, believing that practical tests are of as much importance as a theoretical examination, has arranged a practical demonstration by which miners making application for certificates will have a chance to display their knowledge of gas. Suspended from a rope in the ceiling of a room provided for the purpose, this inspector has a large glass globe into which he turns a jet of natural gas, until it is filled. The windows are then completely darkened, and the interior of the room is identical with that of a gaseous mine, so far as light and atmospheric conditions are concerned. Each candidate for a certificate is given a safety lamp and required to work it in pure air, mixed air and gas. In this way it can soon be determined whether or not the men know the utility of the safety lamp, and are efficient in its use. This test is, of course, supplementary to the oral examination required.

American Institute of Mining Engineers

The Spring Meeting, April, 1907, the 92d Regular Meeting of the Institute, Held in the New United Engineering Societies Building

ADDRESSES, PAPERS, DISCUSSIONS

Following the dedication of the United Engineering Building, which was reported in the JOURNAL last week, the American Institute of Mining Engineers held its regular spring meeting, beginning on Thursday, April 18, at 2:30 p.m., in the auditorium of the new building.

The meeting was called to order by Prof. John Hays Hammond, President of the Council, who said:

"Before taking up the reading and discussion of papers I will call upon Dr. Rossiter W. Raymond, the oldest living past-president of the Institute, who has been in harness almost continuously for 36 years, and who has contributed more than anyone else to bring this society to its present great success and to establish the reputation of the American mining engineer the world over, for a few words supplementary to those which were uttered to engineers generally during the sessions of yesterday and the day before."

Dr. Raymond spoke as follows:

"The arrangements for this meeting having been made during my absence by Dr. Struthers, the assistant secretary, who remains in charge, will be conducted by him; and therefore I feel free to speak as a past-president, rather than as an existing secretary, on this occasion. The Darwinian doctrine of the survival of the fittest is sometimes illustrated by persons who are supposed to be the fittest because they have simply survived. I fear that I come under that category. Almost all of my contemporaries in the early history of this institute have passed away. Only one or two of the original founders remain, and I may fairly say that scarcely any remain who were active at that time in shaping the organization and the future career of the Institute.

"In 1871 I was was just 31 years old. Next week I shall be 67 years old. All the intervening years have been devoted to the service of this Institute almost continuously, either as president or vice-president or secretary. You may easily imagine, therefore, with what pleasure I greet you on this ocasion.

Early Days of the Institute

"I am not here to extend to you the welcome of the city of New York. We have met here over and over again; and we have always had a mayor or some other public functionary to extend to us, as guests of the City, its hospitalities and courtesies. You will never be thus welcomed to New York again, for it is now your home. You enter this day, for the first time, the place that belongs to you. For more than 30 years the Institute was not incorporated, or located anywhere. The very nature of our society was such that we could not without peril to its future tie it specially to any one locality. Comprising as it did a membership most widely distributed, both geographically and professionally, it had no more right to exist in one place than in another; and an attempt to place it at one spot would simply have been a signal for the appearance of other local societies in other spots.

"This is not the time and place to go into a long history of that critical question; but I may say that there was a time when this Institute ought to have been located, if anywhere, in Philadelphia. To the present day, Pennsylvania is far more distinctly a mining State than New York. There was a time when there was danger of the establishment of some rival Institute in the West. There have been times when it was very plausibly proposed to start other national societies, especially for iron and steel and coal. Through all that period the Institute, by being peripatetic, kept itself national. Its office was first at Lambertville, New Jersey, where the first secretary, the late Martin Coryell, happened to reside. When Dr. Thomas M. Drown became the secretary, the headquarters went to Philadelphia, without any vote on the part of the members or the council, simply because the secretary lived in Philadelphia. When Dr. Drown became a professor in Lafayette College, the Institute, in similar informal fashion, went to Easton; and when I succeeded Dr. Drown, the Institute came to my office in New York. For many years, the institute never owned so much as a chair; it was in my private office that its business was done. Headquarters could have been moved, or, rather, would have moved themselves, at any time, if the wholesome and brilliant thought had ever struck you to choose another secretary.

The New Home of the Societies

"The munificence of Mr. Carnegie, extended when the lapse of time had shown the true intent and purpose of the Institute, and allayed once for all every possible local prejudice or ambition, made it possible for us to join in the movement which has ended in the acceptance and occupation of this splendid building. To do that, it was necessary that we ourselves should be incorporated, and that another corporation should be formed, to hold and administer the building in which we were to become tenants. United Engineering Society is not strictly a society at all. It is simply a board of nine eminent and trustworthy trustees, elected (three from each of the Founder Societies) to hold and administer this building. I need not characterize its legal title as an unfortunate misnomer, unless it should lead to embarrassing misapprehension on the part of foreigners, through the inference on their part that a new society, constituting an organic union, has come into existence.

"We Americans know very well that our three societies are the same old organizations, and have joined in the creation of this business board simply to take care of the real estate represented in this building. We occupy our several quarters in the building in a spirit of absolutely free and voluntary fraternity, without any superior authority over us; without any limitation of our organizations, our purposes, or our methods; and without any submission to outside control.

"I deem it important to say this, because our Institute has always differed from the two sister societies in the character of its organization, in the wider distribution and less stringent requirements of its membership, in the practical omnipotence of its governing body, and in the limitations of that absolute power to definite purposes, excluding all action or utterance whatever, in support of any theory, movement, enterprise or purpose, outside of the holding of our meetings and the publication of our proceedings. We are a free forum for information and discussion. We never allow any committee of ours to come to any conclusion that we must adopt. Thus, in many respects, we stand on our own platform, pursue our own purposes by our own methods, recognizing, meanwhile, that the more select societies, such as those of the Mechanical and the Electrical Engineers, which have sprung from our loins, have methods and systems of their own which are doubtless best for them. I wish the members of the Institute from all parts of the country to recognize, once for all, that we have sacrificed nothing of our individuality or autonomy by this new, close and cordial fraternal union.

Credit Where Credit Is Due

"Moreover, I desire to express for our Institute, not, of course, attempting to speak for the others (though confident of their assent), the feeling that, in the numerous formalities and crowded proceedings of the recent dedication, certain acknowledgments were omitted, which, so

far as we are concerned, we will [illegible] pay. We desire to put on record our thanks, by name, to the members of the conference and building committees who did our work on those committees. I have no doubt the other societies will take the opportunity to make similar acknowledgments to their own members, and I do not now extend thanks to any of their members, because it is their business to do it! But, from President C. W. Hunt down, the members of those committees were altogether too modest in the dedication exercises. They did not give us a chance to blow their trumpets, and they did not blow their own trumpets, and consequently the men that did the most have had, so far, very little recognition. As Secretary of the Institute, and intimately acquainted, though not personally concerned, with the progress of all this delicate, difficult and complicated work, I wish to emphasize the names of the three members who represented us at the best of the time: Dr. V. L. Ledoux, Charles Kirchhoff and Theodore Dwight.

"And I wish to emphasize still more strongly a name that has not been heard on this platform, I regret to say, since the dedication exercises began. When, from numerous anonymously offered designs, the building committee had selected, with a unanimity amounting almost to inspiration, the plans for this building, they found that the names signed thereto were those of Herbert D. Hale and his associate, Henry G. Morse. Mr. Hale, as I am informed, has been absent from all these exercises by reason of illness. Nobody that ever met him can doubt the brilliancy of his genius and the breadth of his culture; and we recognize the permanent stamp of both in the design and details of this edifice.

A Clean Record

"Mr. Morse, the son of an eminent and beloved member of the American Institute of Mining Engineers, assumed in this case more than the duties of a clerk or the work of an inspector. Mr. Morse practically camped on this building; he spent his days and nights here; he scarcely forsook it during the whole period of its erection; and, without the least disparagement of the great genius of his brilliant associate and chief, Mr. Hale, I say it is due to Henry G. Morse more than to any other man that the record of this building is thoroughly creditable to us all as engineers. For engineers must not only *plan* things, but also *do* things. Now, we do not have to blush for a building which was not completed on time, or completed with the money provided, or the detailed specifications for which were not always ready when wanted, so that the contractor had the opportunity to make extra charges for errors, changes and delays.

"Any of you who have had to do with the erection of buildings knows what that means. All such delays, corrections and afterthoughts, warranting the claim of extra pay by the contracting builder, are merely so many evidences of somebody's lack of forethought or somebody's lack of promptness and fidelity. The record of this building is as clean as its walls. It was built as it was designed. Not an error in its plan has had to be corrected. In spite of a couple of those exhibitions of irresponsible tyranny known as sympathetic strikes, it was completed practically on time; and it was built with the money provided. Engineers can hold up their heads with pride in the thought that, somehow or other, through somebody's fidelity, this result was achieved. I would distribute the praise for it down through United Engineering Society and its building committee; but they will all heartily agree with me in naming, as chief of all these hearty co-laborers, Henry G. Morse. The stainless record of this construction is mainly due to him. Mr. Morse personally tapped every rivet in every plate or beam of this building. If anything had been covered up he had it uncovered; and hundreds of rivets which did not satisfy his stringent tests were taken out and replaced. In this and in many other particulars his enthusiastic, unselfish and efficient coöperation went far beyond his legal duties and obligations; and we owe it largely to him that the erection of this classic and stately, yet simple and thoroughly suitable structure, was a masterpiece worthily crowning its design.

The Key, a Symbol

"I am requested also to call attention to certain details which Mr. Olcott, past-president of this Institute and now president of United Engineering Society, accidentally omitted to mention, day before yesterday, in his remarks acknowledging the reception of the key to this building. Yesterday afternoon the President of our Council, Prof. John Hays Hammond, in a few fitting words, emphasized the priority of the mining engineer as the pioneer of all engineering progress. I would now emphasize not only that general leadership, but also, as regards the history which culminates in this occasion, the seniority of our Institute. The American Institute of Mining Engineers is practically the parent of the other two founder societies now nestling by its side. Twice we went to sleep; and when we woke up we missed a rib—and there was another society!

"This key fitly recognizes our primacy. The handle is made of gold from the North Star mine, at Grass Valley, California, which many of you have visited, and the president of which has been, for many years, James D. Hague, now Vice-president of the Council of the Institute, who kindly provided the metal for this purpose. It bears upon one side the three symbols representing the seals of the three societies. So far, it sets forth, as it ought to do, their good fellowship and brotherhood, uttered, however, in terms of the mining engineer, namely, in gold, with which the electrical and mechanical engineers have much less to do than we. But on the other side is the frank admission of that primacy upon which we never insist, unless it is by silence or contradiction implicitly denied! For there, in a little frame, covered with a bit of rock crystal, are two or three grains of the very gold washed by Marshall in 1848 from the waters of Sutter creek, in California.

"We owe not only the gift of these historic souvenirs, but also the documentary proof of their authenticity, to George F. Kunz, a New York member of the institute.

"It may interest you to hear that, many years after the great discovery, President Hammond went with Marshall, who was his good friend, to the same spot and panned out some more gold. So, you see, the American Institute of Mining Engineers is directly connected with the epoch-making event, which led to the conquest of a continent, and the inauguration of a new industrial age. Whoever, therefore, shall hereafter open the door of this building will acknowledge thereby the fraternal leadership of the American Institute of Mining Engineers!

"Comrades! as your servant and fellow, I welcome you to your own house. If I should live to be 100 years old instead of 67, my last hour of intelligent effort will be given to the service of American mining engineers. If I should die tomorrow, I shall have lived a happy life in that service!"

Mining in New York City

Dr. Raymond was followed by H. D. Hildage, of New York, who read a paper "On Mining Operations in New York City and Vicinity." He stated in his preface that there is more dynamite used in New York than in any mining district in the United States; that there are under construction about 38 miles of tunnels, and that 66 miles more are projected; that since 1902, at least 2,000,000 tons of earth have been removed in underground work, in addition to about 3,500,000 tons in open cuts in connection with tunnel work and many times this quantity has been removed in excavating foundations for buildings not connected with tunnel work. At the present time there are probably more than 5000 men engaged in mining work in and about New York City. Mr. Hildage then described, with the aid of stereopticon views, the methods employed in constructing tunnels under the East and North rivers. Mr. Hildage has been prominently connected with this work, and his mastery of the subject, which is of great interest, enabled him to make his audience conversant with the

details of [illegible] was highly appreciated.

At the session of April 19, Prof. Henry M. Howe read a paper on the "Influence of the Condition of Casting on Piping and Segregation as shown by Wax Ingots," of which he was joint author with Prof. Bradley Stoughton. This paper was discussed in an instructive and appreciative way by R. W. Hunt. Prof. James F. Kemp then read a paper on "The White Knob Copper Deposits," on which there was no discussion. Prof. H. O. Hofman read a paper on "Laboratory Experiments in Lime Roasting a Galena Concentrate, with reference to the Savelsberg process." Afterward he read a discussion of the paper by George A. Packard, of Rolla, Mo., who was not present at the meeting, and added some comment in reply. J. E. Johnson, Jr., then presented a discussion of the paper by Mr. Meissner on "Notes on the Gayley Dry Air Blast," in which he supported his previous contention that the Gayley process is of real efficiency, but is likely to show better results in the summer than in the winter. Prof. Henry M. Howe made a few remarks supporting Mr. Johnson, who, he said, had presented a logical and competent explanation of the economical features of the Gayley process.

Steel Production in 1906

The total production of steel in the United States, as reported by the American Iron and Steel Association, has been for two years past as follows:

	1905.		1906.	
	Tons.	Per Ct.	Tons.	Per Ct.
Bessemer	10,941,475	54.6	12,275,253	52.5
Open-hearth	8,451,456	44.8	10,970,998	47.0
Crucible, etc.	111,196	0.6	118,500	0.5
Total	19,504,127	100.0	23,364,751	100.0

The increase in bessemer steel was 1,333,878 tons, or 12.2 per cent.; in open-hearth, 1,999,622 tons, or 22.2 per cent.; in crucible and special steels, 7304 tons, or 6.6 per cent.; the total gain being 3,340,804 tons, or 16.7 per cent. The ratio of steel to pig iron was 92.3 last year. The division of the steel into acid and basic in 1906 was as follows:

	Acid.	Basic.	Total.
Bessemer	12,275,253		12,275,253
Open-hearth	1,321,613	9,649,385	10,970,998
Crucible, etc.	118,500		118,500
Total	13,715,366	9,649,385	23,364,751

The basic metal was 88 per cent. of the open-hearth steel, and 41.3 per cent. of the total steel production. All the basic steel was made in the open-hearth furnace; the basic converter, so much used in Germany, and to a lesser extent in England, is not used in this country.

The year shows once more the rapid advance of the open-hearth, and especially the basic open-hearth process. The main part of the increase in 1906 was in basic steel, and the tendency to the use of the basic process gives every sign of advance. The proportion of open-hearth steel to the total production, which was 12.2 per cent. in 1890, increased to 19 in 1895; to 33.7 in 1900; to 44.8 in 1905, and to 47 in 1906; in a short time the open-hearth output will exceed the bessemer.

The geographical distribution of the steel production in 1906, disregarding the small quantity of crucible steel, was as follows:

	Bessemer.	Open-hearth.	Total.
Pennsylvania	4,826,725	7,710,949	12,537,674
Ohio	4,769,913	816,483	5,586,396
Illinois	1,685,056	884,472	2,569,528
Other States	1,993,559	1,559,094	3,552,653
Total	12,275,253	10,970,998	23,246,251

Pennsylvania made last year 53.9 per cent. of the total steel; Ohio, 19.7; Illinois, 11.1; the other States, 15.3 per cent.

It is of interest here to compare the steel output of the three more important producing nations for 1906, classed according to processes of manufacture. The output of the United States and Great Britain is in long tons; of Germany in metric tons:

	U. S.	Germ'y.	G. Brit'n.
Acid converter	12,275,253	407,688	1,307,149
Basic converter	.....	6,772,804	600,189
Total converter	12,275,253	7,180,492	1,907,338
Acid open-hearth	1,321,613	230,668	3,378,691
Basic open-hearth	9,649,385	3,544,612	1,176,245
Total open-hearth	10,970,998	3,765,280	4,554,936
Crucible and special	118,500	189,313	.....
Total	23,364,751	11,145,085	6,462,274
Proportion steel to pig iron	92.3	89.2	63.7

The production of the United States exceeded by 5,567,392 tons that of its two chief competitors combined. Putting the table in a different form, we have the following statement as to the respective makes of acid and basic steel:

	Acid.		Basic.	
	Tons.	Per Ct.	Tons.	Per Ct.
United States	13,715,366	58.7	9,649,385	41.3
Germany	715,952	6.4	10,419,133	93.6
Great Britain	4,685,840	72.5	1,776,434	27.5
Total	19,117,158	46.7	21,844,952	53.3

The make of basic steel was in excess of that of acid; a result chiefly due to Germany with its great supplies of ore suitable for making basic pig iron.

Mineral Production of Germany

The preliminary statement of the mineral production of Germany, as given by *Gluckauf*, from official data, gives the production of coal as below, in metric tons:

	1905.	1906.	Changes.
Coal	121,298,607	137,117,926	I. 15,819,319
Brown coal	52,512,062	56,415,333	I. 3,903,271
Total	173,810,669	193,533,259	I. 19,722,590

The increase in coal was 13 per cent.; in brown coal, or lignite, 7.4 per cent.

The output of other non-metallic minerals was as follows, also in metric tons:

	1905.	1906.	Changes.
Graphite	4,921	4,055	D. 866
Asphalt	103,006	117,413	I. 14,407
Petroleum	78,869	81,419	I. 2,550
Rock-salt	1,165,495	1,236,030	I. 69,535
Kainit	2,387,643	2,679,264	I. 291,621
Other potash salts	2,655,845	2,803,732	I. 147,887
Kieserit, etc.	706	7,356	I. 6,650
Boracite	183	161	D. 22

A remarkable increase is here shown, in everything except two products of small importance.

The production of various salts, in their marketable forms, was as follows:

	1905.	1906.	Changes.
Salt	612,062	632,922	I. 20,860
Potassium chloride	373,177	403,387	I. 30,210
Magnesium chloride	29,017	38,468	I. 9,451
Glauber salts	68,455	81,175	I. 12,720
Potassium sulphate	47,994	54,490	I. 6,496
Pot.-mag. sulphate	34,222	34,239	I. 17
Magnesium sulphate	58,568	43,013	D. 15,555
Aluminum sulphate	52,892	55,969	I. 3,077
Alum	4,127	4,494	I. 367

Here also increases are shown in all except one item; some of the gains being considerable in quantity.

The output of various ores is reported as follows, in metric tons:

	1905.	1906.	Changes.
Gold & silver ore	10,286	8,066	D. 2,220
Copper ore	793,488	768,523	D. 24,965
Lead ore	152,725	140,914	D. 11,811
Zinc ore	731,271	704,596	D. 26,675
Iron ore	23,444,073	26,734,560	I. 3,290,487
Manganese ore	51,463	52 485	I. 1,022
Arsenic ore	4,913	6,259	I. 1,346
Pyrites	185,368	196,571	I. 11,203
Alum ore	636	1,120	I. 484
Miscel'neous ores	11,017	8,044	D. 2,973

Here there were decreases in several important items, such as copper, lead and zinc ores.

The production of metals other than iron is reported below, gold and silver being in kilograms:

	1905.	1906.	Changes.
Gold, kg	3,933	4,202	I. 269
Silver, kg	399,775	393,442	D. 6,333
Copper, tons	33,362	33,032	D. 330
Tin, tons	6,044	7,134	I. 1,090
Lead, tons	156,376	154,878	D. 1,498
Zinc, tons	198,208	205,691	I. 7,483

Metals from imported ores are included. The copper for 1906 includes 32,275 tons refined copper; 193 tons black copper, and 564 tons in copper matte. The lead in 1906 includes 4137 tons litharge.

There were made as by-products in the metallurgical work the following materials, the quantities being in metric tons:

	1905.	1906.	Changes.
Arsenic	2,535	3,052	I. 517
Sulphur	205	178	D. 27
Sulphuric acid	1,228,211	1,305,065	I. 76,854
Copperas	12,949	13,376	I. 427
Copper sulphate	6,988	6,757	D. 231
Mixed sulphates	159	158	D. 1
Zinc sulphate	5,896	6,092	I. 196
Nickel sulphate	220	187	D. 33
Metallic pigments	3,910	4,363	I. 453
Miscellaneous	6,139	6,764	I. 625

The sulphuric acid reported last year included 1,184,438 tons ordinary acid, and 120,627 tons concentrated acid.

The iron production for the year is reported as follows:

	1905.	1906.	Changes.
Foundry iron	1,797,680	2,003,883	I. 206,203
Direct castings	61,320	60,027	D. 1,297
Pessemer pig	410,963	491,086	I. 80,123
Basic pig	7,032,322	8,039,806	I. 1,007,486
Steel pig	580,344	755,678	I. 175,334
Forge iron	976,986	929,122	D. 47,864
Scrap and cinder pig	15,446	14,221	D. 1,225
Total	10,875,061	12,293,825	I. 1,418,764

The iron figures differ slightly from those reported by the German Iron and Steel Union, compiled from the monthly blast-furnace returns. Steel pig includes spiegeleisen, ferromanganese and all similar alloys.

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*Illustrated.

The Market for Copper

The deadlock between the producers and consumers of copper continues. Some of the producers are willing and anxious to sell, but comparatively few of the consumers manifest any inclination to buy, even at the concessions in price which are offered. On the other hand, the United Metals Selling Company, and other interests of the same opinion, are ostensibly holding firmly at the asked price, 25c. per lb. for electrolytic, and display no inclination to sell at anything below that, but who knows at what figure business might be done if it were really offered? In the meanwhile the market is established by sales which are actually made, together with bona fide offerings. The dispute respecting the price of copper, which is exciting the portion of the press that has stock-market affiliations, and is mystifying the daily papers, depends entirely upon the point whether the price of copper is the asking price for metal that is not sold, or is the price actually received for metal that is sold. Our view, now as always, is the latter, and our quotations of the market are based on that view.

Our readers who have memories going back five or six years will recollect that there was a similar controversy in 1901, when the United Metals Selling Company was endeavoring to sustain the price of copper around 18c. Other interests took the business at lower prices, while the United Metals Selling Company accumulated stocks. Toward the end of the year the load became too great, and on Dec. 13 the price was cut to 15⅛c., followed by another cut on the 18th to 13⅞c., and on the 19th to 12⅞c. At present, the situation is not a parallel one (except in so far as the controversy as to the price is concerned), there being no such large accumulation of stock as there was in 1901. As we have previously pointed out, the situation appears to be more closely analogous to that of January and February, 1906. However, the conditions are in many respects different from those which prevailed at the latter time. It is not pessimistic to say that there is now more uncertainty as to the future than there was then.

The statistical position of copper is still apparently strong. During the first quarter of this year there was probably no increase in production. On the other hand, the exports decreased, leaving more copper available for domestic consumption. It is highly doubtful if there were any increase in the consumption during the first quarter of the year. The increase in 1906 was greatly exaggerated. Instead of the 20 per cent. increase, which was commonly talked about, the actual consumption, about 660,000,000 lb., showed a gain of only about 7.7 per cent. over 1905. However, the production in North America having shown an increase of less than 5 per cent., and the year having begun without any stock to speak of, a great increase in price was inevitable, although as in all cases where calm judgment is left behind, the anxiety of the consumers to cover their requirements caused them to bid up the market against each other, which policy was naturally fostered by the producers, always desirous to obtain the maximum possible for their output. As we remarked at the time, if consumers had followed a more conservative policy, they probably would have had no great difficulty in meeting their requirements. This became manifest a month or two ago, when the withdrawal of consumers from the market immediately caused the premium for early deliveries to disappear.

The present waiting attitude on the part of the consumers is easily understandable. There has been a little contraction in activity, and some cancelation of orders, but the governing factor is the awakening to the realization that industrial conditions in general during the last year have developed too high a degree of tension. The price for copper and for other commodities is intimately connected with the financial situation. The producer of copper demands and receives cash on delivery, or at the most grants only 30 days' credit, but the manufacturer is obliged to give long credits, and take many commercial chances. The difference between 25c. and 15c. copper, on the domestic consumption of 1906, means $66,000,000. The enhanced prices for lead, spelter, pig iron, and other commodities swell enormously the load which is put upon the consumers, who have to pay these premiums, and the tax upon our financial resources. As an important consumer of copper has stated recently, in the present temper of the market consumers hesitate to buy heavily for future delivery, and are waiting for stronger incentives before placing further orders. Consuming requirements will have to be more urgent than at pres-

the prices now quoted for distant futures.

heavily to their stocks, unless they are compelled to. If the recent unprecedented industrial demand of the country should slacken, it would be reasonable to expect that the market for raw materials generally will find a more normal and consequently a more healthy level. An extremely high price carries along with it a danger to legitimate trade, especially to consumers with their thousands of customers, to whom inflated and extended credits are unavoidable when accepting long-time orders based on prices now current.

It is unquestionable that we shall be obliged, sooner or later, to come down to a more reasonable level. The hands of the clock do not remain at 12 all the time. The difficulty will be to go down the hill without accident; recent occurrences have shown what is to be feared.

As to the immediate future, everything depends upon the consumers. Their requirements are not provided for beyond June, except in occasional instances. We have now reached the end of April, and they have been absent from the market for nearly two months. Provision for large requirements cannot generally be left until the last minute. Producers are obliged to have considerable time to meet specifications. Consequently, there is likely to be an appearance of consumers in the market during the coming month. The opinion that is then developed will decide the near future. We look for an upward reaction as the result of the buying that will then take place, but after that the trend is likely to be downward.

Again the Debris Question in California

The recent floods in California, which caused great damage, especially at those points where the rivers reach the flat lands of the State, have again aroused antagonism between the men of the mountains and those of the valleys, and the people along the Feather and Sacramento rivers are making protests against the continuance of dredge mining. It seems that the damage by the floods is charged to the dredges. At Oroville, the main seat of dredge mining, all the dredges are at work below the town, and none above it, and the flood waters naturally came from above. The charge is that the cobble-stone piles of tailings below the town held back the water, yet the fact is that the last flood waters came in at the upper end of the town.

The farmers in the valley insist that the streams are being filled with dredge tailings, causing their lands to be flooded, and seem determined to stop dredge mining altogether if they can. The fact is, however, that only two dredges are working in the river proper, the rest being operated at points some distance from the river. They are all landlocked and throw the tailings behind them in the pit in which the dredge floats. Nothing is put there that was not there before they began digging. The dredge men deny positively that their operations had anything whatever to do with the floods, or the damage resulting therefrom, and of course any unprejudiced, rational observation will support their contention.

However, the Sutter County Chamber of Commerce has taken the matter up officially and intends to make the dredgemen comply with the law—whatever that may mean. The dredgers are breaking no laws of any kind, and are honestly and usefully contributing to the welfare of the State, but the valley people are prejudiced against mining in every way and seem determined to make trouble. It is a pity that there cannot be an end to this bickering. Naturally the dredgers do not, however, intend to abandon their profitable industry unless forced to do so, and there will be a merry fight if the Anti-Débris Association attempts any of its usual high-handed proceedings.

Labor Troubles in California

There are decided signs of unrest among the miners in some of the Mother Lode counties of California, which are causing some alarm among the mine-owners. Already at Angels, the principal mining center of Calaveras county, the miners of the Utica, Lightner, North Star, and other large mines have made a formal demand for an eight-hour day, with the same wages as at present for 10 hours. Similar steps are about to be taken at some points in Tuolumne county. As these Mother Lode mines are all low-grade and have been working of late on narrow margins of profit, it is probable that if the miners insist in this change from the present conditions, some of the mines will have to shut down. These mines can be worked at a profit only when they have extensive reduction plants, as in fact most of them have, for the grade of ore is only about $2 to $3 per ton, and even less. It does not pay to work them when only small amounts of ore can be treated daily.

One of the largest mines in Tuolumne county, employing 250 men, has, as an average result of milling its ores, only $1.80 gross per ton. It is evident that in such cases the margin of profit is so small that a reduction in working hours or an increase in wages may compel the owners to quit mining entirely. Nearly the same conditions exist at Angels, where about 500 miners are employed. However, many of the miners are indifferent to this situation, since there is plenty of work for them elsewhere. The migratory Italians and other foreigners are supposed to be responsible for the new demands, which will surely be detrimental to the large number of miners who have their families and homes at these Mother Lode camps, and are permanent residents.

An Epoch in the Transvaal

The final abandonment of the first of the outcrop mines in the Witwatersrand is an event worth noting. The exhausted mine is the Bonanza, which is on the central part of the outcrop and has the Langlaagte and Crown Reef on one side, the Robinson and Ferreira on the other. It is perhaps the smallest property on the Rand, covering only about 10 acres, but as a compensation the ore was of higher grade than in most of the mines, the ore running about $17 per ton. For the last year operations have been confined to clearing out such ore as was left, and by this time the work will have been completed. As it is, the roofs are falling in and the shafts are getting out of shape. Since the commencement, gold to the value of $12,500,000 has been won by the owners, and during the war the Boer government extracted gold estimated at $1,200,000. Dividends amounting to $6,625,000 have been distributed, which is a good record. The nominal capital of the company was $1,000,000, of which $375,000 was working capital, and about $1,400,000 was spent out of income, in developing the mine and providing new plant. The exhaustion of the Bonanza marks an epoch in the history of the Transvaal.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Magnetic Iron Oxide in Copper-matte Smelting

[illegible] article on magnetic oxide of iron in smelting in the JOURNAL of February 2. I have had a little experience with magnetite as a flux, and what I have to say may be of interest to your correspondent, D. B. N.

Some time ago I had a problem somewhat similar to his. The conditions were as follows: Given an ore and fluxes having the following composition, can a proper smelting mixture be made from them? The ore, oxidized, contained approximately: SiO_2, 75 to 80 per cent.; FeO, 3 to 4 per cent.; Pb, 1 to 1½ per cent.; Zn, 1 to 2 per cent.; Cu, 0.5 to 2 per cent.; CaO, 3 to 4 per cent.; MgO, 1 to 2 per cent.; Ag, 30 to 40 oz. The ore also contained from 1 to 2 per cent. sulphur and less than 1 per cent. of antimony. The limestone contained not more than 5 per cent. silica, and 5 to 10 per cent. magnesia. The iron ore was a very pure magnetite containing about 60 per cent. iron, 5 per cent. silica. The sulphide material in the charge was a matte containing about 30 per cent. copper.

My answer was that these ingredients could be combined into a satisfactory mixture. I then began experimenting with small crucible charges, and the results obtained were so satisfactory that it was decided to continue the tests on a larger scale. A lot of 150 tons of the ore was, therefore, sent here to be smelted.

MANNER OF CONDUCTING THE TEST

The only furnace available was a copper-matting furnace 44x140 in. at the tuyeres, and 12 ft. from tuyeres to feed floor. This was too large for the quantity of ore on hand, and too low for proper reducing action. It was, therefore, lined inside with fire brick, making it 36x100 in. at the tuyeres, and its hight was increased about 5 ft. by closing up the feed opening and putting a new one higher up in the brickwork. The magnetite available for this test was not of as good quality as that at the mine. It contained 30 per cent. silicate of magnesia, a rather unpromising flux one would say.

As matte was the only sulphur compound, and to be had only in limited quantity, it was necessary to be as saving of it as possible, so, of course, no oxidizing action was allowable, and the reduction must be only sufficient to change the Fe_3O_4 into FeO. With an ore so silicious it was necessary to flux as much of the silica as possible, so it was decided to make as nearly as possible a bisilicate slag.

The test was begun with a slag of about 45 per cent. SiO_2, and 15 per cent. Fe, and the amount of matte added was about 6 per cent. of the charge. The furnace was run with a top so cold that the hand could be placed on the charge without discomfort. When the slag began to flow freely the charge was gradually changed so that finally the slag contained 47 to 49 per cent. SiO_2, and 12 to 15 per cent. Fe, the balance being principally lime and magnesia, the latter about 5 per cent. The amount of matte added was reduced to a little less than 5 per cent. of the charge. The coke was 14 per cent., and it could have been still further reduced if more ore had been on hand to continue the test.

The slag ran hot and fluid and was low in copper and silver, the copper being 0.3 per cent., and the average silver contents 0.86 oz. The matte was hot and liquid, and contained 30 to 35 per cent. copper, and 250 to 400 oz. silver. It went through the furnace with little change, except for the increased amount of silver. The blast pressure to start with was about 16 oz., and was raised toward the last of the run to 32 oz. The amount of magnetite used was from 300 to 400 lb. to the charge, weighing, exclusive of coke, about 2200 lb.

RESULTS OF THE EXPERIMENT

The run lasted four days and in all somewhat more than 300 tons of charge was smelted. Running a furnace in this way was altogether new to all of the men, except one, who said to me, "Why, you want it run just like a lead furnace." "Yes," I said, "that is the idea exactly." Smelting under such conditions is more like lead smelting than copper matting as the latter is usually carried on.

When the furnace was put out of blast it was found perfectly clean with no accretions of any kind. Theoretically, magnetite should reduce more easily than hematite, for in reducing to metallic iron it absorbs 1169 calories per kg. while hematite takes 1221 calories per kg. When in the course of reduction either from Fe_3O_4 or Fe_2O_3, FeO is formed, it is exactly the same thing chemically, and consequently must act in the same way. Because Fe_3O_4 is found in matte or slag it does not necessarily follow that it is simply unreduced ore or flux that has become mechanically mixed in it. It is just as likely to come from the partial reduction of Fe_2O_3 or perhaps the oxidation of FeO or FeS.

Hoffman, in his very interesting paper on the fusing points of slags, speaks of many slags being magnetic although no [illegible]

I am inclined to think that most, or all, of the supposed trouble with magnetite when used as a flux is more a cry of "wolf" than any real difficulty. In the test as made by me there was a larger excess of free silica, and in this it differed from the case of D. B. N., but otherwise they appear much the same. I think he will have little trouble if he has his ore column high enough and keeps the action of his furnace slightly reducing. As I have already said, run it more like a lead than a copper furnace.

MAGNESIA IN SLAGS

Another bugaboo that has frightened many metallurgists is magnesia, whereas up to a certain amount it is really beneficial, for it lowers the melting point, and weight for weight fluxes more silica than either lime or iron. Some time ago I made a number of experiments to test this point for bisilicate lime slags and found that up to a certain percentage magnesia lowered the melting point. I am writing from memory, my notes not being available; but as I remember it, the limit was about 10 per cent. The analysis and melting point of one slag may be of interest. The determination was made in duplicate and the temperature measured with a Le Chatelier pyrometer. The slag contained 52.6 per cent. SiO_2, 4.54 per cent. FeO, 37.4 per cent. CaO, and 5.36 per cent. MgO. Its melting point was found to be 1250 deg. C.; at 1300 deg. it was entirely fluid.

For a slag containing 50.63 per cent. SiO_2, 9.37 per cent. FeO and 40 per cent. CaO, Professor Hoffman[1] found the melting point to be 1430 deg. C., using Seger cones to measure the temperature.

J. S. C. WELLS.

Butte, Mont., April 10, 1907.

Copper Mines in Colorado

Colorado with its diversified mineral output, and standing at the head of the list in the United States in gold production, never has figured largely as a copper producer. The production of copper is, however, slowly increasing; according to the latest reports the production for 1906 was about 9,500,000 lb., produced

[illegible]

by smelting in the custom smelting plants throughout the State. Colorado is not like her neighboring western States and Territories, where enormous capital is being invested in the development of large copper deposits.

The question has been asked whether there are districts yet undiscovered and undeveloped in Colorado, where conditions exist favorable for copper deposits. Having been interested in 1900 in the revival of the New-Old Nevada and its development, and having traversed and studied the ore-bearing deposits of Utah, Nevada, Arizona and other States of the great inter-mountain region, chiefly the copper mines, I have noted the peculiarities of some of the deposits in the monzonites and also some of the related contact fissures between the Plutonic and sedimentary rocks.

Deposits of the Great Basin

The great basin or inter-mountain area of Montana, Idaho, Utah, Nevada and Arizona, situated between the main Cordilleras to the east and the Sierra Nevada range to the west, evidently is the location of our most extensive copper deposits. The magnitude of some of these ore-bearing shoots and zones must be seen and studied to be appreciated.

There is nothing so far discovered in Colorado similar to these deposits, excepting the extensive mineral-bearing area of Leadville. Although different districts have their peculiarities, there is a certain parallelism between Leadville and some of the copper districts of Utah, Nevada and Arizona, and that is in the large area of Plutonic rocks and limestones and the mineralization adjacent to the contacts of the two rock series and the extension of the ore measures out and into the diff rent rocks.

From recent discoveries in Leadville in some of the deep mining operations of that district, one may be led to believe that at no great distant date the unchanged as well as some of the re-enriched ore-bearing zones of this district will be found to contain bodies of copper ores commensurate in size with some of the bonanza copper deposits of the inter-mountain region.

The pumping problem at Leadville has been such as to prohibit private persons generally from exploring the copper areas, but in the hands of large corporations, with unlimited capital, the venture of opening up the deeper orebodies will result in great profit

The only other copper district so far discovered in Colorado is a limited area in the Red Mountain camp in the San Juan country, where the ore occurs in pipes and shoots of limited size, and can only be depended upon for small quantities, although in the Silverton district some of its large fissures have a considerable by-product of copper, but relatively small compared to the other metals produced. There is an undeveloped country north of the Moffat road and north of Middle Park, immediately west of the main Cordilleras, that promises some copper mines.

In speaking of copper mines I refer to ore masses of 50 ft. and upward in width of profitable ore; a deposit 10 or 12 ft. wide is a small producer. Only where great periods of solfataric action and other agencies have caused enormous depositions and replacements, are the "Big Fellows" among copper mines to be found. Colorado with the exception of Leadville, so far as discovered, does not show any such areas, but in its mineral production is the Mecca of the small mining corporations and not a field for consolidations.

In Colorado the largest production of a single mine is about 500 tons daily, while copper mines in Utah and Arizona will produce from 1500 to 5000 tons per day without effort J. A. Snedaker.

Denver, Colo., April 10, 1907.

Beginners

Most of us remember the time when we were inclined to be a little "fresh" and thought we "knew it all," consequently we should be somewhat tolerant of the young beginner and his self-opinionated ways, providing, of course, that this does not entail any loss or suffering on ourselves or others.

Fortunate is he, who, when leaving school or college, possesses a "silent tongue"; it will save him many a set-back and at the same time will be no hindrance to his advancement.

There is scarcely one of us who cannot recall a few bad breaks in speech and action, some to our shame and others to our sorrow. "Fools rush in where angels fear to tread" is a saying the young enthusiast might lay well to heart, especially one who intends entering the mining or metallurgical profession. The habit, too, of "roasting" is one that a beginner should discard immediately he commences business life. What he received and gave among his college association is not called for at his work; nor will he find respect for age and obedience to superiors at all derogatory to his manhood. Mining engineer, metallurgist, assayer or chemist, though not literally synonymous with *gentleman* does, judged from an educational point of view, imply such.

Some years ago it was the custom in Mexico for government inspectors to watch sampling personally, for taxation purposes, at ore-buying agencies. Following his usual practice an inspector on one occasion presented himself at a particular agency to which a young assayer had just been appointed. Not knowing Spanish the latter waited until his chief arrived, whereupon he blurted out: "Say! K——, what the —— is this —— greaser doing, poking his nose into everything?" Before the manager could reply the inspector, in excellent English, said: "Excuse me, Mr. K——, I shall be glad if you will give me the sample of the lot just finished." Needless to say this was a sufficient lesson to the beginner.

One youthful aspirant to managerial honors, a nephew of a director, was sent as assistant to a superintendent. A week after his arrival, seeing how smoothly everything was running, but not knowing that it was due to twenty years of hard experience of the man in charge, wrote to headquarters that the services of two men were superfluous, and that he could easily manage the whole business himself. The answer to this was a letter to the superintendent instructing him to place the assistant as timekeeper, and afterward as shift boss, where, no doubt, his abilities would prove more useful to the company than in his present capacity. It is to the credit of this beginner that he has since freely acknowledged the wisdom of that procedure.

Let the beginner understand that however well equipped he may be theoretically, other men have his knowledge plus several years' practical experience, to say nothing of riper judgment and, while one does not demand "old heads on young shoulders" one expects that youthful ignorance should give all due consideration to experienced age.

Walter Davis.

Sierra Mojada, Mex., April 4, 1907.

Current Density

Mr. Tommasi's remarks, on page 652 of the Journal of April 6, rather surprised me. Among electrical engineers there is no uncertainty whatever as to the meaning of "current density." Divide the current by the cross-sectional area of the path through which it "flows" and the quotient will be the current density. In referring to the current density at the face of an electrode, the same reasoning applies. If current passes to or from both faces, then the combined surfaces should be used as the divisor.

Cecil P. Poole.

New York, April 5, 1907.

According to a Japanese report, published in *La Nature*, Jan. 5, 1907, the production of gold in Korea in 1905 was 3430 kg., valued at 11,250,000 francs, all of which was of alluvial origin. The chief placer workings are in Hpyengan-To. The figures are based on customs statistics, and are probably much below the actual.

New Publications

LORD KELVIN'S VIEWS ON THE ADVANTAGES OF THE METRIC SYSTEM, WITH OPINIONS OF SEVERAL EMINENT MEN, ALSO EXPLANATORY TABLES. Pp. 64, 5½x8 in.; paper, 3d. London, 1906: Decimal Association.

THE GOLD SUPPLY AND PROSPERITY. Compiled and edited by Byron W. Holt. Pp. 264; 5x8 in.; cloth, $1, net. New York, 1907: The Moody Corporation.

In this volume are collected papers by several different financial authorities on the production of gold and its influence on industry, commerce and values. Mr. Holt has edited these contributions and has added an introduction and a concluding summary. The subject is one that has attracted the interest of financiers and economists; and it is, indeed, of great importance to all.

PRINCIPLES OF COPPER SMELTING. By Edward Dyer Peters. Pp. 612; illustrated, 6x9 in.; cloth, $5. New York, 1907; Hill Publishing Company

This book is not a "revised and enlarged" edition of the author's "Modern Copper Smelting," the value of which successive editions have proved. Nor is it another work of the same kind, cast in the conventional form of a metallurgical text-book, and largely compiled from the literature of the subject. Without denying the necessity and usefulness of such works, I take the liberty of saying that this belongs to,—indeed, almost constitutes by itself—a higher class. It is a manual of methods of thinking, reasoning and generalizing in the field which it occupies. With the exception of two chapters (to be mentioned hereafter), the book contains practically no quotations; gives very few descriptions of plant or apparatus; avowedly omits, as far as possible, such details as can be obtained from other books (including the author's own); and presents, from beginning to end, his original work. It goes without saying, that such a book is much harder to write than one in which the author is little more than a critical compiler, employing the scissors more extensively than the pen.

Yet such a book is also more needed, just now, than a new sample of the old familiar type. In every department, whether of applied or theoretic science, there comes a time when students and practitioners are overloaded with the number and complexity of accumulated data; and someone must sift, classify and illuminate the mass of facts, placing them in true relation and perspective, and revealing the underlying principles which may have been obscured by a confusion of details.

But something more is required for the satisfaction of this need than the recognition of its existence. Superficial and imperfect generalizations are easy. An author may lay down a few "simple" laws, because he does not know enough to say more. Indeed, ignorance usually betakes itself to such dogmatism. It is a very different thing to deduce and state fundamental principles from a wide knowledge of fact and theory. In the particular field here under consideration, it may be said that he who would successfully discuss the principles of copper-smelting must have had practical experience of his own, must have known and critically weighed the experience of others, must have written a manual of practice, and must have acquired, through teaching, the art of clear and logical exposition. These conditions are fulfilled in extraordinary degree by Professor Peters; and his new book, consisting largely of his lectures at the Harvard school (carefully revised and considerably expanded, yet bearing the indelible stamp of the friendly instructor), will be a wonderful aid to all tutors and students of this subject. Indeed, the personal presence of the author is so vividly indicated in it that it might easily be used as an efficient guide to students not at school. Professor Peters seems to fear that in this respect, and for this reason, it will prove less interesting to trained practitioners. On the contrary, I think the latter will find the keenest pleasure in its clear summary of that which they know already, and its logical exposition of the reasons for many familiar rules.

Professor Peters's method and order are extremely simple and practical. In plain and largely non-technical words, he explains the first principles of smelting as a process of metallurgical concentration, with accessory changes of chemical condition. A chapter on the principles of roasting as a preparation for smelting follows, to be succeeded by one on the chemistry of copper-smelting, especially as involved in the mixture of charges. The practice of roasting, and that of matte-smelting in the blast furnace and the reverberatory respectively, are next discussed. At every step, the principles laid down are illustrated by calculations of progressive complexity, involving often not only metallurgical, but also economic conditions. For the author rightly considers the metallurgist's problem as wider than that of the laboratory chemist, because its solution must give a profitable, as well as a technically satisfactory, result. The operation cannot be called successful, if the patient dies.

Many will be likely to feel that the calculations here introduced are too numerous and repetitious, and too elaborately stated, even for such rudimentary reasoning. Thus pages 25 to 28 deal with the relation between the weight of a given ore mined and the weight of the same ore after roasting and before smelting—in other words, the relation between mine-capacity and adequate furnace-capacity. Assuming a simple ideal case, in which the metal R, with an atomic weight of 74.6, is mined as a sulphide (the ore containing 30 per cent. of sulphur), and roasted wholly to RO, the author explains at unnecessary length, that 74.6 lb. of R will unite with 16 lb. of oxygen; hence, 1 lb. R requires 0.2142 lb. O; 2000 lb. (one ton) R, 428.4 lb. O; and 700 tons $700 \times 428.4 = 299,880$ lb., or 149.94 tons O; hence, the total weight, after roasting, of 1000 tons RS mined will be $700 + 149.94 = 849.94$ tons. This is diffuse enough; but he goes on to show how the same result can be reached more directly by taking the ton instead of the pound as a unit If 74.7 tons R require 16 tons O, then one ton requires, etc., and 700 tons require 700 × etc., to the same end. Moreover, there is another way: 74.7 tons R uniting with 16 tons O, give 90.7 tons RO. Hence, one ton R, etc.; hence 700 tons R, etc.; the final result being 849.94, as before. But there is yet another way: the weight of the oxygen gained in roasting may be subtracted from the weight of the sulphur lost, and the difference added to the original weight of ore. Again, this calculation may be shown in the form of a balance-sheet—gains of weight on one side, and losses on the other. Once more, since the atomic weight of O is exactly one-half that of sulphur, so that in roasting, the ore gains in oxygen half as much by weight as it lost in sulphur, the loss of 300 tons of sulphur will mean the gain of 150 tons of oxygen, and hence the weight after roasting of 1000 tons of ore mined will be $1000 - 300 + 150 = 850$ tons. And finally, "methods of solving this problem might be greatly multiplied!"

In a printed book, this seems to be simplicity somewhat overdone. Yet it is excess on the right side; and if the student will obey the author's injunction and wade patiently through all these synonymic variations, he will know the thing thoroughly at last. The skilled metallurgist will, of course, skip such elementary passages, formulas and demonstrations. For him, there is in the book an abundance of less diluted nourishment.

Chapter VIII, "Pyrite Smelting," Professor Peters declares to be based mainly upon the views and sugggestions of his friend, Robert C. Sticht, general manager of the Mt. Lyell Mining and Railway Company, Broken Hill, Australia. If I am not mistaken, Mr. Sticht has never published in English any such statement of his own.[1] Nor does any other English treatise (apart from monographs dealing with special cases and conditions) on this important subject deserve special notice—except, perhaps, "Fyrite Smelting," edited by Mr. Rickard and published by the ENGINEERING AND MINING JOURNAL in 1905. But that was not a coherent and logical treatise. It was a symposium, in

[illegible] Peters.

It is safe to say, therefore, that Mr. Stieht's presentation, as arranged by Professor Peters, will take the first place in the technical literature of pyrite smelting.

Chapter IX, "A Practical Study of Slags," is an excellent example of Professor Peters' simple, patient and practical method. The reader who is studying the subject for the first time will be carried step by step to a knowledge adequate for ordinary problems. The reader already educated will perhaps be impatient of the slow progress of the argument; and one who consults the book casually must beware lest he accept as a general principle the result of a calculation based on assumptions avowedly not only arbitrary, but never occurring in practice. In a word, the book must be judged in the light of its primary purpose of progressive instruction; and, thus judged, it is admirable.

In connection with this chapter on slags, however, I venture to suggest one particular in respect of which it might be made still more useful. Namely, the daring, though not always scientific, experiments of American smelters led to the adoption, years ago, of certain empirical slags which had proved advantageous under given conditions. The adoption of such slags preceded, in fact, the recognition of their chemical formulas and their classification according to any general system. If Doctor Peters had added to his chapter on slags some instances of this character, giving the slags actually made and preferred at certain works for certain classes of ores, he would have furnished a valuable connection between theory and practice, enabling the student, on the one hand, to see how these traditional slags were explainable by the later scientific discussion; and, on the other hand, to know, in a given case, the nature of the slag which practice had already selected, and which theory also would approve. Without such an additional hint it is not impossible that a student of this chapter might find himself pretty completely instructed how to steer, but not clearly told what port he should steer for.

The succeeding chapters deal with "Matte," the "Production of Metallurgical Copper from Matte," and the "Principles of Furnace Building." The last, in particular, is an admirable example of summary statement.

Chapter XIV, on "Applications of Thermo-Chemistry," contributed by Prof. Joseph W. Richards, of Lehigh University, an acknowledged authority in this department, is an interesting, beautiful and valuable discussion of a most important element in metallurgical problems.

A chapter of miscellaneous and commercial facts and formulas concludes and completes the book. I have spent many hours in reading it. It is as fascinating as a story. The reader who would reach the end sooner may "skip" now and then. But let him beware lest he thereby lose something necessary to a safe arrival. Rather than incur such a loss he had better suit his pace to that of Professor Peters, who never skips, but marches "unhasting, unresting" to his goal.

The Assay of Gold Bars

A. C. Claudet, Bull. No. 27 I. M. M., describes a method for the analysis of gold bars. The sample piece is flattened on an anvil with a hammer until thin enough to be cut with shears. The utmost cleanliness in this and all subsequent operations is observed. The weight taken for assay is 0.5 gram, 1000 millièmes. Triplicate portions of about 1001 millièmes are roughly weighed out. These portions are then carefully weighed by substitution weighing on a balance sensitive to 0.05 milliéme as follows:

The 1000 milliéme weight is placed on the right-hand pan of the balance and counterpoised with a rough weight on the left-hand pan and finally by means of the rider on the left-hand side of the beam an exact balance is obtained. The 1000 weight is removed and replaced with the assay piece which is carefully filed until it balances the counterpoise.

Every fourth or fifth assay piece is checked by another operator who has used the same 1000 weight in adjusting his balance. The piece is then wrapped in 4000 millièmes of lead with 35 millièmes of copper and 2500 of silver.

The cupellation is done in a Fletcher gas muffle furnace, cupelling 20 pieces at a time, including one check piece. The cupels are placed in five rows of four each in the center part of the muffle, surrounded by blank cupels and are baked for one hour before use. The check is placed in the eleventh cupel from the front row counting from left to right. Checks from different cupellations parted together seldom vary 0.1 millième, showing the fairly constant cupellation temperature maintained. The cupellation takes about eight minutes and the cupels are removed from the furnace while the metal is still molten, allowing the solidification to take place outside the furnace.

Parting

The buttons are removed from the cupels, squeezed, brushed and flattened with a hammer. They are annealed at a low red temperature and rolled into ribbons of equal length. The ribbons are reannealed and rolled into cornets, the rough side outermost, of the same number of convolutions. The cornets are parted, sixty at a time, in platinum trays. The first parting is in 25 oz. of 1.16 sp.gr. nitric acid and the boiling continues until the disappearance of the nitrous fumes. The tray is then removed, drained, washed with distilled water, drained and immersed in the second acid consisting of 25 oz. of 1.25 sp.gr. nitric acid, and boiled for twenty minutes. The tray is then removed, drained and immersed, without washing, in the third acid, which is of the same amount and strength as is the second, and boiled for twenty minutes. Again the tray is removed, drained, washed twice with distilled water, drained and dried over a gas burner covered with wire gauze and annealed in the muffle at a red heat until the cornets are of a bright gold color.

The cornets when cold are weighed on the same balance as originally weighed and in the same manner by adding small weights and the rider to the cornets until a balance is obtained. Check and assay pieces are checked by another operator. The surcharge varies from 0.7 to 1.0 milliéme.

All balances are examined by the balance maker once a month, as well as the weights and riders, and corrected if found faulty. The silver, lead and copper are tested to insure the absence of gold. The nitric acid is likewise tested for the absence of sulphuric and hydrochloric acids, and the solutions made up to exact srength.

Gold for Control Assay

Claudet's method of refining gold for use as checks consists of dissolving 12 oz. of cornet gold in aqua regia in two flasks and evaporating in porcelain dishes until chlorine commences to come off. The solution is then diluted to about 14 liters with distilled water, allowed to settle for three weeks and then siphoned off through a filter. A filtered solution of 2.25 lb. of oxalic acid is added and thoroughly stirred in and the gold allowed to settle for two or three weeks, and the solution is siphoned off as before. The gold is collected in a porcelain dish, washed by decantation with boiling distilled water, then with hydrochloric acid, water, and ammonia water in the order named.

Finally the gold is collected, dried and melted with niter in a clay crucible. The gold button is allowed to cool in the crucible, is then broken out, washed with water and hydrochloric acid and remelted in a plumbago crucible and cast in a small bar. The bar is washed, cleaned and rolled into a strip, which is cleaned before use.

Coal Production of the Transvaal in 1906

Owing to an error in the typewritten copy, the production of coal in the Transvaal for 1906 was given in the article on "Conditions met in South African Mines," by J. B. Pitchford, in the Journal of March 9, as 14,000,000 tons. The figures should have been "approximately 2,850,000 tons."

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States patent office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ALUMINUM NITRIDE. O. Serpek, Solothurn, Switzerland. Process for producing an aluminum nitride free from carbon by passing air over aluminum carbide. (Brit. No. 13,579 of 1906; March 9, 1907.)

CEMENT

CEMENT and Process of Manufacturing Same. Maximilian Toch, New York, N. Y. (U. S. No. 848,328; March 26, 1907.)

CEMENT KILN. John S. Wentz, Philadelphia, Pa. (U. S. No. 849,873; April 9, 1907.)

HYDRAULIC CEMENT. Process of Making Hydraulic Cement. Emil Mueller, Alsen, N. Y. (U. S. No. 850,778; Apr. 13, 1907.)

KILN. John A. Shumaker, Hyndman, Pa., assignor of one-third to George William Brinham and one-third to Norman Reuben Shumaker, Hyndman, Pa. (U. S. No. 850,066; April 9, 1907.)

CHROMIUM

FERRO-CHROMIUM. H. W. C. Annable and Ferro-Alloys Syndicate, London, England. A method of producing ferro-chromium free from carbon by smelting chromite over oxide of iron. (Brit. No. 5030 of 1906; March 9, 1907.)

COAL AND COKE

COAL BORING MACHINES. H. P. Moorley, Derby, England. Improvements in the upright frames used in supporting coal boring machines. (Brit. No. 13,649 of 1906; Apr. 6, 1907.)

BRIQUETS — Apparatus for Coking Briquets. Bernhard Wagner, Stettin, Germany. (U. S. No. 849,947; April 9, 1907.)

COAL CRUSHING STAMP. F. Meguin & Co., Dillingen, Germany. A pneumatic stamp for crushing coal. (Brit. No. 4923 of 1906; March 9, 1907.)

COAL CUTTERS. R. M. Percy, Wegan. In coal cutters using pronged percussive cutters, the arrangement of the prongs on sockets so that they can easily be renewed. (Brit No. 12,328 of 1906; March 23, 1907.)

COAL CUTTING MACHINES. R. Hay and H. G. Nadin, Burton-on-Trent. Improvements in the structure of coal-cutting machines in which cutting tools are carried on an endless chain to adapt it to use with an electromotor. (Brit. No. 9391 of 1906; March 16, 1907.)

COAL-CUTTING TOOL. G. W. Bonsfield, Wakefield, England. Improved coal cutting tool consisting of a cluster of removable points. (Brit. No. 11,646 of 1906. Mar. 30, 1907.)

COAL TIPPLE. John J. Fleming, Carrick, Pa., assignor to Phillips Mine and Mill Supply Co., Pittsburg, Penn., a corporation of Pennsylvania. (U. S. No. 849,113; April 2, 1907.)

COAL WASHING. P. Schondeling, Langendreer, Germany. In the feeding of coal to washers, the arrangement of nozzles whereby as much of the dust is extracted as possible before going to the washers. (Brit. No. 11,797 of 1906; March 23, 1907.)

COAL WASHING—Special Form of Scrapers for Use in Coal Washing Machines. Hardy Patent Pick Co., Sheffield, England. (Brit. No. 8037 of 1906; March 9, 1907.)

COAL-WASHING APPARATUS. Robert L. Martin, Jr., and Harvey Cory, Pittsburg, Pa., assignors to Pittsburgh Coal Washer Company, Pittsburg, Penn., a corporation of Penn. (U. S. No. 850,594; Apr. 13, 1907.)

COKE—Apparatus for Separating and Discharging Coke. Walter Schumacher, Dusseldorf, Germany. (U. S. No. 849,429; April 9, 1907.)

DUST COLLECTOR. E. Dickinson and G. Smith, Sheffield, England. An apparatus for drawing off and collecting dust from coal ores, etc. (Brit. No. 6910 of 1906; March 23, 1907.)

COPPER

COPPER CONVERTER LININGS. H. L. Charles and F. A. Heinze, Butte, Mont. Improved method of drying and hardening the linings of copper converters. (Brit. No. 16,322 of 1906. Mar. 30, 1907.)

CORUNDUM

CORUNDUM — Treatment of Corundum. Max Buchner, Mannheim-Waldhof, Germany. (U. S. No. 848,439; March 26, 1907.)

GLASS MANUFACTURE

GLASS FURNACE. Scott O. Reed, Toledo, Jr., Toledo, Ohio. (U. S. No. 849,021; April 2, 1907.)

GOLD AND SILVER

DREDGING—Scoop Bucket for Dredging Purposes. Charles Pay, Providence, R. I. (U. S. No. 850,096; April 9, 1907.)

FILTER PRESSES FOR SLIMES. C. Butters, London, England. A vacuum filter press for slimes, in which a solvent is drawn through the adhering cake of slimes so as to increase the total extraction. (Brit. No. 20,979 of 1906; Apr. 6, 1907.)

GOLD EXTRACTION. J. A. Just, Pulaski, New York. Dissolving gold and silver from ores by means of a mixture of nitrate of soda and acid, by means of which the oxygen set free oxidizes the metals which can then be taken up into solution. (Brit. No. 4796 of 1906. Mar. 30, 1907.)

GOLD WASHING and Saving Apparatus. George L. Holmes, Oakland, Cal. (U. S. No. 849,614; April 9, 1907.)

HYDRAULIC MINING—Gold-saving Apparatus. Erastus S. Bennett, New York, N. Y. (U. S. No. 849,101; April 2, 1907.)

METAL EXTRACTION — Apparatus for Extracting Metals from Their Ores. Craig R. Arnold, Philadelphia, Penn. (U. S. No. 849,097; April 2, 1907.)

ROCKER—Machine for Separating Gold and Platinum from Other Material. Charles O. Michelsen, Salt Lake City, Utah. (U. S. No. 848,553; Apr. 9, 1907.)

IRON AND STEEL

BASIC STEEL. F. Benjamin, Beuthen, Germany. In the basic steel process, where iron low in phosphorus is used, producing a slag rich in phosphorus by adding certain phosphorus compounds to the charge. (Brit. No. 1102 of 1906; March 23, 1907.)

OPEN-HEARTH STEEL FURNACES — Compound for Facing the Ports of Open-hearth Steel-furnaces. Addison H. Beale and Elwood F. McDowell, Pottsville, Penn. (U. S. No. 850,723; Apr. 13, 1907.)

REVERBERATORY FURNACES. M. Moore and T. J. Heskett, Melbourne, Australia. Improvements on reverberatory furnaces for producing wrought iron direct from ore, with the object of preventing the great loss of iron usual in this process. (Brit. No. 17,131 of 1906; March 16, 1907.)

ROLLING MILL. William H. Brown, Pittsburg, Penn. (U. S. No. 848,438; March 26, 1907.)

ROLLING MILL—Controller for Rolling Mill Repeaters. Frank P. Townsend, Elyria, O., assignor to National Tube Co., Pittsburg, Penn., a corporation of New Jersey. (U. S. No. 848,581; March 26, 1907.)

LEAD

WHITE-LEAD MANUFACTURE. Union Lead and Oil Company, New York, N. Y. Improvements in plant used for making white lead, in which comminuted lead is projected into corroding chambers. (Brit. No. 5015 of 1906. Apr. 6, 1907.)

PETROLEUM

OIL-WELL CLEANER. Fred N. Scofield, Kern, Cal. (U. S. No. 848,501; March 26, 1907.)

RARE METALS

FILAMENT for Incandescent Electric Lamps. [illegible] of filaments for electric lamps, consisting of [illegible] tungsten. (Brit. No. 4081 of 1906; March 16, 1907.)

FILAMENTS for Incandescent Electric Lamps. Consortium für Electrochemische Industrie, Nuremberg, Germany. In preparing tungsten for electric filaments, keeping it at a temperature just under smelting point for some time in order to improve its electric properties. (Brit. No. 15,021 of 1906; March 30, 1907.)

TANTALUM. Siemens & Halske, Berlin, Germany. Process for producing homogeneous masses of tantalum. (Brit. No. 22,491 of 1906; Mar. 30, 1907.)

TANTALUM. Production of Homogeneous Bodies from Tantalum or Other Metals. Marcello von Pirani, Wilmersdof, Berlin, Germany, assignor to Siemens & Halske A.-G., Berlin, Germany, a corporation of Germany. (U. S. No. 848,572; March 26, 1907.)

TUNGSTEN FILAMENT for Incandescent Electric Lamps. Vereinigte Electricitäts Gesellschaft, Budapest. Improvements on tungsten filaments for electric lamps with the object of rendering them less brittle. (Brit. No. 3213 of 1906; March 16, 1907.)

ZINC

LITHOPONE. J. Ephraim, Berlin, Germany. In the manufacture of lithopone, i.e., the paint consisting of barium sulphate and sulphide of zinc, methods of treatment which will prevent the paint turning gray afterward. (Brit. No. 16,516 of 1906; March 9, 1907.)

MINING—GENERAL

MINING SIGNAL SYSTEM. Norman S. Richmond, Oshkosh, Wis. (U. S. No. 850,100; April 9, 1907.)

METALLURGY—GENERAL

ANTIMONY AND ARSENIC EXTRACTION. J. R. Masson, Melbourne, Australia. A variation of the process for recovering antimony and arsenic from ores by means of a solution of caustic alkali. (Brit. No. 13,012 of 1906; Apr. 6, 1907.)

BRIQUETS. A. Tavernier, Paris, France. An agglutinant for making briquets, consisting of the extract obtained by boiling wood in sulphurous acid solutions. (Brit. No. 24,742 of 1906; Apr. 6, 1907.)

BRIQUETS. R. Middleton, Leeds, England. Improved press for making briquets by extrusion. (Brit. No. 6249 of 1906; Apr. 6, 1907.)

BRIQUETTING. S. Suski, Kieff, Russia. In preparing fuel and other briquets, adding manganese dioxide or other oxidizing agent to the tar or other agglutinant used. (Brit. No. 13,355 of 1906; March 16, 1907.)

ELECTROLYSIS. P. Ferchland, Berlin, Germany. For electrolytic processes, such as the electrolysis of salt, the use, as an anode, of lead peroxide electrolytically deposited in compact form from solutions of lead salts. (Brit. No. 24,806 of 1906; March 9, 1907.)

ELECTROLYSIS—Process of Producing Light Metals by Electrolysis. Franz von [illegible] Rock, Va. (U. S. No. 850,376; Apr. 13, 1907.)

METAL [illegible] production of a metal consisting of a mixture [illegible] (Brit. No. [illegible]

METAL EXTRACTION from Silicious Ores. A. Seigle, Lyons, France. A process for [illegible] ing them with chlorides and acting on the mixture by steam pressure, thus liberating chlorine, which dissolves out the metal. (Brit. No. 3575 of 1906; March 16, 1907.)

METALLIC OXIDES—Method of Manufacturing Metallic Oxides. John H. Montgomery, St. Louis, Mo., assignor of one-third to Francis H. Ludington and Frank Orff, St. Louis, Mo. (U. S. No. 849,355; April 9, 1907.)

liberated from sodium peroxide. (Brit. No.

SOLDER. R. J. Crowley and F. F. Payne, ... A solder consisting of three parts of tin, one of lead and one of zinc, and a method of employing it. (Brit. ... 1906. March 9, ...

MINING MACHINERY AND APPARATUS

ACETYLENE LAMPS. P. Best, Essen. ... Improvements in acetylene lamps used in mines, especially with the object of preventing irregularity in generation due to jolting. (Brit. No. 7531 of 1906; Mar. 30, 1907.)

AERIAL ROPEWAYS—Differential Clip for Aerial Ropeways, etc. Yusuke Tamamura, Ahio, Japan. (U. S. No. 850,504; Apr. 13, 1907.)

BLASTING—Miner's Fuse Tool. Charles Elliott, Scammon, Kas. (U. S. No. 847,923; March 19, 1907.)

BORING APPARATUS. G. Burnside, Durham. Improvements in the inventor's rock boring apparatus, especially useful in boring long holes in prospecting work. (Brit. No. 18,440 of 1906; Mar. 30, 1907.)

CONVEYER—Endless Conveyer. Francis A. M. Smulders, Rotterdam, Netherlands. (U. S. No. 850,684; Apr. 13, 1907.)

CONVEYER — Cross Conveyer. Chester Bradford, Indianapolis, Ind. (U. S. No. 849,594; April 9, 1907.)

CONVEYER. John T. Wilmore, Denver, Colo. (U. S. No. 849,345; April 2, 1907.)

CONVEYER—Apron Conveyer. Henry G. Ginaca, Honolulu, Hawaii. (U. S. No. 848,236; March 26, 1907.)

CONVEYER BELT. Ernest A. Houchin and Anthony Huber, Brooklyn, N. Y. (U. S. No. 850,002; April 9, 1907.)

CONVEYER CHAIN. Michael Garland, Bay City, Mich. (U. S. No. 850,149; Apr. 13, 1907.)

DEEP BORING APPARATUS—Deutscher ... A. G. Neuhausen, Germany. Improvement in the inventor's deep-boring apparatus, with the object of distributing the water more efficiently for cleaning the hole and bringing up the broken rock. (Brit. No. 20,538 of 1906; March 16, 1907.)

DRILL—Core Drill. Robert M. Downie, Beaver Falls, Penn., assignor to Keystone Driller Co., Beaver Falls, Penn., a corporation of Pennsylvania. (U. S. No. 848,227; March 26, 1907.)

DRILLS—Scraper for Disk Drills. Edwin R. Beeman, Minneapolis, Minn., assignor to Monitor Drill Co., St. Louis Park, Minn., a corporation of Minnesota. (U. S. No. 849,187; April 2, 1907.)

DUMPING APPARATUS. Samuel W. Hopkins, Enterprise, Kans. (U. S. No. 850,648; Apr. 13, 1907.)

HOISTING — Safety Rope Clamp. John Collins, San Francisco, Cal. (U. S. No. 849,832; April 9, 1907.)

HOISTING APPARATUS. Lincoln Moss, New York, N. Y., assignor to Robins Conveying Belt Co., New York, N. Y., a corporation of New Jersey. (U. S. No. 849,257; April 2, 1907.)

HOISTING APPARATUS. Victor R. Browning, Nottingham, Ohio. (U. S. No. 848,287; March 26, 1907.)

HOISTING APPARATUS for Deep Wells. Walter S. Sutton, Kansas City, Kans. (U. S. No. 850,549; Apr. 13, 1907.)

HOISTING MACHINES—Brake for Hoisting Machines. Guy C. Grable, Minneapolis, Minn., assignor, by mesne assignments, to W. L. McBride, Minneapolis, Minn. (U. S. No. 850,152; Apr. 13, 1907.)

HOISTING MECHANISM. Geo. W. King, Marion, Ohio, assignor to the Marion Steam Shovel Co., Marion, O., a corporation of Ohio. (U. S. No. 849,625; April 9, 1907.)

MINE CARS—Check Lock for Mining Cars. Charles A. Calsell, Carbon, W. Va. (U. S. No. 848,441; March 26, 1907.)

MINE DOOR. William W. Zuber, Osnaburg, Ohio. (U. S. No. 848,716; April 2, 1907.)

MINING BY SUBLIMATION—Process of Extracting and Recovering the Volatilizable Contents of Sedimentary Mineral Strata. Delos R. Baker, Delaware, Ohio. (U. S. No. 849,524; April 9, 1907.)

MINING MACHINE. Edward G. Tillman, Thayer, W. Va. (U. S. No. 850,192; Apr. 13, 1907.)

MOTOR for Rock Drills and Similar Tools. Charles E. Shadall, Milwaukee, Wis., assignor of one-half to Frederick L. Horneffer, Milwaukee, Wis. (U. S. No. 849,578; April 9, 1907.)

PUMP. William Y. Cruikshank, Freeland, Penn., assignor of one-half to Nixon Maley, Freeland, Penn. (U. S. No. 847,735; March 19, 1907.)

RAILWAY — Underground Eectric Railway. Sylvester M. Sullivan, San Francisco, Cal. (U. S. No. 848,507; March 26, 1907.)

ROCK DRILL. Charles E. Shadall, Milwaukee, Wis., assignor of one-half to Frederick L. Horneffer, Milwaukee, Wis. (U. S. No. 849,506; April 9, 1907.)

ROCK DRILL. Frederick E. Glaze, Victor, Colo., assignor to Eureka Drill Steel Co., Cripple Creek, Colo., a corporation of Colorado. (U. S. No. 849,229; April 2, 1907.)

ROCK DRILL BITS. W. E. Kimber, Johannesburg. In bars of steel intended for the manufacture of rock-drill bits, using a bar composed of a core of the hardest steel with softer steel round it; as the drill is used, the outer parts wear down first and keep the point always sharp. (Brit. No. 8683 of 1906; March 23, 1907.)

ROCK-DRILLING-MACHINE CHUCK. Sigismund R. J. Maynard, Aldrovand V. T. Maynard and Frank Gale, Fordsburg, Transvaal. (U. S. No. 847,590; March 19, 1907.)

ROCK DRILLING MACHINES—Means for Mounting Rock drilling Machines or Engines. Henry Hellman and Lewis C. Bayles, Johannesburg, Transvaal. (U. S. No. 850,885; Apr. 13, 1907.)

ROCK DRILLS—Attachment for Supplying Water to Rock Drills. Eustace M. Weston, Johannesburg, Transvaal. (U. S. No. 849,445; April 9, 1907.)

TUNNELING APPARATUS. Frank A. Moffitt, Chicago, Ill. (U. S. No. 847,801; March 19, 1907.)

WELL-DRILLING MACHINE. John W. Scherer, Petersburg, Va., assignor of one-half to William A. Scherer, Petersburg, Va. (U. S. No. 849,271; April 2, 1907.)

WELL SINKING—Method of and Apparatus for Sinking Wells. Eugene F. Bradt, Detroit, Mich. (U. S. No. 849,043; April 2, 1907.)

ORE DRESSING MACHINERY

CLASSIFIER. Charles W. Merrill, Lead, S. D. (U. S. No. 849,153; April 2, 1907.)

CRUSHER—Gyratory Crusher. Oliver C. Redding, Chicago, Ill., assignor of one-half to William K. Kenly, Chicago, Ill. (U. S. No. 850,491; Apr. 13, 1907.)

CRUSHER—Rock and Ore Crusher. Geo. H. Thurston, Johannesburg, Transvaal, assignor to Allis-Chalmers Company, Milwaukee, Wis., a corporation of New Jersey. (U. S. No. 848,782; April 2, 1907.)

CRUSHING-MILL. Jean Morin, Dayton, Ohio. (U. S. No. 850,596; Apr. 13, 1907.)

CRUSHING MILL — Ore Crushing and Screening Mill. Joseph Aigert, Denver, Colo. (U. S. No. 849,037; April 2, 1907.)

GRINDING and Pulverizing Apparatus. Bertram Hunt, San Francisco, Cal. (U. S. No. 849,545; April 9, 1907.)

GRINDING MILL—Pebble Mill. George S. Emerick, Nazareth, Penn. (U. S. No. 849,730; April 9, 1907.)

GRINDING MILL—Pulverizing or Grinding Mill. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 849,779; April 9, 1907.)

GRINDING MILL—Pulverizing or Grinding Mill. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 849,780; April 9, 1907.)

GRINDING MILL—Pulverizing or Grinding Mill. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 849,782; April 9, 1907.)

GRINDING MILLS—Metal Ring for Pulverizing or Grinding Mills. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 849,781; April 9, 1907.)

MIDDLINGS PURIFIER. Geo. T. Smith, Minneapolis, Minn., assignor of three-fourths to Minneapolis Steel and Machinery Co., Minneapolis, Minn., a corporation. (U. S. No. 848,404; March 26, 1907.)

ORE CLASSIFIER. John Van N. Dorr, Lead, S. D. (U. S. No. 849,379; April 9, 1907.)

ORE-CONCENTRATING TABLE. Howard D. McLeod, Great Falls, Mont. (U. S. No. 850,391; Apr. 13, 1907.)

ORE SEPARATOR. John W. Gibson, Milwaukee, Wis. (U. S. No. 849,385; April 9, 1907.)

PULVERIZERS. J. W. Fuller, Catasauqua, Penn., U. S. A. In pulverizers having balls running in an annular grinding surface, an improved method of supporting the vertical rotary shaft. (Brit. No. 14,628 of 1906; March 23, 1907.)

SCREEN. Frank Mikesell, Jr., Fort Scott, Kans. (U. S. No. 849,154; April 2, 1907.)

SCREENING — Unloading, Screening and Loading Apparatus. John W. Seaver, Cleveland, O., and Alexander Leslie, Walkerville, Ontario, Canada, assignors to Wellman-Seaver-Morgan, Cleveland, O., a corporation of Ohio. (U. S. No. 849,920; April 9, 1907.)

SCREENS IN GRINDING MACHINES. J. W. Fuller, Catasauqua, Penn. Improved arrangement of screens in grinding machines having circular ball tracks. (Brit. No. 14,629 of 1906; March 16, 1907.)

MAGNETIC SEPARATION. The Humboldt Company, Cologne, and the Metallurgischegesellschaft, Frankfort, Germany. In magnetic separators, passing the ore along belts under series magnets of different power, which attract the various constituents up to belts traveling at right angles to the main belt. (Brit. No. 20,545 of 1906; March 23, 1907.)

MAGNETIC SEPARATOR. H. M. Sutton, London, England. A magnetic separator in which magnetic particles adhere to a portion of the surface of a revolving cylinder. (Brit. No. 2993 of 1906; March 9, 1907.)

PULVERIZER. Nickolas Spurgin, Ottawa, Ill., assignor of one-half to Benjamin B. Holland, Ottawa, Ill. (U. S. No. 848,213; March 26, 1907.)

METALLURGICAL MACHINERY AND APPARATUS

CONVEYER for Metal Bars. Jerome R. George, Worcester, Mass., assignor to Morgan Construction Co., Worcester, Mass., a corporation of Massachusetts. (U. S. No. 849,122; April 2, 1907.)

DISTRIBUTING FAN. A. L. J. Queneau, South Bethlehem, Penn. A fan for distributing the charges of retorts, furnaces, etc. (Brit. No. 1101 of 1906; March 23, 1907.)

ELECTROLYTIC APPARATUS. Anson G. Betts, Troy, N. Y. (U. S. No. 850,127; Apr. 13, 1907.)

GAS PRODUCER. William R. Miller, Pittsburg, Penn., assignor to Foster Miller Engineering Co., Pittsburg, Penn., a corporation of Pennsylvania. (U. S. No. 848,118; March 26, 1907.)

GAS PRODUCER. William R. Miller, Pittsburg, Penn., assignor to Foster Miller Engineering Co., Pittsburg, Penn., a corporation of Pennsylvania. (U. S. No. 849,848; April 9, 1907.)

GAS PRODUCER—Process of Producing Gas. Henry L. Doherty, Madison, Wis. (U.S. No. 848,729; April 2, 1907.)

GAS PRODUCERS—Feed Mechanism for Gas-producers. Alonzo L. Parker, St. Joseph, Mo. (U. S. No. 850,395; Apr. 13, 1907.)

MELTING METALS—Device for Feeding Melting Pots. Eugene Trama, Marseilles, France. (U. S. No. 848,868; April 2, 1907.)

ORE ROASTING and Treating Apparatus. Myron Dings and Alvin Dings, Milwaukee, Wis. (U. S. No. 849,465; April 9, 1907.)

ORE-ROASTING APPARATUS. Robert McKnight, Philadelphia, Penn. (U. S. No. 850,-039; April 9, 1907.)

SAMPLING—Sample Mixer. Ulysses A. Garred, Anaconda, Mont. (U. S. No. 849,-540; April 9, 1907.)

SKIMMING DEVICE for Molten Metals. George W. Moore, Burlington, N. J. (U. S. No. 848,840; April 2, 1907.)

VANNER. George O. Bradley, Salt Lake City, Utah. (U. S. No. 850,415; Apr. 13, 1907.)

FURNACES

CALCINING FURNACE. Thomas McNeal, Kansas City, Mo. (U. S. No. 850,041; April 9, 1907.)

CHARGING APPARATUS. Robins Conveying Belt Company, New York. A furnace charging apparatus, specially designed for smelting furnaces treating copper and lead ores. (Brit. No. 16,797 of 1906; Mar. 30, 1907.)

ELECTRIC INDUCTION FURNACE. Grönd al Kjellin Co. and J. Harden, London. In the inventors' electric induction furnace, making the windings of the primary coil of hollow conductors through which the cooling medium may be circulated. (Brit. No. 16,269 of 1906; March 23, 1907.)

ELECTRIC FURNACE IMPROVEMENTS. A. R. Lindblad and O. Stalhane, Ludvika, Sweden. In electric smelters of the transformer type, an improved method of arranging transformer core in order to reduce the magnetic leakage. (Brit. No. 23,379 of 1906; Apr. 6, 1907.)

ELECTRIC SMELTING FURNACES. A. Heorth, Christiania, Norway. Improvements in electric smelting furnaces. (Brit. Nos. 28,960, 28,961 of 1906; March 23, 1907.)

MELTING FURNACE. C. Twer, Urdingen, Germany. An improved melting furnace for melting iron, brass and other metals. (Brit. No. 14,779 of 1906; Mar. 30, 1907.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. C. Barger, of New York City, has been examining properties in Nevada.

W. H. Robertson, of Webb City, Mo., is representing the Cockerill Zinc Company, in Mexico.

G. W. Miller, of Denver, is examining mines near Telluride, Colo., for a London syndicate.

W. H. Blackburn has been appointed superintendent for the Tonopah Mining Company, of Nevada.

C. W. Kempton returned last week to New York from a professional trip to Chile, South America.

C. A. Bohn, of Mexico City, is in Monterey, Mexico, on business for the National Metal Company.

G. G. S. Lindsey, general manager of the Crow's Nest Pass Coal Company, of Fernie, B. C., is in Toronto, Ontario.

A. A. Ireland, of Georgetown, Colo., has gone to Mexico to examine properties in the interests of Eastern parties.

Robert Linton, of R. M. Atwater & Co., has returned to Helena, Mont., from a business trip to Chicago and Pittsburg.

C. N. Brown, of Socorro, New Mexico, is making an extended trip through old Mexico in the interests of the Empire Zinc Company.

E. H. Hadley, manager of the property of the Butte-Montana Copper Company, has returned to Butte from a business trip to Pittsburg.

M. E. Wadsworth, dean of the department of mines and metallurgy of the Pennsylvania State College, has been visiting in New York.

Rees C. Vidler, a well known operator in the Argentine district, Clear Creek county, Colo., has returned from a business trip to London, England.

Victor Rakowsky, of Duluth, Minn., engineer for the Butte & Superior Copper Company, is visiting Butte, Mont., where the company's ground is located.

Freeman Thoman, of Georgetown, Colo., has left for the Cassiar, British Columbia, where he will take charge of copper properties for Denver owners.

Austin King, formerly superintendent of mines for the Dominion Coal Company, is suing the company for $85,000 for wrongful dismissal from that position.

H. Vincent Wallace has returned to Nogales, Arizona, from Guanajuato, Zacatecas and Durango, Mexico, where he has been engaged in professional work.

John C. Adams, superintendent of the Boston & Montana mines in Butte, is inspecting the property of the Butte & Arizona Copper Company near Bisbee, Arizona.

George Squire is on a vacation in the United States before taking up his duties as superintendent of the new plant of the American Smelting and Refining Company, at Chihuahua, Mexico.

George W. Maynard left New York April 20, for the purpose of examining mining properties in Nevada and the Yukon. His address until June 1 will be White Horse, Yukon territory.

B. B. Thayer, who represents H. H. Rogers, of New York, in the Amalgamated, is making his quarterly inspection of Amalgamated properties in Butte, having arrived there from the East.

Alexander Veitch has resigned as superintendent of the Arizona Copper Company, of Clifton, Ariz., to assume a similar position with the Arizona Amalgamated Copper Company, also of Clifton.

S. A. Knowles, superintendent of the Newhouse tunnel at Idaho Springs, Colo., has resigned his position to take one in an executive capacity with the Boston Consolidated Copper Company, at Bingham, Utah.

W. D. Thornton, vice-president of the Butte Coalition Company, and interested in several enterprises with Thomas F. Cole, of the lake country, has returned to Butte from a three months' sojourn in New York.

Dr. Alexander N. Winchell, of the Montana State School of Mines, has been elected to fill the chair of petrography and mineralogy, formerly held by Prof. William H. Hobbs, at the University of Wisconsin.

G. P. Grimsley, of the West Virginia Geological Survey, at Morgantown, W. Va., has been visiting New York. He will soon begin field-work for the season, on a general investigation of the iron ores of the State.

Frank Robbins is examining placer ground on the Colorado river and later in April he will make his usual visit of inspection to the niter lands in Inyo county, California, returning to Los Angeles in May.

H. R. Harrison, assistant superintendent at the American Smelting and Refining Company plant, Monterey, Mexico, has resigned, to take a similar position with the Peñoles Mining Company, at its smelter in Mapimi, Mexico.

John de Forest Junkin, Jr., of Coalgate, I. T., general manager of the Coalgate Company, has been very ill for the past six weeks at the residence of his wife's parents, in New York, with tonsilitis and rheumatism. He is improving.

George Hardy, of Carnegie, Penn., who has been for the past three months examining the zinc and lead-silver orebodies of the Gavilana mining district, near San Jose del Sitio, Chihuahua, Mexico, for Pittsburg capitalists, has returned home.

Horace V. Winchell, formerly chief geologist for the Amalgamted Copper Company, now occupying a similar position with the Great Northern Railroad Company, is in Butte, Mont., on business connected with his company's mining interests.

J. B. Cavanaugh, secretary of the Western Coal and Dock Company, of Chicago, recently spent several days in the Birmingham district, in Alabama. The company owns and operates mines in Alabama and will make further investments in the district.

Lucius Mayer, mining engineer with the American Smelters' Securities Company, has completed a trip through the various coalfields, where he has observed the different methods of flushing, robbing, and mine development, with reference to applying certain principles to properties of his company.

T. S. Lowther, superintendent of the Rochester & Pittsburg Coal and Iron Company mines, at Walston, Penn., has been appointed mine inspector for the Twentieth bituminous district by Governor Stuart. Adolph Cook, of Westmoreland county, is named for the inspectorship of the Nineteenth district.

Eli T. Connor, of Cresson, president of the board of arbitration in the Central Pennsylvania field has tendered his resignation in order to accept the position of general manager of the Jeddo Coal and Coke Company, of West Virginia. J. F. Somerville, of Clearfield, for many years with the Pennsylvania Coal Company, has been chosen as his successor.

Edward H. Coxe, of Hartshorne, I. T., superintendent of Indian Territory mines for the Rock Island Coal Company, has resigned, effective May 1, to accept the position of general superintendent of coal and coke properties of the Tennessee Coal, Iron and Railroad Company, and the Republic Iron and Steel Company, with headquarters in the Woodward building, Birmingham, Ala. This is a new position created by the separation of the coal from the other mines.

Obituary

James J. Ott, who died in Nevada City, Cal., April 1, aged 81 years, was born in Switzerland, but came to this country at an early age. He was a cousin of Col. John A. Sutter, and with him was one of the pioneers of California. After some mining experiences he settled in Nevada City, where he conducted an assay office for 51 years, and where he was well known and esteemed. It is said that in his office the assays were made which first revealed the silver values contained in the Comstock lode. Mr. Ott, at different times, owned several mines, among them the Lecompton on Deer creek, which later passed into possession of George Hearst.

Thomas Venners, a retired ironmaster,

Henry Bessemer, died in Brooklyn, N. Y., April 18. He was born near Birmingham, England, in 1823, and when a boy went to work in a rolling mill. In 1859 he was made superintendent of the Round Oak Iron Works, Brierly Hall, Staffordshire, England. Ten years later he came to America and erected a rolling mill at Portsmouth, Ohio. Later he took charge of the steel works of the Baltimore & Ohio Railroad at Cumberland, Md. He resigned in 1875 to become superintendent of the Keystone Mill at Pittsburg. Mr. Venner invented many improvements in iron and steel manufacture. He retired in 1892. He leaves two sons and four daughters.

Societies and Technical Schools

Joint Meeting—The mining engineering societies of Columbia University, New York; Lafayette College, Easton, Penn.; and Lehigh University, South Bethlehem, Penn., April 26 and 27. On the evening of April 26 a meeting of the three societies was held in Williams Hall. On April 27 the program included visits to the Bethlehem Steel works; the New Jersey Zinc works, and the Atlas cement works, at Cementon.

National Association of State Mining School—A meeting of this association was held in Lawrence, Kan., April 12 and 13. The principal business was the consideration and preparation of a bill to be presented to congress providing for appropriations from the proceeds of public land sales for the benefit of mining schools, in the same way that appropriations of such lands have heretofore been made for agricultural schools. The following officers were chosen: President, Erasmus Haworth, University of Kansas, Lawrence, Kan.; vice-president, M. E. Wadsworth, dean of the department of mining and metallurgy, Pennsylvania State College; secretary, A. H. Purdue, State University of Arkansas, Fayetteville, Ark. The bill will be presented to Congress by the legislative committee, consisting of Victor Alderson, president of the Colorado State School of Mines, and M. E. Wadsworth; the latter being specially charged with the duty of collecting and preparing facts and arguments to be presented in advocacy of the bill.

Industrial

F. P. Leadbetter has been appointed manager of the Pittsburg office of the Buffalo Forge Company. For the past three years he has been at the Philadelphia office, and previous to that time at the factory office in Buffalo. N. Y. C. L. Dean, who until lately has been in charge of the Pittsburg district, has gone into mining operations in Mexico.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Company in Jersey City, N. J., the old board, consisting of Edward F. C. Young, John A. Walker, Edward L. Young, William Murray, George T. Smith, Joseph D. Bedle and George E. Long, was unanimously re-elected. The board of directors re-elected the following officers: E. F. C. Young, president; John A. Walker, vice-president and treasurer; George E. Long, secretary; Judge Joseph D. Bedle, counsel.

The Fried. Krupp Grusonwerk, Magdeburg-Buckau, Germany, gives notice that it has added to its works a separate metallurgical department, which will occupy itself with the manufacture of furnaces, machines and apparatus, as well as complete installations for the recovery of metals from ores, either by metallurgical or by electro-metallurgical processes, and which will also undertake the working out of plants for metallurgical treatment of lead and zinc dust, waste products, and for the concentration of refractory ores. The company has the experience of eminent experts at its disposal for properly designing, erecting, and operating such plants. In particular cases, it is also in a position to ascertain by reliable tests in what manner it is possible to attain the most economical results on a large working scale.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Niles-Bement-Pond Company, 111 Broadway, List No. 13. Second-hand Metalworking Machinery. Pp. 51, paper, 5x7 inches.

Rapid Economy Stamp Mill Company, San Francisco, Cal. Rapid Economy Stamp Mill. Pp. 18, illustrated; paper, 9x12 in.

Mussens, Ltd., Montreal, Canada. Catalog No. 11. Metallurgical Machinery. Pp. 47, illustrated; indexed, paper, 5x8 in. March 1, 1907.

Garvin Cyanide Extraction Company, Portland, Oregon. Bulletin No. 3. Garvin Cyaniding Appliances. Pp. 18, illustrated, paper, 6x9 in.; 1906.

The Green Fuel Economizer Company, Matteawan, New York. "How to Save 15 per cent. of the Coal in Making Water Gas." Pp. 8, illustrated; paper, 6x9 in.

Allis-Chalmers Company, Milwaukee, Wis. No. 4002. Allis-Chalmers Direct Current Motors and Generators Type "K." No. 4003. Electric Hoists. No. 4004. Allis-Chalmers Polyphase Induction Motors. Pp. 4, illustrated, paper, 3½x6 in.; 1907.

Construction News

Angels, California—It is expected that a mill will be erected at the Etna King mine. F. F. Ames, Angels, Calaveras county, Cal., is manager.

Idaho Springs, Colorado—Denver and Eastern people are interested in the Humboldt property on Ute creek, near Idaho Springs, and they propose to install a power plant, including air compressor. Frank C. Smith, 720 Ogden street, Denver, Colo., is agent for the owners.

Columbine, Colorado—The Consolidated Silver-Gold Mines Company, in which Iowa people are interested, is figuring on the erection of a stamp-mill and cyanide plant to handle the ores of its group in Hahn's Peak district. L. A. Stillwagon, Glenwood Springs, Iowa, is president of the company, and the office is located at Hahn's Peak, Colorado.

Cedartown, Georgia—The Woodstock Iron and Steel Company has leased the Cherokee iron mine, and is preparing to develop the property. It will need a steam shovel and other mining machinery; also ore washers, a pumping plant and pipe line for water supply. J. M. Barr, Norfolk, Va., is president; J. B. Carrington, Woodward building, Birmingham, Ala., general manager.

Butte, Montana—The Pilot-Butte Copper Company is planning for the equipment of its mines in Butte with an engine and compressor to be driven by electricty. William P. Jahn, of Milwaukee, will have charge of the work and selection of the plant and will arrive in Butte shortly to confer with other members of the company in regard to the plant. He will stay at the Thornton, in that city.

Cripple Creek Colorado—Notice is given that bids for the construction of the proposed deep drainage tunnel through the Cripple Creek mining district will close on May 15 next. The tunnel will be built by the Cripple Creek Drainage and Tunnel Company, composed of leading mine-owners of the district. E. D. Marr is secretary, with office in the Mining Exchange building, Colorado Springs, Colorado.

Copper River District, Alaska—The Copper River & Northwestern Railway is under construction from the tidewater terminal at Katalla, Alaska, through the Copper River valley, to the interior of Alaska, about 500 miles of railroad in all. A breakwater about one mile long will be constructed at Katalla. This road is one of the J. P. Morgan and Guggenheim interests in Alaska, and will be built by the Katalla Company. M. K. Rodgers, president and general manager, Seattle, Wash.; John Krey, chief engineer, Katalla, Alaska. Contracts for the whole or any part of this work will be let immediately.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

[illegible] tablished with the mining camps in the higher mountains of the State, it is found that more or less damage has been done by avalanches, and that several surface plants have been destroyed during the recent storms, including a few stamp mills. The worst damage, however, has been done to ditches and pipe-lines for bringing in water. It may take several months to repair all the injured places on these lines, and some mines must lie idle until the roads are in order so that supplies may be hauled in. Bridges and electrical plants have been washed away at various points, and at nearly all the camps mines have been more or less flooded, and the pumps have been kept busy at unwatering. In the meantime the miners have had to take a vacation from work. All this will have more or less influence in the bullion output of the current year.

The Mountain Copper Company's electric railroad from Boulder, on the Iron Mountain railroad, to the Hornet mine has been completed, so that ore may be shipped from the Hornet to the smelters at Keswick. There are large reserves in this mine, though the copper ore is of a lower grade than that at the Iron Mountain. Since the resumption of smelting at Keswick, the company is paying as follows, for quartz ore for flux: On ore running from $3 to $15 per ton, 65 per cent. will be returned to the shipper, no smelting charge; from $15 to $25, 77½ per cent., no smelting charge; from $25 to $200, 90 per cent., $3.50 per ton, wet weight, smelting charge. Ninety per cent. of the silver paid for if assaying over 5 oz. to the ton; less than 5 oz. silver to the ton is not paid for. Ores running low in silver are liable to an additional smelting charge. All gold paid for at the rate of $20 per ounce, and silver on New York quotations at date of sampling. All ores must be delivered free at the company's works in lots of not less than 10 tons. The payments are made on the basis of dry weights.

As before noted, the débris barrier erected at Daguerre point on the Yuba river, has been partially destroyed by the recent floods. The first dam built by the California Débris Commission at this point, of brush rock and gravel, was washed out. A dam was then built of brush fascines loaded with rock, but this was all destroyed by the first high water. A stronger dam was then constructed of piles, large rocks and concrete blocks, which stood three high-water seasons and was supposed to be effective. This too has now gone and the Federal Government has canceled the contracts for further work on the barrier. Whether more work on the barrier will eventually be done remains to be seen. Congress had appropriated $175,000 for this year's work but this has been stopped. The project outlined called for an expenditure of $800,000 half to be paid by the Government and half by the State.

A recent discovery of native copper in Diamond Creek district in the Low Divide region of Del Norte county, by F. Zaab and G. H. Crawford, has revived interest in that section. The Low Divide is only a few miles south of the Oregon line. Over 50 years ago copper ore was sacked, and shipped from that point to Swansea.

J. A. Adams and W. E. Horton, former manager of the Oriental Reduction Works, of Portland, Oregon, are in Oroville, negiotating with the dredging operators to purchase the sand which at present is washed out into the tailings. The object of the company is to secure this sand for the platinum which they assert it contains. Experiments will be conducted in Oroville to determine in some manner the values in platinum which the sand carries. When this is approximated an offer will be made to the dredging operators. The plan as explained by Adams is to handle the sands at Oroville by a washing and gravity process and then ship them to Portland for reduction.

The United States Government has placed an order for 2000 squares of slate with the Eureka slate quarry at Slatington, six miles north of Placerville. This will be shipped to Cheyenne, Wyoming, to be used in roofing Fort D. A. Russell. Under the management of C. H. Dunton, superintendent, the quarry has become a good paying property.

There is considerable confusion in Greenwater district, Inyo county, over recording location notices to mining claims. It appears that the retiring county clerk permitted a large number of notices to accumulate without returning them prior to the expiration of his term of office, and they lay huddled away together in a box in the county clerk's office. When it is positively necessary that the papers must be had, the locators are compelled to retain a member of the legal fraternity at Independence, the county seat, to search the box, recover the documents and send them on, for which a fee is imposed of $5. There have been no notices returned since August, and many of the prospectors are suspicious as to whether they have had their locations duly recorded or not.

Salt Lake City

holders of the Star Consolidated Mining Company has been called for May 8, at which time the matter of consolidating with the Black Jack Mining Company will receive consideration. If proposed plans are ratified, the Star Consolidated will be absorbed by the Black Jack. The capitalization of the latter will be increased from 300,000 to 1,000,000 shares; out of which Star Consolidated shareholders will receive 500,000; those of the Black Jack 300,000 shares; and the balance, or 200,000, will go into the treasury.

Much mining activity is in evidence in Beaver county. Recent developments in the Beaver Lake, Star, San Francisco, and Pine Grove districts have resulted in increased attention to that region. In the Beaver Lake district, copper predominates. In the Star district producers of high-grade silver-lead ore have been opened.

The March output of the Cactus mine of the Newhouse Mines and Smelters Corporation amounted to about 15 cars of crude ore while there was sent to the mill for treatment an average of 800 tons per day.

It is expected that work will be started on the Caliente & Pioche Railroad within the next week. Contractors expect to have the line completed to Pioche, Nev., not later than September.

Shareholders of the Silver King and Keith-Kearns mining companies, operating at Park City, have agreed on terms of consolidation. Several adjoining properties, including the Odin mine in Thaynes cañon, will be brought into the merger, and all will form the basis for the formation of what is to be known as the Silver King Amalgamated Mining Company.

Ore and bullion settlements reported to Salt Lake banks last week amounted to $521,600.

Preliminary work has been started on the extension of the aërial tramway operating out of the Alta district. The ropeway is owned by the Unity Mines Corporation, with headquarters in New York. The total length will be about nine miles, which is the distance between Alta and Wasatch, the lower terminal. A branch of the Rio Grande Western Railroad will connect at the latter point.

April dividends have been declared by a number of Utah mining concerns. The Beck tunnel will pay $40,000; Grand Central, $25,000; Bullion Beck, $10,000; Victoria, $10,000; Utah, $3,000; $88,000 in all.

Scranton

April 23—James E. Roderick has been reappointed chief of the Bureau of Mines of the State of Pennsylvania by Governor Stuart. He is a high authority on mining matters and is making a strenuous effort to improve the mining laws of the State.

G. B. Markle & Co., the independent operators of Hazleton, are making efforts to beautify the towns owned by them by planting trees in large numbers on the streets.

Dr. D. H. Lake, the surgeon in charge of the Delaware, Lackawanna & Western mines, has opened a course of instruction in first aid by taking the hospital car to the collieries and there instructing the men in the principles of the work.

The Lehigh Coal and Navigation Company is giving attention to the question of transporting coal by its canal rather than by railroads. A large boat-building plant is to be located at Weissport and improved machinery installed. Upward of 300 additional boats are needed, and with the improved facilities there will undoubtedly be an increase of the demand among shippers. Electricity is to be tested as the motive power and it will be furnished from the company's plant at Lansford. Hauling by mules will be entirely abolished. With the improvements contemplated there will be an effort to compete with the railroads in the shipment of merchandise of all kinds also. The company has formed a canal freight organization and in this manner hopes to reach the trade.

Commissioner C. P. Neill has completed his labors as the umpire of the Anthracite Conciliation Board, and handed in his decisions in the remaining cases. The four cases were as follows: One decided in favor of the men was from the contract miners of the Grassy Island colliery of the Delaware & Hudson Company, who claimed discrimination had been shown in that two men had been allowed to work two chambers and had been furnished cars according to the number of chambers operated, rather than according to the number of miners, as provided in the award of the Anthracite Commission. The umpire held that the grievance was a proper one and decided against the company. All the other grievances related to alleged reductions of various kinds, and were de-

Toronto, Ont.

April 20—Two new mining divisions are to be created in Ontario, one of which will embrace the Larder Lake area, and the other the new Lady Evelyn and Montreal River fields. Each will have a recorder's office for the filing of claims and other business, which will be a great convenience to mining men.

E. T. Corkill, provincial inspector of mines, returned recently from a visit to the Port Arthur district. He reports that a force of men is at work taking out ore at the West End silver mine, and that a concentrating plant will be started in a few weeks. The opening of the blast furnace of the Atikokan Iron Company, which was expected some time since, has been delayed on account of the non-arrival of machinery. It is now almost completed, and will be in position to begin operations as soon as navigation opens and a supply of coal can be obtained. Mining operations have been much interfered with throughout that district by the severe winter and the depth of snow.

The reduction plant now being erected at Sturgeon falls for treating and refining cobalt and copper ores is making good progress. The building is complete, including a laboratory and sampling works, and the company will be ready to sample all descriptions of ores this month. The reduction plant will be ready for operation in July. The company will shortly be in the market to buy ores.

London

April 13—In my letter last week I gave some particulars as to the Rio Tinto Company, and mentioned that rumors had been circulated relating to a proposed increase in the output of copper; but that so far the directors had not made any public pronouncement on the subject. At the general meeting of shareholders C. W. Fielding, the chairman, gave some information which was of interest. The chief anxiety under which the directors labor is caused by the shortness of water supply. This trouble is always more or less with them, but during the past two years it has been acuter than usual. For the 33 years that the company has been in operation the average rainfall has been 28 in. a year. In 1905 the fall was only 20 in., and in 1906, 18 in. The company has large reservoirs, one of which alone can hold two year's supply. Unfortunately, for several seasons the reservoirs have been partially empty, and at the present time there is only a few months' supply. Every possible way of increasing the supply has been adopted; also, re-use of waters, and rigid economy. The directors are very much afraid that unless there is an increased rainfall it will be necessary to restrict the output during the latter part of this year.

As regards the increase in the output, it is now definitely announced that additional furnaces have been erected, with the object of treating ores of lower contents than are treated in the existing smelters, but that it has not been found possible to put them in operation up to the present time, the chief hindrance being that no water can be spared for the water jackets. The question of increasing output depends entirely on the water supply and at the present time such an extension seems likely to be hung up indefinitely. This will be bad news for shareholders, who have been buying the £5 ordinary shares at £100, on the strength of a rumor about increased output. Rio Tintos ought not to be bought on rumors. It is much better to act on the information given officially which, if not voluminous, is reliable and businesslike.

I have often mentioned the fact that, during the depression in Cornish mining, the Cornish smelters and other moneyed men there provided a good deal of capital to develop and work tin properties in other parts of the world. One of the most successful of these outside ventures is the Tronoh Mines, Ltd., which was formed in 1901 to acquire properties in the Kinta district of Perak, Straits Settlements. At first the properties were only taken on lease, but last year a portion of them was purchased outright. The board of directors includes such well known Cornish names as Pearce, Bain and Thomas. The profits derived from the operations have been gradually increasing, and up to the end of 1906, the capital had been more than returned. The distribution during 1906 has amounted to 50 per cent. on the capital of the company, which stands at £160,000. The year shows an income of £199,464, derived from the sale of 1875 tons of concentrates, and a net profit of £99,537. There seems to be every prospect of the mine continuing to pay handsomely.

Johannesburg

To show what a serious state trade in the Transvaal is now in, a statement has been made of the insolvencies for 1906. Voluntary surrenders for the whole of 1906 numbered 117, and compulsory sequestrations 348, a total of 465.

This is the time of the year when the annual reports of the gold mines commence to roll in. During the past week the annual meeting of the Witwatersrand Deep was held. When this mine started up, about 10 years ago, it was under a cloud, the results obtained being unsatisfactory. The latest report shows a vast improvement. The monthly profits have shown a steady increase from £15,000, in January, to £20,000 for December. A dividend of over 40 per cent. was paid for 1906. With regard to Chinese labor the manager states that "they have steadily continued to improve in efficiency, and have become very satisfactory underground workers." It is satisfactory to note that the development in the bottom levels is looking extremely well. At the meeting the chairman emphasized the interest that the larger companies on the Rand are taking in the welfare of the men on the mines, by the building of comfortable quarters, recreation halls, hospitals, and the like.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

Amalgamated Copper Company—This company has made no increase in its dividend for the last quarter. It is $2 per share, or 2 per cent., the same as for the previous quarter. The dividend for the corresponding quarter last year was $1.75 per share.

Arizona

COCHISE COUNTY

Some 700 miners in the Bisbee camp are out on a strike, which was recently ordered by the Western Federation of Miners. All the mines in the district are affected.

YAVAPAI COUNTY

Bannie—It is stated by the management of the Bannie company that this mine will pass into the hands of new owners soon. The Bannie has been a producer, and at this time there are large bodies of low-grade ore in sight.

H. J. Beemer Co.—This company has taken an option on another group of claims in the Hassayampa district. This company now has a holding of about one square mile in the vicinity of the Storm Cloud mine, 10 miles south of Prescott.

Chronicle Gold Mining Company—The annual meeting was held in Prescott, April 10, at which a new board of directors was elected and a program of development mapped out. The mines owned by this company are four miles east of Prescott, and are reached by an excellent wagon road.

Coronado Gold Mining Company—This company, whose mines are two miles west of Congress, has again resumed work. Preparations are now being made to install a mill and tramway to connect the mine with the mill.

Martin Group—George Roper and associates have taken over this group in the Copper Basin district. Some work has been done on the group, and quite a large amount of medium-grade ore has been exposed.

Rosalie Copper Company—This company, whose mines are situated 18 miles east of Mayer, has made its initial shipment, and it will be a regular shipper in the future. This company has been pushing development for the past year, and now has a quantity of ore blocked out. The ore now being shipped was taken out in development work.

California

AMADOR COUNTY

The heavy storms flooded many mines and caused them to be closed down. Mills and chlorination works closed down from lack of rock and sulphurets. There is also a scarcity of both wood and oil fuel.

BUTTE COUNTY

The city of Oroville, recently flooded badly by the Feather river, is about to build a high levee nearly a mile long. El Oro and Butte dredging companies will dig and build the levee free of cost for the gold they hope to obtain by the operations.

CALAVERAS COUNTY

North Star—This property at Angels has been sold by Garland & Madison to A. D. Thompson, of Plainfield, N. J., who will do extensive development work and increase the capacity of the mill. The mill tests on ore proved satisfactory.

Grand Oaks—J. T. Thompson is about to begin work on this mine near Mokelumne hill. The mine has never been equipped with milling facilities, though more or less ore has been crushed in custom mills.

EL DORADO COUNTY

San Francisco men intend commencing to dredge the gravel deposits on the Dormody ranch at Green valley.

INYO COUNTY

The well being sunk north of Greenwater has been abandoned, after a depth of 1000 ft. was reached, greatly to the regret of the miners. It is probable that water will have to be brought in from the Brooklyn springs in the Panamint region. A smelter is being put up 20 miles from the camp at a point where there is plenty of water.

Furnace Creek—This company commenced shipping small lots of ore to Salt Lake, by way of Amargosa. The Copper Blue shaft of this company is now 540 ft. down.

KERN COUNTY

Zenda—The mill at this mine will shortly be started up. The severe weather this winter has retarded operations at the mines in the district.

NEVADA COUNTY

North Star Mining Company—The 300 employees have all reported for duty, the [illegible] of the mine at Grass Valley having been cleared of water after several weeks' continued effort.

PLACER COUNTY

Ophir Valley—This company now owns the Hathaway, Kirkland, Butts and Eureka mines, between Ophir and Newcastle, the united properties extending 4615 linear ft. The Hathaway and Butts have been worked, but the others are new mines. On the Hathaway a shaft 815 ft. deep has been sunk, but it has never been worked below the 600 level. An electrical plant for hoisting and pumping is being put in, as well as a compressor and drills. A. S. Eastwood is superintendent.

RIVERSIDE COUNTY

Gypsum—H. R. Adams and G. M. Herndon, of Los Angeles, and T. A. Blakely, of San Bernardino, have taken up some 2000 acres of gypsum-bearing lands 30 miles west of the Colorado river, and 10 miles west of the Santa Fé cut-off. No work has been done upon the deposits thus far.

SHASTA COUNTY

Mount Shasta—This mine is to be sold on May 1 to satisfy claims of $50,000 of Phelps & Cleland, who hold a trust deed to the property, made by the Mount Shasta Gold Mines Corporation in 1901. The sale will include mine, machines, buildings, etc.

Mammoth—This company is now employing 800 men at the mine, and 300 on the new railroad. Manager F. Logan says that two additional furnaces will be immediately erected. Three furnaces are at present in operation.

Gold Leaf—The owners of this mine are building a two-mile tram to connect with the main line tracks at Middle creek, so that ore may be shipped to the smelters.

Lyons Consolidated—This mine at Old Diggings is to be sold under a deed of trust on May 15 next.

Electrical Furnace—The new furnace for the iron smelter on the Pit river has been finished in San Francisco, and will be shipped to Heroult at once.

SAN LUIS OBISPO COUNTY

Consolidated Quicksilver Company—The mines of this company at Klau have been badly flooded, but Superintendent Bagby will soon have them in order again so as to put on a larger force of men.

SIERRA COUNTY

A snowslide has carried away the five-stamp mill and damaged the power line at the Telegraph mine, at Fir Cap. At the Keystone mine, near Sierra City, a snowslide destroyed the 10-stamp mill, compressor house, and buildings, but no lives were lost. The miners have been two years reopening this mine, and it is somewhat doubtful if the plant will be replaced.

SISKIYOU COUNTY

Quartz valley, 25 miles from Yreka, ore carrying very beautiful leaf gold, is being taken out. One piece taken out recently yielded $6000.

TRINITY COUNTY

Bonanza King—At this property, Trinity Center, the 40-stamp mill has commenced crushing the high-grade ore recently mined.

[illegible] COUNTY

Jessie—Work has been resumed on this drift mine on Table mountain, under superintendency of C. A. Fuller.

Colorado

BOULDER COUNTY

Lost Lake—Denver and Eastern people are interested in this property in Grand Island district, and they are preparing to install a plant of machinery: Wilson Davis, Eldora, Colo., is manager.

CLEAR CREEK COUNTY

Black Forest—Wells Brothers, of New York, are reported to have purchased this property on Trail creek, and will operate in connection with other holdings.

Maud S—Denver people have become interested in a lease and bond on this group on Columbia mountain, consideration being $20,000 for two years. Michael Kelly, Georgetown, Colo., is in charge.

Peruvian—Denver and Eastern people are reported to have completed arrangements for the purchase of this property in Argentine district, consideration being over $100,000.

Waldorf—It is reported that negotiations have been closed for the sale of these properties in East and West Argentine, English people being the purchasers. E. J. Wilcox, Colorado Building, Denver, Colo., is manager.

Adams Mill—The Western Mining Company, on Carbonate hill, is treating 200 tons of raw material daily that comes from the Wolftone. The mill is supplied with Wilfley and Card tables and Huntington mills. From these mills the ore is distributed to the tables and by careful adjustment four separations are made: a lead concentrate, a second-class iron and zinc, a zinc product, while the silica containing the minimum of zinc passes out to the tailings. A system of settling tanks is adopted which insures the saving of a considerable quantity of mineral. The loss in bulk over the tables is not over 12 to 14 per cent.

Colorado Concentrating Company—This company was organized by local men to work the dumps of the Morning and Evening Star mines. The old McHarg shaft and engine room have been secured and are being remodeled to accommodate crushers, concentrating tables and jigs. The dump material is a low-grade lead carbonate, thrown away during the early days, and lends itself readily to the concentrating process; it is estimated that the dumps contain 100,000 tons of this material. The company will treat 200 tons daily and will concentrate six tons into one, the output being a good grade of concentrates. The mill will be ready to start soon.

Crescent—A this mine, on Carbonate hill, the Crescent is shipping 400 tons monthly of manganese ore. Recently a good body of ore carying from 23 to 25 oz. silver per ton was opened, but it is of such a peculiar combination that a market has not been found for it yet. It is iron, but too silicious to ship under the schedule, and there is too much iron to bring it under the silicious schedule.

Sunday—At this mine, Ball mountain, a good body of silicious ore has been opened in one of the upper levels; the ore was found in the porphyry. In addition to this work, the lessees are sinking the main shaft to 450 ft. depth.

ROUTT COUNTY

George Shumway and Frederick Henry, of Colorado Springs, have purchased a tract of land containing 1000 acres in Twenty-Mile Park, paying for it $40,000. The new owners will mine for coal. Property is located near Steamboat Springs, and was purchased from John A. Whetstone.

Indiana

CLAY COUNTY

The Heck mine, south of Brazil, is shut down, because the miners were compelled to work by the day scale of $2.56 instead of receiving the block scale of 95c. a ton, and the miners appealed to the district officers. President Kirkland, of the United Mine Workers, ordered, the miners out till scales had been put in and the mines had been equipped to pay by the ton. While the company was paying the union scale for day work, the agreement prescribes that coal shall be mined by the ton. This is the first case of the kind in district No. 8, the block-coal district.

GREEN COUNTY

Linton Coal Company—A receiver has been appointed for this company on the petition of its stockholders. The company was organized in 1903 and acquired, by purchase and by lease, 600 acres of coal lands near the Sullivan and Green county lines. In acquiring the lands, and making preparations for the mining of coal, $127,851 was expended. The officers of the company then leased the property to the Diamond Coal Company for a period of 15 years. The complainants say the income from the lease is insufficient to meet the fixed charges, and the receiver will attempt to have the lease set aside.

Michigan

KEWEENAW COUNTY—COPPER

Phoenix Consolidated—The control of this property has passed from the Stanton interests to the Keweenaw Copper Company which intends to explore and, if advantageous, develop the property in connection with its present holdings. The purchase price is not stated.

ONTONAGON COUNTY—COPPER

Copper Range—A special meeting of the stockholders is called for May 1 to authorize the issue of 15,000 shares of new stock, which will make the total outstanding 400,000 shares, less the small amount not exchanged for subsidiary stocks. It is planned to give 10,000 shares in exchange for the Globe tract, now under option from the John Stanton estate, and the other 5000 shares will be placed in the treasury and issued as may be needed to provide funds for the development of this tract. The Globe contains 1280 acres, and is immediately north of the Champion. The option was obtained April 20, 1905, and does not expire until next year.

Increase in Wages—An increase of 7 per cent. in the wages of the men at the Michigan, Adventure, Mass and Victoria mines was announced April 13, to take effect May 1. Trammers will henceforth receive $2.25 and miners $2.50 per day. The new rate will benefit about 1000 men.

Missouri

ZINC-LEAD DISTRICT

The developments along the Center Creek bluff, north of Webb City, the last year point to a future for that part of the mining district lying between Webb City and Oronogo. The Yellow Dog on the land of the Underwriters' Land Company started everything with greater vigor than ever before known. The bluff idea has scarcely been exploited, but for 1½ miles west of the Yellow Dog drill-holes have found the core of the blanket vein of zinc-lead ore. The Rochester Land and Leasing Company purchased the Hendrickson fee of 40 acres west of the Yellow Dog. On this land the Red Dog mine has demonstrated the existence of the vein. West of the Red Dog is the 10-acre lease

purchased by Chatman & Lowman, west of the Red Dog, on which three drill-holes indicate the further western extension of this vein. Ball & Gunning have proven by drill that it extends west across the next 40 acres. Still west the Big Stick Mining Company and the Providence have it; and still west of this Geo. H. Davis has 19 drill-holes, every one in ore. West across the McReynolds, Whitworth & Howard tract, drill records continue, with no apparent break in the vein. This stretch of territory is 1½ miles in length and the vein is found on a level, differences in the depth from the surface being due to the variations of the surface.

State Mine Inspector Walter Ragland, Webb City, says that 150 men are needed in the mines between Oronogo and Duenweg. Men are needed as badly in every other portion of the district. The sharpest demand is for experienced miners, but there is also a strong demand for men who are willing to learn.

Cathedral Mining and Smelting Company—This company, while producing considerable ore from its land between Prosperity and Duenweg, is also prospecting by drilling and has made a good strike. The drill penetrated 60 ft. of lead and zinc ore. This land adjoins the Cosgrove land.

Cosgrove Land—H. H. Culver, of Joplin, associated with some Michigan copper-mine owners, is drilling a 10-acre lease of the Cosgrove land near Duenweg and has encountered lead in tallow clay at a depth of 185 ft., an unusual occurrence in this district.

Elking Lead and Zinc Company—This company, through its manager, L. Kreilsheimer, has closed a contract for a new 200-ton mill on a lease of the Little Princess Mining Company, north of Webb City.

State Lead and Zinc Company—C. S. Hollywood, of Webb City, superintendent of this company, operating on a 7-acre lease of the Rochester Land and Leasing Company, north of Webb City, is developing the sheet run of ore at the 150-ft. level. He has added a six-drill compressor and a 100-h.p. boiler to the mill, put down a new shaft and sunk the mill shaft to the blanket vein, where a 15-ft. face of zinc and lead ore has been exposed. On a recent trial run of 200 tubs, 8000 lb. of zinc ore and 1500 lb. of lead ore resulted.

Wampum Mining Company—This company, W. S. McCord, of New York, president, and E. H. Johnson, of New York, treasurer and resident manager, is operating on a 14-lot sub-lease of the Bash Development Company's lease of the Weymann land at Midway, east of Joplin. Drifting operations are being pushed on the 135-ft. level and the mine is outputting 20 to 30 tons of zinc ore per week. The orebody is in new ground.

Montana

Butte District

[redacted] of these companies is shipping about 100 tons of copper ore a day to the Washoe. Some high-grade red oxide of copper has been struck at a depth of 65 ft. in a new shaft on the Amazon. The vein is 4 ft. wide, the largest body of this class of ore that has ever been found in Butte.

Butte Coalition—This company is cutting a station at the 1000-ft. mark in the new shaft on the Tramway and driving the tunnel that is intended to tap the Rarus shaft at 210 ft., with about 50 ft. to go. Its output is about 1100 tons a day, the greater part of which is coming from the Minnie Healey and Rarus. Orebodies in the former are greater than they have ever been since the company secured control of the property. The Corra is still a small producer, but the ore is low grade. Development is progressing in the lower levels of this mine. The Rarus shaft has reached a depth of 2100 ft. and will be continued to the 2500 after a station is cut at the 2100 level.

Colusa-Leonard Extension—At a depth of 560 ft. the shaft struck the apex of a vein 10 or 12 in. wide that has since widened to 5 ft. The filling is improving in quality with depth, some of it being copper glance, in bunches, and all averaging well in copper. Since the vein was struck 15 ft. has been sunk and the entire bottom of the shaft is in ore. The property is located west of the Greenleaf, north of the Pittsburg and southeast of the Butte & London.

North Butte—This company has made final payments on all mining claims it had under lease and bond, the last two being on the John Emmett and Lynchburg. It now owns 17 full claims and fractions outright, control in the Croesus and a minority interest in three others. It is preparing to resume work in the old shaft on the Berlin with a view of taking it down 1600 or 1800 ft. and connecting it with its deep workings farther south; it will use the hoisting engine that did duty at the main shaft before the installation of the new one last summer. This engine is good for 2500 ft. Ore production is about 1400 tons a day.

New Companies—Many of the new companies are pushing development work. Butte & London is again sinking, the bottom of the shaft being close to the 850-ft. mark. No commercial ore has been cut in the work, but none is expected until the 1500 is reached. The shaft on the Colusa-Leonard Extension is 500 ft. deep and is passing through a 10-ft. vein of mineral-bearing ore that will evidently make into copper with depth. The shaft on the Amazon-Butte is 265 ft. deep, and while no ore is coming from it, lessees operating part of the property are mining between 75 and 100 tons of 4 per cent. copper ore a day at a depth of 65 ft. This vein has an east and west course, and its width is not known, for although it has been crosscut 20 ft. only one wall has been found. The property of the company consists of the West Altona, Amazon and Gaynor claims, the location of which is on the east side of the flat. Butte & Bacorn is developing rapidly. Its Belinda shaft is now 745 ft. deep and its Calumet 695. Exploration work is in progress in the Colleen Bawn claim, on which there is a 300-ft. shaft.—Butte Central & Boston is cutting out a third compartment of its shaft from the 500-ft. station to the surface and mining ore on the 100-, 200- and 300-ft. levels.

Nevada

[redacted]

The labor troubles caused by the dispute between the Industrial Workers of the World and the Western Federation of Miners, which has disorganized mining and business operations on this field for the past five weeks, has been settled by the withdrawal of the Industrial Workers from Nevada. The miners' unions in all the Western States have for years been affiliated with the Western Federation of Miners. Recently the rival association established a Nevada branch in Goldfield and commenced to teach strongly anarchistic doctrines which alarmed the officials of the Western Federation and the principal mine-owners. Meetings were held and plans arranged, with the result that after a struggle the Industrial Workers were compelled to retreat from the State.

[redacted]

Montgomery-Shoshone—At a meeting of the directors in New York, last week, Donald B. Gillies was chosen president, to succeed Charles M. Schwab, resigned. C. M. Ward was elected vice-president, in place of Mr. Gillies.

Nye County—Rhyolite

The railroad to Rhyolite from Tonopah is approaching completion. At the present time the graders are at work on the outskirts of Bullfrog, and surveyors are laying out the depot yards and the ground for the erection of freight sheds. The work of laying the rails has been started. In view of the rapid improvement in transportation facilities there is a notable activity in mining. Already the leading properties have large bodies of rich ore ready for shipment.

Indications of oil have been discovered about six miles south of Rhyolite, and a number of claims have been staked. The pioneer locators have formed a syndicate, and have ordered a drilling plant from Los Angeles, which they expect to have in operation within the next six weeks. The ground formation is sandstone and shale, and there are numerous fissures giving off natural gas. The soil is soft,

and it is believed that drilling costs will be low. The development of the field will induce capitalists to test other districts in Nevada, where there are numerous indications of oil deposits. The development of a large oilfield would be a great boon to the goldfield, as at present all the camps are suffering from a fuel famine.

Mayflower Consolidated—A valuable strike has been made on the 300-ft. level in the west drift at a point about 15 ft. from the shaft. A quartz vein showing free gold and assaying up to $30 per ton has been cut. The company is sinking a new shaft on the Starlight claim, with a view of developing the western ground. This shaft is also on the Mayflower vein, which in the Starlight ground carries ore of milling grade.

Mayflower West Extension—Rich ore has been encountered in the west drift 100 ft. from the shaft in the 250-ft. level. Some of the assays give very high returns. The workings on the other levels are also in ore of milling grade.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments over the Tonopah Railroad for the week ending April 11 were: Tonopah Comapny, 250 tons; Belmont, 490; Montana-Tonopah, 185; Midway, 46; total, 971 tons. In addition to this the Tonopah Company sent 3005 tons to the mills, making a total of 3976 tons for the week.

Ohio

PERRY COUNTY

Peabody Coal Company—This company has issued $150,000 in 6 per cent. first-mortgage bonds. The property is known as the Greely mines, near McCunesville, and consists of 1655 acres of coal, of which the company owns in fee 977 acres and under lease 678 acres. The company also owns in fee 773 acres of surface. The mine equipment is new and has a present capacity of 300,000 tons of lump coal per annum. The company owns its own railroad, connecting with the Baltimore & Ohio, and by constructing 5 miles of track connection can be established with the Toledo & Ohio Central and the Zanesville & Western. The proceeds of the bonds will be used for improvements and working capital.

Oregon

BAKER COUNTY

A correspondent writes from Homestead: It has been known that there were large bodies of copper ore in this camp ever since the discovery of the Iron Dike mine about nine years ago. At that time the mines were taken over by the Northwest Copper Company, which also succeeded in getting the right-of-way for a railroad along the west bank of Snake river from Huntington to the mines, a distance of about 65 miles. Part of the grade was built, but the company was unable to complete the work and later got into litigation which was not settled until late in 1906. Since that time the mine has been under development. The railroad has been re-surveyed and early in February, 1907, construction work was started. Since the railroad is assured, mining men have taken under bond the following groups; Farrell, Gelett, O'Toole, Conger, Taylor, Carnyhan, Foster, Homestead and Two Shoes. All are under development. There are several other groups under bond or options, that work will start upon soon. Mr. Winslow in 1906 organized the Ox Bow Electric Power Company, which is at present working some 75 men building wagon roads, and other preliminary work. The river forms a bow and the purpose is to tunnel through about 1300 ft. and build a dam; the fall is enough to generate electric power for all purposes. It is expected that it will take about two years to complete the work now laid out by this company. There is good copper showing along the river on both sides for about 75 miles. There are several kinds of outcrops, but most attention is paid to the iron cap and gossan, while there are some outcrops of gray copper.

South Dakota

LAWRENCE COUNTY

Homestake—The fire which broke out on the 500-ft. level three weeks ago is still spreading and apparently extending its area. An upraise is now being made from the 500 level, and it is hoped to reach it this way. Tunneling and other methods have been employed in vain. No men, except the fire-fighters, are at work in the mine, all the ore now milled being taken from the open cuts and upper level tunnels. The 400 stamps in the Star and Homestake mills are still hung up. There is no improvement in conditions.

Columbus Consolidated—This company has issued a circular letter to its stockholders announcing that on May 1 the property of the Hidden Fortune Mining Company, including its mill and mill site, will be transferred to and become the property of the Columbus Mining Company. The terms are the payment of the Hidden Fortune Company's debt, amounting to about $240,000, and the issue to the stockholders of the Hidden Fortune of 2,000,000 shares of Columbus stock, less the bonus of stock given to sell the before mentioned amount of bonds. The Columbus Company has authorized the issue of $400,00 first-mortgage bonds.

PENNINGTON COUNTY

Wolfram Strike—The richest wolfram ore yet discovered in this section of the country was found recently a quarter of a mile from Keystone. It will run from 35 to 40 per cent., and is found in a well defined ledge, which crops out in the neighborhood where rich ore has previously been found. The property has plenty of water and timber.

Tennessee

FENTRESS COUNTY

United States Lead and Smelting Company—This company has been organized to develop lead deposits near Jamestown. J. H. Connor, of Nashville, Tenn., and Tracy W. Pratt, of Huntsville, Ala., are among the incorporators.

Texas

The production of the Gulf coast region for March was 1,460,000 bbl., an increase of about 200,000 bbl. over that of February. All the increase was derived from Texas fields, which all made an increased output except Dayton. Consumption was 600,000 bbl. in excess of output, reducing stored crude to 6,600,000 bbl. There was a decided increase in development work, 106 wells being completed, of which 83 were producers. The Humble field was the most active, and had the largest increase in output. None of the wild-cat wells created any excitement, and the increased production was due to new wells in the old fields, where drilling has been stimulated by the high prices paid for crude. Oil, f.o.b. cars, sells for 90@95c. per bbl. Present credit balance prices, with estimated March production of the various fields, are as follows: Batson, 250,000 bbl.; 80c. Humble, 275,000 bbl.; 80c. Saratoga, 240,000 bbl.; 75c. Sand Lake, 225,000 bbl.; 81c. Spindletop, 110,000 bbl.; 85c. Jennings, 350,000 bbl.; 75c.

Utah

SALT LAKE COUNTY

Utah Copper Company—Hayden, Stone & Co. report that the first unit of 3000 tons capacity of this company's mill at Garfield is about ready to go into commission. By the time that this is in full operation the second unit of the same size should be ready. Only those who have followed this proposition closely appreciate the enormous scale on which it is laid out. The two completed sections of the mill, together with the adjoining buildings, cover a ground space of 20 acres. Each section is made up of 12 units of 500 tons each, any one of which can be operated independently. The two receiving bins have a combined capacity of 60,000 tons storage. The power plant will supply both the mill and the mine at Bingham, to which a transmission line of 17 miles is being built. It will contain 20 water-tube boilers with a total of 12,000 h.p. and the engine plant five engines, connecting with generators of 13,000 h.p. It is estimated that, handling 5000 tons a day, which will be the limit for the first six months, the maximum output will be 45,000,000 lb. annually.

Virginia

WASHINGTON COUNTY

[illegible]—The new company has leased lands near Damascus, and is preparing to mine iron ore on a considerable scale. W. L. Umbarger, Chilhowie, Va., is president; S. V. Fulkerson, Bristol, Tenn., secretary.

Washington

PEND D'OREILLE COUNTY

[illegible]—The suit for possession has been compromised, J. L. Harper, the deposed manager, having retired. F. R. McMillan is now in charge of the road and is putting it in repair to commence operations.

Winnipeg—The adit is in 830 ft. Rand drills will be used in the mine. A six-drill Leyner compressor and a boiler are ready to be hauled to the mine.

West Virginia

FAYETTE COUNTY

New River Company—This company proposes to increase the authorized capital stock from $15,000,000 ($5,000,000 thereof being 6 per cent cumulative preferred) to $25,000,000, of which approximately one-third is to be preferred stock and two-thirds common stock. There was recently outstanding $4,810,800 preferred and $9,621,600 common. It is not planned to issue any of the additional stock at present, but it is necessary to have it authorized in order to take care of any additional stock which the New River Fuel Company might put out. The New River Company is a holding company and its shares were given in exchange for stock of the New River Fuel Company in the proportion of 1 preferred and 2 common for each 1 share sold. There will be a circular sent to the shareholders when any offering is made of the new stock.

Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

Granby Consolidated—This company is preparing to erect at its smelting works, at Grand Forks, a large steel flue chamber with the chief object of increasing the draft from its copper blast furnaces and converters, the existing brick chambers, one of which is 11x10 ft. and 800 ft. long, not giving sufficient draft for requirements, present and prospective. The new chamber will be elevated 22 ft. above the furnace feed floor, on steel columns resting on one side on a masonry wall and on the other on concrete piers. It will be rectangular in shape, its inside dimensions, width 13 ft., hight 15 ft., and length about 313 ft. Some 250 tons of steel in all will be used in construction, and this has been ordered. That for the sides of the flue will be ¼ in. in thickness and for the top 3/16 in. A special feature of the design is that all bracing will be on the outside. A light roof will afford protection from rain and assist in bracing the top of the flue. For the more expeditious removal of the flue-dust there will be 28 hoppers in the new chamber with conveyers, operated by cable, running its full length; also auxiliary conveyers thence to the briquetting plant. The handling capacity of the conveyers will be about 50 tons in 8 hours. The approximate cost of the structure complete will be $25,000. Delivery of the structural material is expected by July next and completion of construction within three months thereafter, so that the flue should be available for use next winter.

ONTARIO

The bill for the taxation of mines has been passed by the Ontario Legislative without any alteration of the main details. It provides for a tax of 3 per cent. on the profits of mines in excess of $10,000 annually, and an average tax of 2c. per acre on mineral lands in unorganized territory. The bill amending the assessment act providing for local taxation of mineral rights, in cases where such rights have been reserved in selling the surface rights, has been amended by the substitution of the words "petroleum rights" for "mineral rights" so that properties other than oil lands will not be affected. It will probably pass in this form.

ONTARIO—COBALT DISTRICT

La Rose—Negotiations have been for some time on foot looking to a merger between La Rose Mining Company, of Cobalt, and several other extensive mining interests. This arrangement has now been effected. La Rose company is reorganized under the name La Rose Mines, Ltd., with $6,000,000 capital, and the properties passing into its hands include La Rose and University mines, the Silver Hill group, the Epplitt & Wallace in the southeastern section of Coleman township, the Princess, or J. B. 3, and a number of prospects covering about 200 acres in the Wendigo Lake district. The new company, like the former one, will remain a close corporation under the same board: John McMartin, L. Henry Timmins, Noah Timmins, D. A. Dunlap and Duncan McMartin. The policy of the company, as outlined by the board will be to store as much ore as possible until local smelters are ready to begin operations. La Rose property has probably the most extensive and thorough development of any mine in Cobalt. There has been altogether about 2000 ft. of development upon Vein No. 1, ore extraction showing a steady persistency in volume and grade. The bonanza cross-vein running nearly at right angles, partly developed by means of an open cut, shows an outcrop of 6 to 10 in. of almost pure silver.

Mexico

[illegible]

Guanacevi District—The English company, which has taken over the Restauradora property, under the management of Forbes Richard, has ordered a plant with a capacity of 150 tons per day. The Garibaldi mines have been taken over by the Mines Finance Company, under the management of John B. Farish. The San Rafael is in bonanza. The America, a leased Haggin & Hearst property, promises well.

Guanacevi Tunnel Company—Trouble is reported in the management of this company. General Whitlock, president; Hilario Losoya, vice-president; Ernest F. Ayton, chief engineer, and Andrew Meloy have resigned from the management. Mr. Squiers is now president. There has been much criticism of these changes.

Rhodes Consolidated Mines Company—This company has secured a concession from the Mexican Government of exclusive prospecting rights over an area of 110 square miles, situated about 60 miles west of Guanacevi. An exhaustive survey of the tract is being made by Pastor Roucix, who has made the only accurate map of the State of Durango now existing. Frederick J. M. Rhodes, Guanacevi, Mexico, is president; William G. Reinecke, 74 Wall street, New York, secretary and treasurer.

San Pedro District—In this camp, near Guanacevi, a group of three mines—the Nueva Australia, Soto and Porvenir—is owned by the Mexican Mining and Smelting Company, of Boston, and managed by Frank Morehouse. There is a 100-ton plant running, crushing about 2800 tons a month. The high-grade ore and concentrates are shipped to the Monterey smelter, being hauled by wagon to the railroad at Tepehuanes. Another property worked is the Sultana, where surface indications are good; a crosscut tunnel is being run to cut the vein.

Africa

TRANSVAAL

Gold production in March is reported by the Witwatersrand Chamber of Mines at 538,497 oz. fine; which compares with 493,542 oz. in February, and 443,733 oz. in February, 1906. For the three months ended March 31, the total was 1,280,029 oz. in 1906, and 1,569,677 oz., or $32,445,224, in 1907; an increase of 289,048 oz. this year.

The labor return shows that 11,146 natives were distributed to the mines during March by the Witwatersrand Native Labor Association, and that 7967 left through time expiry and other causes. There was thus a net gain of 3179 during the month, and the total number of natives employed, excluding the Robinson group of mines, was 90,841, at the end of March.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

[illegible] in the coal trade in the West is the preparation for the opening of the lake trade. The severe weather has disappointed the [illegible] gation, and coal has accumulated at the Lake Erie ports. The steam coal demand continues good, and transportation conditions are fair. In fact there is too much coal at some points, and mines are beginning to limit production.

In the East there is nothing new, and trade is moving along quietly, both in anthracite and bituminous coal. The demand is chiefly for anthracite at the present time. The coastwise trade is active.

COAL-TRAFFIC NOTES

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to April 13 were as follows, in short tons:

			Balance.
[illegible]	[illegible]	[illegible]	161,174
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Coal and coke receipts at Chicago, and shipments from the city, for the two months ended Feb. 28 were as follows:

	Receipts.	Shipments.	Balance.
Anthracite	248,035	197,762	50,273
Bituminous	3,211,876	1,014,071	2,197,805
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The difference between receipts and shipments represents, approximately, the city consumption. The bituminous receipts were: Pennsylvania, 184,617 tons; Ohio, 170,155; West Virginia, 131,577; Indiana, 668,072; Illinois, 2,057,455 tons.

Coastwise coal shipments from the chief Atlantic ports for the two months ending Feb. 28 are reported as follows:

	Anthracite.	Bituminous.	Total.
[illegible]	[illegible]	[illegible]	[illegible]
Philadelphia	326,412	681,355	1,007,767
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The total increase was 155,168 tons, or 2.4 per cent. New York includes all the New York harbor shipping ports.

New York

April 24—The situation in the hard-coal [illegible] last week. Deliveries are going forward regularly and the market shows strength just before the usual rise, which will take place May 1. Small steam sizes are still scarce and in good demand. Prices remain as follows: Broken, $4.25; egg, stove and chestnut, $4.50; pea, $3; buckwheat, $2.50; rice, $1.85; barley, $1.50; all f.o.b. New York harbor shipping points.

BITUMINOUS

The Atlantic seaboard soft-coal trade continues weak; outside of contract business there is little doing and there seem to be several lots of coal standing in cars at tidewater which are urged for sale, depressing the market accordingly. Inasmuch as these lots have been offered and re-offered in several directions, the quantity seems to be magnified and gives the impression that there is a large surplus. This has called a halt on shipments of a number of companies until the situation has cleared.

Trade in the far East is fairly active on contract business. There seem to be orders in the hands of shippers at the lower ports for considerable coal. There are few vessels at this moment at these ports, but good weather is expected to change this condition. Trade along the Sound is quiet, with some of the cheaper coals being taken on in this region, but with no great avidity.

New York harbor trade is quiet, with little or no demand. Good steam coal is offered at $2.55 f.o.b. New York harbor shipping ports; some ¾-in. gas coal has been offered at $2.45 and for slack $2.40 has been asked, but at these low prices considerable has been withdrawn from the market.

Transportation from mines to tide is fairly good. Car supply is generally up to demand. Vessels in the coastwise trade are in poor supply and chartering is principally "to arrive." Freights seem to maintain themselves, although expected to drop with good weather. We quote current rates from Philadelphia to Boston, Salem and Portland, $1.25 and discharge; to Lynn, Newburyport, Portsmouth, Saco, Gardiner, $1.25; to Bath, $1.15; to Bangor, $1.30; to the Sound, $1; loading and discharging clause included, where usual.

Birmingham

[illegible] Coal operations in Alabama are uninterrupted, the railroads supplying almost all the cars needed. The weather has not been warm as yet. Mine operators do not apprehend any falling off in demand during the summer.

Coke production in southern territory is improving right along, and greater advances are in sight. The Southern Steel Company has let a contract to the Oak Hill Marble Company, in Birmingham, to erect a number of coke ovens in Tennessee and Alabama. The Sayre Mining and Manufacturing Company is making preparations to erect a large battery of ovens at its mines during this year. The coke production in Alabama during the year 1906 went to 2,939,090 tons.

Chicago

April 22—Sales of coal, both bituminous and anthracite, continue fair, under the stimulus of unusually cold weather. The western mines are active and there is little demurrage coal to cut down prices. Contract making continues slow. The demand for steam coal is and probably will continue all summer large, but market prices probably will continue low.

Illinois and Indiana fine coals and run-of-mine are the staple of the market, run-of-mine selling for $1.70@2.25 and screenings bringing $1.40@1.60. Lump and egg from western mines are weakening, though stronger than usual at this season, and bring $2@2.50.

Eastern coals are generally well regulated as to supply. There is hardly any demurrage coal on tracks. Hocking sells for $3.15 for 1¼-in. lump; Pittsburg for $3@3.15 for 1¼ in. No. 8; Youghiogheny for $3.15 for ¾-in. Smokeless holds up firmly to circular prices of $3.35 for run-of-mine and $3.65 for egg and lump.

Anthracite business is improving, with the result that April probably will see an unusually large tonnage placed.

Cleveland

April 23—Indications now are that the receipts of iron ore at Cleveland, as well as the other Lake Erie ports, will be delayed at least another week, by which time the docks will be well cleared of their stocks on hand. Owing to the ice blockade at the Sault Ste. Marie and the frozen condition of the ore at Escanaba, the only ore-loading port on Lake Michigan, many owners intend having their boats take up the second cargo of coal, before carrying any ore. This will cause an exceptionally heavy movement of coal to Lake Michigan.

The market in coke is especially quiet; prices are not firm, and have a tendency

[illegible] cars [illegible] [illegible] [illegible]

iron, and they appear to show indifference as to consequences. Quotations vary according to date of delivery. Forge iron is held at $23 for the best brands; No. 2 X, $25; Middlesboro, $22. For later deliveries quotations are in the neighborhood of $1 less.

Steel Billets—The billet market is in an excited condition over rumors of changes in prices, which cannot be traced to any

Bars—For prompt shipment premium prices are the rule.

exceptionally active. Premium prices are

new work is coming to the surface, involving the construction of big buildings in and near the city.

Rails—The interest in the rail market is directed to the placing of orders for 1908 delivery. All of the mills have some little crevices for delivery this year, but they are guarding them very closely.

Scrap—Some kinds of scrap are very scarce, and consequently high. The advances refer particularly to steel scrap and crop-ends. Railroad scrap is practically out of the market at present, and is held at $21. Machinery scrap can be picked up at about $21 to $21.25; old iron rails are quoted nominally at $27 per ton.

Pittsburg

April 23—New business booked in nearly every line of finished products is equal to production. It is evident today that it will be impossible to fill all orders this year and that a heavy tonnage will go over into 1908. There is not an idle plant in this district. Among the more

tin-plate, pipe and plates. The American

operation and is now running 235 of its

ity of steel. Steel bars continue strong, 1.60c. being the absolute minimum for any delivery this year. One of the features of the week was a contract with an agricultural implement interest for its entire requirements for a year beginning July 1, at that price.

The United States Steel Corporation and other steel-rail makers in the North

continuing the price of $28 at mill which has been in force since April, 1901. The Tennessee Coal, Iron and Railroad Company opened its books about two weeks ago, establishing a price of $30 for open-hearth steel rails, and it has booked an order from the Louisville & Nashville Railroad for 46,000 tons for 1908. The Bethlehem Steel Company will be a producer of open-hearth rails about July, and has some orders on its books. The price, it is understood, will be $30 at mill. Acting on plans which are to be developed before the end of the year, the Ohio works of the Carnegie Steel Company will be making open-hearth rails in January and it is probable the new steel plant

hearth rails about that time. Orders for

and the Carnegie mills are nearly sold up for deliveries this year. The Carnegie rail production for 1907 will be about 1,100,000 tons.

Pig Iron—A number of large and important sales of pig iron have been closed this week, all deliveries being for the second half and at from $1 to $1.50 above the highest price yet paid for that delivery. Some of the transactions have not been made public, and it is understood that two large independent steel interests have entered the market. Sales announced today include 3000 tons for second half at $22.50, 3000 tons for third quarter, 12,000 tons for second half and 8000 tons for fourth quarter, all at $22 f.o.b. Valley furnaces. There is likely to be a further advance in prices of bessemer iron. Inquiries are heavy and, it is estimated, amount to 75,000 tons. There is no iron for second-quarter delivery and there would be no difficulty in getting $24 for bessemer and $25 for No. 2 foundry. Gray forge is stronger and a sale of 2000 tons is recorded at $21.85, Pittsburg.

Steel—Steel continues scarce and bessemer billets are held firmly at $30.50, Pittsburg. Open-hearth billets cannot be

at any price. Sheet bars command

for long time contracts, but for prompt shipment are held at $31. Tank plate remains at 1.70c. and steel bars at 1.60c.

Sheets—New business is being booked

and the mills are still about six

behind on deliveries. Black sheets are held at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—There has been a further decline and quotations for prompt delivery are $71@72 per ton.

Cartagena, Spain

April 6—Messrs. Barrington & Holt report shipments of iron ore for the week: 23,550 tons to Great Britain; 13,170 tons to Rotterdam; 1000 tons to Baltimore; 37,720 tons in all.

Quotations for iron ores are: Ordinary

per unit, ore, 9s. 9d@10s. 3d.; low phosphorus, 10s. 9d.; specular ore, 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganiferous ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 14s. 6d. No higher grades on the market.

Pyrites—The quotation for iron pyrites, 40 per cent. iron and 43 sulphur, is 11s. 9d. per ton, f.o.b. shipping port.

London

April 15—Exports of iron and steel, and of machinery, from Great Britain for the three months ended March 31 are valued by the Board of Trade returns as follows:

	1906.	1907.	Changes
Iron and Steel..	£ 9,076,851	£11,363,089	I. £2,286,238
Machinery	6,193,379	7,007,486	I. 814,107
New Ships.....	1,422,672	2,151,288	I. 728,616
Total	£16,692,905	£20,521,864	I. £3,829,959

The total increase was 22.9 per cent. The leading items of the iron and steel exports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	285,942	483,069	I. 197,127
Wrought iron.....	44,338	52,951	I. 8,613
Rails	100,919	101,559	I. 640
Plates.....	56,291	85,441	I. 29,150
Sheets.....	116,234	128,253	I. 12,019
Steel shapes, etc....	43,666	58,969	I. 15,303
Tin-plates.....	91,771	101,332	I. 9,561

The total quantities of iron and steel were 992,411 tons in 1906, and 1,268,135 tons in 1907; an increase of 275,724 ons. Exports of pig iron to the United States this year were 180,273 tons, an increase of 125,189 tons; of tin-plates, 16,019 tons, an increase of 5146 tons.

Imports of iron and steel and of machinery into Great Britain for the three months were valued as follows:

	1906.	1907.	Changes.
Iron and steel...	£2,485,288	£1,607,489	D. £877,799
Machinery.....	1,242,334	1,203,243	D. 39,091
Total.....	£3,727,622	£2,810,732	D. £ 916,890

The total decrease was 24.6 per cent. The chief items of the imports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	21,071	21,650	I. 579
Wrought iron.....	36,811	15,634	D. 21,177
Steel billets, etc.	164,268	69,845	D. 94,423
Bars and shapes.....	17,872	2,928	D. 14,944
Structural steel	42,701	21,486	D. 21,215

The total quantities of iron and steel were 385,930 tons in 1906, and 205,379 tons in 1907; a decrease of 180,551 tons, or 47 per cent.

Imports of iron ores into Great Britain for the three months were, in long tons:

	1906	1907.	Changes.
Manganiferous ores.	98,891	99,896	I. 505
Iron ores.....	1,960,488	1,899,188	D. 61,300
Total.	2,059,379	1,998,584	D. 60,795

Of the ores imported this year 72,930 tons of manganiferous and 1,482,749 tons of iron ores came from Spain.

Dusseldorf, Germany

April 15—The exports of iron and steel, and of machinery from Germany for the two months ended Feb. 28 were, in metric tons:

	1906.	1907.	Changes.
Iron and steel.....	721,339	522,830	D. 198,509
Machinery.....	68,804	48,036	D. 20,768
Total.....	790,143	570,866	D. 219,277

The total decrease was 27.7 per cent. The imports for the three months were:

	1906.	1907.	Changes.
Iron and steel	[illegible]	[illegible]	I. [illegible]
Machinery	[illegible]	[illegible]	D. [illegible]
Total	[illegible]	[illegible]	I. 8,804

The increase shown in the total was 10.1 per cent.

The estimated consumption of pig iron in Germany in 1906 was as follows, in metric tons:

Pig iron production	13,178,067
Imported as pig iron	197,240
Pig iron equivalent of steel, etc., imported	584,100
Total supplies	13,359,407
Pig iron exported	613,527
Pig iron equivalent of steel, etc., exported	4,467,041
Total deductions	5,080,568
Approximate consumption	8,278,839

The estimated consumption was 134.96 kg., and the production of pig iron 203.43 kg. per inhabitant of the German Empire.

Paris, France

April 6—The preliminary statement of iron production in France for the year gives the output of pig iron as below, in metric tons:

	1906.	1907.	Changes.
Foundry iron	635,[illegible]	591,275	D. 44,397
Forge iron	705,[illegible]	741,571	I. 35,880
Bessemer pig	160,411	149,971	D. 10,440
Basic pig	1,560,671	1,784,726	I. 264,055
Special irons	44,267	51,189	I. 7,222
Total	[illegible]	[illegible]	I. 292,320

The total increase was 7.9 per cent., nearly all of it being in basic pig. The production of wrought iron and steel was as follows, in metric tons; no division of the steel by processes is given:

	1906.	1907.	Changes
Wrought iron	669,841	736,918	I. 67,077
Steel ingots	2,210,284	2,371,377	I. 161,093
Finished steel	1,442,071	1,454,456	I. 12,385

The increase in wrought iron was 10.1 per cent.; in steel ingots, 7.3; in finished steel, 6.9 per cent. Of the wrought iron in 1906, sheets were 90,351 tons; bars and merchant iron, 646,567 tons. The finished steel reported in 1906 was: Castings, 30,878; forgings, 30,715; sheets and plates, 294,714; rails, 338,407; merchant and structural steel, 759,742 tons. The ratio of steel to pig-iron production was 71.4 last year.

New Caledonia

Mineral exports for the full year are given by the *Bulletin du Commerce* of Noumea as follows, in metric tons:

	1906.	1907.	Changes.
Nickel ore	125,[illegible]	[illegible]	I. 5,359
Cobalt ore	[illegible]	[illegible]	D. [illegible]
Chromeore	[illegible]	57,[illegible]	I. 5,[illegible]
Copper ore	[illegible]	[illegible]	I. 297
Iron ore	[illegible]	[illegible]	I. 3
Magnesite	11	[illegible]	D. 11

The exports for 1906 included 451 tons nickel ore and 23,338 tons chrome ore to the United States.

Metal Market

NEW YORK, April 25.

Gold and Silver Exports and Imports

At all United States Ports in March and year

Metal.	Exports.	Imports.	Balance.
Gold:			
Mar. 1907	$ [illegible]	$ [illegible]	Imp. $2,881,146
" 1906	5,918,627	5,630,695	[illegible]
Year 1907	5,703,304	11,607,691	[illegible]
" 1906	20,146,622	10,316,087	Exp. 9,830,535
Silver:			
Mar. 1907	5,058,461	3,936,139	[illegible]
" 1906	5,213,811	3,509,838	1,703,973
Year 1907	14,663,396	11,315,168	[illegible]
" 1906	14,[illegible]	12,[illegible]	6,488,610

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Apr. 20 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 3,000	$ 147,[illegible]	$ [illegible]	$ [illegible]
1907	1,759,336	5,185,847	11,539,079	642,989
1906	3,674,526	4,84[illegible]	[illegible]	603,818
1905	32,440,807	4,486,176	10,382,749	1,136,984

Exports of gold for the week were to Mexico; of silver, to London and Haiti. Imports of gold for the week were from Great Britain and the West Indies; of silver, from Mexico and South America.

The joint statement of all the banks in the New York Clearing House for the week ending April 20 shows loans $1,125,000,000, an increase of $107,575,900; deposits, $1,108,063,500, an increase of $100,699,200, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie	$189,653,600	$215,129,400
Legal tenders	78,579,200	73,616,300
Total cash	$268,232,800	$288,745,700
Surplus	$16,366,725	$ 11,704,925

The surplus over legal requirements shows a decrease of $4,661,900, as compared with the previous week this year.

Specie holdings of the leading banks of the world, April 20, are reported as below, in dollars:

	Gold.	Silver.	Total.
Assn. New York	[illegible]	[illegible]	$[illegible]
England	$179,474,480	[illegible]	179,474,480
France	513,737,365	$196,107,020	709,844,385
Germany	165,755,000	55,250,000	221,005,000
Spain	77,275,000	125,740,000	203,015,000
Netherlands	25,[illegible]5,000	28,077,500	53,853,000
Belgium	16,176,665	8,088,335	24,265,000
Italy	161,675,000	25,486,000	187,161,000
Russia	597,635,000	29,440,000	627,075,000
Aust.-Hungary	227,300,000	62,290,000	289,590,000
Sweden	20,760,000	[illegible]	20,760,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Pixley & Abell as follows, for the year to April 11:

	1906.	1907.	Changes.
India	£[illegible]	£[illegible]	D. £[illegible]
China	[illegible]	[illegible]	[illegible]
Straits	[illegible]	[illegible]	I. 204,050
Total	£[illegible]	£[illegible]	D. £1,[illegible]

Imports for the week were £93,000 in bars and £55,000 in Mexican dollars from New York; a total of £148,000. Exports were £31,500 in coin to the Straits; £80,850 in bars and £25,000 in Mexican dollars to India; £137,350 in all.

Indian exchange remains steady; the Council bills offered in London were all taken at an average of 16.09d. per rupee, though the amount offered was increased from 50 to 70 lakhs of rupees.

The gold and silver movement in Great Britain for the three months ended March 31 is reported as follows:

	1907.	1906.
Gold:		
Imports	[illegible]	[illegible]
Exports	[illegible]	[illegible]
Excess	[illegible]	[illegible]
Silver:		
Imports	[illegible]	[illegible]
Exports	[illegible]	[illegible]
Excess	[illegible]	[illegible]

Of the silver imported this year, £3,210,566, or 63.1 per cent. of the total, was from the United States.

Prices of Foreign Coins

	1[illegible]	1[illegible]
Mexican dollars	$0.50¾	$0.52¾
Peruvian soles and Chilean	0.46	0.49
Victoria sovereigns	4.85	4.87
[illegible]	[illegible]	[illegible]
Spanish 25 pesetas	4.78¼	4.80

SILVER AND STERLING EXCHANGE.

April.	Silver: Sterling Exchange.	Silver: New York, cents.	Silver: London, pence.	April.	Silver: Sterling Exchange.	Silver: New York, cents.	Silver: London, pence.
18	4.85[illegible]	[illegible]	30	22	4.85[illegible]	[illegible]	[illegible]
19	4.85[illegible]	[illegible]	[illegible]	[illegible]	4.85[illegible]	[illegible]	30
20	4.85¾	[illegible]	30⅛	[illegible]	4.85[illegible]	[illegible]	30⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

	Copper.			Tin.	Lead.	Spelter.	
April.	Lake, cts. per lb.	Electrolytic, cts. per lb.	London, £ per ton.	cts. per lb.	cts. per lb.	New York, cts. per lb.	[illegible], cts. per lb.
18	25	24	[illegible]	[illegible]	6.00	6.65	6.50
[illegible]	25	24	[illegible]	[illegible]	6.00	6.65	6.50
[illegible]	25	24	[illegible]	41	6.00	6.65	6.50
[illegible]	25	24	[illegible]	41¼	6.00	[illegible]	[illegible]
23	25	24	[illegible]	41⅛	6.00	[illegible]	6.50
24	25	24	101	41¼	6.00	6.65	6.50

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

market remains entirely unchanged. The situation is discussed more fully elsewhere in this issue. The disparity between domestic and European prices is still material, but has decreased somewhat since last week, owing to an advance abroad. Some business has been reported from day to day, largely for export, at the ruling quotations, as given below, but the total volume has shown no increase over the previous week, and the movement toward a stronger market that was then noted has failed to go further. The great disparity in the domestic market between the prices for Lake and electrolytic, and electrolytic and casting continues.

Some comment has been excited by the fact that bids of 25c. for Lake copper and 24¼c. for electrolytic were made on the Metal Exchange this week without leading to business. Of course, this is quite without significance, inasmuch as the Metal Exchange has not been anything but a statistical bureau for a long time, there being no transactions in copper upon it, and no representatives of the selling agencies present. If the bidder had applied to first hands for the copper wanted he would have been accommodated.

We quote prices unchanged at 25@25½c., for Lake; 24@24¼c., for electrolytic; and 22½@23c., for casting.

There is quite a scarcity of standard copper in the London market, doubtless due in a measure to the drafts which have been made upon the supply for the purpose of refining the material in the United States. Prices have been gradually working up, and the close is quoted strong at £101 for spot, £100 15s. for three months'.

Refined and manufactured sorts we quote: English tough, £108@109; best selected, £109@110; strong sheets, £118.

In our last issue John R. Stanton was named as a member of the committee on copper of the New York Metal Exchange. We are informed that the position was offered to Mr. Stanton, but he declined to serve, and is not a member of the com-

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—It is generally understood that consumers here have allowed their supplies to run down to a minimum, and foreign operators appear to take advantage of this fact by advancing the London quotation from day to day. The closing is cabled at £189 15s. for spot, £188 10s. for three months.

Domestic buyers who have missed the opportunity are slow to follow the advance, and continue to buy only against their immediate requirements. The quotation at the close is 41¾c.

Lead—The price for desilverized remains unchanged at 6c. per lb., New York; 5.92½c., St. Louis. In each market corroding brands sell for 10c. per 100 lb. higher. The premium which has been obtained for some time past on the small quantities of lead for immediate delivery offered by dealers has now practically disappeared.

The higher prices in London have been well sustained throughout the week and the close is steady at £20 for Spanish lead, £20 2s. 6d. for English lead.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull but steady, at 5.92½c. for Missouri brands.

Spelter—The demand is altogether of a hand-to-mouth character and buyers are inclined to await developments before covering their requirements for future shipment. The market closed nominal at 6.65 New York, 6.50c. St. Louis.

The London market has shown a somewhat better tone, and at the close prices are higher: £25 17s. 6d. for good ordinaries, £26 2s. 6d. for specials.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The market continues dull, with quotations nominally at 24c. for Cookson's, 20½@21c. for Hallett's, and 20@21c. for ordinaries; a decline from last week.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is $32@32.50 per ounce for ordinary metal; $35 for hard. Scrap is quoted at $25 per ounce.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

British Metal Imports and Exports

Copper—Imports and exports of copper in Great Britain for the three months ending March 31 were as follows, in long tons; the totals giving the copper contents of all material:

	1906.	1907.	Changes.
Copper ore	24,868	23,476	D. 1,392
Matte and precipitate	19,348	18,153	D. 1,195
Fine copper	18,800	18,564	D. 236
Total imp. fine copper	30,961	29,989	D. 972
Exports	11,532	13,067	I. 1,535
Re-exports	5,857	6,982	I. 1,125
Total exports	17,389	20,049	I. 2,660
Balance, imports	13,572	9,940	D. 3,632

Of the imports this year the United States furnished 61 tons of matte and 6687 tons fine copper; against 1051 and 5824 tons, respectively, last year.

Tin—Imports and exports of tin in Great Britain for the three months ending March 31 were as follows, in long tons:

	1906.	1907.	Changes.
Straits	9,172	8,249	D. 923
Australia	1,189	1,469	I. 280
Other countries	633	1,089	I. 456
Total imports	10,994	10,807	D. 187
Re-exports	8,342	7,011	D. 1,331
Exports	1,789	2,394	I. 605
Total exports	10,131	9,405	D. 726
Balance, imp.	863	1,402	I. 539

Imports of tin ore were 4319 tons in 1906, and 4557 tons in 1907; an increase of 238 tons. Of the imports this year 3873 tons were from Bolivia.

Lead—Imports and exports of lead in Great Britain for the three months ending March 31 were as follows, in long tons:

	1906.	1907.	Changes.
United States	4,294	3,249	D. 1,045
Spain	25,111	25,965	I. 854
Australia	13,357	13,484	I. 127
Germany	3,728	2,722	D. 1,006
Other countries	860	1,566	I. 706
Total imports	47,350	46,986	D. 364
Exports	11,146	13,389	I. 2,243
Balance, imports	36,204	32,597	D. 2,607

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Spelter—Imports and exports of spelter in Great Britain for the three months ended March 31 were, in long tons:

	1906.	1907.	Changes.
Spelter	24,652	22,681	D. 1,971
Zinc sheets, etc	4,158	5,508	I. 1,350
Total imports	28,810	28,189	D. 621
Exports	1,665	1,374	D. 291
Balance, imports	27,145	26,815	D. 330

Imports of zinc ores are not reported separately.

Quicksilver—Imports of quicksilver into Great Britain for the three months ended March 31 were 426,882 lb. in 1906, and 1,191,007 lb. in 1907; an increase of 764,125 lb. Re-exports were 629,251 lb. in 1906, and 767,362 lb. in 1907; an increase of 138,111 lb. this year.

Missouri Ore Market

Joplin, Mo., April 20—The highest price paid for zinc was $52 per ton, on an assay base price ranging from $47 to $50 per ton of 60 per cent. zinc. The average price was $48.74. The highest price paid for lead was $82 per ton, medium grades selling from $77 to $79. The average was $79.40 per ton.

With new mills ready to start it is found impossible to find experienced men to operate them, but the greater demand is for more ground men on the machines and for shoveling. Since the last deportation of miners to the West, this scarcity is lowering the output. Competition for experienced workmen has advanced wages [illegible]

Following are the shipments of zinc and lead for the week ending April 20:

	Zinc, lb.	Lead, lb.	Value
[illegible]	[illegible]	767,580	$104,177
[illegible]	[illegible]	[illegible]	86,451
Galena [illegible]	[illegible]	295,040	45,344
Alba-Neck City	1,124,420		28,073
[illegible]	[illegible]	[illegible]	[illegible]
Badger	[illegible]	2,780	[illegible]
Spring Valley City	[illegible]	[illegible]	15,046
Oronogo	493,110	67,690	13,792
Aurora	511,000		12,264
Granby	315,000	60,000	7,500
Prosperity	[illegible]	[illegible]	7,066
Baxter Springs	125,800		3,050
Carl Junction	65,260	16,050	2,241
Stott City	64,340		1,570
Playter	52,680		1,291
Zincite	35,880		897
Totals	[illegible]	[illegible]	$[illegible]

[illegible] weeks [illegible] 142,756,120 29,881,820 $ [illegible]

Zinc value, the week, $[illegible]. 18 weeks, $4,564,898
Lead value, the week, [illegible]. 18 weeks, [illegible]

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.86	84.58
March	42.68	48.66	March	78.73	82.75
April	44.63	.....	April	75.13	.....
May	40.51	.....	May	78.40	.....
June	43.83	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	48.56	.....	August	75.36	.....
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.13	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

Platteville, Wis., April 20—The greater part of the 60 per cent. zinc ore was sold at $50, no change from last week. The official report of the week shows considerable increase in the amount mined as well as that shipped. Very little has been done in regard to relieving the shortage of cars, but much is promised. Lead is steady and in good demand. Drybone and sulphur sold at a little above last week's prices.

The shipment for the district, by camps, for the week ending April 20, was as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Galena	70,200		
Buncombe–Hazel Green	453,500		
Benton	156,500		
Cuba City	234,000		
Platteville	483,000		
Rewey	62,000	56,000	
Livingston	113,000		
Mineral Point	54,000		
Harker	125,670		
Linden	47,500		
Highland	836,500	41,800	
Total for week	2,555,115	97,800	
Year to April 20	27,584,594	1,229,490	143,160

All of the ore produced was sold, but not all of it was loaded.

Chemicals

New York, April 24—There is no special change in the chemical trade, business remaining good.

[illegible] prices firm. We continue to quote $7.50 per 100 lb. for carload lots, or over; $7.75 per 100 lb. for smaller parcels.

Nitrate of Soda—The demand continues good. Spot prices are $2.70 per 100 lb., with 96 per cent. for all positions of 1907 at $2.50. The price for 95 per cent. is $2.45, for both 1907 and 1908.

Sulphur—Messrs. Emil Fog & Sons report from Messina, Sicily, under date of April 1: We doubt whether it will be possible to report anything new, until the definitive board of directors has been appointed, an event which will probably be delayed until June. Prices remain unaltered. The Consorzio has now settled with the proprietors of the mines for their first deliveries of brimstone, paying them in full, except the deduction of a small quota for expenses. The Bank of Sicily has been authorized by law to issue another 10,000,000 lire of paper in aid of the sulphur industry, and considering this plentiful supply of money, we see no prospect of lower prices in the near future. Although it has been reported that American brimstone was offered in Europe, we can hardly believe this to be true, as otherwise the Consorzio would not refuse permission to export to the United States. As it is, it will not even allow shipment to Canada, so that we must presume that the agreement with Mr. Frasch, which we believe to exist, if not on paper, at least, in a tacit form, has not been encroached on. Of course, no terms have been divulged by the Consorzio.

Exports of sulphur from Sicily for the two months ending Feb. 28 were, in the tons of 1030 kg. usual in the trade:

	1906.	1907.	Changes.
Exports, two months	64,378	54,545	D. 9,833
Stock, March 1	447,282	533,921	I. 86,639

The exports to the United States, included above, were 10,885 tons in 1906, and 76 tons in 1907; a decrease of 10,809 tons.

British Chemical Trade—Exports of chemicals from Great Britain for the three months ended March 31, were as follows, in cwt. of 112 lb. each:

	1906.	1907.	Changes.
Bleaching powder	[illegible]	271,116	I. 29,382
Muriate of ammonia	[illegible]	40,798	I. 13,206
Soda ash	[illegible]	504,048	I. 140,[illegible]
Bicarbonate of soda	[illegible]	100,444	I. 27,169
Caustic soda	[illegible]	[illegible]	I. 18,610
Soda crystals	[illegible]	29,904	D. [illegible]
Soda sulphate	[illegible]	199,103	I. 18,817
Sulphuric acid	28,827	22,772	D. [illegible]

Exports of copper sulphate were 17,106 long tons in 1906, and 19,267 tons in 1907; an increase of 2161 tons.

Imports of chemicals and raw materials into Great Britain for the three months ended March 31, were, in long tons:

	[illegible]	1907.	Changes.
[illegible]			

Estimating sulphur contents of pyrites, the total imports of sulphur were 99,889 tons in 1906, and 84,456 tons in 1907; a decrease of 6433 tons.

Mining Stocks

New York, April 24—The general stock markets have shown rather more activity, chiefly because low rates for money have been the rule. Trading, however, is still of the professional order to a great extent, and the public interest, apparently, is not great. On the curb market the copper stocks were in fair demand, with slight advances in price here and there, but with no special incidents.

One sale of Homestake, of South Dakota, was reported, 100 shares changing hands at $75 per share. This is a fall of $9.50 per share from the latest reported sale.

Considerable business is developing in the new mining stock department of the Produce Exchange. The number of stocks listed is gradually increasing, and there is more interest taken in the calls. This business, apparently, is coming chiefly from the curb market.

Boston

April 23—It has been a week of ups and downs in mining shares in this market, but the main characteristic has been dullness. True, prices are higher than they were a week back and the monetary situation is greatly improved, but there is a lack of interest and the buying power is almost negative. President Bigelow is still on deck with his suits against the Calumet & Hecla, which is a damper on the situation, although it must be said that they have not as yet created any havoc in mining circles. The latest suit is as a Calumet & Hecla stockholder. Calumet & Hecla stock is up $25 for the week to $845 and Osceola $5 to $140. Quincy has advanced $5 to $123 and Wolverine $10 to $160. Copper Range closes a trifle above a week back at $81.50. The suit of this company against A. C. Burrage and T. W. Lawson to recover $3,000,000 damages or the restoration of 70,000 shares of Copper Range Consolidated, which were exchanged for Trimountain mining stock, is now being tried in the Supreme Court, but it is without effect in the market.

[illegible] week to $97.25, with the final tonight a trifle below this. No disappointment is felt because an increase was not made in the dividend, as none was generally ex-

Davis Daly and Nipissing have been the curb features. The former recorded an advance from $12.50 to $17, with re-

Colorado Springs

April 17—The trading on the local stock exchange has been more active than for several weeks. There is a feeling among the brokers generally that the bottom has been reached, and that the whole market will show a decided advance before another 30 days. The market was particularly active today and 95,000 shares changed hands, about half being in the mines' list.

STOCK QUOTATIONS

NEW YORK. Apr. 25	
Name of Comp.	Clg.
Alaska Mines	1
Am. Nev. Mines	3
Amer. Zinc	37½
Amer. Coal	60
Boston Con.	14
British Col. Cop.	7
Buffalo Cobalt	¾
Butte & Boston	2
Butte Coalition*	27
Butte Coal & Coke	8½
Furnace Creek	1
Cobalt Contact	¾
Colonial Silver	¾
Cum. Ely Mining	8½
Davis Daly	17½
Diamond Coal	7
El Paso	1
Foster Cobalt	1
Granajuato	4
Greene Con.	200
Hancock	3
McKinley Dar.	1¼
Mason	4¾
Mines Co. of Am.	1
Nevada Utah	1¼
Nipissing Mines	10
Nor. Light	1
Nova Scotia	4½
Old Dominion	2
Parrot Silver	14
Rambler Cariboo	2
Red Rock	1
Silver Queen	1
Standard Oil	1
Tonopah Extension	2
Tonopah Mining	14
Trethewey	1
Trinity	1
U. S. Coal & Oil	1
U. S. Steel & Ref.	1
U. S. Sm. & Ref., pd.*	2
U. S. Steel	44
U. S. Steel, pd.	62
Utah Apex	1
Utah Con.	8
Utah Metal & Tunnel	1
Washington	1
Wettlaufer	1
West Columbus	14
Wolverine	100
Yukon Gold	1½

BOSTON Apr. 25	
Name of Comp.	Clg.
Adventure	8¾
Algomah	....
Am. Zinc	37½
Arcadian	6¾
Arizona Com.	14
Bingham	18¾
Boston Con.	29
Calumet & Ariz.*	166
Calumet & Hecla*	845
Centennial	30
Con. Mercur	.38
Copper Range	81½
Daly-West	16
Franklin	17½
Greene—Can. ctfs.	16
Isle Royal	19¾
La Salle	17½
Mass.	....
Michigan	15
Mohawk	84
Mont. C. & C. (new)	2¾
Nevada	14
North Butte	86½
old Colony	....
old Dominion	54⅝
Osceola	140
Parrot	22¼
Phoenix	....
Quincy*	122
Rhode Island	5
Santa Fe	3⅝
Shannon	17½
Tamarack*	108
Trinity	21½
United Cop., com.	61¾
U. S. Oil	10
U. S. Sm. & Ref.	54½
U. S. Sm. & Ref., pd.*	44
U. S. Steel	62¾
U. S. Steel, pf.	8
Utah Con.	....
Utah Metal & Tunnel	....
Victoria	....
Washington	....
Winona	....
Wolverine	160
Wyandotte	1½

BOSTON CURB	
Name of Comp.	Clg.
Bingham Con.	....
Black Mt.	....
Cananea Cent.	2
East Butte	18
Hancock Con.	9
Keweenaw	2
Mason Valley	5¾
Raven	1
Superior & Pitts.	18
Tri-Bullion	....

LONDON	
Name of Comp.	Clg.
Camp Bird	1
Esperanza	1
Le Roi	1
Le Roi No. 2	1
Rambler Cariboo	1
Rio Tinto	1
Tharsis	1
Waihi	1
Waihi Extension	1

S. FRANCISCO Apr. 18	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.55
Best & Belcher	1.35
Caledonia	.48
Challenge	.20
Con. Cal. & Va.	1.10
Con. Imperial	.01
Exchequer	.80
Gould & Curry	.30
Hale & Norcross	.20
Mexican	.98
Ophir	2.45
Overman	.16
Potosi	.12
Savage	.98
Sierra Nevada	.60
Union	.57
Utah	.05
Yellow Jacket	1.10
TONOPAH STOCKS	
Golden Anchor	.37
McNamara	.48
Montana-Pitts. ex.	.05
North Star	.36
Rescue	.20
GOLDFI'D STOCKS	
Black Ants	.11
Blue Bull	.49
Columbia Mt.	.95
Comb. Frac	4.65
Conqueror	.20
Daisy	2.15
Florence	5.00
Frances-Mohawk	1.10
Goldfield Con.	8.12
Grandma	.21
Great Bend	1.05
Red Hills	.48
St. Ives	1.55
BULLFROG STOCKS	
Amethyst	.44
Bonnie Claire	.43
Mayflower Con.	.43
Montgomery Mt.	.27
Original	.15
MANHAT'N STOCKS	
Gold Wedge	.11
Manhattan Mg.	.13
Pine Nut	.16
Ruby Wonder	....
Stray Dog	.25
Yellow Horse	.05

NEVADA Apr. 24 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	18.00
Tonopah Exten.	3.50
Montana Tonop'h	3.62½
Belmont	4.75
Tonopah Midway	1.72
West End Con.	1.00
Jim Butler	1.25
GOLDFI'D STOCKS	
Sandstorm	.80
Kendall	.17
Red Top	4.00
Jumbo	4.00
Goldfield Mining	1.45
Dia'dfield B. B. C.	.42
Atlanta	.79
Mohawk	16.00
Silver Pick	1.30
Laguna	1.65
BULLFROG STOCKS	
Mont. Shoshone C.	10.00
Tramps Con.	1.08
Gold Bar	1.15
Bullfrog Mining	.28
Bullfrog Nat. B.	.39
Homestake Con.	1.20
MANHAT'N STOCKS	
Manhattan Con.	.72
Manhat'n Dexter	.22
Jumping Jack	.17
Stray Dog	.25
Indian Camp	.17

COLO. SPRINGS Apr. 20	
Name of Comp.	Clg.
Acacia	9
Black Bell	....
C. C. Con.	5
Dante	5¾
Doctor Jack Pot	7
Elkton	55
El Paso	43½
Findlay	65
Gold Dollar	7¾
Gold Sovereign	63
Isabella	24
Index	....
Jennie Sample	7
Jerry Johnson	4
Mary McKinney	55
Pharmacist	6½
Portland	1.17
Un. Gold Mines	8¾
Vindicator	84
Work	16¾

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	May 27	$2.00	$4,084,758
Beck Tunnel, Utah	Apr.	0.04	40,000
Consolidation Coal	Apr. 30	1.50	153,750
Esperanza, Mex	Apr. 22	1.32	600,600
Grand Central, Utah	Apr.	0.10	25,000
Homestake, S. Dak	Apr. 25	0.50	109,200
Inter. Nickel, pfd	May 1	1.50	131,123
Mary McKinney, Colo	Apr. 25	0.02	39,120
Mines Co. of America	Apr. 26	0.02	40,000
New Central Coal, Md	May 1	0.40	20,000
Nipissing, Ont	Apr. 20	0.15	180,000
N. Y. & Hon. Rosario	Apr. 20	0.10	15,000
Penna. Steel, pfd	May 1	3.50	588,749
Philadelphia Co	May 1	0.75	434,296
Tenn. Coal, Iron & R.R.	May 1	1.00	225,536
Tenn. C. I. & R.R., pfd	May 1	2.00	4,960
Tonopah Co., Nev.	Apr. 22	0.35	350,000
United Copper	Apr. 29	1.75½	787,500
United Zinc	Apr. 15	0.50	9,778
U.S. Cast Iron Pipe & Fdy.	June 1	1.00	150,000
U.S. C. I. Pipe & Fdy. pfd	June 1	1.75	262,500
Utah Fish Springs	Apr.	0.06	3,000
Victoria, Utah		0.04	10,000
Vindicator Con., Colo	Apr. 25	0.03	45,000
Vulcan Detinning, pfd	Apr. 20	1.25	18,750

Assessments

Company.	Delinq.	Sale.	Amt.
Andes Nev.	Mar. 25	Apr. 30	$0.10
Belcher, Nev.	Apr. 16	May 9	0.15
Caledonia, Nev.	Apr. 10	May 1	0.10
Challar, Nev.	Apr. 22	May 16	0.10
Challenge	Apr. 23	May 14	0.20
Con. St. Gothard, Cal.	Apr. 24	May 14	0.10
Gould & Curry, Nev	Apr. 10	May 1	0.10
Hale & Norcross, N.	Apr. 3	Apr. 30	0.15
Last Packer, Idaho	May 6	May 27	1.00
Lucky Dutch'n, Nev	May 4	May 25	0.01
Morrison, Utah	Apr. 16	May 10	0.01
Seg. Belcher	Apr. 9	Apr. 29	0.05
Skylark, Utah	Apr. 9	Apr. 30	0.01
Union Con., Nev.	Apr. 15	May 8	0.10
Utah & N. Y., Utah	Apr. 27	May 16	0.01
Yellow Jacket, Nev.	Apr. 13	May 22	0.10

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30 113	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.765	.....	29.984	.....
May	66.976	.....	30.968	.....
June	65.394	.....	30.186	.....
July	65.105	.....	30.113	.....
August	65.949	.....	30.529	.....
September	67.927	.....	31.483	.....
October	69.653	.....	32.148	.....
November	70.813	.....	32.671	.....
December	69.050	.....	32.003	.....
Year	66.791	.....	30.868	.....

New York, cents per fine ounce: London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	.....	18.688	.....	84.793	.....
May	18.475	.....	18.724	.....	84.867	.....
June	18.442	.....	18.719	.....	83.994	.....
July	18.190	.....	18.586	.....	81.167	.....
August	18.380	.....	18.706	.....	83.864	.....
September	19.033	.....	19.328	.....	87.831	.....
October	21.203	.....	21.722	.....	97.269	.....
November	21.833	.....	22.398	.....	100.270	.....
December	22.885	.....	23.350	.....	105.226	.....
Year	19.278	.....	19.616	.....	87.282	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton. standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.276	.....
February	36.403	42.102	August	40.606	.....
March	36.662	41.313	September	40.616	.....
April	38.900	.....	October	42.852	.....
May	43.313	.....	November	42.906	.....
June	39.260	.....	December	42.750	.....
			Av. year.	39.819	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350	6.000	15.922	19.703
April	5.404	.....	15.959	.....
May	5.685	.....	16.725	.....
June	5.750	.....	16.813	.....
July	5.750	.....	16.525	.....
August	5.750	.....	17.109	.....
September	5.750	.....	18.266	.....
October	5.750	.....	19.350	.....
November	5.750	.....	19.281	.....
December	5.900	.....	19.609	.....
Year	5.657	.....	17.370	.....

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.078	.....	5.931	.....	25.781	.....
May	5.997	.....	5.846	.....	27.000	.....
June	6.096	.....	5.948	.....	27.728	.....
July	6.006	.....	5.856	.....	26.800	.....
August	6.027	.....	5.878	.....	26.938	.....
September	6.216	.....	6.056	.....	27.563	.....
October	6.222	.....	6.070	.....	28.076	.....
November	6.375	.....	6.225	.....	27.781	.....
December	6.593	.....	6.443	.....	27.938	.....
Year	6.198	.....	6.048	.....	27.020	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

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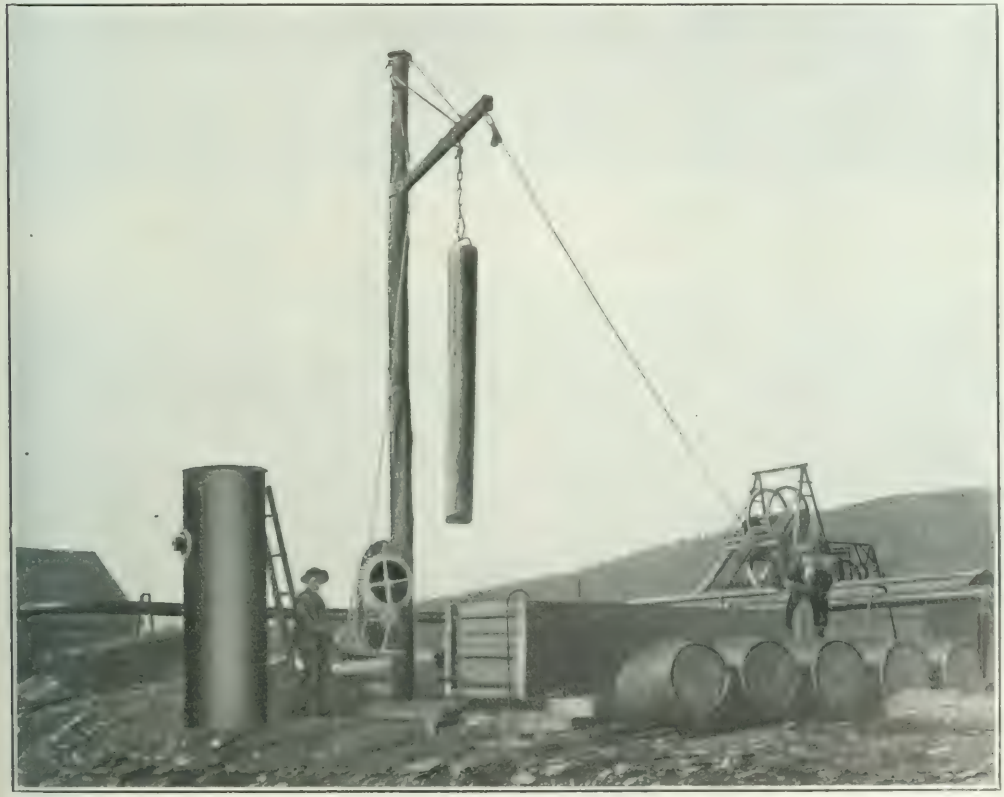
Preservation of Mine Timber from Decay

Experiments Conducted by Philadelphia & Reading C. & I. Co., and U. S. Forest Service Show How Life of Timber May Be Prolonged

BY JOHN M. NELSON

Those who are interested in mining are well aware of the decreasing supply and increasing price of timber suitable for mining purposes. The time has come when every stick of timber used either inside or outside the mines should be so handled during its entire life that it may be expected to give its greatest service.

The Philadelphia & Reading Coal and Iron Company and the U. S. Forest Service, in February 1906, planned a series of experiments to be conducted along practical and economical lines with the primary idea of saving timber and money. Actual tests have been carried on to discover just what methods of handling and treatment would give the greatest service at the least expense.



SMALL EXPERIMENTAL TREATING PLANT FOR THE APPLICATION OF [illegible] BY THE OPEN TANK METHOD. A [illegible] OF SOLUTION OF ZINC CHLORIDE MAY ALSO BE APPLIED IN THIS PLANT

Destructive Agencies

The factors destructive to timber used by anthracite coal companies are (1) decay, (2) breakage, (3) wear, (4) insects, (5) waste. It is decay and the methods of preventing decay in which the Coal and Iron Company and the Forest Service have been more especially interested. It will hardly be profitable for mining companies to apply an expensive treatment to timber which will soon be broken by the crush and squeeze of coal and rock, or worn out by the rubbing of ropes and cables. However, with timber being destroyed either by decay or insects, a preservative treatment may result in an enormous saving to the mining company.

Timber for mining purposes has heretofore been rushed from the woods to the mines and placed in the mines in an ab-

Note—From a lecture delivered before the employees of the Philadelphia & Reading Coal and Iron Company.

*Member the U. S. Forest Service, Pottsville, Penn.

solutely green and unpeeled condition with the result that dry rot or decay causes rapid destruction. We believe by better methods of handling, such as peeling and seasoning and by a preservative treatment with oils or chemical salts, that the life of this timber would be prolonged and its general condition both to soundness and strength considerably improved.

Sets of round gangway timber, used in the main haulage ways, were tested as a basis for this experimental work, inasmuch as with this form of mine timber would be the greatest saving in expense providing preservative treatments were successful. The Pennsylvania pitch and the southern loblolly pines were the more important experimental timbers, as these species furnish the bulk of the round gangway timber 11 in. in diameter and over, used in the mines of the Philadelphia & Reading Coal and Iron Company. Every condition of handling and treatment has been compared with the form of gangway timber now in most general use, namely, green, unpeeled pine. By this comparison it was hoped to learn exactly to what extent the experimental timber would be benefited by various preservative treatments and by better methods of handling.

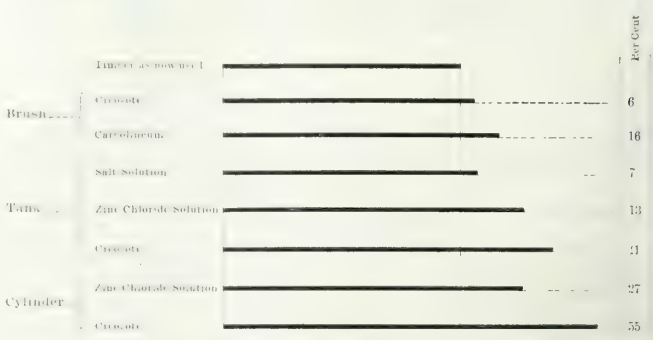


DIAGRAM SHOWING INCREASED LIFE NECESSARY TO PAY FOR THE COST OF PRESERVATIVE TREATMENTS

In the experimental work the following were the main points studied:

(1) The benefits of peeling timber.

(2) The benefit of seasoning timber or drying it out.

(3) The benefit of treating timber with various preservatives applied by several processes.

The preservative treatments tested and their relative costs are given in the accompanying table.

Although this experimental work has been in progress but a comparatively short time, some conclusive results and a great many indications have been obtained.

Factors That Cause Decay

Ventilation is a large factor in the destruction of timber by decay. In badly ventilated air courses, where there is sufficient moisture and temperature, decay is at a maximum. For wood-destroying organisms to exist, they must have air and water. If it were possible to keep the timber always wet or always dry, it would not decay; it is the alternation of wet and dry conditions which produces rot.

By direct experiment, it has been definitely proved that in durability, peeled timber is superior to unpeeled timber. In unpeeled timber the space between the bark and the wood favors the development of wood-destroying organisms and furnishes a breeding place for many forms of insect life. Peeled timber is 7 to 8 per cent. lighter than unpeeled timber.

Great benefits may be derived from seasoning the timber or drying it out. Seasoned timber is far more durable than green timber, and is considerably stronger. A period of from 2 to 5 months is necessary for proper seasoning. In that length of time, it may lose from 30 to 35 per cent. of its green weight. In case the company handles its own timber from the woods to the mines, the possible saving in freight due to peeling and seasoning may easily be estimated.

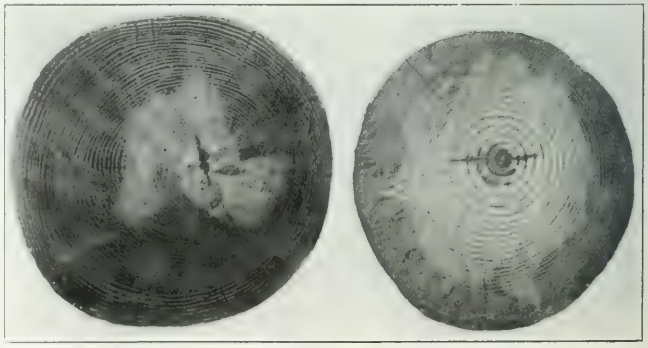
Methods of Treatment

Of the treated timbers, those preserved with creosote and a solution of zinc chloride by the open tank method, have been very successful. A good penetration of the wood by the preserving fluid from 2 to 5 in., has been easily secured, and timbers so treated effectively resist decay.

Timbers treated by the cylinder process are also standing well, but in order to be a profitable investment, they will have to show a considerable increase in life over those treated by the far less expensive open tank process.

COST OF PRESERVATIVE TREATMENT OF TIMBER.

Method of Application.	Preservative.	Approximate Cost of Preservative.	Approximate Cost per Set of Gangway Timber of 26 Cu. Ft.	Cost Per Cu. Ft.
Preservative heated to 180 deg. F. and applied in two coats with a brush.	Creosote (Dead oil of coal tar).	$0.09 per gal.	$0.40	$0.01½
	Xylenarius Carbolineum.	$0.70 per gal.	$1.15	$0.04½
Immersion in an open tank without pressure. Successive baths of hot and cold fluid.	Solution of common salt, 15 per cent.	$0.09 per lb.	$0.50	$0.02
	Solution of zinc chloride, 6 per cent.	$0.04¼ per lb.	$0.90	$0.03½
	Creosote (Dead oil of coal tar).	$0.09 per gal.	$2.85	$0.11
In a cylinder under vacuum and pressure.	Solution of zinc chloride, 6 per cent.	$0.04¼ per lb.	$1.90	$0.07
	Creosote (dead oil of coal tar).	$0.09 per gal.	$3.85	$0.15



SECTIONS FROM CENTER OF 10-FT. STICK TREATED WITH CREOSOTE BY THE OPEN-TANK PROCESS, SHOWING RELATIVE PENETRATION IN SEASONED AND IN GREEN TIMBER

The success of the superficial brush treatment has yet to be proved. Timber so treated is not as effectively resisting decay as the other treatments. On account of their comparative cheapness and ease of application, requiring no plant, they may be of benefit to small operators or in a situation where the timber is likely to be broken.

Time alone can prove which is the most efficient treatment for each and every condition that must be met in the mines. However, we know that we have some good treatments and that the preservation of mine timber has been successfully accomplished. Acting on the results obtained from this series of experiments, the Philadelphia & Reading Coal and Iron Company is considering the advisability of taking up treating work on a larger scale. Plans have been drawn for the construction and erection of an open tank treating plant at one of its collieries. If erected, either creosote or zinc chloride solution will be the preserving fluid used.

The successful application of a preservative treatment to mine timber is largely dependent upon the regulation of the timber supply of the consumer, and a timber supply that will admit of this regulation. Under these conditions, timber cannot be rushed from the woods into the mines. There must be time for treating it and for preparing it for treatment. This means the storage of a reserve supply of felled timber at one or more points.

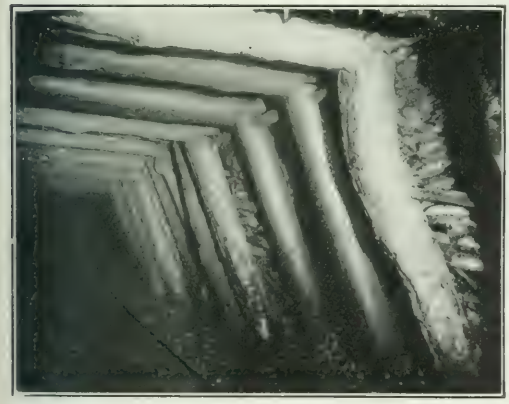
It should be distinctly understood that this series of experiments especially applies to the southern anthracite coal region, where the Pennsylvania and southern pines are the leading mine timbers. To regions where conditions and species of timber differ, the results of these experiments may not be applicable.

DESTRUCTION OF LOBLOLLY PINE GANGWAY TIMBERS BY INSECTS

A result of not peeling timber, accumulation of borings (sawdust) on the floor.

RESULT OF PARTIAL BRUSH TREATMENT WITH CARBOLINEUM

The division between treated and untreated portions is well defined. The untreated part shows the mycelium of a wood-destroying fungus.



TWO SETS OF GANGWAY LOGS CREOSOTED BY OPEN TANK

As a result of the treatment, these sets show a sound condition around the notches of joints of logs and collars where decay is most prevalent.

POLYPORUS ANNOSUS

The chief wood-destroying fungus of [illegible] decay

According to A. Schwartz and W. H. N. James (*Electrician*, 1906, LVI, 468 469) fuses of aluminum wire, particularly of small diameter, are unreliable owing to the molten metal being held up by the skin of oxide which forms on the surface. The metal attains a dull red heat just before fusion, and on disruption will throw off burning globules of metal a distance of several feet even on a low-tension circuit. Aluminum, zinc and cadmium, being highly electro-positive to copper and brass, are liable to considerable corrosion of the contacts when used in damp situations. Consequently their application is somewhat limited.

Italians as Mine Workers

My experience while in charge of an Eastern iron mine may be of interest to those who have to do with Italian employees. At the time of my arrival in midwinter, half the underground muckers were Italians. Several of the race had aspired to run rock drills, but their attempts had met with indifferent success, and the Austrian drill runners did not do well with Italian novices as helpers.

In winter a large number of Italians are idle; the contracts and construction work on which they are employed in warm weather are suspended, and rather than face the cold of the northern woods they usually prefer to hibernate among their compatriots in some large town. The warm, even temperature underground delighted them at first, but their sensitiveness to cold led to a desertion *en masse*, when called to the surface one arctic night to help put back a derailed skip.

However, it was quite another racial trait that finally settled their fate underground. An American miner had the misfortune to be killed by a fall of ground. When the mine was ready to resume after the accident, no Italians were to be found. The absent ones were finally located in a mining camp some miles away, and even then it was only their fear of the padrone that finally made them return to work. Even underground heat seemed to have lost its charm. Timid and superstitious by nature, in spite of their bloodthirsty vendettas, the accident had opened their eyes to the possible dangers of their unaccustomed surroundings.

Even before the accidents, Italians going to work underground for the first time would sometimes throw down their shovels after a few minutes and go up. I heard one of these deserters rejoicing on his departure for the railroad, that he had escaped alive from "that frightful hole."

After the accident, even the influence of the padrone was unavailing to dispel the terrors of the mine darkness. Some of the muckers took ten-hour surface jobs in preference to the eight-hour work underground; others, less industrious and hardy, returned to their winter loafing quarters in the city.

An efficient gang of Italian dock men was obtained by weeding out the small percentage of lazy and incompetent among new arrivals. As ore sorters, the Americans were preferable, but as shovelers the Italians worked well during the day; many were so enthusiastic that they often toiled half the night in addition if given a favorable contract to unload coal or do special grading. The majority were from the coast of Campania, and of small size, but some from the hill country of southern Italy were as large as Teutons.

Their language was a peasant *patois*, so different from literary Italian as to be almost a different tongue. Though the majority were illiterate peasants, one was a blacksmith, who had wandered extensively in South America, another was the son of a mine boss, in Italy, and had some education. In spite of their clannishness, the facility with which they acquire a smattering of English makes them easier to handle than the slower Slavic races.

During a short strike, they acted inoffensively, but their small respect for the sacredness of an obligation was illustrated when they failed to return to work at the time agreed upon.

The theft of coal from our cars was also a common occurrence in winter, and might have risen from the fact that they mistook American liberty for license. Beer was their favorite beverage, being cheaper than their accustomed wine, but few were drunkards, as the Latin races generally are more temperate than their neighbors to the north and east. They took few lay-offs outside of the legal American rest days; for this reason alone, they would be chosen instead of their Slavic competitors whose numerous holidays render them unavailable.

The custom of ticketing Italian laborers with brass checks in order to handle them on the pay-roll by number is a curious one, and is a reflection on the linguistic ability of the average paymaster, as well as a hindrance to the development of American individuality. The Italians themselves do not seem to object, and often call newcomers by number in preference to name; perhaps in Italy the substitution of a number for a man's name does not have a penitentiary flavor, as in this country.

In spite of their faults, Italians can be made very useful as surface workers around mines. In time they might even become good miners, judging by the underground skill of an occasional one, if caught young and properly trained.

Slum Ponds of the Washoe Smelting Works

The fine material not retained in the classifiers and settling tanks of the Washoe Smelting Works, described in a pamphlet prepared by members of the Anaconda Copper Mining Company, is carried by the water to "slum ponds," situated in the valley below the works. There are six ponds of different sizes, averaging about 300x630 ft. When a pond is full, the water is diverted to an empty pond, and as much water drained off as possible. Lidgerwood traveling cableways, each having a bucket capacity of 5 tons. The slum is piled outside of the pond and allowed to drain and dry, and from these piles it is taken by cableway and dropped into a hopper on trucks, from which it runs into the railroad cars beneath and is taken to storage bins for use at the briquet plant. The slime water containing the least values is used for condensing purposes and for sluicing slag at the reverberatories and blast furnaces.

The settling tanks containing fine and second settlement concentrates are emptied from the bottom, after draining, into cars and transported to the charge floor of the calcine building, the material being weighed and sampled before dumping.

Tamarack Mining Company

The report of the Tamarack Mining Company, Houghton county, Michigan, for the year ending Dec. 31, 1906, contains the following statement of operations for the year:

	Total.	Cents per lb.
Sale of 9,832,644 lb. copper	$1,853,456	18.85
Miscellaneous income	63,777	0.55
Total receipts	$1,917,232	19.40
Construction expenses	$ 90,517	0.92
Running expenses at mine	1,255,379	12.77
Smelting, transportation charges, etc.	157,505	1.60
Total cost of refined copper	$1,503,401	15.29
Surplus	$ 413,831	
Deduct two dividends	300,000	
Surplus	$ 113,641	
Balance Dec. 31, 1905	848,589	
Balance Dec. 31, 1906	$ 962,220	

The copper content of the Tamarack rock and cost of mining and milling is shown for the years 1905 and 1906:

	1905.	1906.
Tons of rock stamped	750,120	389,080
Mineral obtained	21,780,945	14,779,890
Percentage refined copper in mineral	63.855	66.53
Refined copper per ton of rock, lb.	21.1	25.2
Product, fine copper, lb.	15,824,008	9,832,644
Cost of mining per ton of rock	$2.1684	$2.926
Cost of stamping per ton of rock	0.2217	0.294

Underground development for the year consisted of shaft sinking, 90 ft.; drifting, 2598 ft.; crosscuts, 860 ft.; sinking winzes, 1083 ft.; total openings, 4632 ft.

The fire which started on Jan. 11, 1906, curtailed operations and reduced the output by nearly one-half and necessitated many hundred feet of re-timbering in the shafts. The total expense directly attributable to the fire was $112,805 for the year.

No. 2 mill was completed by the addition of a new stamp-mill and an additional set of 16x36-in. recrushing rolls with the usual concentrating machinery.

It is the intention of the management to continue changing the single-expansion stamp-mills into compound expansion as rapidly as conditions permit.

The Panasqueira Tungsten District, Portugal

By Wilhelm [illegible]*

Among the [illegible] tungsten mines on the Iberian peninsula are the Panasqueira mines in the province of Beira Baixa, Portugal. They are divided into the Panasqueira group and the Cabeco Piao group, shown in the accompanying map. These two groups comprise about 1000 hectares of steeply sloping country, showing signs of existing mineral deposits, as outcrops and float.

The ore deposits consist of quartz beds, varying from 0.10 m. to 0.60 m. in thickness, containing the minerals wolframite, cassiterite, oxide of iron, iron pyrites, mispickel and mica. There are numerous beds situated in Cambrian schist

In the southern part of the Panasqueira group and the western part of the Cabeco Piao group the strata strike magnetic north. Here the beds contain wolframite, cassiterite, oxide of iron, mica, a small amount of carbonate of copper and iron and arsenical pyrites.

The deposits are well defined, both walls being sharp limits of the quartz. The beds in the Panasqueira group are almost horizontal, dipping 5 to 10 deg. to the South; in the Cabeco Piao group they dip 35 deg. to the North.

[illegible]

There is more or less faulting, the faults being almost vertical, and mostly striking north and south or east and west; they are 0.10m. to 1m. wide, are composed of crushed shale, and are very permeable by water. The faults are generally compensating and the displacement very slight,

TOPOGRAPHY OF THE PANASQUEIRA [illegible] DISTRICT, PORTUGAL

Location

The mines are situated almost in the center of a large sedimentary bed about 11 km. from the nearest igneous rocks. This I think noteworthy, as most tungsten deposits in Spain and Portugal are either within igneous rocks, especially granite, or on the contact of igneous and sedimentary rocks. The strata vary in direction from true north to south to magnetic north to south (16 deg. west—true north.) This fact suggests some influence upon the mineral concentration or deposition of the beds. Those in the schists with strike true north contain wolframite, oxide of iron, pyrites, mispickel, little mica, but no cassiterite or carbonate of copper. The northern part of the Panasqueira group and the eastern part of the Cabeco Piao group have beds of this sort.

being nil in the Cabeco Piao group, and two to three meters in the Panasqueira group.

The mineralization is rather erratic and although faults appear to have had some influence, this is difficult to determine. Nevertheless it has been noted that when three or four faults cross each other forming a triangle or a trapezoid the part of the bed limited by the faults as a rule is richer than other parts of the same bed. A bed recently opened yielded 110 kg. tungsten concemtrates per square meter from a space within three faults, and several lumps of pure mineral weighing 30 to 100 kg. were found; another bed found within triangular faults yielded about 90 kg. tungsten per square meter. Such cases frequently occur.

Panasqueira Group

Exploitation has been going on for about 10 years in the Panasqueira group on the north slope of the Panasqueira Sierra, where an incomplete concentration plant has been put up. There are 15 proved quartz beds on the north slope and corresponding beds have been found on the south slope. Only four of these have been exploited to any extent. The proprietors of the mines have in 10 years exploited, concentrated and sold 600 metric tons of tungsten concentrate (68 to 71 per cent. WO_3) which cost, including freight to Fundao, about $130, Portuguese currency, per ton. The prices obtained during the last three years have varied between $5.25 and $10 per unit ($365 to $700 per ton) c.i.f. Continental ports.

About 30,000 sq.m. of quartz beds have been stoped out during these 10 years, yielding 25,000 tons of ore for treatment at the plant. The mill has been slightly improved but about 25 per cent. of the wolframite is still lost in the dumps; the mines are at present producing at the rate of 200 to 250 tons of concentrates (68 to 71 per cent. WO_3) per year.

The Cabeco Piao Group

In the Cabeco Piao group exploration has proved the existence of 10 beds, and in four of these about 60,000 sq.m. of quartz beds have been laid bare with very little work; these will average 25 kg. of wolframite (68 to 71 per cent. WO_3) per square meter. Simultaneously some development was done and during two years about 50 tons of wolframite were sold. This ore was obtained with a very incomplete manual washing plant.

In the district containing cassiterite only exploration work has been done.

It appears that these mines would be capable of producing 1500 to 2000 tons of wolframite per year at a cost of $80 to $100 per ton, and at this rate they would be able to dictate the European price; but to do this a rational development of the mines and the installation of a modern and effective concentrating plant would be necessary, which is not likely to take place.

Livache and Potain have made a series of experiments on the substitution of zinc white for white lead both as paint, and as a priming composition for porous surfaces. For a satisfactory paint, zinc white requires one-fifth more oil than white lead, but will then cover one-fifth more surface, and by adding to the oil 1 per cent. of manganese resinate and a sufficiency of oil of turpentine, zinc white paint will dry in practically the same time as white lead. As a priming composition, a mixture of 1000 parts of zinc white, 1500 of whiting, and 633 of linseed oil [illegible] resinate is equal, both as regards applicability and rapidity of drying, to one consisting of equal parts of white lead and whiting, while costing only about 10 per cent. more.

*Mining engineer, Estacion Vacar, Prov. de Cordoba, Spain.

A Curious Deposit of Cerussite in Colorado

The Ore in the Terrible Mine, at Ilse, Custer County, is Not Associated with Sulphides and Other Minerals Usually Found with Lead

BY ROBERT B. BRINSMADE*

In the Terrible mine, at Ilse, Custer county, Colorado, there is an unusual deposit of cerussite. First discovered about 1880, it has passed through varying fortunes. At present it lies idle. During its working life the mine produced some 250,000 tons of ore from which over $500,000 worth of lead concentrate was extracted and shipped. A few tons of ore were rich enough to sort and smelt direct, but the greater part was handled as concentrate with 60 to 70 per cent. lead.

Peculiar Method of Manufacturing Litharge

The old concentrator had crushers, sizers, jigs and tables like the orthodox arrangement for galena, but the process of making litharge, adopted by the Crystal Lead Company, the last operators, to utilize the rare nature of cerussite concentrate, is worthy of note. The litharge furnace was a small brick reverberatory. By raising the concentrate to a heat sufficient to free the CO_2, the PbO dropped through the perforated iron grate of the hearth, leaving only a cinder of silica fused with a small percentage of PbO. The furnace had a capacity of 6 tons per day. By grinding the furnace product in an Abbé tube mill and then bolting through a 200-mesh silk screen the litharge became ready for shipment in 150-lb. canvas sacks.

A ton of concentrate averaged a yield of 1500 lb. of litharge containing 90 per cent. PbO, the balance being silica. In spite of the impurity, this litharge was superior to the usual kind for use in vulcanizing rubber, owing to its freedom from shots of metallic lead.

The Mine

The mine lies in Oak Creek valley in the Greenhorn mountains, 25 miles south of Florence, Colorado. The valley, for the 20 miles of its length observed, was apparently eroded in metamorphic schists along the axis of an ancient anticlinal fold. Ascending the creek from the Arkansas valley through a rugged cañon till within 10 miles of the mine, when the bounding hills take a gentler slope that is covered with soil and brush, it exhibits only occasional outcrops of the schist. Here, too, the creek bottom becomes broad enough to permit of considerable agriculture.

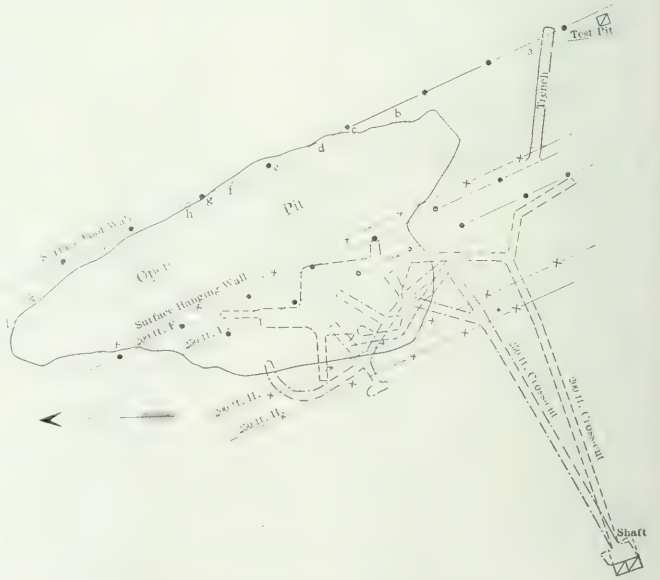
The old mine now has the appearance of an open quarry, about 450 ft. long by 100 ft. wide, filled with water to within 50 ft. of the surface. The local theories of the deposit were either that it was an impregnated igneous dike or a great fissure vein in gneiss. On first sight the iron-stained, decomposed and shattered mineralized material that shows around the pit sides may have been either a dike or a vein, and it required close study to find evidence that these theories were untenable.

Features of the Deposit

The striking feature of the east side of the quarry is the hanging wall, a parting plane on a dip of 67 deg., which is well marked and doubtless first gave rise to the vein theory. This parting plane, however, is filled with a layer of finely divided blue clay 6 to 12 in. thick, which indicates a fault of considerable movement. How far this fault extended horizontally, it is not possible to trace, without trenching, as the valley soil covers the fault outcrop to a depth of several feet. Three miles south along the valley, at Leadhills, was found, some 20 years ago, a pocket of a cerussite in similar rock and 80 tons of concentrate from a hand jig was shipped; but there is little or no showing in the old pits there at present, and no evidence of the hanging wall fault was seen.

The foot-wall faulting, on the contrary, is less well defined and the line by which it is marked on the map indicates a series of irregular slips marking the eastern boundary of the ore. Between foot and hanging there is no porphyry or true-vein matter visible in the deposit, but only metamorphic strata with bedding planes at the surface, represented by *a*, *b*, *c* on the map, parallel to the strike of the surrounding country rock. These strata are alternate layers of granulite (quartz and orthoclase) and gneiss (mica, quartz and plagioclase felspar), in which weathering and movement has obscured, in many cases, the original bedding planes.

The strata of the profitable ore extend between bedding planes and are practically all granulite, forming a solid mineralized block, thrown into this position by the hanging- and foot-wall faulting, and having gneiss for both walls. Just beyond the thick gneiss strata, north and south of *b* and *l*, are more granulite layers containing cerussite, but not found in sufficient quantity for mining.



MAP OF MINE ON THE CERUSSITE DEPOSIT

Nature of the Rocks

The granulite is a hard, brittle rock and when shattered by earth movements the resultant cracks appear to have remained open until filled by solutions. The gneiss, on the contrary, is more decomposed and so soft that small cracks could be easily closed by slight pressure. It is therefore not surprising to find the cerussite confined to the cracks of the granulite, while the gneiss is practically barren.

The cerussite layers are usually 1/16 to ⅛ in. thick and the proportion of ore depends upon their number. In some places the granulite averages 10 per cent. lead, but the general average as mined yielded 4 to 5 per cent. of metallic lead in the mill. Occasionally the cerussite has formed considerable masses. One weighing 115 lb. was exhibited at the Portland Fair. These masses are crystalline druses, appearing casually like white, opaque vein quartz, and only shown the crystal habit along occasional planes on their periphery. The cerussite is dull white, translucent, brittle and easily detachable in small plates from its rock matrix. It is free from metallic impurities and is easily distinguishable from calcite in its thin sheets by giving no effervescence with dilute HCl.

Genesis of the Deposit

There is little doubt that the ore is of secondary origin, for primary lead ore habitually comes up in the form of sulphides. It is true that at Steamboat Springs, Nevada, the minerals deposited by the rising hot water contain a small proportion of cerussite, but it is only in association with ten times as much galena, and at the Terrible no galena has ever been detected.

It therefore appears probable that this deposit has been formed by descending waters. The clay selvage in the fault would stop the lead-bearing waters from penetrating further west and the fault would thus be the hanging wall; while the foot-wall boundary was caused by minor slips, more or less parallel with the hanging wall, shutting off the open cracks of the gneiss and forming a dam on the east side that prevented any considerable penetration of the cerussite into the foot-wall.

There are two possible sources of the lead: beds in limestone or small veins in the schists. No limestone was observed in the vicinity, but small galena veins are found in schists on the hillsides within a mile of the Terrible, and a sufficient number of them in the eroded anticlinal arch could have furnished all the lead in the mine.

With the help of heat and oxidation the two simplest equations for changing PbS to $PbCO_3$ are:

I. $PbS + 4O = PbSO_4$.

II. $PbSO_4 + Ca(HCO_3)_2 = PbCO_3 + H_2CO_3 + CaSO_4$.

Sufficient lime for the reaction in the absence of adjoining bedded limestone could easily have come from the lime felspars of the gneiss. The solutions may have entered the cracked granulite as $PbCO_3$ dissolved in the hot H_2CO_3, and the $PbCO_3$ may have been crystallized out by the cooling of the carrying solution.

In view of the fact that the granulite cracks north and south of the orebody contain calcite instead of cerussite, another method of ore origin is tenable. The lead may have entered the cracks as $PbSCO_4$ dissolved in hot H_2SO_4 and replaced the previously deposted calcite by the reaction of equation II. But this would set free considerable $CaSO_4$ within the orebody, and as no gypsum is to be observed in the pit, this theory of cerussite deposition seems less likely than the first.

It is probable from the method of origin that the ore does not reach a great depth. The rock cracks would tend to close up as depth was gained from the rising pressure, and they would also be smaller as the stress, and consequently also the shattering, is greatest at the top of the anticlinal arch. In the lowest workings on the 250-ft. level the cracks were smaller than at the surface, which seems to corroborate this theory.

Sampling Ores Containing Metallics

F. A. Thompson, *Western Chemist and Metallurgist*, Vol. III, has submitted the results of sampling an ore, containing metallics, not to show the proper method of sampling, but to show the difficulties attending the operation. The ore was porphyritic, the feldspar being pretty well kaolinized and in places was heavily iron stained. The gold and silver was present almost entirely as metallics, flakes of gold being visible to the naked eye; sometimes pieces of gold as large as grains of rice were visible.

The whole lot weighing about 10 tons was crushed to 0.5 in. size, and 1/5 cut out with a Vezin sampler. This two-ton cut was roll-crushed to about 0.12 in., and carefully riffled twice on a Jones sampler, having riffles 1 in. wide. This 500 lb. sample was put through smaller rolls to about 0.06-in. size and cut once with the riffle sampler. Each half was treated separately, being called original and duplicate, by cutting once with the riffler and rolled to about 0.025 in. size, and again cut to about 10 pounds.

The 10-lb. sample was passed through a coffee mill grinder several times, and riffled down to approximately 2 lb. and sifted on a 100-mesh sieve, about 90 per cent. passing through without further grinding. The oversize was bucked on a board until the metallics, which often showed up as ribbons of gold on the board, passed through the sieve. The pulp was mixed, coned and quartered, and divided into samples for the mine and sampler.

Results of the Assay.

Sample	*Oz. gold per ton*
Sampler Original	9.29
Mine Original	[illegible]
Sampler Duplicate	[illegible]
Mine Duplicate	13.74
Average	[illegible]

The results on each sample being the average of at least four assays of ½ assay ton each, which upon the sample differed at times as much as 0.5 oz., it was decided to resample as the differences evidently lay there. The resample was started with the 1/5 portion of the original sampling, and the operation from that point to the division into original and duplicate repeated with more care if possible than at first. The sample now instead of being divided into two parts was divided into four and each part treated separately and reduced as before. The four final portions were ground in the coffee mill and the pulp weighed before screening. The metallics were then sifted out on a 100-mesh sieve, wrapped in lead foil and assayed, two by the mine and two by the sampler, each accepting the other's results. The through-screen portion was divided up into samples for the mine, sampler and umpire:

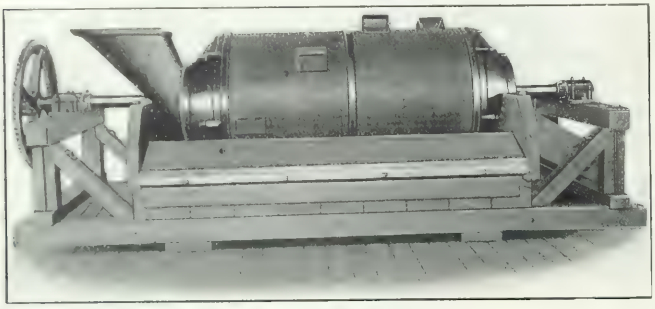
Result of Second Assay, Oz. Gold per Ton

	Pulp			Metallics		Final
	Mine	*Sampler*	*Average*	*Mine*	*Sampler*	*Results*
First original	10.23	10.00	10.11		2.23	12.34
First duplicate	15.88	14.36	15.12	3.20		18.32
Second original	16.80	14.24	15.52		7.04	22.56
Second duplicate	16.90	15.23	16.07	2.39		18.46
Average						[illegible]

The settlement was made on this basis, and the experiment stopped. In the first sampling it is evident that metallics remained on the bucking board and muller, but in either case the results are not conclusive, and it is a question whether an accurate sample can be obtained on such material. The ratio of weight of sample to size of particles is well within the limits prescribed by sampling authorities.

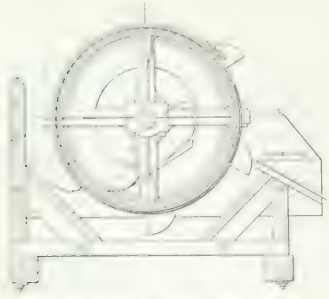
New Century Disintegrating Screen

The New Century Disintegrating Screen, made by the American Concentrator Company, Joplin, Mo., is a washing and disintegrating machine for the preliminary treatment of ore, barytes or other substances imbedded in stiff clay, mud or soapstone. It is a cylindrical screen protected within by round iron bars, and provided with a series of elevator buckets on the outside, the whole revolving in a tank of water.



NEW CENTURY DISINTEGRATING SCREEN

The material, which may include lumps of ore or boulders 10 in. in diameter, is fed into the revolving cylinder through a cast-iron hopper and is separated and washed by the action of the iron bars and the water. The bars are separated by one-inch spaces. The material which passes this revolving grizzly falls upon the screen and if sufficiently fine passes



into the tank whence it is elevated by the buckets and discharged upon an apron and thence by launders to any desired point.

The coarse material, after being rolled over and over in the machine, is discharged by means of a suitable casting.

The screen and revolving grizzly are supported by heavy spiders constructed in two parts so that they may be replaced without disturbing the central shaft. The pinion with either bevel or spur gear, placed as desired.

The machine is furnished in different sizes and with screen perforations varying from 50 mesh to 1½-in. holes. The water required varies with the material treated; usually a 1½- to 2-in. pipe under a 3-ft. head furnishes an ample supply.

In the Bluefields gold district in Central America machines of this type are used having screens as fine as 60-mesh, while for washing carbonate zinc ores in Tennessee 1½-in. perforations are used. At the works of the American Sapphire Company, in Montana, the holes vary from 3/16 to ⅝ inch.

California and Nevada Mining Wages

SPECIAL CORRESPONDENCE

Fifty members of the senior class of the College of Mines, University of California, have gone to visit the mines at Tonopah, Nevada. Field surveying and examination of prominent mines will comprise the work of the trip. It is notable that a large number of University men are now scattered throughout the newer mining camps of southern Nevada. There are representatives of Yale, Harvard, Stanford, California, Pennsylvania, Princeton, Michigan, Northwestern, Chicago, Virginia, Cornell, Georgetown, Brown, Oxford and Heidelberg, in the city of Reno alone, and they are about to form the Nevada University Club with headquarters in that city, where a club house will be built. These graduates have been attracted to Nevada by the opportunities to make money in mining and other occupations.

In this connection it may be said that numbers of practical miners are leaving the mines of California for the better wages offered in the Nevada camps. For this reason there is a shortage of miners in most of the California mining countries. In one of the San Francisco dailies of April 3 there are advertisements for miners to work in California, among them one which calls for 82 machine men at $3.50 to $4 per day; 36 single and double hand drillers $67.50 to $90 per month; 26 muckers $75 to $80 per month; 60 carmen, $60 to $75 per month; 168 drillers for mines and quarries $67.50 to $90 per month. This gives a fair idea of the California wages. The underground miners get $3 to $5 per day according to the section of the State, the former price being the general average. In Nevada wages are much higher, being nearer $4.50 per day on the average and this accounts for so many leaving for that State.

Navigation and Mining in California

SPECIAL CORRESPONDENCE

The California Débris Commission has made a report which may be summarized as follows:

1. That it is advisable to attempt to divert the Bear or American rivers into the tule lands.

2. That it is inadvisable to construct settling basins and restraining barriers in the lower courses of the Bear and American rivers.

3. That it is now time to commence the work of restoring the navigable conditions of 1860 in the Sacramento and Feather rivers.

4. That the most feasible and advantageous method of accomplishing this is by dredging.

In pursuance with these conclusions, and in compliance with the requirements of the Act of March 1, 1893, the commission recommends as follows:

1. That an appropriation of $400,000 be made by Congress contingent upon a similar appropriation being made by the State of California, part of this sum to be devoted to the construction of two hydraulic dredges of high power, and the remainder to their operation and maintenance, in accordance with the general terms of the report on improvement of navigation of the Sacramento and Feather rivers, and for disposing of the mining débris brought into those streams by their tributaries.

2. That these funds be expended by the California Débris Commission under the direction of the Secretary of War, all rights of way and easements for levees and spill banks to be furnished free of cost to the United States.

The River Improvement and Drainage Association of California, which organization has been working for the betterment and improvement of the conditions of the rivers of California has done much to bring about harmony in the interests of the various industries involved in the question of hydraulic mining.

Sloss-Sheffield Steel and Iron Company

This company owns extensive coal and iron-ore properties in Alabama, besides several blast furnaces and other manufacturing plants. The report is for the year ended Nov. 30, 1906. The capital account shows $6,700,000 preferred stock, $10,000,000 common stock, and $4,000,000 mortgage bonds.

The income account for the year is as follows, comparisons being made with the pervious year:

	1905.	1906.	Changes.
Sales and earnings	$6,747,075	$6,289,014	D. $342,939
Working and gen. expenses	4,181,488	4,938,268	I. 756,430
Net earnings	$1,565,237	$1,351,746	D. $213,491
Interest	$ 210,000	$ 210,000	
Depreciation	150,157	140,902	D. $ 9,255
Total charges	$ 360,157	$ 350,902	D. $ 9,255
Surplus	$1,205,080	$1,000,844	D. $204,236

From this surplus in 1906 dividends were paid of $469,000, or 7 per cent., on preferred stock, and of $500,000, or 5 per cent., on common stock; leaving a balance of $31,844.

From President J. C. Maben's remarks the following extracts are taken: "During last year the price of No. 2 iron at Birmingham advanced from $13.50 in June and July to $15.50 by September, which price continued to be maintained for deliveries during the first half of 1907, and in December the price was further advanced to $19 for deliveries during the third and fourth quarters of 1907, while iron for prompt delivery brought from $3 to $4 per ton more.

"Alabama did not share proportionately in the great increase in the production of iron, having produced only about 70,000 tons more than in 1905, when a strike of the miners at the coal mines of all the furnace companies but one in the Birmingham district more seriously interfered with the operation of the furnaces than during last year. The failure of Alabama to show a proportionate increase in production must be attributed somewhat to the scarcity of labor, but more largely to the failure of some of the railroads to handle the raw material for the furnaces. The labor situation was somewhat improved during the year, but some of the roads seemed less able to handle their business than during the previous year, and our furnaces were frequently banked for from a few hours to a day for the want of coke, when train loads of it were standing on sidings within a few hours' run of the furnaces, which, despite every effort, it seemed impossible to get placed in time. This, of course, decreased our output of iron, added to the cost, and produced bad working of the furnaces. . . .

"The furnaces of the company produced 31,000 tons less iron than in 1905, while the output of coal fell off 90,000 tons, and that of coke 20,000 tons, which must be attributed entirely to the causes before enumerated. The profits of the year were further curtailed by the failure to secure cars for the shipment of pig iron, which forced us to carry over into the present year a large tonnage. Altogether, last year was a most trying one in many ways, certainly for those in the iron and steel business in the South. . . .

"The working capital shows a decrease of a little over $200,000, which must be accounted for by the large amounts spent during the year in opening new coal and ore mines, improving furnaces, providing additional equipment in the way of steam shovels, dinkey locomotives and large side-dump tram cars for the brown-ore mines at Russellville and paying for the one-third interest in the North Alabama Furnace Company. During the year the company bought the one-third interest owned by outside parties in the North Alabama Furnace Company, including the bonds, so that it now owns all of the bonds and the entire capital stock of that company."

Frank J. Hearne

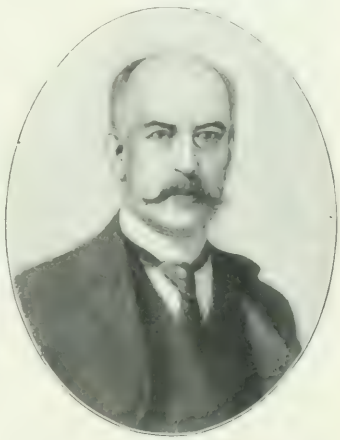
Frank J. Hearne, who was selected by the Gould-Rockefeller interests about three years ago to effect the financial rehabilitation of the Colorado Fuel and Iron Company, and whose death was announced in the JOURNAL a few weeks ago, was a descendant of William Hearne, who settled in Maryland in 1688. He was born in Cambridge, Maryland, September 21, 1846, received his early education in the academy at that place, and graduated from the Rensselaer Polytechnic Institute at Troy, New York, at the head of his class of engineers in 1867. Until 1872 he served as assistant engineer of the Hannibal & Saint Joe Railroad, when yielding to the solicitation of his father, William J. Hearne, he left the railroad to become assistant manager of the Riverside Iron Company's plant.

His remarkable executive ability was soon recognized by his associates and, having become thoroughly familiar with all the details of the business, he was promoted in 1875, when but 29 years old, to the position of general manager.

Riverside stock was then selling at about 70. Mr. Hearne put in a quarter of a century of active work in the management of the company, and when, in 1899, it was absorbed by the National Tube Company its stock was selling for 216⅔. Mr. Hearne became first vice-president of the National Tube Company and later president. When the National Tube Company became a constituent part of the United States Steel Corporation, he retired from active business with a fortune of several million dollars.

In 1903, however, when George J. Gould and John D. Rockefeller secured control of the Colorado Fuel and Iron Company, Mr. Hearne yielded to the solicitations of these gentlemen, made on the suggestion of H. C. Frick, to assume the management of the Colorado corporation with almost unlimited powers. Indeed, the powers of a resident viceroy were necessary to carry out successfully the difficult task. Under his efficient guidance the company has been put on a sound financial and economic basis. He developed the company's resources for raw materials and put the mines in such shape that the present visible ore supply will be sufficient for the company until 1940 or longer.

Coming as the successor to a group of exceptionally popular men, Mr. Hearne's position at first was far from easy. Nevertheless, by his tact and charming personality, he soon gained an enviable position in the social life of Denver. His thorough knowledge of every detail of the fuel and iron business, his abounding



FRANK J. HEARNE

common sense, and his absolute fairness, won the respect and admiration of employees and associates. It was his liberal policy and his quiet masterfulness that preserved the cordial relations between the company and the people of Colorado and made an enduring reputation for him as one of the industrial giants of the West.

G. I. Petrenko *(Zeit anorg. Chem.*, 1906, XLVIII, 347-363) reports conclusive evidence of the existence of four alloys of silver and zinc; these correspond to the formulas Ag_3Zn_5, $AgZn$, Ag_2Zn_3, Ag_2Zn_5. In the same journal, pp. 319-346, R. Vogel states that gold forms three chemical compounds with zinc, corresponding to $AuZn$, Au_3Zn_5, and $AuZn_8$; and two with cadmium, represented by Au_3Cd_5, and $AuCd_3$.

The Manufacture of Nitrates from Air

By Alfred J. Lotka†

At the inauguration of the new Institute for Technical Chemistry of the Technische Hochschule at Berlin, Prof. O.N. Witt delivered an address, dealing chiefly with the utilization of atmospheric nitrogen. He described, more particularly, Birkeland and Eyde's process for the manufacture of nitric acid and nitrates.

Principles of the Process

This process is based on the observation that the electric-disk discharge, produced by establishing an electric arc in a strong magnetic field, possesses to a peculiarly high degree the power of causing the combination of a mixture of oxygen and nitrogen. Such a disk-flame, fed by an alternating current, is inclosed within a flat furnace, built of refractory clay with a copper mantle, a vigorous current of air being maintained through it. The furnace is placed between the poles of a powerful direct-current electromagnet; the copper electrodes are so close together that, but for the diffusing action of the magnetic field, they would be short-circuited. These electrodes are hollow and water-cooled; owing to this precaution, they have a long life. The furnaces are used at the present on a practical scale at Notodden, Norway; they consume under normal conditions 500 kw. (at 5000 volts); but this figure has occasionally been raised to 700 kw. without injury.

The immense disk of flame in these furnaces is over 6½ ft. in diameter, and probably represents the most extended electric discharge ever maintained for any considerable time.

Norway has peculiarly favorable conditions for the development of industries depending on water power. Careful examination has shown that the water falls (with an aggregate capacity of about 350,000 h.p.) controlled by the company which is exploiting the Birkeland and Eyde process, can furnish electric energy at a cost of about $3 per h.p. year. The yield of nitric acid obtained regularly hitherto has been about 500-600 kg. of HNO_3 per kw.

Condensing the Gases

The gases issuing from the furnace contain only about 2 per cent. of nitric oxide. First of all they are cooled, the heat being utilized for concentrating the nitrate lyes finally obtained. The cooled gases are then passed through reaction towers lined with acid-proof slabs. Here the combination of nitric oxide with the excess of oxygen is carried to its limit.

The gases next enter granite absorbing towers filled with quartz, over which water is kept trickling from above. The nitric acid flowing out at the bottom is returned to the top, being circulated in this way until it reaches a concentration of 50 per cent. The residual gas, too dilute in oxides of nitrogen for further absorption by water, is passed through towers fed with milk of lime, and through a chamber packed with solid lime. The calcium nitrite thus obtained is subsequently treated with nitric acid, to obtain calcium nitrate solution and to liberate nitrous vapors. The latter are returned to the granite absorption towers.

By-products

At Notodden the dilute nitric acid obtained is converted into calcium nitrate by neutralizing with limestone. The solution so obtained is united with that from the lime towers, and evaporated, the fused calcium nitrate being allowed to solidify in iron drums.

The plant at Notodden makes about 1500 kg. (3300 lb.) nitric acid in the form of nitrate, per day. Calcium nitrate promises to be in demand as raw material for various chemical processes. It is considered to be an excellent fertilizer, its freedom from sodium and chlorine giving it an advantage over Chile saltpeter.

DOLORES MINE, WAREHOUSE FOR MINE AND MILL SUPPLIES

Genesis of Graphite

Two theories as to the formation of graphite deposits are discussed in the *Bull. Imp. Inst.*, Vol. IV, No. 4, 1906. In some cases it is thought to be formed by the action of intense heat on coal or other carbonaceous material, such heat being the result of the presence of igneous intrusive rock in the immediate neighborhood. Graphite formed in this way is compact, being the so called amorphous graphite, and includes the dull and earthy varieties and certain special forms which present a close resemblance to anthracite. Deposits of graphite formed by this contact metamorphism are those in the Alps in northern Italy, in the Caucasus in India, in Queensland, New South Wales, the eastern township of Quebec, in Rhode Island in the United States, Sonora in Mexico, and in Brazil.

The more usual mode of occurrence of graphite is as a secondary mineral, deposited in pre-existent rock by gaseous emanations from the interior of the earth, usually following on the intrusion of igneous dikes. Deposits of this character may occur as local impregnations of the rock or as stockwerks. Typical deposits formed in this way are those of Cumberland, Bavaria, Bohemia, Ceylon, and southern India. The secondary deposits have been ascribed to the alteration in place of veins or other fillings of solid or semi-solid hydrocarbons, such as asphalt, or to the decomposition of the vapors of acetylene or other volatile hydrocarbons. However, Weinschenk believes that the carbon forming the graphite was deposited from emanations containing carbonic oxide of the metallic carbonyls, especially those of iron and manganese, the oxides of which are often found in decomposed rock associated with deposits of graphite. He also thinks that cyanogen compounds may have played some part in the formation of a few graphite deposits.

Graphite of secondary origin may be either flaky, prismatic, fibrous or compact in structure. The coarser forms of graphite occur where the deposits have not been disturbed by earth movement. Although the secondary graphite deposits are usually of better quality, the irregularity of their mode of occurrence renders systematic mining of them well nigh impossible.

In view of the present dissatisfaction among Nebraska coal dealers over short weight, a bill is to be introduced to the State legislature, compelling the railroads to install track scales along their lines for the purpose of making weights on demand and compelling them to give destination weights.

The Dolores Mine, Chihuahua, Mexico

By John B [illegible]*

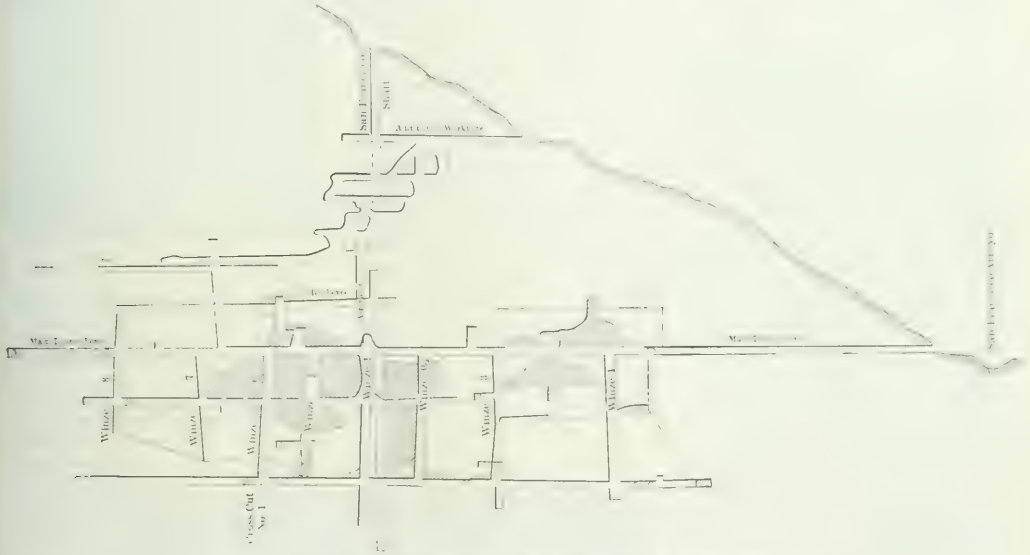
The country rock of the Dolores district is diabase. This is cut by dikes, more or less silicified. They have approximately an east and west course, the outcroppings of which form a prominent feature of the landscape. Accompanying the dikes at a greater or less distance—often in connection with and generally parallel to them—are zones of shearing of greater or less magnitude, the mineralization of which constitutes the veins of the district. Considerable leaching has taken place, and the outcroppings of the zones show a reddish coloration. Small bodies of ore were mined from a number of places on the surface 20 years ago. The largest of these old workings are on the Alma de Maria vein. So far as is now known the ore taken out by them was not very high grade, nor do the workings indicate that the bodies were important, facts probably due to the surface oxidation and leaching, which appears to extend in some instances to depths of over 400 ft. The only mine in which developments have extended below this level is the Alma de Maria, which has been opened in the zone of enrichment lying below the zone of oxidation.

Note—From a report made to the Dolores Mines Company, as the result of a visit to the property in June and July, 1906.

*Consulting mining engineer, Denver and New York

Veins and Development

Alma de Maria—The Alma de Maria vein, upon which are the principal workings of the Dolores company, is a zone of shearing such as has been described. It extends in a generally north-northwest and south-southeast direction, and its cropping is easily traced for a distance of over a mile. Considerable leaching action has taken place on the surface, and to a depth of from 200 to 400 ft. Below this occurs the rich body of ore first encountered in the San Francisco tunnel. The main shoot, as developed, has a length of about 600 ft. The accompanying map shows a longitudinal section of the workings on the Alma de Maria vein.



LONGITUDINAL SECTION WORKINGS OF THE ALMA DE MARIA MINE

San Francisco—Besides the Alma de Maria, there are other shear zones and dikes. One of the most prominent of these is the San Francisco. This vein is cut in the Alma de Maria crosscut tunnel where it shows a considerable width of oxidized and leached material.

Barron—Another prominent shear zone is that on which the Barron tunnel has been driven for a distance of 325 ft. in a northwesterly direction, and from which a crosscut driven 100 ft. to the west has probably cut one of the dikes that show on the surface.

Other Prospects—Another very important dike is the Macho dike, which extends for a long distance and is especially prominent in the San Luis Gonzaga claim. Other dikes and shear zones appear, but nothing of importance has been done upon them.

Character and Treatment of the Ore

The ore is a high-grade gold and silver ore, containing its value at the present market price of the latter metal (65c. per oz.) in the ratio of 40.6 per cent. in gold to 59.4 per cent. in silver.

During the administration of the old company it was the habit carefully to sort out and ship the high-grade ore, the lower grade being left upon the dump. Amalgamation served its purpose well. Five stamps of the mill were started on May 5, 1905. The yield from this part of the operations cannot but be satisfactory to any person acquainted with mining. However, it is probable that this part of the process will be superseded by concentration; for the ores now being amalgamated can be as well treated by that process and the tailings cyanided, as by the present one, and the concentrates will furnish the back freight desired. The cyanidation of the ore proved the success anticipated. I do not know of any place where as high an extraction of the silver is made as at Dolores.

Amalgamated zinc has generally been considered applicable only to the reduction of sulphuric-acid solutions of iron for its determination by permanganate. D. L. Randall has found (*Zeit. anorg. Chem.*, 1906, XLVII, 389-392) that it can be applied equally well to ferric chloride, provided that the titration is carried out in presence of manganous sulphate and with sufficiently dilute solutions. Under these conditions, excess of hydrochloric acid is no disadvantage; thus 25 c.c. of the acid may be present if the solution of about 0.5 gram of iron be diluted to 1 liter.

The Ferrocyanide Method for the Determination of Zinc

The conflicting opinions of various au- [illegible] to study the conditions influencing the determination of zinc by the ferrocyanide method. In agreement with Waring[1] and Miller and Hall[2] he found that a large excess of hydrochloric acid increases the consumption of ferrocyanide. The excess permissible was found to be from 1 to 10 c.c. in a bulk of 150 c.c. of solution. Undecomposed chlorates as well as bromine also increased the ferrocyanide used which confirms the statements of Waring[1] and Low[3].

The use of ammonium chloride is not harmful in the titration, and, in fact, aids the operation by settling the precipitate and sharpening the end reaction. Iron, copper, cadmium and manganese all affect the determination as has long been known. Aluminum did not affect the determination and here the author's work is in conflict with Waring[1], Miller & Hall and Low, who all claim that aluminum salts produce incorrect results.

In the effect of lead, which the writer finds to consume ferrocyanide and therefore objects to its use in removing copper when present, he has the support of Low,[3] who, however, objects to its use because the lead sometimes fails to remove all of the copper and affects the acidity of the solution. Furman[4] and Waring[1] both use test-lead to remove copper from the solution and Waring emphatically states that lead salts do not affect the titration.

Metallic zinc and zinc oxide were used for standardizing the ferrocyanide and it was found that the value of the solution varied with the amount of zinc taken and the author recommends the use of a table of factors. H. Nissenson and W. Ketteinbeil[5] in their report to the International Congress of Applied Chemistry as well as other writers do not mention this fact.

The method outlined by the author is as follows: Cover 5 grams of the ore, in a No. 3 casserole with 7 c.c. concentrated nitric acid, after which add an equal amount of hydrochloric; allow these acids to act for 15 minutes at a temperature not exceeding 60 deg., after which add 7 grams of ammonium chloride and evaporate to dryness on a hot plate. Remove from this hot plate, make alkaline with ammonia water (5 c.c. is enough), add 15 c.c. of bromine water and boil for three minutes. Filter, while hot, through a 11 c.m. filter paper, into a 400 c.c. breaker. Wash carefully three times with a hot solution of ammonium chloride and dilute ammonia. Make the filtrate weakly acid with dilute hydrochloric; place a piece of aluminum foil in the beaker, cover with a watch glass and boil for about three minutes, when all the copper, lead and cadmium will be precipitated. Remove the foil, wash it off and heat to boiling for titration. It is unnecessary to remove the precipitated metals, as their presence does not affect the results.

In titrating the operator should use a constant bulk, which may be 150 or 200 c.c. as he elects. Add 5 c.c. strong hydrochloric acid and titrate according to the method given by Low, starting the titration at a temperature of about 85 deg. and completing it before the temperature falls to 40 degrees.

To standardize: Weigh out into casseroles 0.05, 0.1, 0.15 and 0.2 gram of the oxide and treat precisely as an ore, omitting only the bromine treatment, the aluminum foil and the filtration. Run ore blank assay to determine the amount of ferrocyanide required to produce the coloration of the indicator or to the depth selected by the operator and deduct this from all burette readings. Use the factor nearest corresponding to the percentage of zinc in the ore.

Up to 1 gram of potassium chlorate may be used to decompose sulphides without disturbing the results; if more is used, Low's directions must be followed. Hydrogen peroxide may be substituted for the bromine water to remove manganese.

pp. 209, 222.

LXXIII, pp. 951-955; E. M. J., LXXX, pp.

Asbestos in the Transvaal

By J. Hartley Knight*

Several years have elapsed since the Transvaal Asbestos Syndicate was formed, but it was not until lately that the Anglo-Swiss Asbestos Company succeeded in proving that the Carolina district contains quantities of this mineral in a form which may be turned to profit. The part of Carolina which is apparently richest in asbestos deposits is located about 50 miles to the southeast of Machadadorp station, on the railway line running between Delagoa bay and Pretoria. On one farm alone, Goedverwacht, there is believed to be 200,000 tons of asbestos, a large part of it of good quality.

Half a dozen different syndicates are now actively at work in the Transvaal, and in a month or so one of them confidently expects to be in a position to ship regular monthly supplies of fine white asbestos to Europe and America. There seems to be no doubt about the quality of the mineral. The formations of serpentine containing asbestos are said to occur with great regularity, the formations frequently being more than 4 ft. thick, and invariably dipping about 5 deg. to the northwest. Deep shafting is not required; the deposits will be worked by adits running into the sides of the hills, and it is not anticipated that there will be any trouble in regard to water. For the most part, haulage will occasion no difficulty as the asbestos will be tipped down the sides of the hills.

* [illegible] Coal hill avenue, London, England

Batopilas Mining Company

The report of the Batopilas Mining Company, Chihuahua, Mexico, for the year 1906 shows an extraction of 1182 tons of first-class, 140 tons second-class, and 40,477 tons of third-class ore, the last averaging 8.145 oz. silver per ton. There were 25,472 ft. of mine workings. The treasurer's report is given partly in Mexican and partly in United States currency, but the latter only is given herewith:

FINANCIAL STATEMENT FOR 1906.

Gross earnings	$782,972
Interest, store, rents, etc.	35,202
Total income	$818,174
Taxes and bullion expense	$44,310
Operating expenses	406,697
Depreciation, interest, repairs, New York office, etc.	52,829
Total expenses	$503,836
Balance Dec. 31, 1906	$314,338
Balance previous year	355,801
Total surplus	$670,139
Adjustments	6,437
Carried forward	$663,702

Piping in Steel Ingots

A paper prepared for the American Institute of Mining Engineers by Prof. H. M. Howe, of Columbia University, New York, on "Piping and Segregation in Steel Ingots," and presented at the New York meeting, is published in full in the March *Bulletin* of the society. Through a printer's error one of Mr. Howe's most important contentions has been made unintelligible. In dealing with "Check Drillings," on page 270, the sentence printed below should have added to it the words in italics, which are omitted in the text as published: "Drillings from each such place shall be analyzed separately, and all the steel of the heat from which said drillings have come shall be rejected in case either the carbon or the phosphorus in said drillings exceeds *by one-third* the limit prescribed for carbon and phosphorus respectively for the ladle test, or in case the sulphur in said drillings exceeds *by two-thirds* the limit for sulphur set for the ladle test."

The recent Sunday labor law which has been passed in France restricts all work to six days in the week and imposes a Sunday holiday whenever possible. Among workmen paid by the hour the law is not favored.

Barytes Mines of the Commercial Mining and Milling Company

By Chas. A. Weller*

The barytes mines of the Commercial Mining and Milling Company, in Cocke county, Tenn., are well up in the moun-

OPEN CUT MINE NO. 2

tains, and just beyond the last limestone formation before reaching the North Carolina line, where a granite formation is encountered. The property consists of about 1500 acres lying along the Southern Railroad and the French Broad river about 10 or 12 miles from the North Carolina line. The mineral appears in the mountains about 800 to 1000 ft. above the water of the river, and occurs in a well defined vein, which can be traced through the property for a distance of about three miles.

The outcrop shows a series of small veins from 18 in. to 2 ft., all taking the same general dip. At a depth of 150 ft. these veins have concentrated into one vein of about 7 ft. between walls which are well defined the hanging wall being a quartzite, and the foot wall a species of sandstone, partially decomposed, carrying with it more or less pyrites, which shows a trace of nickel. There are three openings, or tunnels, designated as Nos. 1, 2, and 3. No. 2 has been worked the most extensively and has a stope of about 150 ft. The mineral is highly crystalline and runs about 99.16 per cent. pure sulphate of barium. Some of the mineral is almost transparent.

LOADING BARYTES, MINE NO. 1, COMMERCIAL MINING AND MILLING COMPANY

*Knoxville, Tenn.

Development Work in the Slocan, British Columbia

Special Correspondence

Mining on what is now known as the Rambler-Cariboo group, situated in McGuigan basin, Slocan district of British Columbia, has been carried on under various ownerships, over a period of about 14 years. The group has been owned since the spring of 1899 by the Rambler-Cariboo Mines, Ltd., a company capitalized at $1,750,000, and having its head office at Kaslo, British Columbia. The total value of ore taken from this property is about $1,200,000. There has been practically no production for the past three years, for during this period important development has been in progress with the object of making the ore in the lower levels accessible at a much lower cost for delivery at surface than was practicable under the conditions prevailing when this work was undertaken.

The present manager, W. E. Zwicky, took charge of the mine in 1902. After a thorough study of the known orebodies in the mine, from which up to that time silver-lead ore having a gross value of about $800,000 had been mined, he concluded that they continue down to a considerable depth. The manager's recommendations were adopted, and the old method of working abandoned. The new plan involved the driving of a cross-cut tunnel between 4000 and 5000 ft., with the object of cutting the vein at a depth of about 1400 ft., or 600 ft. below the bottom level of the old workings.

[illegible] distance of 4600 ft. had been driven, the dimensions of the tunnel being 9 ft. 6 in. high by 7 ft. wide (7 ft. 6 in. by 7 ft. in the clear). Several small stringers of ore were cut but not the main vein, so as funds were getting low a raise was commenced. At 150 ft. up it entered the vein, giving a depth of 450 ft. below the old bottom level and 1250 ft. from the surface. Thence up to the old 800-ft. level the raise was made large enough for later use as a 3-compartment main working shaft, 12 ft. by 4 ft. 6 in. in the clear.

Early in March of this year it was calculated that the top of the raise was about 18 ft. from the bottom of the old workings, so a drill hole was put up and at 17 ft. it tapped the water. Once tapped, the water took eleven days to run off. It is estimated that it would have cost fully $10,000 to have pumped the mine out.

By March 20 the raise was completed through to the old workings; and now preparations are being made for a resumption of production. Already some ore has been taken out, and as soon as the road down to the railway shall be in good condition for hauling, shipment to the smelter will again take place.

The successful completion of this enterprise, which was the most important mining development ever undertaken in the Slocan district, is a matter for much satisfaction to all concerned. The significance of the success attained in this instance will be better appreciated when it is borne in mind that by drifting farther into the mountain, which rises high above the collar of the old shaft, it will be practicable to gain a depth of 2500 ft., or twice that at which the raise from the deep-level tunnel entered the vein.

Machine drills were used in the work, operated with compressed air from a Canadian Rand Drill Company's 14x22-in. D1 air compressor, belt-driven by a 3 ft. 6 in. Pelton wheel running under a head of 759 ft., or a pressure of about 325 lb. to the sq.in. The rock formation of the district is slate, through which a great boss of granite has been forced up, the whole being much cut by porphyry dikes. A well defined quartz vein cuts through both slate and granite, and across the contact, and has been traced on the surface for a long distance, in a northeast by north direction, with a dip to the south or into the mountain.

According to the report of the Government mining engineer, for the year ending June 30, 1906, the ratio of whites employed on the Witwatersrand mines to natives and Chinese was 1:7.82. The ratio for the previous year was 1:8.57. The average monthly wage of natives was 51s. 11d., housing and food costing 7s. The average wage of Chinese was 39s. 9d., feeding, etc., costing 11s. 7d. The salaries of whites amounted to £1,078,087,

Mines and Minerals in the Philippines

Under American Rule the Industry Promises to Flourish in the Islands. The Deposits are Rich and Conditions are Not Unfavorable

BY THORNTON CHASE*

Prior to American occupation, the vast mineral resources of the Philippine islands were little known. Imperfect records in the obscure archives of the Spanish bureau of mines furnished but little information, none of which could be used as accurate data for either scientific or economic purposes. Many of the richest deposits were in regions inhabited by natives so hostile that a Spaniard raely dared show himself among them. Spanish sovereignty, toward the close of the last century, extended, in reality, no farther than the Spanish outposts, and for this power to foster and encourage the necessary exploration and development was beyond all possibility. Under the influence of the vigorous pioneer spirit that Americans have transplanted in the islands, the locality of various deposits has been accurately determined, and many claims have been located under the new mining laws. Some of these claims are being worked industriously.

Coal

First in importance, from an economical viewpoint, is the coal. Paleozoic coal has never been found in the islands, but its place is taken by a brown lignite, resembling that found in Washington. It occurs in large quantities in southern Luzon and the southern islands. In Cagayan province, near Calbong bay, outcroppings of lignite are plentiful; and near Aringay, in Union province, and in the Rio Malanas valley, in Abra, the seams are from 3 to 7 ft. thick.

In Rizal province, at Tataurian, and in the province of Camarines Sur, near Casaco, the outcroppings, while not so promising, disclose a finer quality of fuel. Fourteen miles south of Catanduanes lie the islands of Rapurapu, Batan and Carraray, upon which a black lignite of excellent quality and equal to the best Japanese coal, is found close to tidewater. The seams here vary from 4 to 8 m. in thickness and are easily accessible to the coasting steamers.

In Negros island the outcroppings are traceable for nearly 30 miles parallel to, and 6 miles from the southwestern coast. Speaking generally, the lignite fields extend from Abra province, in Luzon, southeast throughout the group. Sorsogon, Cebu and Albay provinces, because of their natural advantages, will become the first extensive sources of the coal supply of the islands. During the last decade, the island steamers have drawn considerable of their supply from the Compostela group of mines in Cebu, and a smelting work at this place was long contemplated by the company holding the concession. The Compostela seams are 8 ft. and more in width, and should be able to compete successfully with Japanese and other foreign coal in the Manila market. Labor is cheap, and energy and method are all that is required.

The existence of unexplored coal beds in the great island of Mindanao, and in the neighboring island of Leyte, has been proved, but little else is known regarding them.

The coal deposits of the islands offer great opportunities for investment and will be operated upon an extensive scale as soon as the necessary capital can be interested. The new railroads which are at present under construction in Panay, Negros and Luzon, will lend an impetus to their development, offering, not only a means of transportation, but also an inexhaustible market near at hand.

Iron Mines

The Filipinos are indebted to the Chinese for their early knowledge of iron-working, and at Angat, in the mountains to the eastward of the great plains of Luzon, there are numerous iron mines that have been in existence for centuries. Through these mountains extends a belt of magnetite, 40 miles in length, whose ores carry from 65 to 70 per cent. of iron.

All the iron mines in this district, which are at present producing, lie in the range forming the western boundary of La Infanta. On the Malaquit river in the province of Camarines Norte there is an extensive deposit of magnetite which is being worked by the natives. The ore is treated in a way similar to that employed in Borneo and one marvels at the excellent quality of steel which the crude efforts of the "Indios" produce. Europeans and Spaniards have long sought to develop these ores by modern methods but the local scarcity of labor and Spanish red-tape have hitherto played havoc with their attempts.

Copper

Santos is authority for the statement that from 1840 to 1855 twenty tons of manufactured copper were annually exported by the Igorrotes. This race of industrious natives smelted copper many centuries before Magellan's voyage of discovery. The process consists in alternate roasting and reduction to matte, and ultimately to ingots; a process long since introduced from Japan.

Copper ores abound in numerous localities in Luzon, Panay, Mindoro and Luzon. The deposits of northern Luzon are best known and their richness is indisputable. Most of the native workings are located in Bontoc province, some of the producing veins being 7 m. wide and carrying an average of 16 per cent. copper. The gangue is quartz. The bureau of mines has determined the mean composition of the Mancayan ore as follows: Cu, 16.64; SiO_2, 47.06; S, 24.44; Sb, 5.12; As, 4.65; Fe, 1.84; loss, 0.25.

Native copper was discovered in Masbate's mountains in 1847. In 1903 I located a rich deposit of carbonate in Antique province, Panay. Dana mentions a large deposit on Lubang island, near Lubang, and Santos describes chalcopyrite, tetrahedrite, chalcasite and bornite deposits in several Luzon provinces. But little is known of their extent.

Lead

Galena, together with other sulphurets, has been found in several promising localities in Camarines Norte. At Tinga, near the town of Paracale, several lead concessions have been worked during the last two decades, mainly, however, for the gold carried by the crystalline schists through which the galena occurs. Centeno reports valuable deposits of lead chromate in the hornblende schist composing the mountain known as Dinianan, a form of ore closely resembling that occurring in the Ural mountains. The chromate is deposited in quartz veins and is accompanied by vauquelinite.

Lead ore, carrying 56 per cent. lead, has been recently discovered in the island of Marinduque, while a valuable deposit of gold- and silver-bearing galena has been located in central Cebu near the pueblo of Consolacion. The cañons of Mindanao are also known to expose outcroppings of lead and zinc ore, but this great island is so imperfectly explored that nothing further can be said of these deposits.

Gold

Gold is found in nearly every island of the group, and the traveler will find native gold ornaments adorning the robust shoulders of the village belles in the most distant barrios. Mr. Espina, quoting from an early report of La Inspeccion de Minas, says: "Gold is found in moderate quantities nearly all over Luzon, but most particularly and under conditions favorable for exploitation in the following town-

*Mining engineer, Monterey, Mexico.

ships and districts, proceeding from north to south: Throughout Abra province; at Fidelisan, Bontoc province; Suyue, Tubue and Dugon, Lepanto province; Tabio, Capunga and Itogan, Benguet province; Gapan and Peñaranda, Nueva Ecija province; and at Paracale, Mambulao, Labo, Capalongan and Maculabo in the province of Ambos Camarines."

In the province of Abra gold is found in alluvial deposits and in the sands of the river of the same name, as grains, having a fineness of from 0.750 to 0.792. In Lepanto the gold occurs in veins, alluvial deposits and river sands. The Lepanto gold is usually accompanied by silver, copper, lead and iron. In Bontoc and Benguet, the deposits are in all respects analogous to those of Lepanto. In Neuva Ecija the metal is exceedingly pure, brilliant and of an average fineness of 0.958.

Morga mentions the gold mines of the Igorrotes over two hundred years ago, and there is no doubt that they had been worked many centuries prior to that. Until recently, the Igorrotes allowed no one in the vicinity of their workings, and the extent and exact location of the deposits have always been cherished as a tribal secret. These Indians are energetic and gifted with a rare amount of mechanical skill, and while their mining is crude, measured by our standards, it is nevertheless very effective.

Most of the auriferous deposits of Luzon are in gneissic rocks, which also carry zinc blende, galena, and copper and iron pyrites.

On the northeast coast of Negros island, a beach of characteristic gold-bearing black iron-sand stretches for many miles along the sea, but the separation could only be attained through the use of magnets. The fact that platinum (and my analyses have disclosed the presence of iridium with it) is found in the gold-bearing gravels of Mindanao may prove of great value to the scientific world in the near future.

The scope of this brief summary will not permit me to dwell further upon the auriferous deposits of the islands, but one can safely say that the mother-lodes have never been located, unless we except those existing in the Igorrote country of Luzon. How long it will take American enterprise to replace the pan and "arrastra" with hydraulic stream and mill is a matter for speculation.

Pending a definite decision by the central government, the governor-general at Delagoa Bay has ruled that the export duty to be levied on minerals exported under the new mining law shall apply only to minerals mined in the province of Mozambique, says the *South African Mines, Commerce and Industry*, and not to those exported from the Transvaal by way of Delagoa Bay.

Gila River Alum Deposits

Deposits of alum are found in a small arid region in Grant county, N. M., on both sides of the Gila river. These deposits, which are described by C. W. Hayes, of the United States Geological Survey, in "Contributions to Economic Geology," 1906, lie about 27 miles due north of Silver City, and are at present accessible from that point by a wagon road which follows the river down to the mouth of Alum creek.

The alum deposits occupy a nearly circular depression below the general level of the volcanic plateau, the alum rocks consisting of andesitic volcanic breccias.

The most striking peculiarity of the alum rock is its extreme alteration. Careful search failed to reveal at any point within the Alum creek basin a trace of the unaltered breccia, so that its original character could not be determined. Where exposed to leaching as in the upper parts of pinnacles and cliffs, the rock is always porous, giving a hollow sound under the hammer. It is evident that a considerable part of its substance has been removed in solution.

Two forms of incrustations having entirely different chemical composition, are common in association with the alum rock wherever the conditions are favorable for their accumulation. Upon the sides of the cliffs are extensive deposits of material evidently leached out of the adjacent rock and deposited from solution. These incrustations vary in thickness from a few inches to three or four feet. They are generally yellowish white in color, and fairly hard with a porous cellular structure. Within this outer crust the material is much softer and often occurs as a perfectly white powder. This incrustation consists of the hydrated sulphate of aluminum known as alunogen. The white powdery material is very pure and has practically the theoretical composition of alunogen, while the outer crust contains a slight amount of impurities and less than the theoretical amount of water.

The second form of incrustation is most abundant on the walls of the tunnels which have been driven into the alum rock. It consists of halotrichite, a silky fibrous mineral closely resembling asbestos in appearance. It has a pale green color, and a strongly astringent taste. The outer exposed surface of the incrustation has generally lost its fibrous structure, becoming compact and assuming a yellowish color. Although the incrustation may be several inches thick, the individual fibers are rarely more than a third or a half of an inch in length, the crust being made up of successive layers of short crystals. Each layer probably represents the growth of a single season during which the supply of percolating water was relatively abundant. The layers of crystals are sometimes separated by a very thin film of the rock, which has been split off by the growth of a subsequent layer of crystals.

The value of the deposits will depend on the utilization of the soluble sulphates which they contain. The present surface accumulations of alunogen, while probably amounting to many hundreds or more probably thousands of tons, represent but an insignificant quantity compared with the sulphates still in the rock. Wherever observed the rock is highly porous. In the higher and more exposed ledges the rock is thoroughly leached, and will yield nothing more. At lower levels the rock still contains a part of its soluble constituents which are coming to the surface by the capillary circulation of surface waters.

Assay of Copper Ores for Precious Metals

By A. R. Crook

Tests made with a large variety of copper ores from various parts of the country indicate the superiority of the combination wet and dry method of assay over the dry method alone. The combination method gives more accurate results, makes smaller demand upon the time and attention of the assayer, and costs about one-quarter as much for material. In the methods described by various assayers attention does not seem to have been called to the best method of handling the residues obtained after the wet treatment of the ore.

In practice it appears that by far the larger number of ores contain so much insoluble material that they are not adapted for scorification. If the ores are pure sulphides or carbonates, as is seldom the case, the residue can be scorified. Usually, however, they are composed chiefly of quartz or insoluble silicates and consequently the plan to follow is to treat them with a crucible charge adapted for quartzose ores.

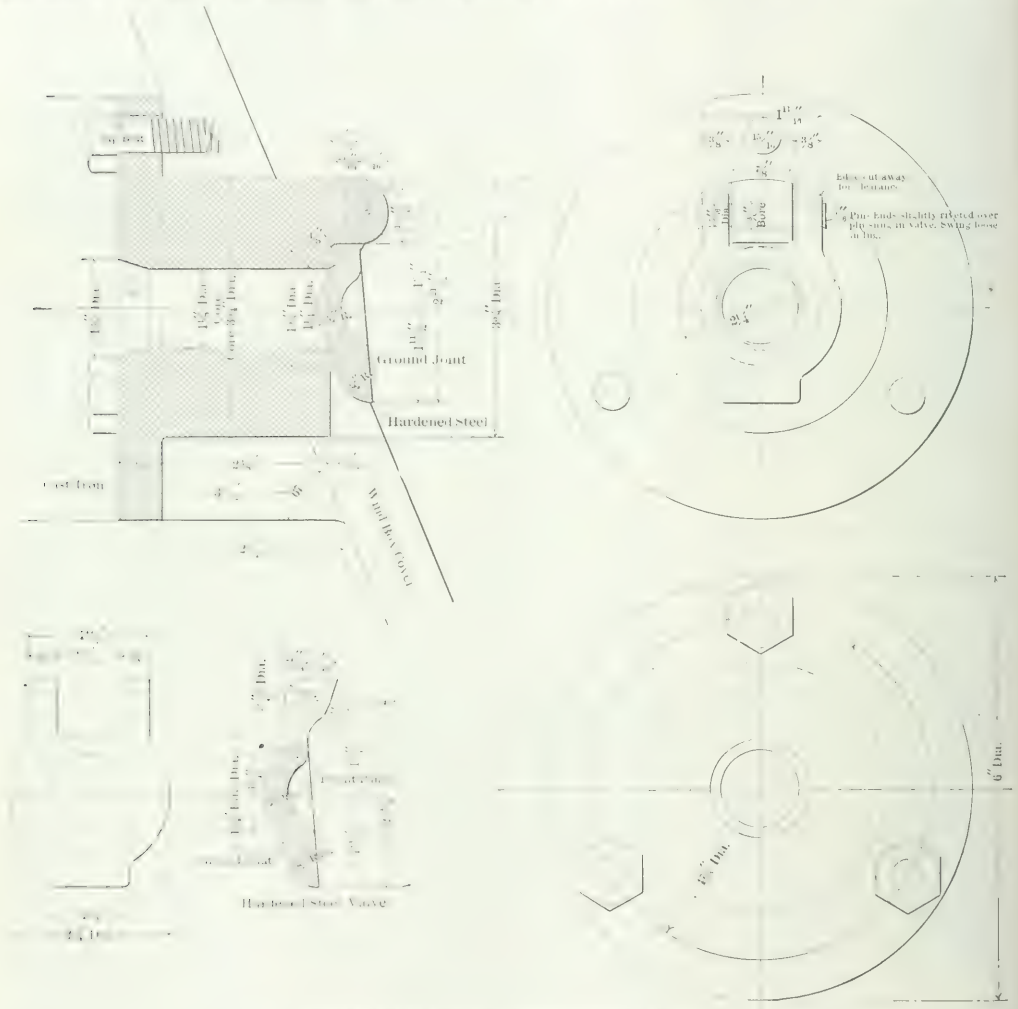
A method which has commended itself is as follows: Stir one assay ton of ore into a No. 5 beaker containing 100 c.c. water. Add 50 c.c. commercial nitric acid (sp.g. 1.42). Cover and allow to stand till action apparently ceases. Add another 50 c.c. nitric acid and boil gently till greater part of the free acid has been expelled. Dilute to 500 c.c. and allow to settle. To precipitate the suspended gold and dissolved silver add 2 to 4 c.c. normal salt solution, 5 c.c. sulphuric acid, and 10 c.c. lead acetate. Set aside to settle over night; filter and wash. Dry the residue in a roasting dish, and heat until the paper is consumed and any sulphur present is oxidized. Mix with 1½ a.t. lead oxide, one a.t. of sodium carbonate, 10 grams borax, and 1½ grams argol in a 20-gram crucible; cover with salt, and fire for 30 min.; cupel, part, and weigh.

The Cananea Tuyere Valve

A new valve, designed by the reduction division of the Cananea Consolidated Copper Company, of which Charles F. Shelby is superintendent, has been in use since the early part of December, 1906, and gives better satisfaction than any ball [illegible] the efficiency of the oxygen in the air blown into the converters, meaning a corresponding deficiency in the work delivered by the blowing engines.

In the valve illustrated there are several important features to overcome this point. There is a full 0.25-in. surface on the ground joint, which means a long life, and the valve will remain practically air tight until the punching rod wears away [illegible] punching rod, and the valve will not catch on any projections on the rod. The rod, on which the valve hangs, has a 1/16-in. play in order to provide a perfect valve seat and to prevent it from turning completely over when pushed out of the way by the punching rod. A tangential extension is also provided at the top of the valve to prevent it from turning over.

This device is not patented, is giving



THE CANANEA CONVERTER TUYERE VALVE

with the ball valve is that the seat wears out very quickly and an abnormal loss of air results. This is not apparent to the casual observer, and it is only when [illegible] the blast delivered by the engines that its full importance is realized. When the seats on the ordinary ball valve become worn, there is a drop of 25 per cent. in this amount of metal on the bottom side of the punching hole.

The valve itself has a spherical boss which is case-hardened (as well as the ground joint) and takes the brunt of the punching rod, which never comes in contact with the bearing surface; the end of the valve is rounded off so as to give the same effect as a ball in drawing out the satisfaction, operates as easily as the ball and lasts longer.

To avoid the disadvantages arising from the use of red lead in luting the flanges of steam pipes, there has recently been introduced a preparation of zinc gray and tung-oil. The paste hardens rapidly when heated.

Compressed Air in Mining

By J. H. [illegible]*

The use of compressed air in mining operations is so general in its application that it is a subject for remark that the production of compressed air has not achieved a more efficient status in the mechanical world that it has today. The modern compressor wastes more than 40 per cent. of its energy in the machine alone. This applies to compressors of the reciprocating type and no rotary compressor capable of giving a pressure over 5 lb. is in commercial operation.

The reasons are mechanical, but the fact remains that the reciprocating compressor is extremely inefficient. The friction factor alone takes nearly 40 per cent. of the work. The compression is in every case almost adiabatic, and compressed air is used in spite of all these difficulties only on account of its wonderful adaptability as an energy reservoir and its range of usefulness and ease of application in difficult environment.

Falling-water Compressor

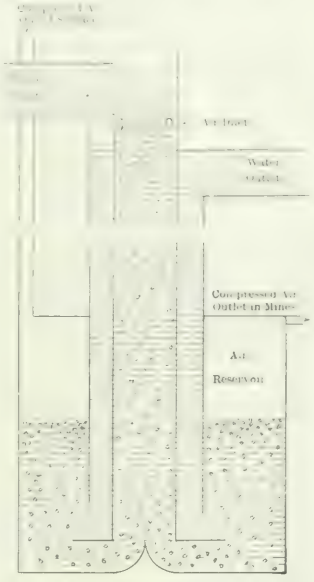
There is, however, one method of making compressed air which is simple, efficient, practical and isothermal, and, in comparison with a reciprocating compressor, possesses almost twice the efficiency with a cost of only a fraction of that machine. That mining operators and owners are not more familiar with this process of compressing air is a matter of regret, but it is to be expected, as the process has not been exploited or developed except in a few instances. The process referred to is known as the water-compression system and is in active and efficient operation at Magog, Quebec, Norwich, Conn., and a number of other places. These plants produce compressed air in large quantities very efficiently with a minimum cost of operation and a minimum cost of installation. There are, however, patent rights involved in the process which may be responsible for its lack of development in other fields. However, the process is so simple and efficient that it could stand a large royalty and still be on a par with the ordinary compressor.

Principle of Operation

The process is extremely ingenious and was so simple in theory and practice that it was utterly condemned by a number of consulting engineers before being put in active operation. A description of the plant will explain its operation. Water is carried in a large pipe on a slight slope to the edge of a vertical pipe of any desired length. It is then allowed to fall down this pipe. An annular hollow ring with a large number of fine points on the lower side is immersed in the water at its entrance in the hole and this is connected with a pipe to the outside air.

The water flowing by these small holes, which are often extended into projecting hollow needles for increased efficiency, entangles and carries with it small bubbles of air caught at the points of these needles. Rushing down the pipe, it gradually compresses the bubbles, and if the water is suddenly turned at the bottom into a fairly large reservoir, it comes to rest and the bubbles rise to the surface under pressure. A pipe carries the water from this reservoir to the surface.

The difference of level of the inflowing and outflowing water need only be a few feet in order to produce rapid flow, and the pressure obtained depends simply on



PLAN OF PLANT FOR COMPRESSING AIR BY MEANS OF FALLING WATER

the depth of the hole. The pipes are so arranged that the inflowing pipe is inside the outflowing conduit so that only one hole is necessary. The reservoir at the bottom is merely an enlargement of the hole, and is generally lined with metal.

The operation is extremely simple. Air collects in the lower reservoir, which is connected by a pipe with the upper ground, and can be drawn off under pressure, as desired. When the reservoir becomes full the machine automatically relieves itself, the surface of the water in the reservoir being lowered to the entrance of the outflowing pipe and the excess of air being thus automatically carried off with the outflowing water. It requires absolutely no attention and compressed air can be obtained in any quantity, the amount depending simply on the stock and its speed

[illegible] ranges from 75 to 83 per cent. of the theoretically possible efficiency obtainable from the water. The efficiency of a reciprocating compressor on the other hand is seldom greater than half of this, besides the requirement of a steam engine to operate the compressor. The first cost is but a fraction of that required in the ordinary methods of compression

[illegible]

In mining operations, especially, this development seems to be especially applicable and free from most of the very few limitations necessary in other utilizations. For instance, in many mining operations the hole is already there. All that is necessary is to put in two pipes with a large box at the bottom and turn in the water. In this case the pipe is always open to inspection, and can be readily repaired whenever repairs, which occur seldom, become necessary. In addition, the compressed air is on the spot ready for use.

The loss in pressure due to its passage through pipes from the surface is diminished and the compression is carried on isothermally, so that the air can pass, if desirable, through a heater for increased efficiency. The compression is carried on isothermally and hence the heating can be put in just where it is desired for best work, and does not interfere before this point. Every development in this line points to an increased efficiency, and there is nothing which tends to diminish it.

It is remarkable that this process for the production of compressed air has not been developed more than it has in mining engineering. The Norwich company has been in active operation since its inception, has paid large dividends, and supplies the entire town with compressed air at 90 lb. pressure. The only lapse in the operation of the plant occurred a few years ago through the breakage of the dam which gave a head to the water and rendered a supply available. As a practical, efficient process for the compression of air it is unexcelled, and its development in mining engineering is hampered merely by the lack of knowledge of its possibilities.

According to the *Journal de l'Electrolyse*, of Feb. 1, 1907, the Société de Métallurgie Electro-Thermique du Chili, Jan. 16, recently sent Mr. de St. Seine, a mining engineer, to Chile, to examine its copper mines and water resources, and estimate the advantage from adopting his electro-thermic furnace. His report demonstrates that in the Cachapoal district a considerable amount of copper can be obtained from the company's mines, and from custom ores. Experiments to develop the furnace will soon be undertaken.

*Consulting physicist, University of Pennsylvania, Philadelphia, Penn.

Taxing Texas Oil Production

SPECIAL CORRESPONDENCE

The fight of the Texas oil producers in the legislature at Austin against the gross receipts tax bill overshadows all other news. The proposed bill is manifestly unjust to all persons engaged in the petroleum industry, which has brought so much benefit to the State. The bill imposes a tax of 2 per cent. on all oil producers; 4 per cent. on pipe lines; 4 per cent. on wholesale dealers, and 4 per cent. on retail dealers. The taxes are practically cumulative, as nearly all the petroleum marketed will be subject to at least three of the specified taxes, or a total tax of 10 per cent. on the gross value. Refiners are already paying more than the crude is worth for refining purposes, and only transportation conditions—which will be changed very shortly—warrant the use of Texas crude oil by them. Fuel users cannot pay any increased price for coal, and mid-continent crude will be cheaper than coastal crude. Louisiana and mid-continent crude would only be liable to a tax of 4 per cent. In refined products the Standard Oil shipments from Eastern points would also be given a decided advantage over those of their Texas competitors.

Various delegations, representing the oil producers and allied interests, have made a vigorous protest and showed conclusively that their interests always have been heavily assessed, Jefferson county alone showing an increased assessment of $8 [illegible] that practically only one company engaged in drilling for and marketing petroleum had ever made 10 per cent. on the investment, and that the proposed tax was both unjust and absurd. The strong opposition to the bill will probably result in some modifications, but the oil industry has large investments confined to a very few counties. The State must [illegible] that the legislature, [illegible] representatives of agricultural interests, will suffer [illegible] the mining and manufacturing communities.

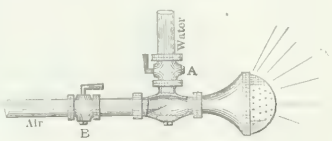
[illegible] which has been favorably reported by a senate committee provides [illegible] and a fire test [illegible] All [illegible] are usually of 120 flash test and 125 to 130 fire test. This present grade has given general satisfaction, and the enforcement of the proposed bill will undoubtedly strengthen the market for Eastern oils and cause serious loss to local refineries. The oil interests have received no encouragement or aid from the State, and have been burdened with high taxes. The State Geological Survey has been abolished, and the mineral resources of the [illegible] the legislators is, apparently, to discourage all mining and manufacturing industries.

A Combined Air and Water Spray*

For settling dust produced when dry lode-rock is crushed in a rock breaker, a combined air and water spray has been designed by Thomas White. A spray of water alone generally has too great a volume, but the quantity of water may be reduced to a minimum if compressed air is used as the carrier.

The taps *A* and *B* regulate the quantities of water and air respectively and the spray may be varied from moist air to a full stream of water.

A "rose" nozzle is used, which varies in size according to the work required. When used for rock crushers, the nozzle



AIR AND WATER CONNECTIONS

should be larger than for drill holes, and in all cases should be applied directly to the place where dust is produced.

Chambers Auger Brick Machine for Briquetting Ore

The Chambers No. 7 auger brick machine, manufactured by the Chambers Brothers Company, Philadelphia, is used for briquetting fine ore and flue dust in the smelting works at both Great Falls and Anaconda.

The machine is built with heavy shafts and is designed especially to stand unusual strain. A double-shaft mixing machine is placed on a platform over the machine, discharging directly into the hopper. The material as it comes from the machine is stiff enough to bear handling and piling on edge about seven courses high. The brick machine and mixer weigh about 15 tons. The capacity is equivalent to about 5000 or 6000 standard-size building brick per hour, depending largely on the nature of the material, as some materials can be forced through the machine more readily than others.

The machines at Anaconda are so speeded that they can make each 750 tons wet weight of brick per day of 24 hours. The moisture in the bricks is about 13 per cent., and the bricks are made up of fine ore, fine concentrates, slimes, coke and partly burned coal, which is obtained by jigging the reverberatory ash. No binding material is used, but as the material contains considerable alumina, the bricks in drying become quite hard. They are, however, not allowed to dry, but are passed from the brick machines directly into bins, each bin holding about the quantity required for one blast-furnace charge. By an arrangement of levers the whole train of blast-furnace cars is loaded at once, the other material for the charge, such as limestone, ore and coarse concentrates, being dumped in the cars afterward and before reaching the furnace.

The auger and also the "former" are made of hard cast iron. When flue dust is used, it has been found advisable to use composition metal for these parts. At Great Falls the average composition of bricks for the last quarter of 1905 was as follows:

SiO_2	35.2 per cent.
FeO	23.2 " "
S	22.5 " "
Al_2O_3	11.9 " "
CaO	0.4 " "
Cu	7.14 " "

The machine at Great Falls is not run as fast as those at Anaconda, 90 tons per day, 8-hour shift, being the duty at the present time. Some flue dust is used, but the principal ingredients are slimes, fine ore and fine concentrates. The machine is run by an electric motor of about 55 horse-power.

* Abstract from the *Bulletin of the Inst. of Min. and Met.*

Trojan Non-freezing Powder

Trojan non-freezing powder, manufactured by the Independent Non-Freezing Powder Company, Allentown, Penn., is an explosive compound said to contain no nitro-gycerine or picric acid. It is claimed that the powder will not freeze and that on explosion no injurious fumes are given off. The powder is reported to have an explosive force equal to that of nitro-glycerine dynamite, and that in two years of practical rock-drilling tests the powder has met all requirements. It is put up in cartridge form and can be detonated by ordinary methods.

One of the advantages claimed for the new explosive is that the absence of poisonous gases permits the workmen to return to their work immediately after blasting.

Practically all the California and Texas fuel oils contain more or less water, sand, asbestos, fiber, and marsh gas, says the *Paint, Oil and Drug Review*. Some grades of oil flow freely, while others are more viscous even though they have a lower specific gravity. In general, the specific gravity of these oils ranges from 14 to 20 deg. Beaume.

Breaker of the Pacific Coal Company in Alberta

At This Canadian Plant Both Anthracite and Bituminous Coal From the Same Mine Will Be Prepared For the Market

BY LEWIS STOCKETT and B. R. WARDEN

The coal breaker recently erected for the preparation of the anthracite coal mined by the Pacific Coal Company may be a matter of interest to mining men, and should be a matter of pride to Canadians, as it is the first plant of this kind to be erected on Canadian soil.

The geology of the field has been described in other papers, and it is not therefore the purpose of this article to give any description thereof. Seven of the seams have been developed up to date, and a cross-cut tunnel driven across the measures will develop the remaining beds, the prospecting work having shown that there are at least twelve seams in the basin. Of the seven opened up, four are being worked: one is used for the main haulage road and air courses and two are not being worked on account of the friability of the coal and the large percentage of the smaller sizes they make, the market for which is at the present time somewhat limited, but is being extended as the proper appliances for burning these small sizes under boilers are put in.

An average analysis of the coal is as follows:

	Per Cent
Moisture	0.50
Volatile	8.00
Fixed Carbon	83.50
Ash	8.00
Sulphur	0.40
Specific Gravity	1.40
Ash, White	
British Thermal Units	14,000

Note—From the *Journal* of the Canadian Mining Institute, Vol. IX.

*Bankhead, Alberta.

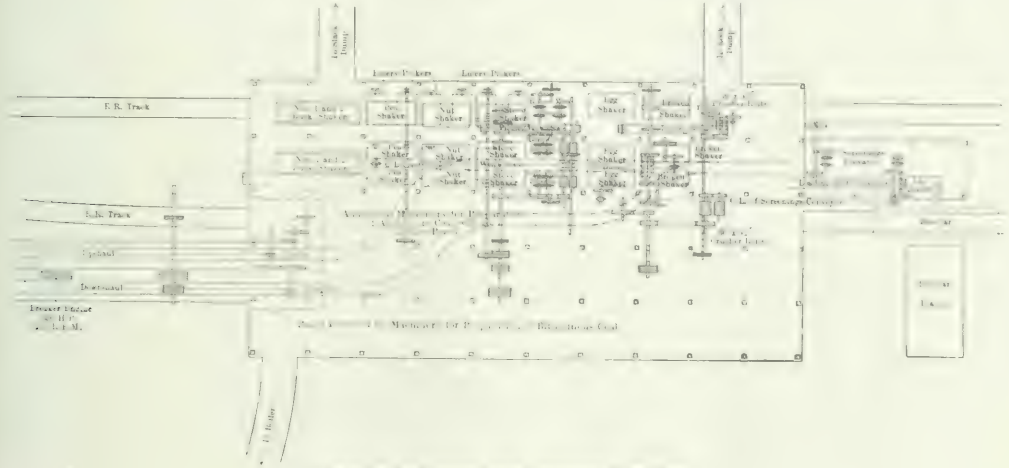
In the preparation of anthracite coal machinery is required to screen out all the dust, remove all the impurities, such as rock, sulphur balls, slate and bony coal, and separate it into several sizes. These sizes, conforming very nearly with the practice of the anthracite collieries of Pennsylvania, are divided as follows:

Broken, through 3 in. bars and over 2¼ in round holes.
Egg, through 2¼ in. holes and over 2¼ in holes.
Stove, through 2¼ in. holes and over 1½ in. holes.
Nut, through 1½ in. holes and over 1 in. holes.
Pea, through 1 in. holes and over 9/16 in holes.
Buckwheat No. 1, through 9/16-in. holes and over 5/16 in. holes.
Buckwheat No. 2, through 5/16-in. holes and over ¼-in. holes.
Buckwheat No. 3, through ¼ in. holes and over ⅛-in. holes.
Dust, through ⅛ in. holes and over ⅛-in. holes.

All the sizes are marketed with the exception of buckwheat No. 3 and the dust, the latter of which, preparations are being made to briquet, and buckwheat No. 3 will be used under the plant boilers as more and more of the buckwheat No. 2 is taken by the general market.

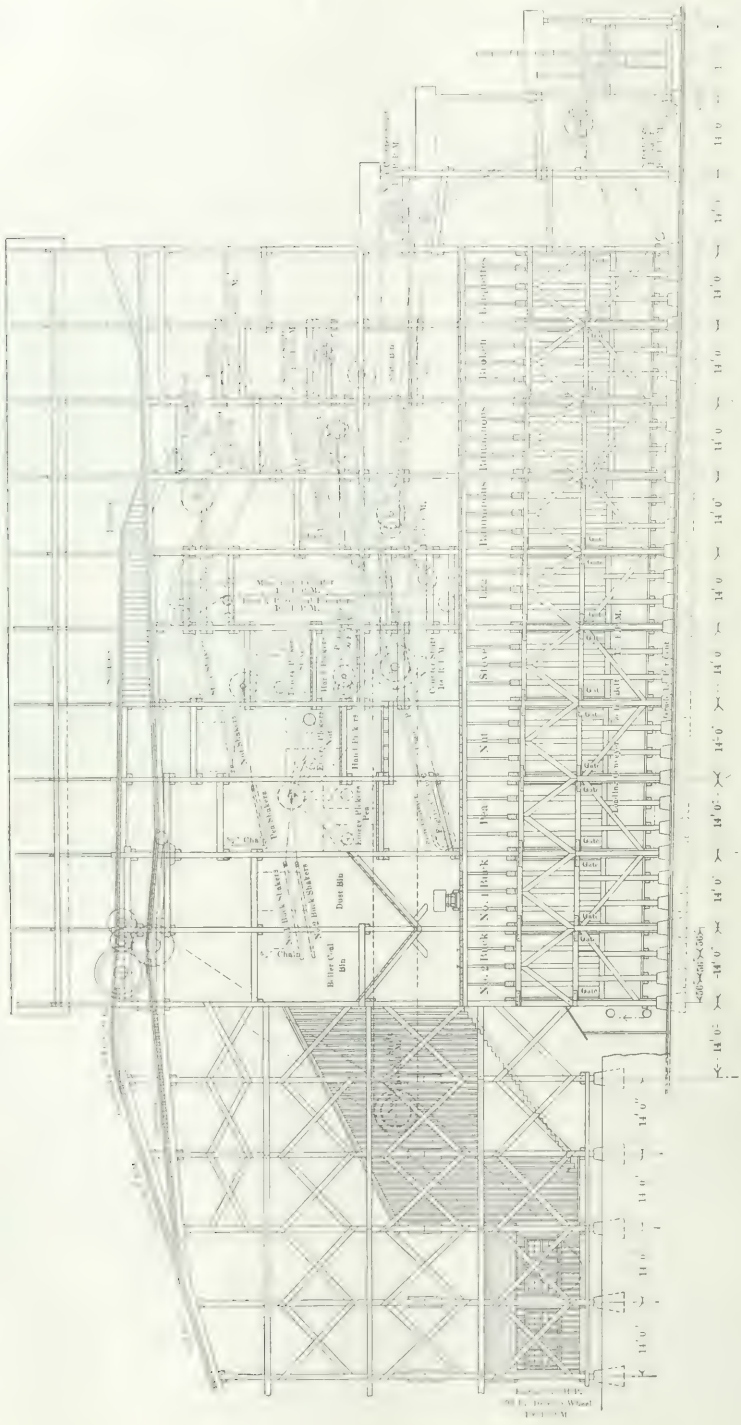
Receiving the Coal

The accompanying diagram gives graphically the method used in the preparation. The coal is hoisted to the top of the breaker (100 ft. above the railroad tracks) by means of an endless chain, traveling 60 ft. per min., with hooks spaced 30 ft. apart, to engage the axles of the mine cars. This will deliver two cars per min. The capacity of these cars is something over two tons, giving a capacity of 2400 tons per day of 10 hours, which can be increased by spacing the hooks 20 ft. or even 15 ft. apart as may become necessary. The empty mine cars are returned down the incline by another endless chain, traveling at the same speed and with hooks spaced 12 ft. apart, to which they are fed by an auxiliary chain so arranged that as the cars are delivered to the main chain a hook is waiting in readiness for each car and the car is delivered to the chain without shock. The grades of the track are such that the car handles itself, from the time it leaves the top of the uphaul chain until it arrives at the top of the downhaul chain. The tracks at the bottom of the incline also have their grades arranged so that the loads feed into the bottom of the incline and the empties run away from it.



PLAN OF THE PACIFIC COAL COMPANY'S BREAKER

The coal after passing over a scale which weighs it as it passes, is dumped by means of a crossover tipple, into a dump chute, and fed by an automatic feeder regularly over a set of screen bars with 3-in. spaces on to a platform. This automatic feed revolves 1½ r.p.m., has four compartments, each of which contains about 1000 lb. of coal, so that it has a capacity of two tons at each revolution, or three tons per min., and 1800 tons in 10 hours.


Nut
Nut
Nut

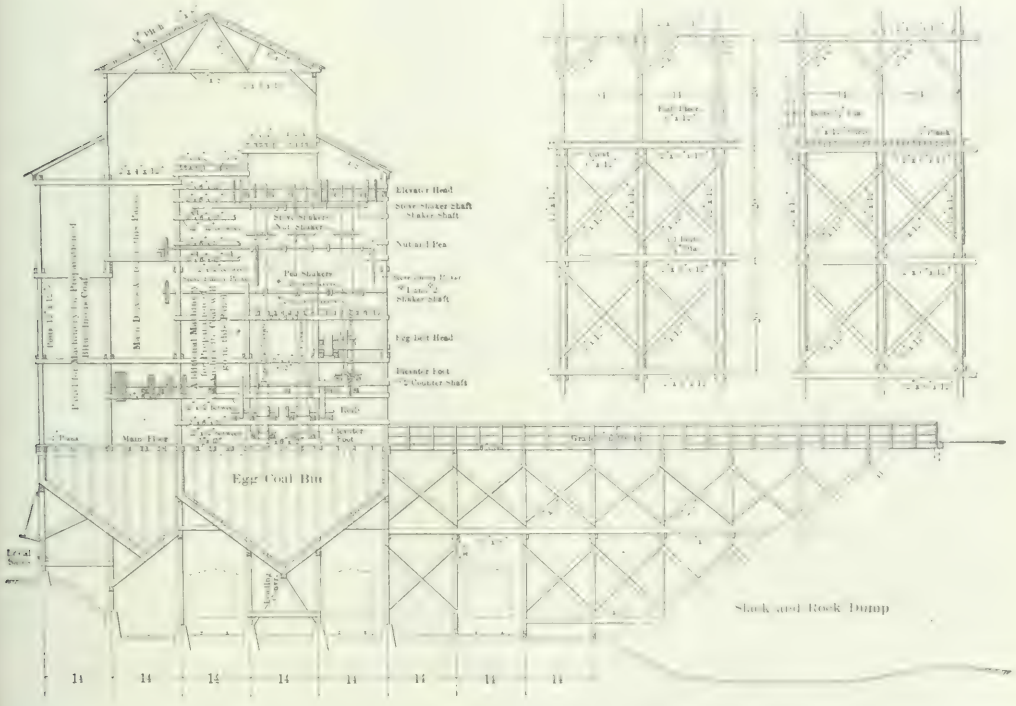
[illegible] the platform the [illegible] and the rock and slate pushed into the rock bin, the coal is separated, the lumps of pure coal going through a set of rolls and broken up into marketable sizes, and the lumps containing a portion of bone or slate through another set of rolls to be likewise broken up and to allow the removal of the pieces of bone and slate. These rolls revolve at 90 r.p.m., are 36 in. in diameter, and 36 in. long, and have inserted steel teeth 1¾ in. square and 3½ in. long, spaced 4¾ in. apart and set diagonally.

From here we have three separate and distinct streams of coal, which, [illegible] the screen on to a picking band, from which the impurities are removed by hand picking, the rock and slate going into a conveyer which takes it to the rock bin, and the pieces containing both coal and slate or coal and bone to another set of rolls to be broken up smaller, so that the coal can be saved in the smaller sizes.

The Smaller Sizes

What remains after the broken and egg sizes are taken out is elevated to the top of the building and, passing over another set of screens, is separated into stove, nut, pea, buckwheat Nos. 1 and 2 sizes, the dust going into the dust bin, to be hauled out and dumped on the waste buckwheat, as it leaves the screen, passes over slater bars which remove the flat pieces, and as these flat pieces are nearly all slate, cleans the coal with very little loss. The No. 2 buckwheat is found to be sufficiently clean without any further preparation, and goes direct to the bin.

The "mine-run" coal, that portion which passes through the 3-in. bars above the platform, is conveyed to the broken screen by means of a chute, the bottom of which has ¼-in. square perforations to remove the dust, which falls into the dust bin; the broken screen removes the broken size, the remainder passing over 3/16-in. round perforations on the bottom of the broken screen, which removes the remaining dust.



CROSS SECTION OF THE PACIFIC COAL COMPANY'S BREAKER, ALSO SHOWING SYSTEM OF FRAMING

count of their different characters, require different treatment, and by keeping them separate until they reach the loading bins, to be loaded into the railroad cars, they are enabled to get the preparation they require.

The "pure coal" as it comes from the rolls needs only screening to take out the dust made in the breaking, and to separate it into the different sizes, any pieces of slate or bone which may appear being removed by hand.

The "bony coal" not only requires this, but also thorough cleaning of the pieces of slate and bone; this is accomplished in the broken and egg sizes, by passing from bank at the present time; later on, a briquet plant is to be erected to briquet this dust. The stove coal, after it leaves the screen, goes over a mechanical picker, known as the "Emery" picker (Fig. 1), which removes the slate and bone. The coal from this picker and also the refuse are picked by hand to save any coal that may be thrown out with the slate, and to remove any pieces of slate which the machine has failed to remove. The coal then passes to the bins, and the refuse to a conveyer to be conveyed to the rock bin. The nut and pea coals are similarly treated, with the exception that with the pea there is no hand picking. The No. 1 This broken coal joins the broken coal from the "bony coal" stream on the same picking band to have the refuse removed. The egg size has similar treatment, and the remainder is elevated to the top of the building, to go through a like treatment as the "bony coal" stream, with the exceptions that, containing a larger proportion of impurities, it has double the number of Emery pickers and hand pickers, and the nut and pea sizes pass over slater bars which remove the flat pieces.

The screens on the "mine-run" side are 6 ft. wide and 12 ft. long, with the exception of the buckwheat screens, the No. 1 being 5 ft. wide and 18 ft. long, and the

on the "pure coal" and "bony" sides are 4½ ft. wide by 12 ft. long, with the exception of the buckwheat screens, which are the same size as those on the mine-run side. They are built of steel plates and angle iron, suspended on ⅝-in. chains and are driven by eccentrics having 6 in. travel and running 100 r.p.m. The pitch of the screens is 2 in. per ft.

The "mine-run" elevator is of the continuous-discharge type, with deflecting shafts to give a more perfect discharge; having buckets 24x12 in., each bucket containing 80 lb. of coal when level full, the speed is 66 buckets per min., giving a capacity of about 2½ tons per min., or 1500 tons per day of 10 hours. The "pure" and "bony" coal elevators are of the same type as the "mine-run" elevator and both alike as to size, having buckets 16x8 in., containing 22 lb. of coal when level full, and at a speed of 100 buckets per min., give a capacity of one ton per min., or 600 tons for the 10 hours. The combined elevating capacity of the three elevators is 2700 tons per day of 10 hours.

The material to be separated is fed over the inclined chutes by feeders. The lower ends of these chutes are slate slabs, and as the material is fed over them the difference in the specific gravity of the coal and of the refuse, and also the difference in shape, causes a difference in the friction, that of slate being the greater as it passes over the slate slab, which retards the movement of the slate so that it falls into the opening and thence into the slate chute, the coal acquiring velocity enough to jump the opening at the bottom and pass on into the coal chute. Both the pitch of the slab and the width of the opening are readily adjustable by means of levers, and these are adjusted to meet the requirements of the coal and changed when found necessary. The feeders oscillate 65 times per min., and it is to this regularity in the feed that the success of the machine is largely due. The capacity of each picker is 100 tons per day of 10 hours.

The slater bars are shown in the accompanying cut. These are set on the end of a screen, or in a chute, where the coal can slide over them. The flat pieces fall through the narrow openings, and as nearly all of the flat pieces are slate, by getting the proper width of opening all of the flat slate is removed, leaving those pieces of slate which are the same size as the pieces of coal to be dealt with by the Emery picker and hand picking.

The hand picking is done on picking bands for the larger sizes and on inclined chutes set at pitches varying from 4 to 5 in. to the foot for the smaller sizes. Chinamen and boys are employed for this purpose.

The Larger Sizes

A set of re-breaking rolls, 24 in. in diameter and 36 in. wide, with 1¼-in. square steel teeth 2 in. long, set diagonally and spaced 3¼ in., revolving at 133 r.p.m., is provided for re-breaking the broken and egg sizes into stove and smaller sizes when the market conditions are such that a larger proportion of these sizes is required than is ordinarily made.

A set of bony rolls of the same diameter and width and running at the same speed as the re-breaking rolls, with steel teeth 1 in. square and 1½ in. long, set diagonally, and spaced 1 15/16 in., is provided to break up the pieces containing both coal and bone or coal and slate, picked from the broken and egg-picking bands.

The material from the re-breaking rolls is elevated in the pure-coal elevator to the screens above, to be separated into sizes, and the material from the bony rolls is likewise elevated in the bony elevator to the screens above, to be separated into sizes and cleaned.

The stove, nut and pea sizes, after preparation, are conveyed into the bins by means of spirally inclined chutes to save the breaking of the coal. These inclined chutes extend from the top to the bottom of the bins, and the coal slides down them until it reaches the pile of coal in the bottom of the bin or wherever it may be. The broken and egg sizes are

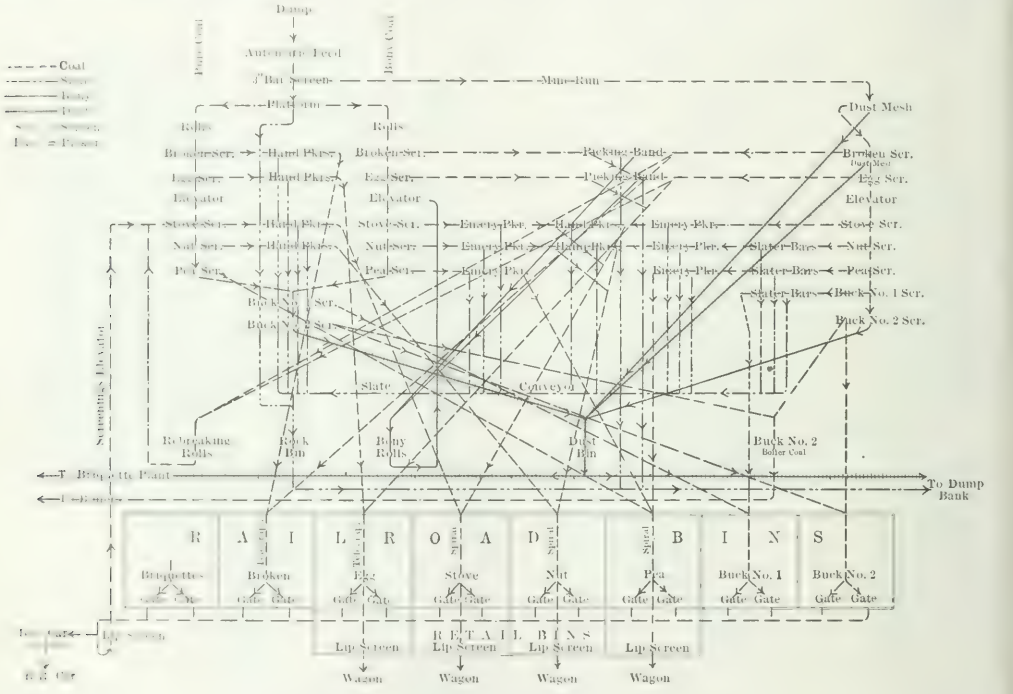


DIAGRAM SHOWING METHOD OF PREPARING ANTHRACITE COAL

conveyed to the bin by straight inclined chutes, called telegraphs; it having been found that the spirally inclined chutes would not work well with these larger sizes.

CONVEYERS.

From the bins the coal is drawn out through gates to a belt conveyer, 30 in. wide and running the full length of the building at a speed of 150 ft. per min., which conveys it to a lip screen set on an inclination, with different sized perforations for the different sizes of coal. This screens out any dust and smaller sizes that may be in the coal before it passes into open cars direct or to the box-car loader, to be loaded into box cars. From this lip screen an elevator conveys the screenings to the top of the bins, where a conveyer takes it to the pure-coal elevator, to be elevated to the screens above and separated into such sizes as it will make.

This lip-screen elevator is of the same size as the bony and pure-coal elevators, simply not to have too many different-sized pieces of machinery, but is run at one half the speed.

The screenings conveyer is a flight conveyer, working in an iron trough with 1068 in flights every 30 in., and having a speed of 100 ft. per minute.

The slate and other refuse from the various picking machines and hand pickers slides by gravity into a flight conveyer, similar to the screenings conveyer, except that the flights are spaced 18 in. apart, giving double the capacity.

The box car loader is the Victor loader, and is run by its own engine with steam from the main boiler plant.

Power is furnished for all the rest of the machinery, including the hoisting on the incline, by a 16- and 28x36-in. cross compound horizontal engine, running at 100 r.p.m., using steam at 120 lb. pressure in the high-pressure cylinder and capable of developing 350 h.p.

All of the drives are 1¼-in. Manila rope, except a few short drives where rubber belting is used. The main drives are continuous ropes with tension carriages, and the side drives are loops, the plan being followed of putting one more loop on each drive than was necessary, so that in case of one coming off or breaking, the plant could still continue to run. Splicing and shackles of different kinds have been tried on the ropes with the result that the splicing, while troublesome until a rope gets stretched, and taking longer to make, has been found the most satisfactory. All of the main lines of shafting in the breaker run at 100 r.p.m., from which the required speeds for the different machinery are made by a difference in the size of the pulleys or rope wheels, and where a very slow speed is needed, by pinion working from large spur wheels.

BUILDING.

The foundations of the building and machinery are [illegible] and sand [illegible] excavations. Eight hundred and fifty barrels of cement were used. The [illegible] of the building and machinery rests upon piers.

The timber used was coast fir, about 1,000,000 ft. b.m. being used; no mortises and tenons, gaining or dapping were used, and the style of framing may be described as continuous posts, spliced together, with all cross timbers, braces, etc., bolted on, these cross timbers when necessary being further supported by wooden brackets bolted on. As a square, crosscut saw, auger, hammer and monkey wrench were the only tools used, it gave a quicker and cheaper method of erecting. There is not the settling due to rotting of mortises and tenons, the drying out of the timber or the load being carried across the grain of the wood. There is also a great stiffness, which in a building of this kind, where there is so much moving machinery and vibration resulting therefrom, is necessary. As the timber dries out, all that is needed is to go over the bolts and tighten them up. The building has proved to be solid and free from shaking, either from the movement of the machinery, or the wind pressure from some severe winds which have occurred since erection.

The building is heated by direct steam in coils of 2-in. pipe, about 5000 linear feet being used for the purpose. The lighting is done with 16-c. p. incandescent electric lights, about 200 being used. For fire protection there are two fire plugs on the outside of the building, with two connections on each plug for 2½-in. fire hose, the water pipes having a head of 400 ft. Also two stand pipes, one at each end of the building, with hose connections at three different hights, having a hose and nozzle always attached and requiring but the opening of a valve. Sixty fire buckets set in convenient racks and standing full of water are ready for immediate use on the breaking out of a fire.

The rock and dust are hauled out over trestles in iron dump cars holding 1½ tons each by a 6x10-in. compressed-air locomotive, weighing 5 tons, to the waste bank. The dust will later be taken by a flight conveyer to the briquetting plant, and the resulting briquets returned to the breaker by the same method.

Every car of coal loaded is sampled and tested for the percentage of slate, bone and small sizes contained in it; if it does not come within the following table of standards adopted by the Pennsylvania anthracite market, it is unloaded into the breaker to be recleaned:

	Slate.	Bone.	Undersize.
Broken	1	2	0
Egg	2	2	0
Stove	1	2	6
Nut	1	2	12
Pea	..	..	12
Buck, No. 1	15	..	20
Buck, No. 2	..	..	30

[illegible] the power to the several machinery which are liable to break or wear out have been provided and are kept convenient [illegible]

Excavation was commenced	April	1905
Foundations were commenced	April	"
Framing was commenced	May 27,	"
Erection was commenced	May 31,	"
First machinery placed	July 24,	"
Foundations finished	July 25,	"
Erection finished	Oct. 14,	"
Machinery started	Oct. 25	"
Breaker tried	Nov. 9,	"
Breaker started up	Nov. 13,	"

The cost of the breaker and machinery is shown in the table below:

General expense	$ 3,076.73
Labor	34,829.35
Lumber	15,709.97
Cement	1,228.90
Iron and Hardware	6,269.34
Machinery	30,262.45
Freight	17,414.19
Duty	4,740.08
Power, tools, etc	815.66
Pipe and fittings	1,561.72
Electric supplies	317.19
	$119,175.58

The force required to man the breaker is as follows:

Breaker engineer	1
Oiler	1
Bottom man	1
Car oiler	1
Sprayger	1
Top man	1
Weighman	1
Dumpers	2
Platform men	5
Screen men	6
Emery picker men	3
Hand pickers	35
Dirt bank men	4
Locomotive engineer	1
Locomotive switchmen	2
Laborers	5
Box car loader engineer	1
Box car loader men	4
Foreman	1
Carpenter and repairman	1
Weighman	1
	76

The breaker is not complete until another side of mine-run machinery will have been installed, which will require another dump, bar screen, platform, screens and elevator; it will then be abundantly able to handle 2000 tons of material per day of 10 hours. After the additional mine-run machinery is installed, there is still a vacant panel in the breaker and also a set of bins, these [illegible] being reserved for bituminous coal, the prospecting having shown that there are bituminous veins on the property which will be reached in time. We will then have something unique in coal preparation; that is, both anthracite and bituminous coal from the same mine and loaded from the same building.

According to G. P. Scholl, the best conditions for operating a tube mill are to deliver the pulp to the mill in a fairly thick state, say about 50 per cent. moisture; under these conditions the output will be a maximum and the wear and tear of the lining and pebbles a minimum.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

As showing the cosmopolitan character of the miners in Pennsylvania, it may be stated that the special rules are printed in 32 different languages.

All miners timbering in roadways or removing loose roof should set temporary props, so as to make the place safe for themselves while repairing it.

The empty track in the gangway at the foot of a plane or slope should be on the upper side of the haulage road, while the loaded track should be on the lower side.

Careful investigation shows as a general rule that where an explosion of gas and dust has taken place, the deposit of coked dust is deposited on the opposite side of the timber, to that facing the direction in which an explosion travels.

The report of the commissioners who investigated the cause of the Wingate colliery explosion in England states that the area affected by the explosion was practically coincident with the area over which coal dust was present in sufficient quantity.

The anthracite coal output for the first 3 months of 1907 amounted to 15,047,814 tons, as compared with 15,967,350 tons during the same period last year. This decrease is of little significance, as the production during the early part of 1906 was abnormally large.

It is most advisable, whenever possible, to have conditions so arranged that the hoisting engineer will be able to see the one cage leave the pithead and the other cage arrive at it. Over-winding and other serious accidents may often be prevented by adopting such a plan.

The illuminating power of safety lamps varies in different makes, and much depends on the kind of oil used; other things being equal, however, the following lamps are arranged in ascending order according to their illuminating power: Georgy, Davy, Clanny, Muesseler, Thomas, Marsant, Ashworth, Hemplewhite, Gray and Wolf.

It has been shown by experiments on a large scale that the effective power of an engine pulling a loaded trip of 20 cars up a plane 5900 ft. long with an average grade of 5 per cent. is 50 per cent. of the moving power. In tail-rope haulage, when an engine is pulling a train of cars along a level, the effective power is 40 per cent. of the moving power.

Sulphur in coal occurs in three forms—hydrogen sulphide, sulphate of the alkali [illegible] phide can be removed in coking; sulphur in sulphate form cannot be eliminated by coking as it goes with the ash; the sulphur in pyrites is partly removed by washing, partly by coking, and the remainder goes with the ash.

An experienced mine manager in a Western State is credited with the assertion that electric mine lighting does not bring compensating results, in that it fosters idleness rather than industry on the part of the men in the ground. For this reason it has been decided to remove all electricity from under ground at the mines controlled by this engineer, supplanting this modern light with the old-fashioned miners' oil lamp, worn on the hat.

The following is the average cost of three different mechanical haulage systems at four English collieries; the figures given include wear and tear of ropes, cars, grease, oil, steam and all necessary repairs to engines; also the cost of labor and depreciation of plant are considered:

Tail-rope haulage, 1860 tons per day, 3.914c. per ton-mile.
Endless-rope haulage, 1080 tons per day, 5.262c. per ton-mile.
Endless-chain haulage, 1940 tons per day 2.877c. per ton-mile.

In studying the action of a gob fire, the process of oxidation may be illustrated by powdering some coal in a fine condition, moistening it, and leaving it in a heap until it becomes warm. If some of the coal is then placed in a tube and air allowed to pass through it very gently, it will become warmer. If the flow of air is now increased, the coal will become hot, and if the air current is considerably increased, vivid combustion will ensue.

Turbine pumps are becoming more popular in the anthracite coal fields. These pumps are directly connected to an electric motor. The advantages of using this kind of a machine are: First, small initial cost for installation of plant; second, less space is occupied and a smaller amount of oil and attention is required. A 120-h.p. motor with 500 volts will discharge 700 to 750 gal. of water per min., against a hight of 375 ft. The cost of installing such a plant is approximately $4000.

The fall of roof and sides in a coal mine is largely due to the action of the atmosphere. This is caused by the moisture in the air being condensed on coming in contact with any strata colder than the mine atmosphere. The action is greater in shallow mines than where the seam is deep, for the reason that the surrounding strata in shallow workings are much colder than in deep mines. The greater amount of vapor contained in the atmosphere in the summer months also makes these accidents more frequent during that season.

In robbing coal pillars when the roof is strong, the most successful method is to employ two or more sets of men working at one time, so as to draw the pillar as quickly as possible. If the roof is strong and the pillar is worked out slowly, the weight often breaks a number of props, which result in unnecessary loss. With a bad roof the pillars should be taken out in lifts from the top end, as this keeps the weight from coming on the drawing roads and causes less expense to keep them in repair. The last 20 ft. of the pillar should be worked from the entry, working outward until finished.

English mine managers have shown great reluctance in substituting mining machines for the older system of pick mining. The results of this backwardness is best illustrated by the following figures: During 1905, approximately 350,000,000 tons of coal were mined by 626,000 men in the United States; during this same year Great Britain employed 847,000 miners to produce 260,000,000 tons of coal. In 50 years the output of coal in the United States has increased from ¼ ton per head of population of over 4¼ tons; this increase of output, however, has been attended by an increase in the accident rate.

Experiments made by J. E. Dowson, with reference to the relative efficiency of gas and steam, show interesting results. The comparisons were made on a steam plant and a producer-gas power plant, each of 250 horse-power capacity. In the case of the steam plant, he found that of 1120 heat units contained in the fuel, 224 units are lost in radiation, flue gases, ashes, etc., and that 896 units appear in the steam that is generated. Of this amount 112 units are lost by condensation in the pipes, etc., leaving 784 units that are supplied to the engine. Of these, 667 units are lost in the exhaust, leaving only 117 units to be converted into work in the engine. Of these, 17 must be deducted for engine friction, leaving only 100 units, out of 1120 originally in the fuel, available for useful work on the engine shaft. A similar investigation of the producer-gas plant shows that there need be only 525 heat units in the fuel consumed in the producer to give 100 heat units of useful work on the engine shaft.

Metallics

The first thing to do upon finding a missed hole is to pull the fuse out of the charge, for the fuse may be only hanging fire. A person should never go back to a missed hole in less time than half an hour after the hole was spit.

A miner should have plenty of time to load and cut his holes, for the value of the day's work depends upon his blasting his holes properly. When holes are loaded hurriedly, a stick of powder may get hung up in a hole. Besides, many missed holes result from their being loaded in a hurry.

In many square-set mines the line of set above the drift, on the first floor, is kept open as a storage place. In case that the timbers are lowered into the stope, as they should be instead of being hoisted as is too prevalent a custom in mines, one or two sets at the top of each raise should be kept open for storage purposes.

Shaft ladders rarely wear out, but their rungs are sometimes broken by rocks, etc., falling down the shaft. Owing to the infrequent use, vertical latters are quite justifiable in shafts, although in some countries inclined ladders are made obligatory by law. Frequent stations or platforms should be placed in the ladder compartment so as to break the fall of falling objects.

In wet raises, where the copper or acid water rapidly corrodes iron, ladders with round rungs placed through auger holes in the uprights should be used. In case ladders with the rungs nailed are used, these should be fastened with copper nails. All shaft ladders should have round rungs. These may be made from gas pipe, but better from some hard wood; water in shafts rapidly eats away iron, but oak resists water and lasts a long time.

The size of tank in electrolytic copper refining is chiefly a matter of construction. The number of electrodes placed in parallel does not seem to bear any direct relation to the current efficiency. This is probably because low efficiency is caused rather by the condition of the deposit or its tendency to sprout and form trees than by local mechanical troubles between single pairs of electrodes. Sixty electrodes in a single multiple tank give no trouble.

When splicing mine ladders they should be sawed so that the distance between the rungs at the joint is the same as elsewhere. This distance between rungs should approximate 10 in. in vertical ladders. Generally in ladders in mines west of the Rockies uprights are made of 2x4-in. scantlings notched an inch deep to receive the rungs, which are of 1x2-in. or 1x3-in. stuff. The distance between uprights is generally from 12 to 14 in. in the clear.

[illegible]

a defective cap, and still more frequently a defective fuse, imperfect in manufacture or injured by tamping, a missed hole sometimes occurs when a fuse is used which is slightly damp but which appears to be in good condition. A slight deadness in the spitting of the fuse should always make one suspicious. The misfire resulting from such slightly damp fuse is due to the fact that the heat of the burning fuse drives the moisture further along the fuse, until finally the increasing moisture retards the burning of the powder and finally may even put it out.

In determining the treatment charge on the ore purchased, the zinc smelter starts with the cost of smelting a ton of the ore of average composition, that is to say, the mixture on which he proposes to operate his furnaces. It is aimed to have all the furnaces on the same charge, for various reasons. To this smelting charge he adds the profit that he ought to make to obtain a proper interest on his investment, allowing for the necessary amortization of his outlay in plant. The further addition of the freight on the ore to his works, and on the spelter product to its market, with allowances for the cost of buying the ore and selling the spelter, gives the returning charge which he must make against the ore in buying it on the basis of f.o.b. cars at the mine or mill where produced.

The supply of steel can conveniently be kept in a special box having different compartments for starters, seconds, etc., while one large compartment is kept for dull steel. This box should be placed near the manway where the steel is lowered or hoisted into the stope. This box has only the bottom 8 or 10 in. inclosed. Above that the partitions extend, but the front is left open, so that the miner can readily select the different lengths required. This box not only encourages an orderly storage of the drill supply, but it also saves much time, which is wasted when a miner has to go through a pile of many different lengths of steel to find those approximately the length desired. At the Daly-West mine, Park City, Utah, a box similar to the one described is used on each level for storing machine steel.

Various "dopes" have been tried for controlling the character of deposit in electrolytic copper refining. Ammonium sulphate exerts a beneficial effect in encouraging smooth deposits. This may be due to some secondary cathode reaction in which the ammonium radicle is momentarily freed. Ammonium sulphate increases the resistance of the solution, however, by driving back the dissociation of the free sulphuric acid present. Organic reducing agents, notably gelatin, have marked effect in restraining the crystalline nature of deposits, but are not easily controlled in copper solutions. The peculiar structures sometimes seen at the cathode are doubtless due to the effect of various soluble impurities in the anode. Often a total change in the character of a deposit can be induced by simply lowering or raising the temperature of the electrolyte.

The value of a zinc ore depends chiefly upon its tenor in zinc and objectionable impurities; especially iron, manganese and lime, which increase the corrosion of the retorts; and lead, arsenic and antimony, which contaminate the spelter. The value of the ore is also affected by its character, whether oxidized or sulphide, or a mixture of both; the sulphide ore must be roasted, but yields a diminished weight for the subsequent treatment, which is the more expensive part of the process; the oxidized ore escapes preliminary treatment, unless it be carbonate, but suffers no diminution in weight. The preliminary treatment of ores which are mixtures of sulphides and oxides is often troublesome. The value of an ore is, moreover, affected by its physical character. Lump ore is subject to an additional expense for crushing; fine slimes are more expensive and troublesome to roast than coarser concentrates. Some ores roast and distil easily, others with more difficulty. All these factors are given consideration by the zinc smelter. The chemical composition of the ore is, however, the most important factor in determining its value.

The question of current density to be carried in electrolytic copper refining is largely one of power cost. Present American practice runs all the way from 12 to 35 amp. per sq.ft. The steady full load on a large power-house gives ideal conditions for the generation of cheap steam power. With high current density the tank room requires much closer supervision, as there is a greatly increased tendency toward polarization. It is customary to circulate the electrolyte from tank to tank to maintain uniform composition throughout. If this were not done the heavy liquor from the surface of the anode would form a horizontal layer of increased specific gravity at the bottom of the tank. Different strata would then have different conductivities, crystals of blue vitriol would form on the bottom edge of the electrodes and the operation of the tank be thoroughly disorganized. The higher the current density the greater this tendency and the more active must be the circulation. An excessive circulation tends to stir up the silver mud and results in an increased silver loss in the cathodes. Roughly, the silver contents of the cathodes made at a density of 30 amp. per sq.ft. will be double that of cathodes made at half the density. High current density also means rougher deposition and necessitates more frequent renewal of the cathodes to maintain the current efficiency. Most of the Eastern refineries run at from 17 to 20 amp. per square foot.

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*Illustrated.

Progress in the Science of Ore Deposits

In looking over a back volume of the JOURNAL, our attention was recently attracted to an article in the issue of Dec. 7, 1901, which described a cyanide plant in course of erection at the Chainman mine, Ely, Nev. Only five years ago that district, which had been known since the 60's, was still regarded as a low-grade gold mining district, and efforts were being made to operate by improved methods the mines, which as gold mines had been failures for more than 30 years. The original exploitation for gold of districts which subsequently became famous for great ore deposits of baser metals is no new thing. Mining began in that way at Leadville, Colo., at Bingham, Utah, and elsewhere. However, no one dreamed five years ago of the immense deposits of copper ore which underlaid the lean, copper-free gold ore of Ely. That discovery was analogous to the nearly contemporaneous discovery that the great bodies of gold ore at the Mount Morgan mine, in Queensland, Australia, were also underlaid by immense deposits of copper ore. These discoveries, to our mind, are of more far-reaching importance than the development of their own supplies of copper, inasmuch as they lead to a knowledge of new facts in the science of ore deposits which perhaps will be of immense value. History presents numerous precedents.

Although the discovery of ore deposits is chiefly fortuitous, the progress in the science of economic geology has greatly improved the ability of the prospector to prosecute successfully his search for ore, and of the miner to estimate the value of his discovery. For example, the discovery of rich silver ore at White Pine, Nev., in a limestone formation was the prime cause of redirecting attention to the mineralization of the same kind of rock at Eureka, Nev., and ever afterward prospectors looked especially for great deposits of lead ore in limestone formations; not that limestone had not previously been known as a kindly rock for the deposition of lead, but that it remained for the discovery of the Eureka bonanzas to impress the fact on all minds. Similarly, the discovery of gold in the andesite and phonolite of Cripple Creek, Colo., in 1891, right in the shadow of Pike's Peak, a district that had been overlooked by prospectors since 1859, led directly to the rich discoveries at Tonopah, Goldfield, and Bull Frog, about 10 years later. Previous to 1891 American prospectors did not know that gold occurred in the andesite class of rocks. The "heavy" rock that led A. B. Wood to the discovery of the carbonate deposits of Leadville doubtless troubled the placer miners of old Oro from the very beginning of their operations in 1860. Where was the prospector of 1880 who would not have identified it?

Now we conceive that the discoveries at Ely and Mount Morgan are likely to prove of a similar epochal character. Attention will be redirected to deposits of lean gold ore and drill holes will be put down through them to discover if they be underlaid by copper ore, while after the experience at Mount Morgan no manager of a gold mine of similar occurrence will be safe until he has prospected the bottom of the deposit. In cases where the geological conditions are similar to those at Ely and Mount Morgan, prospecting of this character will be likely to develop the existence of similar deep deposits of copper ore. It is the function of the mining geologist, whose importance in the economics of mining is now well recognized, to study the conditions with a view toward such similar prospecting. It is immaterial as to whether this last discovery was first made at Ely or Mount Morgan. Its scientific importance is that in two cases great deposits of copper ore have been found under extensive bodies of gold ore, one of good grade, the other of low grade, neither of which at the surface or even at moderate depth, showed any indication of copper that would attract more than casual attention. It is in the deduction of generalizations from such new discoveries and their application to future prospecting that the mining geologist becomes the guide of the prospector and the mining engineer.

Dredge Mining Troubles in California

The controversy between the dredge miners on the one hand, the farmers of the valleys, the Anti-Débris Association, and others inimical to gold mining, on the other, is increasing in bitterness and bids fair to result in as much acrimonious de-

bate as did the hydraulic mining question in California. Several millions of dollars have been invested in dredge mining, and several millions of dollars of new gold are produced by it each year. But there are those who are opposed to it, and will do what they can to have it restricted according to their ideas, or even, if possible, put under the ban entirely. A legal contest is bound to come shortly. The recent unprecedented floods throughout California, caused by heavy and continued rainstorms, were not confined to any one locality; but in those localities where dredges are extensively operated, especially near Oroville, in Butte county, Marysville, in Yuba, and Folsom, in Sacramento county, the local damages have been attributed entirely to the dredge system. This is unproved, of course, but the men whose property has been damaged evince a strong desire to begin a fight against the dredges, and, in fact, have already begun it. The newspapers of the valley, which formerly fostered the prejudice against hydraulic mining, now argue against the dredges. The moribund State Anti-Débris Association sees an opportunity for a renewal of its former influence, and a chance to fatten on the differences between two antagonistic industries. An organized effort is being made to force the dredge men to impound their débris or to cease operations. As a matter of fact the dredge men put nothing into the rivers that was not there before, though they turn over the land, and they dump their débris into the pits behind the boats which float the machinery. Yet all the silt, mud and débris which is carried down by the rivers at times of flood is laid to their operations. It will be but a short time before the matter will come up in the courts, inasmuch as those damaged, especially below Oroville, are taking steps for a legal adjudication of the trouble.

A British Goldfield

Recently there has been considerable talk in mining circles in London of the discovery of a so-called "English Rand;" a deposit of gold-bearing conglomerate similar to the great banket bed of the Transvaal. More has been said, however, in the daily press, than by mining engineers, which involves some suspicion of the promoters. Nevertheless, the promoters have succeeded in raising a considerable amount of working capital, and propose soon to begin operations.

A great mystery has been made over the whole affair and not even the location has been divulged. Our London correspondent, however, has learned that the scene of operations is in the Forest of Dean coal district in Gloucestershire, which is not many miles east of the South Wales coalfield. The bed is a conglomerate which occurs above the Old Red Sandstone and below the mountain limestone. It is supposed to be the sedimentary deposit formed by the débris brought down from the still older formations in Wales. The promoters, who call themselves the Chastan Syndicate, claim to have conducted a considerable number of tests of the outcrop, and state that all the samples show gold, the contents varying from $0.25 to $5 per ton. It is not said what proportion of the samples give 25c. and what $5. The surmise is naturally that the majority lean toward the former result, inasmuch as the promoters hope that other portions of the bed may be richer than what has yet been examined. Probably no great attention will be bestowed upon this new discovery until it has been reported upon by experienced engineers. In the meanwhile we advise investors to be cautious.

The Flotation Process Litigation

A statement by the chairman of the Broken Hill Proprietary Company, at its last semi-annual meeting, throws the light that has been waited for upon the recent litigation between the owners of the Potter process and the Proprietary Company, the latter having been sued on the ground that the process invented by G. D. Delprat, general manager of the Proprietary Company, and employed by it, was an infringement of the Potter process. After the hearing of lengthy evidence on both sides, the judge gave a verdict in favor of the Broken Hill Proprietary Company, on the ground of want of utility, the plaintiff's patent claiming to treat all ores and to use all acids, which it was not capable of doing.

This is another example of the importance of retaining a first-class lawyer for drawing the specification and claims of any patent that promises to be of importance, and associating with him one or more consulting engineers to advise as to technical points. The cases are too many where the patentee of an important invention, which has proved to be of great value in the world's industrial progress, has failed to reap commensurate benefit from it; indeed the inventor of such a process is lucky if he obtain any benefit at all. The patentee of an invention of small, or only moderate importance, is the only one who is comparatively safe, his safety depending upon the chance that it is not worth the while of any one to infringe his patent. On the other hand, a process patent of revolutionary character is particularly unsafe.

The MacArthur-Forrest patents on the cyanide process are a case to the point. The cyanide process has been of immense importance in the treatment of gold ore, but its fathers derived comparatively little advantage from it. In the most important of the recent metallurgical litigations in the United States, namely with respect to the Brown roasting furnace, its patentee was finally defeated by an ingenious evasion of his claims, for which there was a loop hole. With respect to the flotation processes in which an acid bath is employed, no engineer will question that C. V. Potter was the real inventor, but unless he is more successful in the trial of his case on appeal, he will lose his patent rights because of unwise legal advice in the drafting of his claims. His only satisfaction then will be the knowledge that the engineering profession will credit him with being the real discoverer of a process that has proved to be of great industrial importance.

Anthracite Mine Inspection

There is a constant agitation and demand for improvement in the anthracite mining laws as well as the system of inspection. This condition is principally due to the fact that there has been no well-based legislative revision of the existing laws since their original passage. The mine-inspection service in Pennsylvania may be generally assumed to date back to the passage of the law of 1870, which applied to the whole of the anthracite region.

Although the laws passed in 1870 represent the first important legislation bearing on the operation of these mines, there was an inspection act approved for the county of Schuylkill in 1869. This law, and the

first reports under it, are of special historical interest as being the first examples of coal-mine inspection in the United States. The passage of the Schuylkill law was a direct result of a strike for an eight-hour day in Schuylkill county in 1868, which was brought to the attention of the legislature by a petition sent in from that county.

The first general law was remedial and not preventive, being brought about by the disaster at the Avondale colliery of the Delaware, Lackawanna & Western Coal Company, near Plymouth, on Sept. 6, 1869. This accident, which was really the first great disaster in American coal mining, was the result of a partition in the shaft, between the intake and the upcast, catching fire from the ventilating furnace. The fire was communicated to the breaker situated directly over the shaft, and the smoke and gases were carried into the mine, causing the asphyxiation of the 108 men employed underground.

In 1885 the first anthracite laws were revised in accordance with the regulations of a commission appointed by the governor, consisting of six miners, three operators and six inspectors. One of the provisions was the establishment of a system of certificates for mine foremen. In 1889 an act was passed requiring each miner to show a certificate based upon two years' experience in mining before he would be allowed to work as a miner in the anthracite region. The last revision of the anthracite law occurred in 1891. It was expected that the present legislature would take up the matter and have a commission appointed to recast the entire law, but little effort in that direction has so far been exerted, and all of the present deficiencies continue to exist. Certainly a thorough revision of the anthracite law is needed, and the coal miners of the region should give earnest attention to the matter of securing it.

California Mining Prospects

Three counties of California are attracting especial attention. These are Inyo, Shasta and Sierra. In Inyo county the Greenwater copperfields which are new, and other camps which are old, but are being revived, are much in the public eye. Up to date the values are mostly prospective, for railroads and smelters ing built. Shasta county has made good with its magnificent copper properties, and more of them are being rapidly brought to a productive stage. With several smelters of large capacity in operation the metal output of the county already makes a fine showing, but this is to be supplemented by mines now being developed and smelters being built. Sierra, one of the highest mountain counties, has been a laggard, as it has badly lacked capital and suitable means of transportation. The hydraulic mining difficulties of a quarter of a century ago closed down hundreds of its mines and caused a decided loss of population. Now, however, certain districts are again coming to the front, capital is being invested, and several of the old mines are being reopened with favorable prospects. The gravel channels of the county have not been half exploited, and the quartz mines have never been given sufficient attention.

Some of the other counties of California are unable to congratulate themselves as much as these mentioned. In Amador the mining population is decreasing. In the northwestern counties there are not enough miners to do the necessary work. In Calaveras, strikes have closed down a number of productive mines. In Tuolumne strikes are impending and investors are shy. In Nevada county, however, the largest gold producer of all, the labor troubles have been temporarily settled and there is a distinct revival of interest in all branches of mining.

The desert regions of the southern portion of the State are being vigorously prospected by large numbers of miners and hundreds of new mines are being developed in all directions. The prosperous new mining camps of Nevada are, however, attracting many miners away from California; and are attracting capital away also. Not so many new properties are being opened in the older mining counties of California as might be worked, yet it is not probable that the gold yield will show much falling off during the present year unless the Mother Lode counties suffer temporary set-backs through strikes of miners.

Imagination and Mining

An active imagination is a necessary part of an engineer's equipment, but it must be kept well in hand. When the fancy becomes too exuberant it may lead to unpleasant results. Despatches from Denver recently announced the arrest of a mining engineer, charged with having reported that a certain property in New Mexico, said to show nothing more promising than an old cave, contained "mountains of untold wealth," and "millions of tons of ore in sight, all ready for shipment."

This engineer's imagination apparently got beyond control. Every mining man gifted with powers of that sort ought to have some means of letting off pressure. Even then, the excessive activity produced by association with mines and mining may not be sufficiently reduced. Take the case of the author of "Baron Munchausen." He seems to have left but a poor reputation as a mining engineer, in spite of his efforts to work off his surplus fancy elsewhere. The following is from a letter by Bennett H. Brough, secretary of the Iron and Steel Institute, in a recent issue of the *Mining Journal*, London.

"Your Cornish correspondent suggests that the author of 'Baron Munchausen' ought to have been a mining engineer, and written reports. As a matter of fact, Rudolph Eric Raspe, the author in question, did pose as a mining engineer, and victimized his contemporaries with his reports. Some years ago, when preparing a paper on the first Institution of Mining Engineers (*Trans.* Inst. M. E., Vol. XVII, pp. 2-13, 1899), of which Raspe was a member, I endeavored to collect some particulars of the career of this remarkable character. Briefly, they were as follows: He was the author of numerous scientific works, including an account of some German volcanoes in 1776; he translated the works of Ignaz von Born and J. J. Ferber. Born in 1737, he was educated at Göttingen and became curator of the collection of coins at Cassel, where he appropriated 2000 dollars' worth of medals. He was hunted over Germany, being captured at Clausthal, when he escaped to England, and was for some years storekeeper and assayer at Dolcoath mine in Cornwall. There he wrote 'Baron Munchausen.' Subsequently he was mixed up in some unsatisfactory prospecting in Scotland, and victimized a Highland proprietor. The incident furnished the material for Sir Walter Scott's Dousterswivel in "The Antiquary." He died in 1794, having sought refuge in the north of Ireland."

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Utilization of Black Sand

I have taken particular pleasure in reading your interesting editorial upon "The Utilization of Black Sand" in the JOURNAL of April 13. As one who has had considerable experience in the treatment of black sands, I wish to accept the general invitation extended in your article and contribute a few words upon the subject.

In the first place, I desire to heartily endorse the idea as expressed in your editorial, that the vital and as yet unsolved problem, on which the success of the enterprise depends is the economical collection of the black sand, with its accompanying gold and platinum metals, in a low-grade concentrate. The primary operation in any successful scheme of treatment must be the obtaining of such a product.

The secondary operations, namely, the concentration of this first product, followed by the separation and extraction of the valuable ingredients, are matters which have already been satisfactorily solved. In fact, these latter steps in the process are in no way problematical, satisfactory procedures having been devised both by the U. S. Geological Survey in its investigation of the matter under the direction of Dr. David T. Day, and by private enterprise. The main problem, however, has received very little attention.

Collecting the Sand

What seems to be needed is some practical mechanical device or series of devices that can be applied to a sluice-box or installed on a dredge, that will be capable of making the low-grade concentrate already referred to. While I am acquainted with various patented apparatus which claim to save black sand as part of their field of usefulness, I have as yet failed to find one able to recover the sands on the large scale required and at the same time remain practical from a commercial standpoint. Further, I do not believe that there is any device on the market which meets these demands.

To invent and thoroughly test some apparatus which shall satisfactorily fulfil the requirements is a matter which calls for experimentation. The ordinary placer miner cannot afford to try experiments along any line and the larger companies with the necessary financial backing hesitate to undertake a work where the benefit from results could not be kept within their own [illegible] the results are of such wide interest, the benefit derived from successful experimentation would be shared almost equally by the individual or concern who conducted the experiment and by the outsider. For these reasons, a satisfactory investigation of the matter by private enterprise is practically precluded and black sand mining will continue to be classed as a failure unless the U. S. Geological Survey continue the investigation it has so satisfactorily commenced.

U. S. Survey Should Continue the Work

I do not think that your argument that the investigation is now outside the scope of the Survey's work is at all well taken. I agree with you fully when you say that "It is an engineering problem rather than a geological or metallurgical," but cannot see how the fact that the question is "distinctly of an engineering character" removes it from the field where its solution can be legitimately undertaken by the Survey. Is the treatment of sands in a sluice-box classifier, for instance, any more of a mechanical or engineering problem than the treatment of the same sands on a concentrating table or magnetic separator?

In my estimation, the work which the Survey has already accomplished in its investigation of the matter has embraced more than one strictly engineering problem; for example, is not the determination of the best and cheapest method of elevating, screening, concentrating and drying sands something that might be classed in an engineering line? If it is within the province of the Survey to start the work, why should it not be allowed to carry the matter to a successful termination and take the glory of the accomplishment? The honor would be no mean one, for the work is of as widespread interest and as capable of as great benefit to the people as a whole as any work the Survey has yet undertaken.

In concluding, I wish to say that from my own observation I can see no reason why the Survey, which can command the best engineering talent in the country on the question, if necessary, should find any difficulty in bringing an investigation along these lines to a successful issue. For one (there are hundreds of other miners who have the same feeling in the matter), I should like to see the Survey undertake the work. FREDERICK W. HORTON.

Portland, Ore., April 22, 1907

[illegible] would be wise to ask the U. S. Geological Survey to carry its investigation of black sands to the conclusion suggested will be discussed in a future issue of the JOURNAL.

Galvanized Sheets for Fire Protection of Bridges

An experiment on the Northern Pacific Railway promises to increase the market for heavy galvanized sheets and spelter. It consists of the use of such sheets for the decks of wooden bridges to guard against fire. A large percentage of railway bridge destruction by fire, comes from live coal cinders from the ash pans of the locomotive.

There is a great volume of air, under high wind pressure always rushing between the bottom of the ash pan and the grates of the firebox. The momentum of speed creates a fierce draft which often sweeps live coals out to the road bed. If a section of the latter happens to be a wooden bridge, it receives this live coal, and in very dry weather, a fire is often the result. Most of the wooden bridge conflagrations are due to this cause. The wooden bridge is subject to danger from this source. It entails constant supervision by inspectors and watchmen, and is one cause of heavy expense, delays and wrecks.

The scheme has been in use on the Northern Pacific Railway for over a year, and is giving good results, in cutting down the expense in supervision and also in protection to the woodwork of the bridge structure. The sheets are put on in 8-ft. lengths, each lapping the other, riveted with copper rivets. The rivets are placed one foot apart so as to leave a space through which the drainage from rain and melted snow can drop through. The rails are laid on top of the sheets and spiked through. The bolts for the timbers also go through the sheets. On the ends of the bridge, the sheets are flashed under the first tie of the road bed, and no part of the wooden frame is exposed.

The section observed between Wallace, Idaho and Missoula, Montana, shows that the scheme is a practical one. In winter, the ice lies very loosely on the plate, and is subject to the slightest change in temperature. GEO. HUSTON.

Wallace, Ida., Apr. 2, 1901.

New Publications

[illegible] By W. [illegible] Pp. 200; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

MANUAL OF THE GEOLOGY OF CONNECTICUT. By W. N. Rice and H. E. Gregory. Pp. 273; illustrated. 6x9 in.; paper. Hartford, Conn., 1906: State Geological and History Survey.

ECONOMIC GEOLOGY OF THE BEAVER QUADRANGLE, PENNSYLVANIA (SOUTHERN [illegible] COUNTIES). By Lester H. [illegible] Pp. 132, illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

ELECTRICITY IN MINING. By Sydney F. [illegible] Pp. 281, illustrated. 5½x9 in.; cloth, $3.50. London and New York, 1907: Harper & Brothers.

Contents: Definitions, Units, etc. Electric mining signals and telephones. Electric lighting for mines. The generation of electricty. Distribution of power by electricity. The application of electricity to driving machines, etc., in mines. Faults in electrical apparatus.

FIRE ASSAYING. A PRACTICAL TREATISE ON THE FIRE ASSAYING OF GOLD, SILVER AND LEAD, INCLUDING DESCRIPTION OF THE APPLIANCES USED. By Evans W. Buskett. Pp. 105; illustrated. 5x7½ in.; cloth, $1.25. New York, 1907: D. Van Nostrand Company.

Contents: Sampling. Reagents and fluxes. Assay of acid ores. Assay of base ores. Lead assay. Bullion assay. Methods of handling work. Laboratory tests. Appendix.

THE CONSOLIDATED STOCK EXCHANGE OF NEW YORK. By S. A. Nelson. Pp. [illegible] illustrated. 5x7 in. flexible leather. Price, $1, New York; the A. B. Benesch Company.

History of the Exchange; the Clearing House; the Gratuity Fund; Day's Work of a Commission Broker; Membership; Work of a Trader; Principles of the Consolidated Exchange; the Mining and Grain Departments; Glossary of Wall Street terms; Mechanism of a Complete Bear Trade; Mechanism of a Complete Bull Trade. The book refers to the Consolidated Exchange, which is distinct from the New York Stock Exchange, having a different membership entirely; it has always given more time to dealing in mining stocks than the older Exchange. It describes the career, methods, mechanism and machinery of a Wall Street institution that is more than 30 years old. It is appropriate that the publication of the volume comes at the time when the Consolidated is about to change its home from Broadway and Exchange Place to the new building on Broad Street.

The Labor Question in the Transvaal

SPECIAL CORRESPONDENCE

The general feeling on the stock exchange is almost one of dull despair. About 10 days ago, the citizens of Pretoria gave a public dinner to the new ministry. The speech made by General Botha was non-committal, but on the whole it was considered conciliatory and statesmanlike. He declared in general terms that it was not the intention of his ministry to do anything to damage the main industry of the country. He said that the chief thing this colony needed was rest and quietness.

Last week the first parliament of the Transvaal met in Pretoria. It was known that the session would be a very brief one, but the Progressive party and the mining community hoped that the Government would make a definite pronouncement on the unskilled labor question.

In the speech from the throne, the country learned that the Boers were determined to get rid of Chinese labor as soon as possible. They stated nothing definite about the immediate future and seemed indifferent to the serious state of affairs.

In June the contracts of the first crowd of Chinese coolies expire. Parliament will not meet again until June 14. What the opposition wanted to know was whether these coolies would be allowed to sign on again. But the Government refused point blank to make any statement on the labor question and the general feeling is that it will adopt the policy of drift. In spite of the eloquent protests of the Progressive leaders, who demanded that a commission be appointed to inquire into the question of unskilled labor, the Government used its big majority in the most ruthless fashion, and refused to allow discussion on the subject. Parliament ended its sitting without a pronouncement on the most vital question before the country, that of the supply of unskilled labor for the mines.

The mining community feel rather blue at the outlook. The Boers stated that their party would do nothing to injure the mining industry, but the suspense and apprehension caused by their policy of drift will no doubt bring on a panic, and add to the already heavy load of distress the community has to bear. So uncertain of the future are the merchants that they dare not order any large stocks. Developing mines will not go forward with work.

The Boers reply to the threats and warnings by stating that there is any amount of Kafir labor to be obtained in the country. Perhaps 40,000 Kafirs could be obtained, to work for three months, but at the end of that period they would go home for a year. It is utterly impossible to carry on an industry such as this, with an erratic supply of labor.

The yearly report of the French Rand mine shows what excellent work is being accomplished with Chinese labor. For 1906 the company made a profit of £50,657, compared with about £18,000 for 1905. A much larger tonnage was crushed with fewer Chinese than in the previous year. The working costs show a reduction of 58.6c. per ton milled. The improvement was due to the increased efficiency of the Chinese.

Mineral Production of New York State in 1906

Through the courtesy of D. H. Newland, assistant State geologist, we are able to present the following statistics of the mineral production of the State of New York in 1906:

MINERAL PRODUCTION OF NEW YORK IN 1906.

Product.	Unit of Measurement.	Quantity.	Value.
Portland cement	Barrels.	2,423,374	$2,766,488
Natural rock cement	Barrels.	1,691,565	1,184,211
Building brick	Thousa'ds.	1,600,059	9,688,289
Pottery	.....	.....	1,795,008
Other clay products	.....	.....	2,472,003
Crude clay	Short tons.	5,477	9 125
Emery	Short tons	1,307	13,870
Feldspar and quartz	Long tons	13,660	44,350
Garnet	Short tons.	4,729	159,298
Glass sand	Short tons.	9,000	8,600
Graphite	Pounds.	2,811,582	96,084
Gypsum	Short tons.	264,581	685,053
Iron ore	Long tons	905,367	3,393,609
Millstones	.....	.....	22,442
Metallic paint	Short ton	2,714	29,140
Slate pigment	Short tons.	2,045	15,960
Mineral waters	Gallons.	8,000,000	1,000,000
Natural gas	1000 cu.ft.	3,007,086	766,679
Petroleum	Barrels.	1,043,088	1,721,095
Pyrite	Long tons.	11,798	35,550
Salt	Barrels.	9,013,993	2,131,650
Roofing slate	Squares.	16,248	57,771
Slate manufactures	.....	.....	4,150
Sand lime brick	Thousa'ds.	17,080	122,340
Granite	.....	.....	255,189
Limestone	.....	.....	2,963,829
Marble	.....	.....	460,916
Sandstone	.....	.....	1,976,829
Trap	.....	.....	847,403
Talc	Short tons.	64,200	641,600
Other materials*	.....	.....	1,850,800
Total value	.....	.....	$37,118,430

*Includes apatite, arsenical ore, carbon dioxide, diatomaceous earth, fullers earth, marl, and sand and gravel, exclusive of glass sand.

Arsenic is the most difficult impurity with which to deal in electrolytic copper refining. If much is present in the anode, say over 1 per cent., it rapidly accumulates in the solution and necessitates a large expenditure for purifying to hold it down. With small quantities it seems to slime more rapidly and no purifying is necessary. With other conditions properly cared for, satisfactory cathodes can be produced in an electrolyte running 2 per cent. arsenic, though this is considerably above the customary figure.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. B. Tyrrell, of Toronto, is in Cobalt, Ont., sampling and valuing the Right-of-Way mining properties.

E. Percy Smith is now superintendent of the Minas Dolores y Anexas, at Matehuala, San Luis Potosi, Mexico.

Richard Linthicum, editor of the *Rico News*, of Rico, Colo., was a recent visitor to New York, where he has been attending to mining business.

H. C. Booth is appointed superintendent of the Indian Territory mines of the Rock Island Coal Company, with headquarters at Hartshorne, I. T., in place of Edward H. Coxe, who has gone to Alabama.

Edwin C. Holden has entered the firm of Hill & Irvine, mining engineers and geologists, New York. The firm is now Hill, Holden & Irvine, the members being Robert T. Hill, Edwin C. Holden, and Frederick B. Irvine.

J. S. Watson, manager of the Link-Belt Company's drive chain department, sailed for Europe on the "Amerika," April 25. While abroad Mr. Watson will visit the chain-making plant of Hans Renold, at Manchester, England.

Johan August Brinell, of Stockholm, Sweden, will receive the Bessemer gold medal for 1907 at the meeting of the Iron and Steel Institute, in May, chiefly for his researches on the changes in texture on heating and cooling steel.

T. B. Bassett has resigned his position as general manager of the Belen Mining Company, near Cumpas, Sonora, Mexico, to take effect June 15. Mr. Bassett will again enter into general practice as a mining engineer, and has engaged to do some professional work in the northern part of Sonora.

John W. Seaver, who with S. T. Wellman and the late Charles H. Wellman, formed the Wellman-Seaver Engineering Company, at Cleveland, Ohio, about 10 years ago, and for several years has been a vice-president of the Wellman-Seaver-Morgan Company, has resigned his position. He has opened offices as consulting engineer in the Caxton building, Cleveland, and will devote himself to the design and construction of manufacturing and power plants, iron and steel foundries and machinery for handling material.

Obituary

William J. Johnston, who was president of THE ENGINEERING AND MINING JOURNAL, INC., from 1902 to 1904, died at his residence in New York, April 29, aged 54 years. He was born in Ireland and came to this country when 15 years old. After some years as a telegraph operator, he started a journal called the *Operator*, which subsequently developed into the *Electrical World*. After selling his interest in that paper he spent some time in travel, and then started *Mining and Metallurgy* in New York, which was later consolidated with [illegible] through the Johnston Publishing Company, of which he was president. He retired in 1904 and started the *Mining Magazine*, which he sold two years later to the Hill Publishing Company. He became owner of the *American Exporter*, of which he was publisher up to the time of his death. Mr. Johnston had a thorough knowledge of the publishing and advertising business, and was successful in several of his ventures. He leaves a widow, four sons and two daughters.

David Willcox, whose resignation as president of the Delaware & Hudson Company was recently noted, killed himself, April 24, while on board the steamer on his return to this country from a trip to Europe, undertaken for the benefit of his health. He was 57 years old, having been born in Brooklyn in 1850. After graduating from Yale College and the Columbia Law School, he began the practice of law in New York in 1874. He was engaged largely in corporation practice, and later became counsel for the Delaware & Hudson Company. For a number of years he was at the head of that company's legal department as its general counsel. In 1903 he was chosen president of the company, a position which he held until two weeks ago, when he resigned on account of ill health. His legal training and thorough acquaintance with the trade made him prominent in the councils of the anthracite companies. At the time of the great strike in 1902-3, he appeared as their spokesman on several occasions. An able lawyer and pleader and a fluent writer, he was the author, in addition to his official documents, of pamphlets, magazine articles, etc., which were widely read, and made his name known to the general public. Mr. Willcox was never married; he was connected with many clubs and organizations in New York. He was a stockholder and director in the Union Pacific, the Southern Pacific and other railroad companies.

Societies and Technical Schools

Nevada Mining and Scientific Society—This society has been organized, with headquarters at Goldfield. Its object is to collect and publish reliable information about the mineral resources of Nevada. The society has elected officers as follows: President, J. W. Finch; first vice-president, Capt. J. A. Hassell; second vice-president, A. F. Price; secretary, F. J. Swears; treasurer, G. V. Burton.

Industrial

The Carnegie Steel Company recently ordered four 400-kw. Allis-Chalmers oil-filled, self-cooled power transformers for installation at the Carrie furnaces, Rankin, Pennsylvania.

Horace T. Frizelle, who was for several years connected with the Colorado Fuel and Iron Company, Denver, Colorado, has been appointed purchasing agent of the New York Engineering Company.

The San Francisco office of the General Electric Company is now permanently in the Union Trust building, in San Francisco. Since the fire, the office has been at Oakland, large temporary warehouses having also been erected in the same city.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

American Locomotive Company, 111 Broadway, New York City. Mogul Type Freight Locomotives. Pp. 60, illustrated, paper, 6x9 in.

Wellman-Seaver Morgan Company, Cleveland, Ohio. Circular No. Ca-3. Mine Cages, Skips, Ore Cars, etc. Pp. 40, illustrated, paper, indexed, 6x9 in. 1907.

Construction News

American Falls, Idaho—It is proposed to build a smelter at this place. James H. Brady, Pocatello, Idaho, has charge of the project.

Nevada City, California—There is talk of putting up a matte-smelting plant at the Junction mine. T. A. Varden is superintendent.

Rough and Ready, California—This company will erect a mill and put in a pipe-line 1400 ft. long at the Ironclad mine. H. M. Black is superintendent.

El Paso, Texas — The Southwestern Portland Cement Company is preparing to establish a plant and will need machinery. A. Courchesne, El Paso, Texas, is general manager.

Peacock Mountain, Washington—A compressor plant is to be installed at the Salmon River mine. William McDaniel, Conconalli, Okanogan county, Washington, is in charge.

Nighthawk, Washington—Preparations are being made to put in power drills at the Little Chopaca mine. Charles A. Andrus is manager; address at Nighthawk, Okanogan county, Washington.

Bullion, Nevada—The Nevada Phœnix Mining Company is arranging to develop a mining property, and will need air-compressors, drills and other machinery. P. B. Locker, Salt Lake City, Utah, is president.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

The expected has happened and miners' strikes have suddenly closed down several important Mother Lode mines, including those of the Utica system, the Stickles, Lightner, Matson, Angels, Crystal and others at Angels, where between 900 and 1000 miners were employed. The miners are mostly Austrians, and there are about 900 members in the local union. The Utica, formerly and for some years the most productive gold mine in the State, and still a large producer, has taken the pumps out of the Gold Cliff and Stickles and suspended work in the main mine. The mill has been cleaned up, the windows stoutly boarded, and the powder at the mine removed. The entire works have been virtually closed down. The company, while a large gold producer, has been running behind of late, the grade of ore being only about $2 per ton. They have been paying miners $3 and muckers $2.50 per day for 10 hours' work, and to cut down to eight hours means too much loss. The men did not ask for an advance in wages, but wanted an eight-hour day. This the mine-owners refuse to grant. In the same county, without any notice, the underground men at the Penn Chemical Works, a productive copper mine at Campo Seco, refused to go to work under the prevailing schedule of 10 hours. The smelter men also joined in. The superintendent was unable to act without authority from the owner, H. Harmon, of Chicago. About 200 men were involved, but belonged to no union. The matter was finally settled by granting the underground men, mostly Italians, a nine-hour day, and increasing wages of the men at the smelter 10c. per day. At Sierra City, in Sierra county, rumors of a strike at the Sierra Buttes mine caused the discharge of 60 Austrian and Italian miners, but some 70 men are still at work there.

Salt Lake City

April 25—The construction of the Caliente & Pioche Railroad, between Caliente and Pioche, Nev., a distance of 30 miles, has begun. Contractors say the line will be completed in July. In the meantime the camps of Pioche and adjoining districts are active. Several deals have been made recently, the most important of which was the asquisition of the E. & F. mine, at Bristol, by W. A. Clark and associates.

Articles of incorporation of the Nevada Phœnix Mining Company, which will [illegible] the development of ground in the Bullion, Nev., district, have been filed. P. B. Locker, of Salt Lake, is president; John Janney, vice-president; Geo. Rust, secretary. Salt Lake is the headquarters of the company.

The headquarters of the Nevada Hills Mining Company will shortly be moved from Goldfield to Salt Lake, where a majority of the stock is held.

The Ohio-Kentucky Mining Company, operating at Pioche, has opened the Susan Duster orebody at 200 ft. depth. On the 100 level this orebody was crosscut for 30 ft. The vein contains a large amount of shipping ore.

Plans are being worked out looking toward a consolidation of the May Day and Uncle Sam Consolidated mines in the Tintic, Utah, mining district.

Shareholders of the Morrison Mining Company, operating in Humboldt county, Nevada, have changed the name of that corporation to the Imlay Copper Mining Company and have increased the capital stock from 400,000 to 500,000 shares. The headquarters will remain in Salt Lake City, as heretofore. G. W. Morgan is president.

The Moscow Extension Mining Company has been formed in Salt Lake City to operate a group of mining claims in the Star mining district in Beaver county. The incorporators are James M. Russell, Howard Russell, William Pischel, Robert B. Harkness and Frank A. Robison. All but the latter are residents of Salt Lake City.

James H. Brady, of Pocatello, is at the head an enterprise being formed for the purpose of building a smelter at American Falls, Idaho, where electric power is available.

Toronto, Ont.

April 27—The Ontario legislature has passed a bill, introduced as a government measure, validating the title of the purchasers of mining rights in Cobalt lake and Kerr lake. An action is now before the courts, brought by the Florence Mining Company against the Cobalt Lake Mining Company, claiming title to the location on the ground of prior discovery. The Government takes the ground that the claim of the Florence company has been already investigated and found not to be sustained. Amendments in the bill recognizing the right of the rival claimants to substantiate their claim in court, and, of sustained, to obtain compensation, were defeated.

A claim for the royalties collected by the Provincial Government on the output of the O'Brien mine, being 25 per cent. of the value of the ore mined, has been preferred by La Rose Mining Company. The royalty arrangement between the O'Briens and the Government was the result of a protracted lawsuit undertaken by the Government at the instance of La Rose interests, who claimed the location as the original discoverers. The matter was settled by the Government confirming the title of the O'Briens on condition of their undertaking to pay a royalty, and La Rose owners realized nothing. They now claim that the royalties, amounting to the present date to $54,406, rightly belong to them.

The town of Parry Sound has voted a bonus of $100,000 to the Dominion Smelters, Ltd., the company undertaking to commence this summer the building of a smelter to cost $1,500,000, which is to be finished within two years, and to employ 400 hands with a pay roll of $1000 per day.

London

April 20—Some months ago I referred in this column to the farcical promotion of a company intended to send a prospecting expedition to an unnamed island off South Africa, where it was alleged there were diamondiferous deposits. The whole thing was a failure, and for a time after Mr. Kenyon-Collis's name was not heard of in the city. This gentleman has now cropped up again with another diamond scheme. He has given up locating his mines in unnamed islands and has settled down instead on a property next door to a famous producer. His tract of land is the Vogelsfontein, and immediately adjoins the Jagersfontein, in the Orange River Colony. It is stated that a pipe of diamond ground has been opened up, and that the content of the ground so far treated has been 7 carats per 100 loads, which compares with 10 carats at the Jagersfontein. The promoter is making a big profit by the flotation, and takes care that his services as managing director shall be handsomely remunerated. The other directors, which number among them a few titles, such as general and baronet, make a great boast of their forbearance in not asking for any fees until a 10 per cent. dividend has been paid. The company starts with a big nominal capital, but far too much goes as purchase price, and too little as working capital. The company also has been able to afford a good editorial notice in one of the financial papers.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

[illegible] Co.

Cypress Creek Coal—This company is organized with the following officers: W. E. Leake, Birmingham, Ala., president; W. G. Somerville, Tuscaloosa, vice-president; R. E. Rodes, Tuscaloosa, secretary and treasurer. The company has secured options on 3000 acres of coal lands on the west side of the Warrior river, about eight miles from Tuscaloosa, and will develop the property at once.

Arizona

Yavapai Co.

Dividend Mine—This mine has passed from the Dividend Consolidated Mining Company to the Mount Elliot Mining Company. This mine has a large amount of ore blocked out and development work well ahead. The new company will at once put on a force of men and work the property to its capacity.

[illegible] Mines Company—It is reported that this company will increase its mill capacity 50 tons. On account of the developments in the mine it is impossible to treat all of the ore in the present mill.

Octave—This mine has passed from the ownership of the Octave Gold Mining Company, a close corporation, to the Octave Mining Company. The new company has made numerous improvements about the mine, mill and camp and will soon place the mill in operation. This mine is one of the large gold mines of Arizona, and at this time has large bodies of good milling ore blocked out. The property has been developed to a depth of 1850 ft. on the incline, making a vertical depth of about 900 ft. It is equipped with a modern plant of mining and milling machinery.

California

Amador County.

Defender—From this mine, Defender, ore valued as high as $60 per ton has recently been taken out at a depth of 200 ft. The mill will shortly be started.

Butte County

Magnolia—E. R. Agersinger and others, of Goldfield, Nevada, have organized a company to work gravel mines at this place.

Calaveras County

Benson Mining Company—There has been some dissatisfaction with the conduct of affairs of this company at Angels and a new board of directors has been elected, who will put in a new president.

El Dorado County

Big Cañon and Pyramid—J. B. Menardi, of Goldfield, Nevada, is investigating these properties with a view to purchase, if the ore tests are satisfactory.

Lamb—This hydraulic mine near Indian Diggings is again being worked, although but one nozzle is in use.

Inyo County

Red Boy—In this mine, Greenwater, a strike of rich carbonate ore has been made at 250 ft., which is considered an encouraging sign.

Inyo Copper Company—This company has been organized by Chas. Wing, of Greenwater, A. Olson and Captain Horton, to develop copper and silver claims near Darwin.

Kern County

At Bakersfield a contract has been made by the terms of which the McKittrick oil producers have agreed to sell a large quantity of their product to the Associated Oil Company for 30c. a barrel.

Mono County

Standard Consolidated—This company at Bodie has bought the New Standard group, including the Agawan, Adirondack and Remmart claims.

Nevada County

Gold Mound—This Spokane, Washington, company, which has been prospecting for some months on Deadman's Flat near Grass Valley, is now erecting machinery for extensive development work.

Belle Union—This mine, near Grass Valley, has been purchased by Grass Valley, Los Angeles and San Francisco capitalists. It has not been worked since 1872.

Orleans Mining Company—This company is about to disincorporate, the property having been sold to the Sultana Mining Company.

Junction—The first carload of copper ore has been shipped from this mine to the Shasta county smelters. T. A. Varden is superintendent. The company intends shortly erecting a smelter.

San Bernardino County

Copper—A discovery of high-grade copper ore has been made in the Ivanpah mountains, 25 miles northwest of Vanderbilt.

Colorado

Gilpin County

[illegible] Mines Association Co.—At a depth of 1350 ft. on the east side of Running Lode shaft, copper-lead ores have been opened up, carrying high values. T. Dunstone, Black Hawk, Colo., is superintendent.

Old Town Consolidated—A strike of copper ores is reported at a depth of 1800 ft. in main shaft, carrying high values in gold, silver and copper. G. K. Kimball, Jr., Idaho Springs, Colo., is manager.

Routt County

Antler Group—A. J. Smith, of Columbine, has sold to L. A. Stillwagon, of Glenwood Springs, Iowa, for a consideration of $20,000, this group in Little Red Park, near Hahn's Peak. Machinery is to be at once installed.

Hyatt-Verde Copper Company—A plant of machinery is to be installed on this property. G. I. Bratton, Steamboat Springs, Colo., is manager.

Helvey Ranch—Natural gas is reported to have been found on this property, and C. H. Rowlette, C. E. Bivens and others, of Steamboat Springs, have taken an option on the property and will determine the extent of the proposition.

Manganese Ores—A find is reported by H. S. Dougan, of Kremmling, an assay of outcroppings showing over 15 per cent. manganese.

[illegible]

Fairmount Group—South of the Mammoth work has been started sinking on the Fairmount ground; the shaft is 4½x9 in the clear, and will be sunk the first 50 ft. by windlass, when machinery will be installed.

First National—Water was the great drawback to the successful working of this property. Iowa gulch, a few years ago; a recent examination of the shaft proved that the water had been greatly lowered, and it is believed now that a small Cameron sinker will be able to handle the flow. A good body of zinc ore was opened before the property was closed down, and it is to develop this oreshoot that the property will resume operations.

Fryer Hill—Recently the tonnage of iron from this section has fallen off, but the shortage has been more than made up by the silicious ore that is being shipped from a number of properties. The leader

sending out 30 tons daily of high and medium grade material. The Matchless is shipping 25 tons daily of a good grade of lead ore, opened in one of the lowest levels. From the 200-ft. level of the Anderson lease on the Seneca, north, 15 tons daily are being shipped from an iron ore-body that carries considerable lead; a drift to the east has tapped the edge of another iron ore-shoot. From the 225-ft. level of the Robert E. Lee a good body of silicious ore has been opened, from which two carloads daily are being shipped. At the Dewar lease, on the Amie, a carload a day of good iron is being shipped from the 270-ft. level. From the Dunkin No. 3 and No. 4 shafts some good mineral is being shipped. The Little Silver has resumed operations. The old Chrysolite shaft is in such poor condition that it is no longer safe, and has been abandoned; it is likely that a new shaft will be sunk. A number of lessees are working over the dumps of different properties, hand sorting, and all are doing well.

Indiana

Greene County

Calora Coal Company—This company, with offices in Jasonville, has put the miners at work on off days drilling a number of oil wells, and the several hundred acres of coal land owned by the company is dotted all over with derricks. In addition to its holdings, options have been taken by the company on 7000 acres of adjoining territory.

Kentucky

Knox County

Matthews Coal Company—This company has taken over the Cumberland Company, having purchased the personal property and leased the coal plant, together with 834 acres of coal land, at Warren. It is intended to continue the operation of the plant, developing it to a capacity of 600 tons of coal per day. Officers of the Matthews Coal Company are: John G. Matthews, Barboursville, Ky., president; R. W. Cole, vice-president; H. W. Matthews, secretary; A. L. Matthews, treasurer.

Michigan

Atlantic—Sinking on section 16 shaft has reached a depth of approximately 350 ft. Work will be continued until the sixth level is reached, when a cross-cut will be extended to connect with a drift from the Baltic. This work is being done in view of bettering the ventilation in this shaft.

Calumet & Hecla—This company will install another 2000-kw. generator at the power plant at Lake Linden. The changing of the pumping station on Lake Superior to electrical power operation, and the erection of the large re-grinding plant, necessitate this additional electrical power.

Keweenaw County—Copper

Keweenaw Copper Company—The shaft on the Medora property is down 600 ft., and is bottomed in fine rock. A new hoist is to be installed at this shaft, and a second shaft started during the coming summer, also a shaft is to be sunk on the Empire tract. This company has secured control of the Phœnix Copper Company, and will start immediately to fully explore the lands. The acquiring of this property will give the Keweenaw all the stamp-mill facilities needed for some time, as the Phœnix has a well equipped mill, that can be put into operation with very little alteration, and shipments can be made from the stock-pile.

Montana

Butte District

Boston & Montana—The company is now raising ore through the new four-compartment shaft on the Leonard, which, with improved transportation facilities, enables it to maintain its daily output of 3300 tons of ore. A surface haulage system operated by electricity has been installed on the Meaderville side, the point of several of its large producers. By it ore can be thrown into any of the bins from any of the mines on that side. Sinking is again in progress in the West Colusa and continued to the 2000 level.

Davis-Daly—Drifting east and west on the 500 of the Smokehouse is still in progress. The new electric hoisting engine ordered several months ago for this claim, has been delivered, but the motor has not arrived. The engine will lift 7000 lb. 1300 ft. at the rate of 600 ft. a minute. Sinking will be resumed in a month or six weeks, and continued from the 500- to the 1800-ft. mark. Sinking is going on in the Colorado, Mt. Moriah and Silver King shafts, and the face of the crosscut south of the 1800 of the Original is advancing 5 ft. a day. No ore in commercial quantity has been encountered in any of the workings of the company.

Parrot—Development is confined to the lower levels of the main workings adjoining Nipper ground. The daily ore production is about 300 tons.

Nevada

Churchill County—Fairview

Fairview has developed rapidly, though at the present time has not the boom which is on in Wonder. The Golden Boulder, adjoining the Dromedary Humps, has a strike on what is supposed to be an extension of the Dromedary Humps vein, and lying close to the latter property. A new hoist has been ordered and preparations are being made for active development. The shaft at the present time is down over 50 ft., and the bottom is entirely in quartz and silicious ledge matter, which shows manganese and iron staining. Some silver sulphides occur, also horn silver. Considerable ore is sacked, ready for shipment. At the Dromedary Humps several new strikes have been made. Ore has been sacked, and a hoist will soon be installed.

Active development work is being done throughout the camp. At the Nevada Condors, which lies north of the Nevada Fairview, in the southern part of the district, a tunnel is being driven to cut the ledge, which is exposed on the surface. The Fairview Eagle and Eagles Nest Fairview have recently made some promising disclosures. Several new companies are starting work—the Nevada Hills Annex, Lena Fairview, Fairview Reliance, St. Paul, Cedars, and others.

The Nevada Hills is shipping steadily, and nearly every returning freighter brings ore to the railroad at Fallon. New developments have been encouraging and the company has already declared a second dividend. In No. 4 tunnel ore has been cut, which is said to sack without sorting.

New silver strikes are reported from Westgate, about 12 miles from Fairview. Water has been developed in the well below the town.

Nye County—Tonopah

Ore Shipments—Shipments of ore over the Tonopah Railroad for the week ending April 20 were: Tonopah Company, 619 tons; Belmont, 488; Montana-Tonopah, 129; West End, 48; total, 1285 tons. There were 30 tons from Lone Mountain, making a total of 1315 tons. In addition the Tonopah Company sent 1850 tons to its mill.

Pennsylvania

Anthracite Coal

Philadelphia & Reading — This company will build a mammoth breaker at Buckville, near Tamaqua, this summer. Plans have also been completed for a large breaker at Reevesdale, where a new shaft is being sunk.

Bituminous Coal

Pittsburg Coal Company—This company has issued a statement for the quarter ended March 31, which gives the earnings as follows:

	1906.	1907.	Changes.
Earnings	$1,025,492	$1,025,430	D. $ 62
Charges	742,790	698,100	D. 44,690
Net balance	$ 282,702	$ 327,330	I. $44,628

The charges in 1907 were made up as follows: Allowance for depreciation of coal lands, $159,899; depreciation of plant and equipment, $255,237; interest on first mortgage bonds, $282,964. The coal statement is as follows, in short tons:

	1906.	1907.	Changes.
Pittsburg Dis.	4,142,227	3,637,163	D. 505,064
Hocking Dis.	317,767	219,715	D. 98,052
Total coal	4,459,994	3,856,878	D. 603,116
Coke made	105,649	113,796	I. 8,147

The coke is all made in the Pittsburg district.

South Dakota

LAWRENCE COUNTY

Homestake—It has been found necessary to flood the Homestake mine to put out the fire which has burning for four weeks. Water has been turned in through two shafts and the open cut, and flumes are now being built, so that it may also be run in through the old Savage tunnel. All mills with the exception of the cyanide annexes, which have not made their clean-ups, are closed down for the first time in the history of the mine. There are in the workings 68,000,000 cu.ft., which it will be necessary to fill with water.

Texas

HOPKINS COUNTY

Lone Star Lignite Mining Company—This company has been organized at Dallas, Texas, with a capital stock of $200,000 for the purpose of mining lignite in Hopkins county. Officers of the company are: N. Watelsky, president; H. N. Watelsky, general manager; L. A. Allen, secretary-treasurer.

Utah

JUAB COUNTY

Tintic Ore Shipments—Shipments last week amounted to 136 carloads the contributing mines and respective amounts being: Ajax, 3; Beck Tunnel, 9; Black Jack, 1; Bullion Beck, 4; Carisa, 8; Centennial Eureka, 56; Colorado, 1; Eureka Hill, 3; Gemini, 6; Godiva, 2; Grand Central, 6; Laclede, 1; Lower Mammoth, 6; Mammoth, 10; Scranton, 8; Swansea, 2; Tintic Iron, 6; Uncle Sam, 2; Yankee Consolidated, 4 cars.

Shoebridge Bonanza—This property is to be operated again after a shut-down of several years.

Washington

OKANOGAN COUNTY

Molson Gold Mining Company—This company has placed a contract with the Merralls Machinery Company for machinery for the Poland China mine in Myers' Creek district, to cost, with the installation, about $18,000. It will include a 9x24-in. rock crusher, nine 1200-lb. rapid-crushing quadruple rapid-discharge stamp mills, with feeders; a No. 3 Merrall's improved roller mill, with large amalgamation plates; a 50-h.p. steam engine, boiler and accessories, and general equipment. The ore exposed in the mine averages about $20 per ton. The officers of the company are: D. W. Dart, president; Wm. H. Phillips, vice-president; Charles A. Haskett, secretary, and H. F. Beery, general manager, all of Dayton, Ohio. M. A. Smalley, of Chesaw, Wash., is treasurer.

West Virginia

MERCER COUNTY

Producers' Coal Company—At a recent meeting at Bluefield, E. L. Bailey was elected president of the company in place of A. I. Godfrey, and H. Archer Mitchell was elected general manager in place of S. S. Cofer. The company is one of the independent shipping companies in the field.

Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

Granby Consolidated—Hayden, Stone & Co. report that adverse weather conditions, together with a fuel shortage, proved a serious handicap to operations during the winter months, in consequence of which production suffered. Results for March, however, were probably the most satisfactory for those of any like period in the company's career. Net earnings were in excess of $225,000, while the cost of production was approximately 7.64c. per lb. copper. For the nine months ended March 31, the Granby has secured net earnings in excess of $1,600,000. Under normal working conditions it is capable of supplying 25,000,000 lb. of copper per annum, at a cost of 8c. per pound. The company has a well-filled treasury, an excellent management, an extraordinary ore supply, and one of the best smelting plants in the country.

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of Cobalt ore over the Timiskaming & Northern Ontario Railway for the week ended April 20 were: Coniagas, 64,910 lb.; O'Brien, 128,290; Trethewey, 165,340; total, 358,540 pounds.

Buffalo—A rich silver vein has been struck about 20 feet north of the boundary between this property, in Cobalt and the Townsite. It was about 4 ft. below the surface and averages 2 in. in width.

Coniagas—Large additions to the plant and buildings at Cobalt are being made. There is now in place a Fairbanks-Morse friction hoist, a 100-h.p. boiler and a 12-drill duplex air compressor. Another 100-h.p. boiler is being installed. A concentrating plant will be in operation in a few weeks, which will be supplied with water by an electrically driven turbine pump to be installed at Sasiganaga lake. The concentrator will have a capacity of 100 tons of ore per day. Over 1400 ft. of drifting has been done at the 75-ft. level from the main shaft. The vein is narrow, but rich, and the wall rock in many places is shot with silver for 4 ft. on each side of the vein. A force of 96 men is at work in charge of Superintendent John Redington.

UNGAVA TERRITORY

A return presented to the Canadian Parliament regarding leases of mineral and coal lands and water powers in Ungava territory shows that the Dominion Development Company, of Philadelphia, is the only one which has not allowed its leases to lapse after application had been made and granted. The company has staked and now holds under patent 52 claims.

Mexico

Rumor has it that the American Smelting & Refining Company, or the Guggenheim, interest, is contemplating the erection of a smelter or large reduction plant in the Guadalajara district, that engineers are in the field seeking the mines necessary as a basis for such a plant, and also that negotiations had been under way for the properties of Carlos Romero in Hostotipaquillo, as well as others in Jalisco, Colima, Tepic, and Sinaloa. Without doubt, however, this is mere rumor for a prominent official of the company has stated positively that there was nothing in it. It seems proper therefore to give this denial to the rumor so as to prevent in so far as it is possible an unnatural boom. The district is receiving much and natural attention and obtaining a healthy growth. The latest large deal in the district is that just consummated in Hostotipaquillo by the consolidation of the Cabrera, of Carlos Romero, and the America, of W. J. Payne, of Richmond, Va., into what will be known as the Virginia & Mexico Mining and Smelting Corporation, with a capital of $2,000,000 gold, and Jesse Scobey, of Denver, the promoter, as vice-president and general manager. The plans include the erection of a 150-ton stamp, concentration and cyanide mill. The ores are largely a silver sulphide.

Caridad y Anexas—This new company has acquired 180 pertinencias on the Panico ranch near Guachinango and about 60 kilometers west of Ameca. The company is capitalized at $200,000 Mexican, subscribed principally in Mexico City, Adolph Marx is president and Otto Vorrath manager. The ore runs high in copper, with good values in gold and silver, and the first shipments have already been made to the Aguascalientes smelter.

Africa

RHODESIA

Gold production reported in March was 46,887 oz. bullion. This makes a total for the three months ended March 31 of 125,561 oz. bullion in 1906, and 134,417 oz. in 1907; an increase of 8856 oz. The bullion reported this year was equal to 119,631 oz. fine gold, or $2,472,773. There were also 11,321 oz. silver reported.

Other production for the three months was 160 tons lead; 26 tons copper; 1 ton wolframite; 50 tons antimony ore; 3405 tons chrome ore; 27,815 tons coal.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, May 1—The coal trade in the West has received some support from the long continued cold weather, which has brought about a demand for domestic use which is quite unusual at this season. The call for steam coal is heavy, and the trade generally in good condition. Railroad service is better than it has been for a long time past.

In the East there is nothing new to report, the trade being quiet and steady, both in anthracite and bituminous coal.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to April 20 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	1,[illegible]	1,[illegible]	I. 260,220
Bituminous	10,11[illegible]	11,[illegible]	I. 709,[illegible]
Coke	[illegible]	1,250,104	I. 230,374
Total	1,[illegible]	1,088,857	I. 1,101,[illegible]

The total increase this year was 8.9 per cent.

The Southwestern Interstate Coal Operators' Association gives out the following statement of coal production for the two months ended Feb. 28, in short tons:

	1906.	1907.	Changes.
[illegible]	[illegible]	587,048	D. 22,981
[illegible]	1,[illegible]	111,456	D. 10,825
[illegible]	[illegible]	486,964	I. 12,241
[illegible]	[illegible]	488,180	D. 188,547
[illegible]	[illegible]	[illegible]	D. 41[illegible]

The total decrease this year was 11 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to April 27 were 339,590 tons.

New York

Anthracite

May 1—There was little or no change in the market during the past week. Demand is fair and shipments regular. Small steam sizes are extremely scarce and the demand is strong. Pea and buckwheat Nos. 1 and 2 are nearly out of the market and there seems to be no favorable outlook for increasing the supply in the near future. The new schedule takes effect today and prices are as follows: Broken, $4.35; egg, stove and chestnut, $4.60; pea, $3; buckwheat, $2.50; rice, $1.85; barley, $1.50. These prices for small coal are nominal and in many cases a premium is being received by the producer.

Bituminous

The Atlantic seaboard soft coal trade shows little change from last week, there being considerable unabsorbed coal at tidewater ports, but it is believed that these stocks are somewhat reduced from those of a week ago. Contract coal is moving forward fairly well and there seems to be a good supply of such orders in the hands of shippers. The vessel question is a prominent factor at the present time and rates are maintained. It is believed that with summer weather rates will decline 10@15c., which is the usual custom at this time.

Trade in the far East is fairly active on contract business, and there seems to be a slight shortage in stocks in this territory. Accumulations of anthracite at the discharging points are causing demurrage in numerous cases. Trade along the Sound is slow, some low-priced coal having been taken on, but the general trend is to give anthracite the preference. We hear of 20,000 tons at two points and 40,000 tons at another point on the Sound, the coal being of all kinds, awaiting unloading, and demurrage is general.

New York harbor trade is quiet and some stocks of coal are unsold at tide-water ports. This has produced a depressed feeling in the market and the lower grades have been offered as low as $2.35 @2.40 f.o.b. loading port. Good steam grades may be bought for $2.55@2.60. Trade is hampered by lack of barges. All-rail trade is slow, and there have been shipments on this class of business to relieve tidewater ports. Transportation from mine to tide is a little irregular, although fairly up the schedule; car supply is up to all demands.

Vessels in the coastwise trade are in small supply and charters are made "to arrive." When vessels are discharged in the East the scarcity in this district will be relieved. We quote current rates from Philadelphia, Boston, Salem and Portland $1.25 and discharge; to Lynn, Newburyport, Portsmouth, Saco and Gardiner, $1.25; to Bath, $1.15; to Bangor, $1.30; to the Sound, $1; loading and discharging clause included where usual.

Birmingham

April 29—Continued activity is noted in the coal districts of Alabama. The production is greater than it has been in many months. No change is noted in prices for coal or coke. Present conditions as well as the future prospects in Alabama are all that could be desired.

Chicago

April 29—Strength continues to characterize the local coal market. In part this is due to the cool weather of the month just closing; in part also to the resolution of operators to close out the surplus of coal on track in this city. Anthracite sold heavily in the last week.

Production at the Western mines has been reduced, to reduce demurrage troubles. Eastern coals have been quiet but firm, with no disposition on the part of either sellers or buyers to force the market.

Coal from the mines of Illinois and Indiana brings $2@2.75 for lump and egg; $1.75@2.50 for run-of-mine, and $1.40@1.60 for screenings. The tendency is toward increase of demand for fine coals.

Eastern coals are quiet and firm. Hocking brings $3.15 for 1¼-in.; smokeless, $3.35 for run-of-mine. Youghiogheny is quiet at $3.15 for ¾-in. gas and Pittsburg is firm at $3.15 for 1¼-in. No. 8.

Cleveland

April 30—The tardiness of the lake navigation season this year is occasioning some inconvenience in local coal movements. The anthracite business continues steady with good absorption of coal receipts. Bituminous dealers state that considerable coal is coming into the city, and as consumers are more than stocked up, prices are low. Pittsburg No. 8 slack is quoted at $1.70@1.75 and straight No. 8 at $1.80. Pittsburg run-of-mine $2.15 and ¾-in. $2.25 on track Cleveland. The season will open the latter part of this week on the lakes, which is expected to restore the market to its normal condition.

Indianapolis

April 27—The continued low temperature has kept the consumption of coal up to an average almost equal to the winter months. The dealers have been kept so busy delivering that they have made no attempt as yet to solicit summer business. During May, however, local dealers will make their usual contracts with customers for anthracite coal.

The demand for Indiana coal is a shade better than usual—especially is this true of steam coal. The 16,000 Indiana miners all have work now from three to five days each week. The railroads are moving the coal satisfactorily in the coal business.

The Indiana mine operators have appealed to consumers of coal, and especially the public institutions, for a more

generous use of Indiana coal, protesting against the discrimination in favor of Ohio and West Virginia coal. In many instances they have induced institutions to give Indiana coal a thorough test.

Pittsburg

April 30—The week opened with all the mines in the district in full operation, but today there was a scarcity of cars. Operators fear that this is the beginning of a shortage and do not expect to run the mines as fully as they have during the past two months. Some large shipments have been made to lake ports for the northwestern markets and the contracts taken for this trade greatly exceed former years. Some doubt is expressed as to filling all of these contracts, due to the inability of the railroads to handle the tonnage. Prices are firm on the basis of $1.20@1.25 for mine-run coal at mine, and an advance likely will be made if the car shortage becomes more serious. Some large shipments of coal to Southern ports were made by the Monongahela River Consolidated Coal and Coke Company, the rivers being navigable all week.

Connellsville Coke—Another decline in coke prices for prompt shipment is noted this week, furnace coke being quoted at $2.50@2.60 and foundry at $3.25@3.40. For second-half delivery prices are from 15 to 25c. higher. The *Courier* in its summary for the week gives the production in both regions at 416,583 tons. The shipments aggregated 14,503 cars, distributed as follows: To Pittsburg, 4726 cars; to points west of Connellsville, 8854 cars; to points east of Connellsville, 923 cars.

Foreign Coal Trade

May 1—The coal production of the colony of Natal, South Africa, for the year is reported as follows:

	1906.	1907.	Changes.
Exported by rail	172,827	166,460	D. 6,367
Exported by sea	42,618	215,057	I. 172,439
Sold to steamships	503,250	487,892	D. 74,358
Natal railways	208,223	221,444	I. 13,221
Sold in colony	144,489	146,940	I. 2,451
Total	1,129,407	1,238,713	I. 109,306

The coal exported by rail goes to the Kimberly diamond district chiefly.

Exports of coal and coke from the United States for the three months ended March 28 are reported by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
Anthracite	376,013	469,463	I. 93,450
Bituminous	1,681,414	1,784,653	I. 103,239
Total coal	2,057,427	2,254,116	I. 196,689
Coke	186,201	205,907	I. 19,706
Total	2,243,628	2,460,023	I. 216,395

These figures do not include coal bunkered, or sold to steamships engaged in foreign trade. The coke exported went chiefly to Mexico and eastern Canada; the distribution of the coal was as follows:

	1906.	1907.	Changes.
Canada	[illegible]	[illegible]	[illegible]
Mexico	[illegible]	[illegible]	[illegible]
Cuba	216,950	199,826	D. 17,124
Other W. Indies	103,714	136,321	I. 30,607
Europe	10,925	18,532	I. 7,607
Other countries	4,250	[illegible]	[illegible]
Total	2,057,427	2,254,116	I. 196,689

The exports to Europe were chiefly to Italy; those to other countries, to South America. The exports to Canada—65.9 per cent. of the total in 1907—were, in detail, as follows:

	1906.	1907.	Changes.
Anthracite	466,490	468,864	I. 2,374
Bituminous	1,025,087	1,027,554	I. 2,467
Total	1,388,586	1,485,888	I. 97,302

There was a considerable increase in anthracite, but only a small one in bituminous coal.

Imports of coal and coke into the United States for the three months ended March 31 are reported as follows, in tons:

	1906.	1907.	Changes.
Great Britain	58,990	10,535	D. 48,455
Canada	450,663	347,223	D. 103,440
Japan	4,962	47,900	I. 42,938
Australia	53,399	86,163	I. 32,764
Other countries	4,060	483	D. 3,577
Total coal	571,000	491,304	D. 79,776
Coke	41,174	44,777	I. 3,603
Total	612,294	536,097	D. 76,197

Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal is on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Iron Trade Review

New York, May 1—There are signs of an increased buying movement apparent, and the demand for fourth-quarter pig iron is more pronounced than it has been for some weeks. Buyers seem to be making up their minds that it is of little use waiting, or else they want to protect themselves by contract in good season. In finished material also there are signs of renewed buying and inquiries are more frequent. This is especially the case with structural steel, while bars are also in strong demand. In other lines a good business seems to be assured.

United States Steel Corporation—The preliminary statement for the quarter ended March 31, shows net earnings of $39,122,492; which compares with $36,634,190 for the March quarter of 1906, and $41,744,964 for the December quarter. The income statement for the quarter is as follows:

Net earnings	$39,122,492
Sinking funds, depreciation, etc	$5,154,521
Interest on bonds, etc	6,936,963
Fund for new additions, etc	14,500,000
Total charges	$26,591,484
Dividends	$846,432
Balance	$12,531,008
Net surplus for quarter	$3,684,576

Dividends declared for the quarter were 1¾ on preferred, and 0½ per cent. on common stock. The unfilled orders on the books March 31, amounted to a total of 8,043,858 tons, which compares with 8,489,718 tons on Dec. 31, and 7,018,712 tons on March 31, 1906. The losses by the floods in Pittsburg and the Ohio valley are estimated at about $1,500,000, but this is not officially stated.

Iron and Steel Exports — Exports of iron and steel, including machinery, from the United States for March, and the three months ended March 31, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes
March	$14,290,183	$16,412,616	I. $2,122,433
Three months	40,019,546	44,686,594	I. 4,667,048

The total increase for the two months was 9.9 per cent. The leading items of export for the three months were, in long tons:

	1906.	1907.	Changes.
Pig iron	2,000	2,000	I. 2
Billets, ingots & blooms	69,147	30,861	D. 38,286
Bars	19,877	20,540	I. 663
Rails	91,079	72,712	D. 18,367
Sheets and plates	20,219	31,220	I. 11,001
Structural steel	22,189	30,266	I. 8,077
Wire	9,625	9,625	D. 548
Nails and spikes	17,704	13,697	D. 4,007

The main increases were in structural steel and wire. There was a considerable decrease in rails.

Iron and Steel Imports — Imports of iron and steel, including machinery, from the United States for March and the three months ending March 31 are valued by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
March	$3,028,592	$3,702,060	I. $ 673,468
Three months	7,328,782	10,019,108	I. 2,690,326

The increase for the three months was 36.7 per cent. The chief items of the iron and steel imports for the three months were, in long tons:

	1906.	1907.	Changes.
Pig iron	72,344	154,679	I. 82,335
Scrap	6,759	4,053	D. 2,706
Ingots, blooms, etc	5,431	4,501	D. 930
Bars	9,536	8,412	D. 1,124
Wire-rods	4,255	4,271	I. 16
Tin-plates	11,242	12,649	I. 1,407

There was a large proportional increase in pig iron, chiefly from Great Britain.

Iron Ore Movement—Exports and imports of iron ore in the United States for the three months ended March 31 are reported as follows, in long tons:

	1906.	1907.	Changes.
Exports	10,662	1,692	D. 8,970
Imports	276,781	264,896	D. 11,885

Most of the exports were to Canada. Imports were from Cuba, Spain and Algeria.

Imports of manganese ore for the three months were 50,899 tons in 1906, and 50,069 tons in 1907; a decrease of 830 tons.

Baltimore

April 30—Imports for the week included 889 tons spiegeleisen, 779 tons ferromanganese and 215 casks of ferrosilicon. There was also received 420 tons manganese ore. Receipts of iron ore were

4200 tons from Cuba, and 6630 tons from Beni-seif; 10,830 tons in all.

Exports included 2948 tons steel rails and 153 tons splice-bars to Buenos Aires.

Birmingham

iron is strong and during the past 10 days some good orders have been booked for future deliveries. What little iron can be obtained for delivery during the third quarter of the year is quoted at over $19 per ton, No. 2 foundry. Fourth-quarter iron is being held strongly at $19. The production shows a little improvement. The Woodward Iron Company now has two furnaces in operation. The Shelby Iron Company is doing well with its two furnaces in blast, one on charcoal and the other on coke iron. The furnace at Anniston will be ready for the torch in a few weeks. The little Quinn charcoal furnace at Gadsden has changed hands and will be started up in a few weeks. The iron to be manufactured here will be used entirely by the car-wheel works.

Small lots of spot iron are being dealt in again in this section, $23.50 per ton, No. 2 foundry, being the quotation mentioned.

Chicago

April 29—To all appearance the iron market is slowly but surely strengthening. Contracts for second-half deliveries are increasing and the amount of quick-delivery orders has not abated.

Southern holds firmly to $18.50@19 Birmingham, for second-half delivery, and $27@27.50 Chicago for quick deliveries. Northern is held at $27@28 for speedy delivery and about $24.50 for second-half delivery on contracts. Northern iron is scarce for immediate deliveries and Southern agents profess to be independent concerning the same kind of business. There is every evidence of advance to greater firmness. The local market continues extraordinarily strong for finished materials.

Coke is still easy, the supply being plentiful and the demand not yet great. Connellsville 72-hour sells for $6.15, Chicago.

Cleveland

April 30—Since no iron ore has been received at Cleveland as yet, supplies on docks are diminishing rapidly. Valley furnaces are taking up considerable ore, and it is expected that when navigation opens there will be a very light supply on hand. No trouble is expected with lake hands this season. The wages of mates have been raised voluntarily by the Lake Carriers' Association.

Pig iron is quiet. Bessemer is quoted $21.90; No. 2 foundry, $23; No. 2 Southern, $22.85. The Youngstown Sheet and Tube Company has advanced the price of merchant pipe one point in the base throughout.

Coke is weak. Future-delivery furnace is $2.65; foundry, $3.35, at ovens.

Philadelphia

May 1—Very little change has taken place in the pig-iron market, and the sentiment among the trade is that there is very little probability of any material changes. There is some talk of increasing importations, and the surface facts of the situation make this seem probable, but nothing definite has transpired upon which to base predictions. Basic iron is developing strength under urgent inquiry; malleable is strong under fair sales; forge is holding its own without any difficulty. A few inquiries are being made with reference to late deliveries, but the parties interested on the selling side manifest indifference. Foundry irons are selling in a moderate way, and there is but little inquiry this week for future deliveries. Gray forge is quoted today at $22.75; basic, $24; No. 2 X, $26@26.50. Scotch iron is nominal at $23.50, and English iron at $21.25.

Steel Billets—For the time being very little is transpiring in the billet market, and quotations are given at $32.

Bars—The bar-iron demand is stronger from store, but our mill people are not able to report the placing of large orders. The car builders might be able to obtain slight concessions were they to place some of the orders which have been talked about. Steel bars are scarce and strong.

Sheets—The mills are shipping out a great deal of sheet, and are keeping their engagements promptly, which is a matter of satisfaction to customers. The retail distribution is increasing a little.

Pipes and Tubes—The market is strong, the mills are badly oversold and buyers are showing an anxiety to make arrangements for the delivery of material during the third quarter of the year. Discounts remain unchanged.

Plates—There is a growing demand for iron and steel plate during the second quarter, but only a small amount of business actually placed.

Structural Material—There is more activity on the part of the smaller buyers, who need a few hundred tons promptly. Most of the business is of this sort.

Old Material—The scrap market is quiet and scrap dealers are busily endeavoring to increase their supply, as they are confident of a heavy summer demand.

Pittsburg

April 30—There was no material change in the iron and steel markets during the week, demand for all lines of finished products continuing heavy and mills unable to catch up on deliveries. One of the events of the week was the opening of the cotton tie market, a month earlier than usual, and fixing the price for the season at 95c. a bundle, an advance of 10c. The Carnegie Steel Company is the principal producer of cotton ties in this district. It is expected that the total business will amount to fully 50,000 tons, which is greatly in excess of previous years. The opening of the order books for steel rails for 1908 has not brought out any large contracts.

Specifications for structural material are larger and promises for delivery range from two to three months. The large plate mills are filled with business for the rest of the year. For prompt shipment premiums are freely paid. Eastern mills are still able to supply plates for early delivery, but are not receiving 2c., or $6 premium, as they were a couple of months ago.

The merchant pipe trade is the most congested of all finished lines. The National Tube Company is not prepared to name prices, as it cannot promise delivery before Oct. 1 and the Youngstown Sheet and Tube Company has announced an advance of one point, or $2 a ton, on steel pipe. Its extreme discount in large lots is now 73 and 5 per cent. or $6 a ton above the quotations withdrawn by the leading interest early last month. The principal wrought-iron pipe producer this week revised its quotations and advanced the price of 7- and 8-in. pipe $4 a ton. The American Sheet and Tin Plate Company is not booking orders for tin-plate beyond Oct. 1, but the independents are accepting business for the fourth quarter at $4 a box, an advance of 10c. a box over the ruling price.

Pig Iron—Bessemer pig iron is practically sold up for the rest of the year and this indicates that large steel interests have bought and the sales have not been made public. There are rumors that the Steel Corporation, the Jones & Laughlin and the Lackawanna Steel companies entered the market for second-half early and the heavy buying is responsible for the sharp advance in prices noted last week. The only sale recorded this week was 1200 tons of bessemer iron for May and June delivery at $23, Valley furnaces, but this was merely an accommodation to an old customer and does not represent the price for second quarter. Bessemer for second quarter is nominally $24, No. 2 foundry, $25 and gray forge, $21.50, all f.o.b. Valley furnaces. For second-half delivery $22 is the minimum price for bessemer and basic.

Steel—Early deliveries of bessemer and open-hearth steel billets are hard to obtain at any price. A small lot of bessemer billets is reported to have been sold this week at $29, Youngstown, equal to $29.95, Pittsburg. Steel bars are strong at 1.60c. and a few sales are said to have been made for prompt delivery at $1 premium. Plates remain firm at 1.70c.

Sheets—There is no change in the sheet

market. Mills are not catching up on deliveries and new business is still being booked. Black sheets are strong at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—Prices are lower, quotations for prompt shipment being $70 [illegible]

Cartagena, Spain

April 13—Messrs. Barrington & Holt report shipments of iron ore for the week: Great Britain, 13,400 tons; Rotterdam 16,400; Baltimore, 2950; total, 32,750 tons. Shipments are active, chiefly on contracts, little new business being reported. Freight rates are easier.

Quotations for iron ores are: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; low phosphorus, 10s. 9d.; specular ore, 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganiferous ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 14s. 6d. No higher grades on the market.

Pyrites—The quotation for iron pyrites, 40 per cent. iron and 43 sulphur, is 11s. 3d. per ton, f.o.b. shipping port.

Chemicals

New York, May 1—The market is active, with good demand for all kinds of heavy chemicals.

Copper Sulphate — Demand remains steady, with no surplus of supplies. Prices remain unchanged, and we quote $7.50 per 100 lb. for carload and larger lots; $7.75 per 100 lb. for smaller parcels.

Exports of copper sulphate from the United States for the three months ending March 31 were 6,763,582 lb. in 1906, and 3,877,832 lb. in 1907; a decrease of 2,885,750 lb. The exports this year contained the equivalent of about 433 tons of fine copper.

Phosphates—Exports of phosphates from the United States for the three months ending March 31 were, in long tons:

	1906.	1907.	Changes.
Crude	252,412	267,572	I. 15,160
All other	5,856	7,077	I. 1,221
Total	258,268	244,649	D. 13,619

The chief exports this year were 68,456 tons to Germany; 43,270 to Great Britain; 12,874 to France; 15,826 to Italy.

Metal Market

NEW YORK, May 1

Gold and Silver Exports and Imports

At all United States Ports in March and year

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1907	$2,126,178	$ 5,007,319	Imp. $2,881,146
" 1906	5,918,627	5,630,695	Exp. 287,932
Year 1907	5,950,894	11,607,691	Imp. 5,656,797
" 1906	20,141,022	10,316,087	Exp. 9,824,935
Silver:			
Mar. 1907	7,058,401	3,936,139	Exp. 1,122,922
" 1906	5,213,811	3,509,838	" 1,703,973
Year 1907	14,669,396	11,315,168	" 3,354,228
" 1906	19,165,608	12,676,998	" 6,488,610

These statements [illegible] of gold and silver [illegible] States. These [illegible] Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending Apr. 24 1907 [illegible]

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ [illegible]	$ [illegible]	$ [illegible]	$ [illegible]
1907	1,791,536	3,276,857	1,344,180	[illegible]
1906	[illegible]	13,760,41[illegible]	[illegible]	[illegible]
1905	24,871,556	4,392,123	1,8[illegible],54	1,1[illegible]

Exports of gold for the week were to South America; of silver to London. Imports for the week, both gold and silver, were from the West Indies and Panama.

The joint statement of all the banks in the New York Clearing House for the week ending April 27 shows loans $1,123,417,600, a decrease of $1,587,300; deposits, $1,106,083,300, a decrease of $1,980,200, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie	$[illegible],734,000	$[illegible],126,400
Legal tenders	[illegible],804,200	57,766,200
Total cash	$267,538,200	$288,892,600
Surplus	$10,[illegible],100	$ 12,[illegible],775

The surplus over legal requirements shows an increase of $641,750, as compared with the previous week this year.

Specie holdings of the leading banks of the world, April 27, are reported as below, in dollars:

	Gold.	Silver.	Total.
Asst'l New York	.....	.....	$[illegible],126,400
England	$[illegible],956,920	.....	[illegible],956,920
France	517,807,880	$196,117,120	714,[illegible],000
Germany	171,135,000	58,875,000	230,010,000
Spain	77,250,000	126,[illegible],000	203,[illegible],000
Netherlands	25,[illegible],000	28,775,000	54,551,000
Belgium	[illegible],480,000	[illegible],245,000	24,[illegible],000
Italy	162,110,000	25,095,000	187,205,000
Russia	597,635,000	29,440,000	627,075,000
Aust.-Hungary	227,300,000	62,290,000	289,590,000
Sweden	20,760,000	.....	20,760,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Imports of gold and silver at the port of San Francisco for the three months ending March 31 were as follows:

	Gold.	Silver.
Coin	$ [illegible],521	$ [illegible],131
Bullion	544,142	740,855
Total	$1,277,[illegible]	$ [illegible],986

Exports for the three months are reported as follows:

	Gold.	Silver.
Coin	$ [illegible],000	$ [illegible],240
Bullion	[illegible],000	27,471
Total	$ [illegible],000	$ [illegible],711

Exports this year have been light. The silver was chiefly in Mexican dollars.

The United States Treasury Department on April 29 bought 100,000 oz. fine silver at 66.355c. per oz., delivered at the Philadelphia mint.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to April 18:

	1906.	1905.	Changes.
India	£ 5,751,978	£4,376,908	D. £ 1,375,070
China	[illegible],000	[illegible],000	[illegible],000
Straits	.....	201,450	I. 201,450
Total	£ 5,751,978	£4,580,458	D. £ 1,171,520

Receipts for the week were £102,000 from New York, £352,000 from the Straits and £47,000 from China; a total of £501,000. Exports were £227,500, all to India. The receipts from the East indicate an unusual movement.

Indian exchange has shown a weaker tendency, but the Council bills offered in London were all taken at an average of 16.09d. per rupee. The demand for silver for India has been moderate.

Prices of Foreign Coins

	Bid	Asked
Mexican dollars	50 [illegible]	50 [illegible]
Peruvian sols and Chilian pesos	[illegible]	[illegible]
Victoria sovereigns	4.85	4.90
Twenty francs	3.85	[illegible]
Spanish 25 pesetas	4.78	4.83

Silver and Sterling Exchange

	Silver				Silver.	
April	Sterling Exchange.	New York, Cents.	London, Pence.	April	Sterling Exchange.	New York, Cents.	London, Pence.
25	4.86	65 [illegible]	[illegible]	[illegible]	4.87	65	[illegible]
26	4.86	65[illegible]	30 [illegible]	30	4.87 [illegible]	65	30 [illegible]
27	4.86	65 [illegible]	[illegible]	1	4.88 [illegible]	[illegible]	30 [illegible]

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

Daily Prices of Metals in New York.

April-May.	Copper.			Tin.	Lead.	Spelter.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per Ton.	Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
25	25 @25.5	24 @24	[illegible]	42.5	6.00	6.60	6.45
26	25 @25.5	24 @24	[illegible]	42.5	6.00	6.60	6.45
27	25 @25.5	24 @24	.....	42.5	6.00	6.55 @6.60	6.40 @6.45
29	25 @25.5	24 @24	[illegible]	42	6.00	6.55 @6.60	6.40 @6.45
30	25 @25.5	24 @24	[illegible]	42.5	6.00	6.55 @6.60	6.40 @6.45
1	25 @25.5	24 @24	[illegible]	42.5	6.00	6.55 @6.60	[illegible] @6.45

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former 2 months. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper — Further progress has been made during the past week toward the re-establishment of a more proportionate parity between the European and domestic markets. While consumers in this country are still holding aloof, buyers abroad took hold quite vigorously and rather large transactions in electrolytic are reported for export, which did not fail to have a stimulating influence. The market for Lake copper, however, continues quiet and unchanged, while business in casting

lags and that grade continues to sell at an unusually large discount. As the result of the improving demand the market closes firmer at 25@25½ for Lake copper; 24¼@24½ for electrolytic in ingots, cakes and wirebars; 22¾@23¼ for casting copper.

There has been quite an upset of the bear element in the London standard market, which, upon being forced to cover, found that the supplies had been withdrawn either for export to America or for European consumption. As a result, quite a sharp upward movement ensued, and the market closes considerably higher, the last quotations being £106 15s. for spot, £104 15s. for three months'.

Statistics for the second half of April show a decrease in the visible supplies of 800 tons.

Refined and manufactured sorts we quote: English tough, £113@114; best selected, £114@115; strong sheets, £123.

Exports of copper from New York for the week were 1138 tons. Our special correspondent gives the exports from Baltimore for the week at 755 long tons of copper.

The first shipments of Lake copper by water, for the season, were made this week.

The offices of L. Vogelstein & Co. have been removed to the American Security building, No. 100 Broadway, New York.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—Notwithstanding the continued improvement in prices abroad, where quite an active business is taking place from day to day, consumers in this country have not changed their attitude and persist in their policy of covering only their immediate requirements. The closing is cabled from London as £195 10s. for spot, £193 10s. for three months. Business here has been done at 42¾c.

Statistics for the month of April show a decrease in the visible supplies of 1200 tons.

Lead—The market is unchanged at 6c. New York.

There has been quite a heavy demand for lead abroad, particularly for near-by shipment, supplies for which are scarce. The close is higher at £20 5s. for Spanish lead, £20 7s. 6d. for English lead.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead presents no novelty; it is quiet, with sales at 5.92½c. for all the various brands.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 13, that the price of lead has been 90.50 reales per quintal, silver being 13.25 reales per ounce; exchange, 27.95 pesetas to £1. The lead price is equivalent, on current exchange, to £18 3s. 3d. per long ton, f.o.b. Cartagena. Exports for the week were 600 tons desilverized and 490 tons argentiferous to Great Britain; 66 tons desilverized, and 227 tons argentiferous to Marseilles; 300 tons desilverized to Amsterdam; 50 tons antimonial lead to Hamburg; 1733 tons in all.

Spelter—The market is rather dull. Offerings are not very heavy, but the demand is of such insignificant proportions that the small quantities which come on the market have an undue influence, so that prices close somewhat lower at 6.55 @6.60 New York, 6.40@6.45 St. Louis.

The London market is slightly better and closes at £26 for good ordinaries, £26 5s. for specials.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 13, that the market remains quiet. Shipments for the week were 90 tons calamine to Liverpool and 1900 tons blende to Antwerp.

Antimony—The market is lower, with Cookson's at 23½c., Hallett's at 20½@21c., and ordinary brands at 20c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is $32 per ounce for ordinary metal and $35 for hard. Scrap is quoted at $24 per ounce.

Minor Metals—For minor metals and their alloys, wholesale prices are, f.o.b. works:

	Per Lb.
Cadmium, 99.5% f. o. b. Hamburg	1.40@1.46
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-chrome, 70%	11½c.
Ferro-chrome (6% carbon, per lb. Cr.)	10½c.
Ferro-Chrome (1% C. for each 1% Cr.)	11@11½c.
Ferro-Chrome (60-64% Cr., 3-4% C.)	12@12½c.
Ferro Chrome (60-70% Cr., 1% C. or less)	38c.
Ferro-Molybdenum (50%)	90c.
Ferro-Titanium (20%)	80c.
Ferro-Tungsten (67%)	50c.
Ferro-Vanadium (25-50%, per lb. vanadium contents)	$5@10.
Magnesium, pure, N. Y.	1.50
Manganese, pure 98@99%, N. Y.	75c.
Manganese Copper (50%, N. Y.)	45c.
Molybdenum, 99%, pure, N. Y.	$1.70
Phosphorus, foreign red (f. o. b. N. Y.)	90c.
Phosphorus, American yellow (f. o. b. Niagara Falls)	42c.
Platinum, 99.8% pure metal	1.35
Ferro-Silicon, 50%, spot, N. Y.	$110 ton.

Variations in price depend chiefly on size and conditions of orders:

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Imports and Exports of Metals

Copper — Exports of copper from the United States for the three months ended March 31 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each:

	1906.	1907.	Changes.
Great Britain	4,775	5,281	I. 506
Belgium	637	379	D. 58
France	9,525	7,781	D. 1,744
Italy	1,758	2,163	I. 405
Germany and Holland	25,974	20,772	D. 5,202
Russia	682	888	I. 206
Other Europe	3,045	1,798	D. 1,247
Canada	330	386	I. 56
China	800	...	D. 600
Other countries	37	21	D. 16
Total metal	47,563	39,469	D. 8,094
In ores and matte	1,937	1,011	D. 926
Total	49,500	40,480	D. 9,020

The total decrease was 18.2 per cent. The actual quantity of ore and matte exported this year was 19,298 tons, of which 16,835 tons went to Canada, 2320 tons to Mexico and 123 tons to Germany.

Imports into the United States of copper and copper material for the three months ended March 31, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico	9,776	4,280	14,056
Canada	2,546	1,482	4,028
Great Britain	6,165	...	6,165
Japan	710	...	710
South America	...	1,296	1,296
Other countries	4,769	315	5,084
Total imports	23,966	7,373	31,339
Re-exports	178	...	178
Net imports	23,788	7,373	31,161
Net imports, 1906	19,106	6,095	25,201

The total increase in the net imports was 5960 tons, or 23.7 per cent. The actual tonnage of ores and matte imported from Mexico this year was 23,827 tons; from Canada and Newfoundland, 34,496; from South America, 10,955 tons.

The exports and net imports compare as follows:

	1906.	1907.	Changes.
Exports	49,500	40,480	D. 9,020
Net imports	25,201	31,161	I. 5,960
Excess, exports	24,299	9,319	D. 14,980

This shows a decrease of 61.6 per cent. in the excess of exports this year.

Tin—Imports of tin into the United States for the three months ending March 31 were as follows, in long tons:

	1906.	1907.	Changes.
Straits	3,904	4,339	I. 435
Australia	159	159	...
Great Britain	6,493	6,029	D. 464
Holland	116	502	I. 386
Other Europe	447	366	D. 81
Other countries	6	1	D. 5
Total	11,115	11,386	I. 271

[illegible]

Lead—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the three months ended March 31, in short tons, of 2000 lb.:

	1906.	1907.	Changes.
Lead, metallic	[illegible]	[illegible]	I. [illegible]
Lead in ores and base bullion	20,027	14,884	D. 5,143
Total imports	[illegible]	14,990	D. [illegible]
Reexports	1,955	5,299	D. 3,656
Net imports	12,418	14,191	I. 1,773

Of the imports this year 12,395 tons were from Mexico, and 1492 tons from Canada. Exports of domestic lead were 64 tons in 1906, and 104 tons in 1907; an increase of 40 tons.

Spelter—Exports of spelter from the United States for the three months ended March 31 were 1664 short tons in 1906, and 218 tons in 1907; a decrease of 1446 tons. Exports of zinc dross were 3419 short tons in 1906, and 3259 tons in 1907; a decrease of 160 tons. Exports of zinc ore were 8002 tons in 1906, and 6071 tons in 1907; a decrease of 1931 tons.

Imports of spelter for the three months were 264 short tons in 1906, and 216 tons in 1907; a decrease of 48 tons.

Antimony—Imports of antimony into the United States for the three months ended March 31 were as follows, in pounds:

	1906.	1907.	Changes.
Metal and regulus	2,089,521	2,924,058	I. 834,537
Antimony ore	487,641	755,595	I. 269,954

There was a large increase this year, both in metal and in ore.

Nickel—Imports of nickel ore and matte into the United States for the three months ended March 31 were 2977 tons in 1906, and 3555 tons, containing 4,487,585 lb. metal, in 1905. The metal contents were not reported last year.

Exports of nickel, nickel oxide and nickel matte for the three months were 3,234,180 lb. in 1906, and 2,872,832 lb. in 1907; a decrease of 361,348 lb. this year.

Platinum—Imports of platinum into the United States for the three months ended March 31 were 3042 lb. in 1907, and 2536 lb. in 1906; a decrease of 506 lb. this year.

Quicksilver—Exports of quicksilver from the United States for the three months ended March 31 were 205,834 lb. in 1906, and 159,536 lb. in 1907; a decrease of 46,298 lb. this year.

Aluminum—Exports of aluminum from the United States for the three months ended March 31 were valued at $29,503 in 1906, and $84,283 in 1907; an increase of $54,780 this year.

Missouri Ore Market

Joplin, Mo., April 27—The highest price paid for zinc was $52 per ton, on an assay base of $49, ranging down to $47 per ton of 60 per cent. zinc. The average price was $47.28. The highest price paid for lead was $82, and the average price $[illegible].

The shipments of four months this year exceed the corresponding period of last year by 23,152,060 lb. zinc ore, 7,995,480 lb. lead ore, and in value, $562,395.

A strike in the mines of the American Zinc, Lead and Smelting Company has thrown 300 men out of employment and shut down all five of this company's mines and mills, the most extensive in the district. The machine-drill men, their helpers and the tub-hookers struck for an advance of 25c. each per day, which would make their wages $3, $2.75 and $2.25. The cause of the strike is dissatisfaction because of the high prices paid shovelers, who, working by the piece, earn as high as $1 per hour.

Following are the shipments of zinc and lead from the various camps of the district for the week ending April 27:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	922,780	$112,346
Joplin	2,654,830	[illegible]	81,014
Galena-Empire	1,214,380	190,440	36,586
Alba-Neck City	1,093,780	1,450	27,402
Badger	[illegible]	[illegible]	17,219
Duenweg	391,220	149,370	15,568
Oronogo	520,200	32,580	13,465
Granby	555,000	60,000	12,500
Prosperity	384,340	68,680	11,428
Spurgeon	398,240	79,890	11,186
Aurora	541,510	31,000	9,737
Carthage	160,120	[illegible]	4,000
Zincite	153,130	1,460	3,733
Sherwood	127,210	2,940	3,170
Carl Junction	109,910	7,880	2,952
Baxter Springs	107,190	[illegible]	1,518
Sarcoxie	56,710	[illegible]	1,361
Ash Grove	[illegible]	32,460	1,265
Totals	12,187,660	1,963,460	$366,441
Four months	204,943,780	31,845,280	$6,176,348
Zinc value, the week, $288,146; 4 mos.			$4,893,044
Lead value, the week, 78,295; 4 mos.			1,314,304

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN.		
Month	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51	....	May	78.40	....
June	43.83	....	June	80.96	....
July	43.25	....	July	74.31	....
August	43.56	....	August	75.36	....
September	42.58	....	September	79.64	....
October	41.55	....	October	79.84	....
November	44.13	....	November	81.98	....
December	43.68	....	December	81.89	....
Year	43.24	....	Year	77.40	....

Wisconsin Ore Market

Platteville, Wis., May 1—The zinc-ore market on the whole was satisfactory last week. Prices were not changed materially, the ruling quotation being $49 per ton for 60 per cent. zinc ore. Nearly all the ore produced was sold, but not loaded. A large percentage of all the ores is now being roasted, and this is attracting new buyers. A representative of one of the Joplin district smelters, not heretofore represented, is looking over the district and stated that a regular buyer would be located here before long.

Lead is now abundant and in good demand. The Federal people take nearly all of the production, last week's prices prevailing. Dry-bone and sulphur are scarce; prices not changed.

The shipment for the district, by camps, for the week ending April 27 was as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral [illegible]	[illegible]	[illegible]	[illegible]
Linden	[illegible]	[illegible]	[illegible]
Prattsville	[illegible]	[illegible]	[illegible]
Galena	[illegible]	[illegible]	[illegible]
Bentley	[illegible]	[illegible]	[illegible]
Cedar City	[illegible]	[illegible]	[illegible]
Rowes	[illegible]	[illegible]	[illegible]
Davis [illegible]	[illegible]	[illegible]	[illegible]
[illegible] Hazel Green	[illegible]	[illegible]	[illegible]
Total for week	[illegible]	[illegible]	[illegible]
Year to April 27	29,327,797	1,310,370	143,160

Owing to the shortage of cars several of the camps were unable to ship all the ore produced.

Mining Stocks

New York, May 1—The general stock markets have fluctuated in rather a meaningless way, and are evidently depending mainly on professional trading for the most part. The curb market has been dull, without any serious changes in price. The dealing in mining stocks on the Produce Exchange is increasing slowly, but has not yet assumed much importance.

A sale of 100 shares of Homestake, of South Dakota, was reported at $56 per share, a drop of $19 from the last reported transfer.

Boston

April 30—It has been another quiet week in the mining share market, and as a rule some improvement is to be noted in prices. Monetary conditions are greatly improved locally, with rates from 4½ to 5½ per cent. for carrying. The Copper Range suit against A. C. Burrage and T. W. Lawson for accounting in the Trimountain suit, after being in court for two or three days, was settled out of court after some rather spicy testimony. The Copper Range report, issued today, concludes in this manner: "All litigation between this company and Albert C. Burrage has been settled by agreement of the parties, with the result that under the terms of this settlement Mr. Burrage pays to this company the entire amount of the Trimountain debt—$8,40,000—assumed under agreement of Aug. 25, 1903."

The day of this settlement Copper Range jumped $1.75 to $82.25. The final tonight is a trifle above a week ago at $81.87½. Amalgamated is a trifle better at $95 ex-dividend. It has sold both above and below this.

The Old Dominion Company of New Jersey has decided to increase its capital by 12,000 shares and will offer it to stock-

holders at $50. Inasmuch as the Old ... fifteen-sixteenths of the stock of the New Jersey company it will be obliged to take substantially all of the increase. The Maine company will probably make a similar increase on the same terms.

Colorado Springs

April 27—Trading on the local mining exchange has been dull and featureless during the entire week. The recent heavy snows in the Cripple Creek district have retarded mining operations to some extent, and interfered with the transportation of the ore from the mines. To this can be attributed, to some extent, the extreme dullness of the stock market.

STOCK QUOTATIONS

Name of Comp.	Clg.
Am.New.M.&P.Co	
Amalgamated ...	..
British Col. Cop..	
Buffalo Cobalt .	
Butte Cop. & Zinc.	
Cobalt Contact...	
Colonial Silver...	3
Cum. Ely Mining.	9
Davis Daly.	16
Foster Cobalt.....	11
Furnace Creek...	1
Mass.....	
Nipissing Mines..	14
Nowhouse M. & S.	
Nipissing Mines..	14
West Columbus..	4
Bethlehem steel..	
Federal M.&S., pf.	
Inter. Salt.....	
Pittsburg Coal ...	
Penn. C. & I.....	1
U. S. Red. & Ref..	
Va. Car. Chem....	
Va. I. Coal & Coke	

Name of Comp.	Clg.
Copper Range...	8
North Butte.....	8
Old Colony.....	2
Tamarack*.....	1
Winona.....	

*Ex. Div. †Ex. Rights.

BOSTON CURB

Ariz. Com.....	2
Cananea Cent....	
East Butte.....	
Hancock Con...	
Majestic.....	
Superior & Pitts..	

Name of Com.	Clg.
Center Creek	
Cent. C. & C.	
Con. Coal..	
Tenn. Ran...	
Utah Bingh...	
Cent. Oil...	140
Columbia...	
Cons. Coal..	
Tenn. Ran...	
Utah Bingh...	

S. FRANCISCO Apr. 25	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Best & Belcher..	1.35
Con. Cal. & Va....	1.00
Overman.....	1
Savage.....	.92
Sierra Nevada ...	.55
Utah	.04
TONOPAH STOCKS	
Golden Anchor...	.37
Montana-Pitts.ex.	.18
Rescue	.17
GOLDFI'D STOCKS	
Black Ants.....	.12
Blue Bull.....	.51
Columbia Mt....	1.02
Comb. Frac	5.37
Daisy.....	2.00
Florence	6.87
Frances-Mohawk.	1.40
Great Bend	1.20
Red Hills..	.69
St. Ives.....	1.60
BULLFROG STOCKS	
Amethyst.....	.45
Mayflower Con....	.55
Montgomery Mt..	.25
Original.....	.17
MANHATTAN STOCKS	
Gold Wedge....	.11
Manhattan Mg....	.12
Ruby Wonder	.31
Stray Dog.....	.24
Yellow Horse...	.07

NEVADA May 1 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	18.00
Montana Tonopah	3.50
Belmont.....	4.50
Tonopah Midway	1.60
West End Con....	1.25
Jim Butler.....	1.14
GOLDFI'D STOCKS	
Sandstorm.....	.11
Kendall.....	.45
Red Top.....	4
Jumbo.....	4.75
Goldfield Mining.	1.55
Goldfield D. C....	.78
Mandalay.....	.75
Mohawk.....	16.00
Silver Pick.. . .	1.14
Laguna.....	1.65
BULLFROG STOCKS	
Mont. Shoshone..	10.00
Tramps Con.. .	.87
Gold Bar	.97
Bullfrog Mining..	.26
Bullfrog Nat. B...	.87
Homestake Con..	
MANHATTAN STOCKS	
Manhattan Con..	.73
Manhattn Dexter	.20
Jumping Jack	.16
Stray Dog.....	.23
Indian Camp.....	.14

COLO. SPRINGS Apr. 27	
Name of Comp.	Clg.
Acacia	9
Black Bell.....	
C. C. Con.....	
Dante	
Doctor Jack Pot..	7
Elkton.....	56½
El Paso.....	45
Findlay.....	67
Gold Dollar....	7
Gold Sovereign..	6
Isabella.....	24
Index.....	
Jennie Sample...	
Jerry Johnson....	4
Mary McKinney..	58½
Pharmacist.....	6¾
Portland.....	1.18
Un. Gold Mines.	8½
Vindicator.....	
Work.....	19

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated Copper..	May 27	$2.00	$3,000,000
Beck Tunnel, Utah.....	Apr.	0.04	40,000
Consolidation Coal.....	Apr.	1.50	153,750
Grand Central, Utah.....	Apr.	0.10	25,000
Inter. Nickel, pfd.....	May	1 1.50	131,123
Kendall, Mont.	Apr.	24 0.03	15,000
Mary McKinney, Colo....	Apr.	25 0.03	39,128
Mines Co. of America.....	Apr.	26 0.02	40,000
New Central Coal, Md	May	1 0.10	20,000
Nipissing, Ont.....	Apr.	20 0.15	180,000
N. Y. & Hon. Rosario....	Apr.	29 0.10	17,000
Penna. Steel, pfd.....	May	1 1.50	585,750
Philadelphia Co.....	May	1 0.75	434,296
Pocahontas Collieries, pfd..	May	1 1.50	22,500
Tenn. Coal, Iron & R.R	May	1 1.00	225,536
Tenn. C. I. & R.R., pfd.....	May	1 2.00	4,960
Tonopah Co., Nev.....	Apr.	22 0.05	350,000
United Copper.....	Apr.	29 1 75½	787,500
United Copper, pfd.....	May	15 3.00	150,000
United Zinc.....	Apr.	15 0.50	75,778
U.S. Cast Iron Pipe & Fdy..	June	1 1.00	150,000
U.S. C. I. Pipe & Fdy. pfd...	June	1 1.75	262,500
U. S. Steel Corp.....	July	1 0.50	2,437,500
U. S. Steel Corp., pf.....	May	31 1.75	6,000,000
Vindicator Con., Colo.....	Apr.	25 0.03	45,000

Assessments

Company.	Delinq.	Sale.	Amt.
Belcher, Nev.	Apr. 16	May 9	$0.15
Caledonia, Nev.. .	Apr. 10	May 1	0.10
Challar, Nev.	Apr. 22	May 16	0.10
Con. Imperial, Nev..	Apr. 24	May 14	0.10
Con. Imperial, Nev..	May 7	May 29	0.01
Con. St. Gothard, Cal..	Apr. 24	May 14	0.10
Gould & Curry, Nev.	Apr. 10	May 1	0.10
Hale & Norcross, N	Apr. 3	Apr. 30	0.15
Lost Packer, Idaho.	May 6	May 27	1.00
Lucky Dutch'n, Nev.	May 4	May 25	0.01
Morrison, Utah.....	Apr. 16	May 10	0.01
Overman, Nev.....	May 17	June 7	0.10
Segregated, Nev.	May 13	June .	0.10
Union Con., Nev	May 8	May 29	0.10
Utah & N. Y., Utah..	Apr. 27	May 16	0.01
Yellow Jacket, Nev.	Apr. 13	May 22	0.10

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30 113	31.769
February	66.108	68.835	30 464	31.852
March	64.597	67.519	29.854	31.325
April	64.765	65.192	29.984	30.275
May	66.976		30.968	
June	65.309		30.185	
July	66.108		30.113	
August	65.949		30 529	
September	67.927		31.483	
October	69.523		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30 868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	New York.				London.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	24.224	18.688	25.760	84.793	98.825
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.685		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.350		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.606	
March	36.662	41.313	September	40.516	
April	38.900	40.938	October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year.	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.350	6.000	15.922	19.703
April	5.494	6.000	15.959	19.975
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.625	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.950	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.078	6.685	5.931	6.545	25.781	25.900
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.863	
October	6.222		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

CHEMICALS, MINERALS, RARE EARTHS, ETC. CURRENT WHOLESALE PRICES.

ABRASIVES—
Bort, good drill quality, carat $85.00
Carborundum, f.o.b. Niagara Falls, powd. lb. .08
Grains " 10@ 17
Corundum, " 07@ 10
Crushed Steel, f.o.b. Pittsburg " .05½@ .06
Emery, in kegs: Turkish flour " .01½@ .02
Grains " .02@ .02½
Naxos flour " .01@ .02
Grains " .02@ .04
Chester flour " .01½
Grains " .03@ .04½
Peekskill, f.o.b. Eastern Pa., flour " .01½@ .01½
Grains, in kegs " .02@ .02½
Garnet, per quality...sh. ton 25.00@30.00
Pumicestone, Am. Powd. lb. 1.00@2.00
Italian, powdered " .01½@ .01½
Lump, per quality " .05@ .20
Rottenstone, ground " .02@ .03
Lump, per quality " .05@ .25
Rouge, per quality " .05@ .30
Steel Emery, f.o.b. Pittsburg " .07½@.07¾

ACIDS—
Acetic 28% lb. .02½@ .02½
Boric " .09¾@.10
Hydrofluoric, 30% " .02¾@ .03
" 48% " .06
" 60% " .10
Hydrochloric acid, 20°, per lb. 1.25@1.50
Nitric acid, 38°, per lb. 4.25@4.62½
Sulphuric acid, 50°, bulk, per ton.. $12 up.
60°, 100 lb. in carboys .85@1.12½
60°, bulk, ton 16.00@18.00
66°, 100 lb. in carboys 1.00@1.25
66°, bulk, ton 18.00@20.00
Oxalic .08½@.09

ALCOHOL—Grain gal. 2.46½
Redned wood, 95@97% " .70@.75

ALUM—Lump 100 lb. $1.75
Ground " 1.85
Chrome Alum lb. .04¼

ALUMINUM—Sulphate, com'l. " 1.25@1.60

AMMONIA—24 deg. lb. .04½@.05½
" 26 " " .04¾@.05¾

AMMONIUM—
Bromide lb. .23
Carbonate " .07¾@.08
Muriate grain " .06¾@.06¾
Lump " .09@ .09
Sulphate, 100 lb 3.05@3.10
Sulphocyanide com " .30
" " chem. pure " .40

ANTIMONY—needle, lump lb. .12@.13

ARSENIC—White.....(nominal) " .07½@.07¾
Red " .07½@.07

ASPHALTUM—
Barbadoes per ton. 40.00@80.00
West Indies " 20.00@60.00
Egyptian lb. .08@.14
Gilsonite, Utah ordinary per ton. 50.00
Trinidad " 30.00@40.00
California " 20.00@35.00

BARIUM—
Carb. Lump, 80@90% lg. ton. 30.00@35.00
Powdered, 80@90% lb. .02@.02½
Chloride com'l " 37.50@40.00
Nitrate, powdered, in casks..lb. .06
Sulphate (Blanc Fixe) " .02¾

BARYTES—
Am. Ground sh. ton. 14.50@21.00
Floated " 22.00
Foreign floated " 19.50@22.50

BISMUTH—Sub-nitrate lb. 1.50

BLEACHING POWDER—35%, 100 lb. 1.30@1.50

BLUE VITRIOL—(copper sulphate), carload, per 100 lb. 7.50

BONE ASH lb. .02½@.03

BORAX " .07½@.07¾

CALCIUM—Acetate, gray " 2.35@2.40
Acetate, brown " 1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. sh. ton. 65.00
Chloride, f.o.b. N. Y. " 16.00@18.00

CEMENT—
Portland, Am. 500 lb. bbl. 1.55@1.60
Foreign " 2.25@2.90
"Rosendale," 300 lb. " .85
(in sacks) .65
Slag cement " .75@1.25

CHROME ORE—
New Caledonia 50% ex. ship N. Y. per lg. ton 17.50@20.00
Bricks, f.o.b. Pittsburg, M. " 175.00

CLAY, CHINA—Am. common ex-dock, N. Y. " 8.00@9.00
Foreign " 11.50@17.50

COBALT—Oxide lb. 2.50

COPPERAS—Bulk 100 lb. $1.35
In bbls " 1.65
In bags " 1.75

CRYOLITE lb. .06½

FELDSPAR—Ground best...sh. ton. 7.00@15.00

FIRE BRICK.
American per M. 30.00@40.00
Imported " 25.00@45.00
St. Louis No. 1 " 18.00
" No. 2 " 14.00
Extra " 20.00@25.00

FIRE CLAY.
St. Louis mill, per ton 2.50

FLUORSPAR—
Domestic f.o.b. shipping port
Lump lg. ton. 8.00@10.00
Ground " 11.00@13.00
Gravel " 4.25@5.00
Foreign crude ex. dock " 8.00@10.00

FULLER'S EARTH—Lump..100 lb. .80@.85
Powdered " .85@.90

GRAPHITE—
American, ore, common lb. .01@.10
Artificial " .06
Ceylon, common pulv " .02½@.03½
Best, pulverized " .04@.08
German, com. pulv " .01½@.01¾
Best, pulverized " .01½@.02
Italian, pulverized " .01@.02

GYPSUM—
Fertilizer " 7.00
Rock lg. ton. 4.00

INFUSORIAL EARTH—
Ground Am. best lb. .01¾
French lg. ton. 56.00
German lb. .02½@.02¾

LEAD—Acetate (sugar of) lb. .07¾
Nitrate, com'l " .08½@.09

MAGNESITE—Greece.
Crude (95%) lg. ton. 7.00@8.00
Calcined, powdered sh. ton. 30.00@40.00
Bricks, domes, per qual. f.o.b. Pittsburg M. 160@200

MAGNESIUM—
Chloride, com'l 100 lb. .80@1.15
Sulphate (Epsom salt) 100 lb. .90@1.00

MANGANESE—
Crude powdered:
70@75% binoxide lb. .03
75@85% binoxide " .03½
85@90% binoxide " .04
90@95% binoxide " .06
Ore, 80%-85% sh. ton. 35.00@45.00

MARBLE—Flour sh. ton. 9.50@10.00

MINERAL WOOL—
Slag, ordinary " 19.00
Selected " 25.00
Rock, ordinary " 32.00
Selected " 40.00

MONAZITE SAND—
Guar. 9% with 5% Thorium oxide, nominal lb. .08 and up.

NICKEL—
Oxide, crude, lb. (77%) for fine metal contained. .47
Sulphate, single lb. .13@.18
" double " .14@.15

NITRATE OF SODA—100 lb. 96% for 1907 2.50
95% for 1908 2.45
95% for 1909 2.40
96% is 5c higher per 100 lb.

OZOKERITE—best lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered " .07½@.07¾
English glassmakers' " .08½@.08¾
Lithopone " .04½@.05
Metallic, brown sh. ton. 19.00
Red " 16.00
Ocher, Am. common " 8.50@9.00
Best " 16.00
Dutch, washed lb. .02½@.03
French, washed " .01½@.02½
Paris green, pure, bulk " .21@.23
Red lead, American " .07½@.07¾
Foreign " .08½@.08¾
Turpentine, spirits bbl., per gal. .75@.78
White lead, Am., dry lb. .06½@.06
American, in oil " .07½@.07
Foreign, in oil " .09½@.10
Zinc white, Am. extra dry " .06½@.06¾
Foreign, red seal, dry " .07½@.07¾
Green seal, dry " .07½@.08½

PHOSPHATES—Acid .65@67½c per unit
*Fla., hard rock land pebble 68% 4.50
†Tenn., 78@80% 6.50@7.00
78% 5.50
75% 5.00
68@72% 4.50
‡Bo. Car. land rock 6.00
" " river rock

POTASSIUM—
Bichromate, crystal lb. .06½@.07
Carbonate, 80@85% " .04½@.05
Bichromate " .04½
Caustic " .07
Chlorate " .11
Cyanide, 98@99% " .16
Hydrate " .05½@.06
Muriate, 80% basis 80% " 1.30
Nitrate, crude " 4.00@4.25
Permanganate " .09
Prussiate, yellow " .16½@.17
Red " .23
Salt Cake lg. ton. 2.00@2.25

PYRITE
Domestic, imported fines, furnace size, per unit .11@.11½
Domestic, non-arsenical, fines, per unit, f.o.b. mines .10@.10½
Imported, non-arsenical, furnace size, per unit .18@.18½
Imported, arsenical, furnace size, per unit .12@.12½
Imported fines, arsenical, per unit. .8½@.9
Imported, non-arsenical, per unit .10½@.11
Pyrite prices are per unit of sulphur basis, of 25%, per ton, is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.18
N. Y. agricultural sh. ton. 3@4.40

SALTPETER—Crude 100 lb. 3.75@4.00
Refined, crystals " 5.25@5.75

SILICA—
Ground quartz, crude lg. ton 13.00@15.00
Silex " 13.00@30.00
Lump quartz " 2.50@4.00
Glass sand " 2.75

SILVER—Nitrate, crystals oz. .43½@.45¾

SODIUM—
Acetate lb. .04@.04½
"Alkali," per 100 lb., 58/48 .80@.87½
Bicarb. soda, per 100 lb 1.20@1.50c.
Soda, caustic, per 100 lb., 76/60 1.80@1.90
" powdered " .02¾@.03
Salt cake, per 100 lb .65@.85
Soda, monohydrate, per lb 14c.
Bichromate lb. .06½@.06¾
Bromide " .16
Chlorate, com'l " .08@.09
Cyanide, 96@100% KCN " .18@.19
Hyposulphite, Am. 100 lb. 1.85@1.90
German " 1.60@1.70
Phosphate " 1.80@1.90
Prussiate " .10@.11
Sal soda, f.o.b. N. Y 100 lb. .70@.75
Foreign, f.o.b. N. Y " .80@1.00
Silicate, com'l 100 lb. .75@1.15
Sulphate, com'l, (Glauber's salt) 100 lb. .45@.50
" " calcined " .60@.70

STRONTIUM—Nitrate lb. .08½@.08¾

SULPHUR—
Louisiana (prime) to New York, Boston or Portland lg. ton 22.00
To Philadelphia or Baltimore " " 22.50
Roll 100 lb. 1.85@2.15
Flour " " 2.00@2.40
Flowers, sublimed " " 2.20@2.60

TERRA ALBA—French & Eng. 100 lb. .90@1.00

TALC—Domestic sh. ton. 15.00@20.00
French, best " 25.00
Italian, best " 35.00@40.00

TIN—Bichloride, 50% lb. .12
Crystals " .25@.30
Oxide, lb. .40@.45

URANIUM—Oxide 3.50

ZINC—Metallic ch. pure " .15
Chloride solution, com'l " .02½@.04
Chloride, granular " .04@.05
Dust " .06@.07
Sulphate " .02½@.02¾

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

DIVIDENDS.

Metal and Mining Companies—U. S.

Name of Company and Location.	Author. Capital.	Shares. Issued.	Par Val.	Dividends. Total to Date.	Latest. Date.	Amt.
[illegible]	[illegible]	[illegible]	[illegible]	$1,372,881 Jan.	1907	$ .50
[illegible]	[illegible]	[illegible]	25	9,235,000 Jan.	1907	1.00
[illegible]	[illegible]	[illegible]	[illegible]	686,000 Jan.	1907	0.30
Amalgamated, c....	Mont.	1,500,000	1,382,520	100	6,184,788 May	1907	2.00
Am.Sm.&Ref.,com.	U. S.	500,000	500,000	100	23,588,053 Apr.	1907	1.75
Am. [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Am. [illegible]	[illegible]	[illegible]	170,000	100	1,430,000 Mar.	1907	1.50
Am. Smelters, pf. B	U. S.	30,000,000	300,000	100	2,625,000 Mar.	1907	1.25
[illegible]	Mexico	30,000,000	1,200,000	25	34,850,000 Apr.	1907	1.75
Annie Laurie, g....	Utah.	5,000,000	25,000	100	466,061 July	1905	0.30
Arizona, c.....	Ariz..	3,750,000	1,082,520	6	6,182,381 Apr.	1906	.05
Atlantic, c.....	Mich.	2,500,000	100,000	25	990,000 Feb.	1905	.02
B. & H., l.z.....	Mo....	400,000	400,000	1	40,000 Dec.	1905	.01
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bingham & N.H.,c.g	Utah.	2,000,000	226,000	5	22,600 Sept.	1906	.10
Boston & Montana.	Mont.	5,750,000	150,000	25	47,875,000 Nov.	1906	12.00
Bruce Gold, g.....	Utah.	1,000,000	100,000	10	2,558,400 Apr.	1907	.10
Bullion Hill & Mill	Ida.	3,000,000	300,000	10	5,500,000 Apr.	1907	.60
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Cactus Queen, g....	Mont.	15,000,000	1,000,000	15	1,300,000 Mar.	1907	.50
Calumet & Arizona	Ariz.	2,500,000	200,000	10	7,000,000 Mar.	1907	5.00
Calumet & Hecla....	Mich.	2,500,000	100,000	25	101,400,000 Mar.	1907	20.00
Camp Bird, g.....	Colo.	5,000,000	820,000	5	3,781,360 Apr.	1907	.24
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Central Eureka, g...	Cal.	500,000	500,000	1	55,000 Nov.	1906	.01
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Con. Mercur, g.....	Utah.	1,500,000	300,000	5	778,921 Mar.	1906	.07
Comb'tion Co.G'f'd	Nevada.	400,000	320,000	1	105,000 Mar.	1907	.20
Con. Mercur, g.....	Utah.	1,000,000	1,000,000	1	688,000 Sept.	1906	.15
Continental, z.l....	Mo....	550,000	22,000	25	1,205,000 Dec.	1906	.02
Copper Range Con.	Mich.	38,500,000	383,781	100	187,000 Jan.	1907	.50
Creede United, g...	[illegible]	2,000,000	1,625,000	1	4,558,896 Apr.	1907	2.00
Cripple Creek Con., g	[illegible]	2,000,000	2,000,000	1	214,035 July	1906	.005
Daly Judge, g. & s.	Utah.	1,000,000	300,000	1	180,000 Mar.	1906	.005
Daly West, g. & s.	Utah.	300,000	300,000	1	225	1907	.37½
De Lamar, g. & s.	Ida.	3,600,000	180,000	20	5,695,000 Mar.	1907	.60
Dolores, g. & s.....	Colo.	400,000	67,180	5	2,926,370 May	1905	.72
Dunkin, g.....	Cal.	1,250,000	1,250,000	1	21,875 July	1905	.01
Doctor Jack Pot....	Colo.	3,000,000	3,000,000	1	268,000 July	1906	.005
Dos Run, l.....	Mo....	10,000,000	59,062	100	1,255,854 Apr.	1907	.50
Elkton, g.....	[illegible]	3,000,000	2,500,000	1	1,841,960 Feb.	1907	.01
El Paso, g.....	[illegible]	2,500,000	2,450,000	1	1,022,500 Dec.	1906	.02
Fed. Sm., com.....	Idaho.	10,000,000	60,000	100	2,048,750 Mar.	1907	5.00
Federal Sm., pf.	Idaho.	20,000,000	120,000	100	2,651,250 Mar.	1907	1.75
Findley, g.....	[illegible]	1,250,000	1,250,000	1	325,000 Aug.	1906	.01
Florence-Mercur, g	Nevada.	1,000,000	1,000,000	1	141,000 Dec.	1906	.10
Gemini-Keystone..	Utah.	500,000	5,000	100	1,850,000 July	1906	10.00
Gold King Con.....	Colo..	5,750,370	5,750,370	1	1,407,584 May	1905	.01
Gold Sovereign....	[illegible]	2,000,000	2,000,000	1	10,000 Jan.	1907	.005
Grand Central, g...	Utah.	250,000	250,000	1	1,186,000 Apr.	1907	.10
Gwin Mine, Dev., g.	Cal.	1,000,000	100,000	10	35,000 Mar.	1906	.25
Hecla, s. l.....	Idaho.	250,000	1,000,000	0.25	870,000 Mar.	1907	.02
Homestake, g.....	S. D.	21,840,000	218,400	100	22,241,040 Apr.	1907	.50
HornSilver,g.s.c.z.l	Utah.	10,000,000	400,000	25	5,602,000 Mar.	1907	.05
Inter'l Nickel, pf.	N. Y.	12,000,000	87,415	100	655,613 May	1907	1.50
Iron Silver.....	Colo.	10,000,000	500,000	20	4,000,000 Apr.	1907	.20
Jamison, g.....	Cal..	3,000,000	300,000	10	270,670 Apr.	1907	.03
Jerry Johnson.....	Cal....	2,500,000	2,500,000	1	61,700 Apr.	1906	.03
Kendall, g.....	Mont...	2,500,000	500,000	5	1,095,000 Apr.	1907	.03
Liberty Bell, g. s....	Colo..	700,000	130,551	5	110,857 Jan.	1906	.15
Lightner, g.....	Cal..	125,000	102,255	1	295,694 Aug.	1905	.05
Mammoth, g. s. l...	Utah.	10,000,000	400,000	25	2,080,000 Oct.	1906	.05
Mary McKinney, g..	Colo..	1,800,000	1,304,252	1	801,765 Apr.	1907	.01
Mohawk, c.....	Mich.	2,500,000	100,000	25	900,000 Jan.	1907	4.00
Mont. Ore Purch...	Mont.	2,500,000	80,833	25	9,437,274 Jan.	1907	15.00
Monument, g.....	Colo..	300,000	300,000	1	27,124 Apr.	1905	.01
New Century, z.,l..	Mo....	300,000	300,000	1	211,500 Nov.	1906	.01
New Idaho, g.....	Cal.....	500,000	100,000	5	900,000 Apr.	1907	.20
New Jersey Zinc ..	U. S.	10,000,000	100,000	100	8,400,000 Feb.	1906	3.00
North Butte.....	Mont.	6,000,000	400,000	15	4,200,000 Mar.	1907	2.00
North Star, g.....	Cal....	2,500,000	250,000	10	1,336,989 Mar.	1907	.20
Northern Light, g.s.	Utah.	2,000,000	400,000	5	20,000 Feb.	1904	.05
Old Dominion Cop.	Ariz....	7,500,000	281,589	25	280,843 May	1906	.50
Old Gold, g.....	Colo....	2,101,150	2,101,150	1	10,506 Mar.	1906	.05
Ophir, g.....	Nevada.	302,400	100,800	3	1,797,400 July	1904	.25
Osceola.....	Mich.	2,500,000	96,150	25	6,362,600 Jan.	1907	6.00
Parrot, c.s.....	Mont....	2,000,000	229,850	10	6,692,724 Mar.	1907	.25
Pennsylvania, g...	Cal....	5,750,000	51,500	100	284,925 July	1905	.20
Pinewood, l. z.....	Wis.	20,000	500	40	89,500 Oct.	1905	10.00
Portland, g.....	Colo....	3,000,000	3,000,000	1	7,257,080 Apr.	1907	.04
Quincy.....	Mich....	3,750,000	110,000	25	16,965,446 Mar.	1907	4.50
Rob Roy, z.....	Mo....	15,000	15,000	1	9,600 May	1906	.03
Rocco Homest'k,l.s.	Nevada.	300,000	300,000	1	112,000 Dec.	1905	.02
Sacramento, g, q...	Utah....	5,000,000	1,000,000	1	245,000 Nov.	1906	.005
Sacramento, g. & l.	Utah....	200,000	200,000	1	6,500 Aug.	1904	.01
St. Joseph, l.....	Mo....	20,000,000	1,000,000	10	5,108,200 May	1907	.15
Silver Hill, g. s	Nevada.	108,000	108,000	1	59,400 Feb.	1906	.05
Silver King, g. s. l.	Utah....	3,000,000	150,000	20	10,675,000 Dec.	1906	.334
Silverine, s.....	Ariz.	3,000,000	300,000	10	300,000 Mar.	1907	.50
Silverado, g.....	Ida.	1,500,000	1,500,000	1	135,000 Jan.	1907	.03
Speculator, g. & l.	[illegible]	1,500,000	1,500,000	1	165,500 Jan.	1905	.01
Standard Con., g. s.	Cal....	2,000,000	178,600	10	5,149,004 Mar.	1907	.10
Stewart, g. & l.....	[illegible]	5,500,000	1,004,877	5	4,895,866 Apr.	1906	.125
Tamarack.....	Mich.	1,500,000	60,000	25	9,180,000 Jan.	1907	3.00
Tecoma.....	Utah.	5,000,000	175,000	25	1,093,750 Jan.	1907	1.25
Tomboy, g. s.....	Colo....	1,750,000	300,000	5	900,000 June	1906	.48
Tonopah, g. s.....	Nevada.	[illegible]	[illegible]	1	3,000,000 Apr.	1907	.35
Tonopah Belmont..	Nevada.	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]
Tonopah Extension	Nevada.	2,000,000	1,295,007	1	548,906 Apr.	1907	.10
Tonopah Mining...	Nevada.	1,000,000	928,433	1	278,530 Apr.	1907	.15
Tuolumne, g. s. l....	[illegible]	[illegible]	[illegible]	1	980,000 Apr.	1907	.05
Uncle Sam, g.s.l....	Utah....	[illegible]	[illegible]	1	130,000 Oct.	1906	.01
United Cop. com....	Mont....	75,000,000	450,000	100	5,175,000 Apr.	1907	1.75
United, c. pf.....	Mont....	[illegible]	[illegible]	100	1,500,000 May	1907	3.00
United, z.l., com ..	Mo.-Kan.	500,000	92,400	5	27,450 Oct.	1903	.05
United, z.l., pf	Mo.-Kan.	500,000	19,556	25	283,250 Apr.	1907	.50
United, (Cripple C'k)	Colo....	5,000,000	4,009,100	1	280,071 Apr.	1906	.05
Utah Apex, g. s. l....	Ariz.	[illegible]	[illegible]	10	17,965,000 Dec.	1904	.75
Utah Con., g.....	Utah.	[illegible]	[illegible]	5	3,281,250 Apr.	1907	.87½
Utah Mines, g.....	Utah.	[illegible]	[illegible]	[illegible]	887,130 Apr.	1907	1.50
Victoria, g. s. l....	Utah.	[illegible]	[illegible]	10	246,000 Apr.	1907	.03
Victor, g. s. l.....	Utah.	[illegible]	[illegible]	5	[illegible] Apr.	1907	1.50
Virginia, g. s. l....	Utah.	250,000	250,000	1	87,000 Apr.	1907	.04
Vindicator Con., g	[illegible]	1,500,000	1,500,000	1	1,695,000 Apr.	1907	.08
Wolverine.....	Mich	1,500,000	60,000	25	4,050,000 Apr.	1907	10.00
Work, g.....	Colo....	1,500,000	1,500,000	1	90,000 Apr.	1907	.01
Yankee, g. s. l.....	Utah	[illegible]	[illegible]	1	140,000 Jan.	1907	.03

[illegible] [illegible] [illegible] [

THE MINING INDEX.

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in even dollars we will return the excess over an order in coupons upon request.

ALUMINUM

3124—ALLOYS. Disintegration of Aluminum Alloys. E. S. Sperry. (Brass Wld., Mar., 1907; 1½ pp.) Relates some instances of disintegration of aluminum and nickel alloys which came under the observation of the author. 20c.

3125—ALLOYS. Light Aluminum Alloys. J. E. S. Jones. (I. and C. Tr. Rev., Apr. 12, 1907; 1 p.) Abstract of paper read before the Coventry Eng. Soc., describing the properties of various alloys of aluminum and other metals, and giving notes on the present practice of casting them. 40c.

3126—ELECTROLYSIS—Ueber Elektrolytische Gleichrichtung von Wechselstrom. J. Sebor and L. Simek. (Zeit. f. Elektrochem., Mar. 29, 1907; 2½ pp.) Gives briefly the results of investigating the effects of foreign metals upon the properties of aluminum, also the electric relations of aluminum cells. 40c.

ANTIMONY

3127—METALLURGY—Sur la métallurgie de l'Antimoine. G. Pautrat. (Rev. de Chimie Industrielle, Mar., 1907; 5 pp.) A study of the methods used in smelting and refining antimony ore, as carried on in a plant at Mayenne, France, describing furnace construction, the charges used, the course of the smelting operation and the products obtained. 40c.

ASBESTOS

3128—ASBESTOS DISCOVERIES in Foreign Countries. F. Cirkel. (Can. Min. Journ., Apr. 1, 1907; ½ p.) Gives some brief notes on the recent discovery of asbestos in the Ural region of Russia, and describes briefly the present condition of mining. 20c.

BARYTES

3129—BARYTES INDUSTRY of the South. E. K. Judd. (Eng. and Min. Journ., Apr. 20, 1907; 2 pp.) An account of the present state of the barytes industry in Tennessee, describing the methods of mining, cleaning, roasting and grinding barytes. 20c.

BROMINE AND IODINE

3130—PRODUCTION OF BROMINE—Ueber die elektrolytische Gewinnung von Brom und Jod. Max Schlötter. (Halle, A. S., Germany, 1907; Wilhelm Knapp; 50 pp.) Monograph describing in considerable detail the various practical electrolytic methods of producing and purifying bromine and iodine, with notes on the sources of the raw material and some discussion of the properties, uses and methods of analysis of these two substances. 80c.

CEMENT

3131—PORTLAND CEMENT—Aus Pomm erns Ziegel-, Zement, und Kalkindustrie. H. Hirsch. (Toninduslrie Zeit., Mar. 19, 1907; 4 pp. Continuation of article previously indexed, describing the works and appliances of the cement works at Stolp. 20c.

COAL AND COKE

3132—ACCOUNTING—A System of Coalmine Accounting. F. A. Hill. (Eng. and Min. Journ., Mar. 30, 1906; 1½ pp.) Describes a system of mine accounting in actual use, with examples of pay-rolls and time-sheets, and notes on the proper method of keeping them. 20c.

3133—BOBBINITE. Report of the Departmental Committee on Bobbinite. (Coll. Guard., Apr. 12, 1907; 4 pp.) Deals with the characteristic features of this explosive, and tabulates the results of tests in which it was compared with several other explosives. 40c.

3134—CANADA—The Coals and Coal Fields of Alberta, Saskatchewan and Manitoba. D. B. Dowling. (Can. Min. Journ., Apr. 15, 1907; 2½ pp.) Reviews the extent and character of the coal found in these three Prairie Provinces. 20c.

3135—CANADA—Notes on the Mineral Fuel Supply of Canada. R. W. Ells. (Trans. Royal Soc. of Canada, Vo. XII, Section IV, Second series, 1906-1907; 22 pp.) Describes various known occurrences of lignite, coal and petroleum in Canada, which may become available for fuel supply in the future, but which at present are not exploited.

3136—CERTIFIED MINE POSITIONS. H. H. Stoek. (Mines and Min., Apr., 1907; 2 pp.) Paper read before Coal Mining Inst., Dec., 1906, discussing the character of examinations of competency as required in several States. 20c.

3137—COAL CONSUMPTION—Efficiency in Coal Consumption. Myles Brown. (Sci. and Art of Min., Mar. 23, 1907; 1 p.) Continuation of article previously indexed, dealing in this instalment with the losses in the form of potential energy in the flue gases. 20c.

3138—COAL DUST PROBLEM. J. Ashworth. (Engineer, Lond., Mar. 15, 1907; 1 p.) Comments at length upon the unsatisfactory state of present knowledge regarding the relations of coal dust to explosions, and the efficiency of watering as a means of preventing them. 40c.

3139—COAL MINING—Heading by Longwall Machines. Sam Mavor. (Trans. Min. Inst. of Scotland, Vol. XXIX, Part 3, 1907; 11 pp.) Describes the relative advantages of channeling, chain-breast and longwall bar machines for driving advance workings, with a discussion of their advantages and limitations.

3140—COAL MINING—Mining Anthracite by Longwall. (Mines and Min., Apr., 1907; 2 pp.) Describes how this method of coal mining was applied in a mine where working conditions were rendered difficult by previous operations above and below. 20c.

3141—COAL MINING—The Technics of Coal Mining. G. J. Winstanley. (Min. Engineering, Apr., 1907; 3 pp.) Continuation of a series of articles previously indexed, dealing in the present instalment with machines and mechanical powers. 20c.

3142—COKE—The Connellsville Coke Supply. L. W. Fogg. (Iron Age, Mar. 28, 1907; 1 p.) Reviews industrial conditions in this coke field, with a few figures showing the growth of the Lower Connellsville output. 20c.

3143—COKING Freeport Coals in Preston County, West Virginia. J. B. Hanford. (Mines and Min., Apr., 1907; 2 pp.) Paper read before Coal Mining Institute, Dec. 19, 1906, outlining the development of the process for manufacturing these West Virginia coals into high-grade coke. 20c.

3144—COLORADO—The Yampa Coal Field, Routt County, Colorado. N. M. Fenneman and H. S. Gale. With a chapter on the Character and Use of the Yampa Coals, by M. R. Campbell. (Bull. 315, U. S. Geol. Surv., 1906; 96 pp.) Monograph describing the geological features of this Colorado coal field.

3145—ELECTRIC POWER—Central Electric Drive for Collieries. F. E. Junge. (Eng. and Min. Journ., Apr. 13, 1907; 3 pp.) A comparison of the advantages of a central electric drive for collieries whether operated by steam or gas engines, as against direct drive for the prime movers. 20c.

3146—ELECTRIC WINDING PLANT at a German Colliery. Alfred Gradenwitz. (Eng. and Min. Journ., Apr. 13, 1907; 3½ pp.) Details the features of the equipment of the Vereinigte Marie Luise mine at Neindorf. 20c.

3147—GAS PRODUCERS—The Manufacture of Producer Gas with Special Reference to Western Coals. R. S. Moss. (Black Diamond, Apr. 6, 1907; ½ p.) Gives a few reasons why Western coals have not been considered suitable for use in gas producers, and describes methods whereby they can be utilized with efficiency. 20c.

3148—GAS PRODUCERS—The Utilization of Low Grade Fuel in Gas Producers. F. E. Junge. (Iron Tr. Rev., Apr. 4, 1907; 3 pp.) A consideration of the special features of the utilization with a discussion of the relative advantages of low-grade steam coal, lignite, peat and briquets as fuel for gas producers. 20c.

3149—INDIA—Note on the Makum Coal Field between the Tirap and Namdang Streams (Season 1905-6). R. R. Simpson. (Records, Geol. Surv. of India, Vol. XXXIX, Part 4, 1906, 13½ pp.) Describes the geological and physical features of this district.

3150—INDIA—The Jaipur and Nazira Coal Fields, Upper Assam. R. R. Simpson. (Records, Geol. Surv. of India, Vol. XXXIV, Part 4, 1906; 40 pp.) Enumerates the principal outcrops of coal in the several producing fields of this country, and gives brief notes upon the quality of coal and the workable areas.

3151—LABOR—Hours of Labor in Coal Mines. Departmental Report on the Eight Hours Day. (Coll. Guard., Apr. 12, 1907; 1 p.) Contains the report of the British Departmental Committee, rehearsing the evidence taken by it in regard to the eight-hour day, and giving statistics of labor conditions which exist at present in the mines. 40c.

3152—MINE EXPLOSIONS in Illinois. R. Newsam. (Mines and Min., Apr., 1907; 2 pp.) Shows the results of firing a tight shot when neither gas nor coal dust was present. 20c.

3153—MINE EXPLOSIONS—La Cause des Coups de Grisou simultanés de Reden, Liévin, Charlestown et Fayetteville. M. Mascart (L'Echo des Mines, Apr. 4, 1907; ½ p.) Reviews the causes of simultaneous dust explosions in coal mines in different countries, and points out the influence of earthquake and falling barometer upon the appearance of gas in mines. 40c.

3154—MINE GASES—Chemical Composition of Gases. J. Robinson. (Min. Engineering, Apr., 1907; 3 pp.) Gives the properties and compositions of all the gases met with in mines, with methods for detecting their presence. 20c.

3155—MINE INSPECTION SERVICE of Pennsylvania. (Mines and Min., Apr., 1907; 5 pp.) Gives the history of the growth of the mine inspection service of Pennsylvania, and describes the present organization and the requirements of the law. 20c.

3156—OHIO—Coal Mining in Ohio During 1906. Geo. Harrison. (Eng. and Min. Journ., Apr. 20, 1907; ½ p.) Gives the advance figures from the Report of the Chief Mine Inspector of Ohio, showing developments in the field during 1906. 20c.

3157—OHIO—Methods of Working the Coal Seams of Ohio. F. W. Parsons. (Eng. and Min. Journ., Apr. 20, 1907; 5½ pp.) An account of mining operations and colliery equipment at several points in the field where the methods of working are conditioned by the presence of an overlying stratum of quicksand, which makes it impossible to rob pillars with subsequent caving. 20c.

3158—PENNSYLVANIA Geology of the Buck Mountain Coal Bed. H. W. Althouse. (Eng. and Min. Journ., Apr. 6, 1907; 2 pp.) Gives some notes on the geological features of this Pennsylvania district where the different degrees of inclination of the coal make it necessary to employ different methods of anthracite mining in the St. Clair colliery. 20c.

3159—POWER PLANT of the Berwind-White Coal Company's No. 40 Mine. (Engineer, Apr. 1, 1907; 6 pp.) Describes some of the important labor-saving devices connected with the electrical plant of this Pennsylvania mine. 20c.

3160—PROPS—The Use of Steel Props and Girders in Mines. J. Ashworth. (Mines and Min., Apr., 1907; 1 p.) Compares the cost of steel mine props as against wooden girders and describes some installations of steel props in English coal mines. 20c.

3161—QUALITY—Specific Gravity of Coal as a Measure of Purity. M. S. Hachita. (Eng. and Min. Journ., Apr. 6,

Schmerber. (Génie Civ., Apr. 6, 1907; 3 pp.) Continuation of article previously indexed.

of non portable rescue apparatus, which require air-tubes connecting the rescuers with

Habershon. (Coll. Guard, Apr. 12, 1907; 1 p.) Paper read before the Midland Inst. of

on the experiences gained in the use of various types of rescue apparatus, means of testing them, and of drilling miners

ry Briggs. (Mines and Min., Apr., 1907; 2½ pp.) Shows how roof pressures may be taken advantage of in longwall mining, so that the coal may be brought down without blasting. 20c.

3166—SMOKELESS FUEL from Coal. J. Grossmann. (Min. Engineering, Apr., 1907; 2½ pp.) Reviews the conditions which will have to be fulfilled in order to produce economically a smokeless product standing between the original coal and coke. 20c.

3167—WEST VIRGINIA—Development of Freeport Coals in West Virginia. J. B. Hanford. (Indus. Wld., Apr. 13, 1907; 3 pp.) Considers the historical and geological development of the coals of this district, and describes the utilization of a Bradford breaker for eliminating bone and small pieces of binder. 20c.

3168—WYOMING—Coal in Wyoming. (Min. Rep., Mar. 21, 1907; 2½ pp.) A review of the present state of the coal mining industry compiled from various official sources. 20c.

COPPER

3169—Notice Géologique et Minière sur le Bassin Cuprifère du Kouilou-Niari (Congo Français). D. Leavit. (Ann. des Mines, T. XI, 1 livr. of 1907; 59 pp.) An account of a trip by the author along the old caravan routes across the French Congo, describing particularly the geological features and the ore deposits in the copper region of Kouilou-Niari.

3170—CANADA—Eldorado Copper Mine. A. G. Burrows. (Can. Min. Journ., Apr. 15, 1907; 1 p.) Notes upon the equipment, buildings and the smelter of this copper mine situated in Hastings Co., Ontario. 20c.

3171 CONCENTRATION PRACTICE at Great Falls, Montana. C. W. Goodale. (Mines and Min., Apr., 1907; ½ p.) Gives brief notes on concentrating and smelting practice as carried on in the works of the Boston and Montana Cons. Copper Co. 20c.

3172—CONVERTER—A Modern Electric Converter. G. B. Shipley. (Min. Wld., Mar. 23, 1907; 1 p.) Gives features of the design of this converter, which is operated by electricity, and which has individual tuyeres and

3173—COPPER SCRAP—The Recovery of Copper from Scrap. (Metal Industry, Apr., 1907; 1½ pp.) Describes a standard design of a scrap recovering furnace with details of its operation and management. 20c.

3174—COPPER SMELTING—The Chief Advances in Copper Smelting in Modern Times. W. Gowland. (Presidential Address before the Instn. of Mining and Metallurgy, and published in Bull. No. 31, Apr. 11, 1907; 26 pp.) Reviews briefly the art of copper

smelting and furnace practice.

3175—DESULPHURIZING—The McArthy-Rogers Process for Desulphurizing Copper Ores and Mattes. T. C. Cloud. (Paper read before the I. M. M., April 18, 1907; 11 pp.) Describes the chemistry of this process of desulphurizing copper ores and mattes, in which it is essential that the charge be wet, and contain from 15 to 35 per cent. silica, the basis of the operation being the blowing of air through a bath.

Kupfer, Bezw. das Anodische Verhalten des Kupfers in Natronlauge. E. Müller. (Zeit. f. Elektrochem., April 12, 1907; 8 pp.) Describes and discusses in considerable detail a tions, with reference to polarization of the anode copper and resultant variations in electromotive force. 40c.

3177—ELECTROLYTIC COPPER—A Study in Refining and Overpoling Electrolytic Copper. H. O. Hofman, R. Hayden and H. B. Hallowell. (Bi-monthly Bull., A. I. M. E., May, 1907; 25 pp.) Studies the physical and chemical changes undergone during the process of refining copper, also a discussion of the phenomenon of overpoling.

3178—GEOLOGY—Some New Points in the Geology of Copper Ores. J. F. Kemp. (Min. and Sci. Press, March 30, 1907; 1½ pp.) Paper read at March meeting of Can. Min. Inst. Contains a few speculations as to the formation of orebodies by secondary enrichment through the agency of ascending waters. 20c.

3179—IDAHO—The White Knob Copper Deposits, Mackay, Idaho. J. F. Kemp and G. Gunther. (Paper read at New York meeting of A. I. M. E., April, 1907; 28 pp.) Gives notes on the geological relations of the mineralized area in this camp; also describes the rocks and the contact phenomena met with.

3180—LAKE SUPERIOR—Notes on the Copper Range. (Min. and Sci. Press, March 23, 1907; 1 p.) Gives brief notes on hoisting practice and handling of ore in the rockhouse as carried out in this Lake Superior region. 20c.

3181—MEXICO—The Cananea Copper Deposits. R. B. Brinsmade. (Mines and Min., April, 1907; 2½ pp.) Gives an account of the early discoveries and work in this Mexican copper district, describes the extent and richness of the orebodies in the different mines and comments on the mining methods. 20c.

3182—MILL—The Garfield Mill of the Utah Copper Company. L. H. Beason. (Min. and Sci. Press, April 13, 1907; 1½ pp.) Describes briefly the power and concentrating equipment of this new copper mill, which went into commission in April, 1907. 20c.

3183—PENN-WYOMING COPPER COMPANY. (Min. Journ., March 16, 1907; 1 p.) Gives the report of the engineer detailed to examine the mines of this company, which speaks of the economical conditions surrounding the property and of the prospects for good ore production. 40c.

3184—PYRITIC SMELTING—Fundicion piritica sin el auxilio de combustible carbonifero. I. D. Ossa. (Bol. de la Soc. Nac. de Mineria, Jan. 31, 1907; 22 pp.) Reviews the present state of pyritic smelting practice and discusses the thermal principles involved in this art.

3185—SMELTER—Enlargement of B. C. Copper Co.'s Smelter at Greenwood. (B. C. Min. Rec., Feb., 1907; 2 pp.) Outlines the progress made in enlarging the works of this copper company. 20c.

3186—UTAH—Mining Developments in Bingham, Utah. A. L. Pearse. (Min. Journ., March 2, 1907; 1 p.) Describes the general conditions of the mining industry in this State from an English point of view. 20c.

DIAMONDS

3187—CARBON: A Remarkable Mineral. I. C. Yawger. (Min. Wld., March 30, 1907; 2 pp.) Gives an outline of the carbon industry, especially in regard to supplying diamonds for drilling purposes, with notes on methods of splitting, use in drills and costs of stones. 20c.

3188—SOUTH AFRICA—Paardeberg Mines and District. H. D. Griffiths. (South African Mines, March 23, 1907; 1 p.) Outlines the geological conditions and developments on the claims of this district. To be continued. 20c.

FLUORSPAR

3189—HYDROFLUORIC ACID—The Manufacture of Hydrofluoric Acid. Anson G. Betts. (Eng. and Min. Journ., April 20, 1907; 1 p.) Describes simple apparatus for making this acid in small or in commercial quantities, and gives the procedure for analyzing the commercial acid. 20c.

GOLD AND SILVER

3190—ALASKA—Water Supply of Nome Region, Seward Peninsula, Alaska. J. C. Hoyt and F. F. Henshaw. (U. S. Geol. Surv., W. S. and I. Paper No. 196; 52 pp.) Gives the results of the systematic measurement and study of the sources of water supply of this district, with regard to the possible development of placer operations.

3190a—BLACK SANDS—The Auriferous Black Sands of California. J. A. Edman. (Bull. No. 45, State Mining Bureau of California, Apr., 1907; 22 pp.) Discusses the industrial aspect of the gold-bearing black sand situation in this State, with brief notes on methods of treating these sands, and their approximate values. 20c.

3191—COBALT—Genesis of Ores of the Cobalt District. H. W. Hixon. (Eng. and Min. Journ., March 30, 1907; 1 p.) Contains a few remarks upon the possible genesis of these Canadian silver ores in refutation of the theory proposed by Prof. Van Hise. 20c.

3191a—COBALT—The Bonanza Silver Mines of Cobalt, Ontario. W. Spencer Hutchinson. (Eng. and Min. Journ., Apr. 27, 1907; 2½ pp.) Describes the condition of mining operations in this camp as seen by the author in April, 1907. 20c.

3192—COBALT—The Geology of the Cobalt District. C. R. Van Hise. (Paper read before the Can. Min. Inst., March, 1907; 1½ pp.) Outlines the geological features of this district, considers the probable source of the minerals, and gives the author's opinion that the depositions have been produced by double concentration. 20c.

3193—COLOMBIA—The Eocene Gold-bearing Gravels of Colombia. F. C. Nicholas. (Min. Wld., April 20, 1907; 1 p.) Gives the results of explorations of these South American gravels, with a few remarks upon their geological relations. 20c.

3194—COLORADO—Old Hundred Mine and Mill. (Mines and Min., April, 1907; 5 pp.) Illustrates the possibilities of mining in San Juan Co., Colorado, by the use of aerial trams and describes the method of mining as carried out at the Old Hundred mine. 20c.

3194a—CYANIDATION—Electrolysis of Gold from Cyanide Solutions. D. Lay. (Eng. and Min. Journ., Apr. 27, 1907; 2½ pp.) Describes the construction and operation of electrolytic precipitation devices at the Pelaniec mill at Colusa, B. C., with detailed drawings of the precipitation tanks used. 20c.

3195—CYANIDATION—Last Drainings. H. A. White. (Journ. Chem., Met. and Min. Soc. of South Africa, Feb., 1907; 5 pp.) Discusses the washing of tailings with a view to finding an advantageous ratio between time of treatment and increasing amounts of gold dissolved. 60c.

3195a CYANIDATION—The Moore and Butters Filter. E. H. Nutter. (Min. and Sci. Press, Apr. 20, 1907; 1 p.) A reply to some of the criticisms made by Mr. Bosqui which tended to show the superiority of the Butters process over the Moore process. 20c.

3196—CYANIDATION—The Butters Filter. James Frier. (Min. and Sci. Press, April 6, 1907.) Gives data on the working costs and the metallurgical results achieved by a Butters filter during a period of continuous running. 20c.

3198—CYANIDE PLANT for Treating Guanajuato Ores. C. W. Van Law. (Eng. and Min. Journ., April 6, 1907; 3 pp.) Descriptions of the mill, cyanide plant and methods of agitating and treatment as carried out by the Guanajuato Reduction and Mines Co. 20c.

3199—CYANIDE PRACTICE at the Reliance Mill. D. Lay. (Eng. and Min. Journ., April 20, 1907; 2 pp.) Outlines the working of the Hendryx cyanide process, also the procedure in agitating, settling and decanting, with statements of rates of filtration and extraction obtained. 20c.

3200—CYANIDE SOLUTIONS—The Assay of Cyanide Solutions. (West. Chem. and Met., April, 1907; 1½ pp.) Discussion by J. L. Martel of paper on the above subject by C. H. Jay and others, giving the procedure for a new method of testing cyanide solutions, whereby the gold is collected in spongy lead. 60c.

3201—DREDGING—The Fraser as a Dredging Field. H. G. Stringer. (Min. Journ., March 16, 1907; 1 p.) Describes general placer-mining conditions in this British Columbia field and comments briefly upon the future prospects of the district. 40c.

3202—ELECTRIC POWER—The Economy of Electric Power in Quartz Mining. C. O. Poole. (Journ. Elec., Power and Gas, April 13, 1907; 3 pp.) Compares the relative efficiencies of wood, coal, oil and electricity as a source of motive power for mines on the Mother Lode of California. 20c.

3203—FAULTING—The Extraordinary Faulting at the Berlin Mine. Ellsworth Daggett. (Eng. and Min. Journ., Mar. 30, 1907; 5 pp.) Paper presented at the April, 1907, meeting of the A. I. M. E. Sums up the principal features of the remarkable faulting movements which have taken place in this Nevada mine. 20c.

3204—FINE GRINDING—Pans vs. Tube Mills. R. Clarke. (Min. and Sci. Press, Apr. 6, 1907; ½ p.) Discusses two grinding tests made respectively in pans and tube mills, showing that tube mills are more economical as regards power and costs, but that there is a small margin in favor of the pans for slimes. 20c.

3205—GOLD DREDGE as a Machine Claim. [illegible] Land Act, April 24, 1905. [illegible] upon the question of the [illegible] gold dredge, and enumerates the principles which [illegible] Court in view in deciding such [illegible] the [illegible]. 40c.

3206—GOLD DREDGING. Some Patent Acts of New Zealand Dredging Operations. [illegible] (Min. Mining Manual, 1907, [illegible] Compares the [illegible] the New Zealand Mining Handbook, 1906. [illegible] assay and time of operation of the principal dredging companies operating in New Zealand. 40c.

3207—GOLD DREDGING MACHINERY. Recent Applications of. F. C. Nicholas. (Min. Wld., March 23, 1907; 1 p.) Describes the design of a special dredge recently built [illegible] in saving placer gold and diamonds in Brazil. The material containing the diamonds as delivered to the sluice head [illegible] a [illegible] pump in order to obtain a [illegible] for the concentrating [illegible]. 20c.

3208—GOLD EXTRACTION. Notes on the Occurrence and Treatment of an Auriferous Ore Containing Insoluble Arsenides. J. K. Wilson. (Journ. Chem., Met. and Min. Soc. of South Africa, Feb., 1907; 4 pp.) Sums up the results of many experiments to determine an efficient method of working up gold ores containing insoluble arsenides. 60c.

3209—GOLD MILLING. Melting of Gold Ores. (L. A. Min. Rev., March 23, 30, and April 6, 1907; 3 pp.) Continuation of article previously indexed, dealing with the evolution of he stamp mill and milling practice of the West. 60c.

3210—HYDRAULIC MINING—Conserving the Water Suply in Placer Mining. D. H. Stovall. (Ores and Metals, March 20, 1907; 1 p.) Shows how forethought in the construction of reservoirs for storing water will often allow the extension of the working site. 20c.

3211—HYDRAULIC MINING—Making Vibrating Riffles. L. Kingsbury. (Ores and Metals, April 5, 1907; 1 p.) Gives some points about the construction of vibrating riffles in reply to criticisms concerning them, together with a drawing illustrating the method of building them as carried out on the Banner placer in Summit Co., Colo. 20c.

3212—HYDRAULIC MINING — The Government and Hydraulic Mining in California. W. W. Harts. (Min. Wld., April 6, 1907; 1½ pp.) Sums up the investigations made by the Government Commission instituted for the [illegible] [illegible] in relation to the settling of the débris resulting from hydraulic mining, and gives general instructions of the [illegible] to be selected [illegible] for retaining the débris. 20c.

3213—MEXICO—The Mines of the Altar District, Sonora. J. S. Alexander. (Eng. and Min. Journ., April 6, 1907; 2 pp.) Reviews briefly the present mining conditions in this territory, which borders on Arizona, and which [illegible] many [illegible] and [illegible]. 20c.

3214—MEXICO. The Placer Deposits of Mexico. J. Lynwood Garrison. (Min. and Sci. Press, March 23, 1907; 2 pp.) Describes present mining conditions in this famous silver-mining district, Chihuahua, where American capital and energy are responsible for renewed activity. 20c.

3215—MINE AIR — Witwatersrand Mine Air; Recent Investigations. James Moir. (Journ. Chem., Met. and Min. Soc. of South Africa, Feb., 1907; 16 pp.) Author's reply to the discussion on his paper of the above title, which was previously mentioned in the Index. 60c.

3216—NEVADA Mining in the Wonder District, Nevada. Edward R. Zalinski. (Eng. and Min. Journ., April 20, 1907; 2 pp.) Reviews the present state of the mining industry in this Nevada district, describing a few of the principal claims. 20c.

3217—NEVADA—The Mines of the Fairview District, Nevada. Edward R. Zalinski. (Eng. and Min. Journ., April 13, 1907; 4½ pp.) Contains notes on the present state of development of the mining industry in this silver-gold camp. 20c.

3218—PLACER MINING—Examination of Placer Ground. Regis Chauvenet. (Min. Rep., April 4 and 18, 1907; 3 pp.) Compares the relative merits of the process of determining the value of placer ground by panning and by ore assay of the samples. To be continued. 40c.

3219—QUEENSLAND — The New Dawn Mine, Gympie. (Queens. Gov. Min. Journ., March, 1907; 1 p.) Describes briefly the state of mining development at this gold mine in Queensland. 60c.

3220—RUSSIA. A Visit to the Gold Fields of Orenburg, Russia. F. H. Hatch. (Paper read before I. M. M., April 18, 1907; 5 pp.) Describes the [illegible] of the Kirgis-slan gold field, with a few notes on mining conditions underground.

3220a—SIBERIA. A Brief Sketch of the Lena District, Siberia. C. W. Purington. (Min. [illegible] April 6, 1907; 4 pp.) A few general notes describing the conditions of placer mining along the basin of the Lena river, with statements of gold production. 40c.

3221—TUBE MILLS. The Computation of the Crushing Efficiency of Tube Mills. S. H. Pearce and W. A. Caldecott. (Journ. Chem., Met. and Min. Soc. of South Africa, Feb., 1907; [illegible] R. H. Richards of the above paper, which was previously mentioned in the Index. 60c.

3222—YUKON. Mining in the Yukon. A. Thompson. (Can. Min. Journ., April 1, 1907; ½ p.) Contains a few notes on the present [illegible] and [illegible] in the Yukon. 20c.

3223—ZINC PRECIPITATES — The Production of Bullion from Zinc Box Precipitates. E. H. Taylor. (Monthly Journ. Chamber of Mines of W. A., Feb. 28, 1907; 1 p.) A few brief statements upon melting zinc-box sludge and producing the bullion from it. 80c.

GRAPHITE

3224—CANADA — Graphite in Canada. (Can. Min. Journ., April 15, 1907; 1 p.) Reviews the recent progress and present development of this Candian mining industry, the [illegible] of which is increasing. 20c.

GYPSUM

3225—WYOMING. Gypsum Deposits and Industry in Wyoming. L. W. Trumbull. (Min. Wld., March 23, 1907; 1 p.) Contains some [illegible] notes on the occurrence of gypsum and the methods of mining it in this State. 20c.

IRON AND STEEL

3226—BLAST FURNACE CHARGING—Ueber Hochofen-Begichtung. E. Münker. (Stahl u. Eisen, April 10, 1907; 2 pp.) Shows the construction and working of a device for charging blast furnaces where a central tube for the ore and fluxes is run down [illegible] [illegible] [illegible]

[illegible] Rapid Determination of Nickel in Steel. G. T. [illegible] Apr. 27, 1907; 1½ [illegible] detail the procedure for a [illegible] determining nickel in steel, the capacity of it being considerably above that of the standard ether method. Contains also directions for determining nickel in steels [illegible] but with copper. 20c

3250—RAIL SPECIFICATIONS—Comparison of American and Foreign Rail Specifications with a Proposed Standard Specification to Cover American Rails Rolled for Export. (Bi-monthly Bull., A. I. M. E., March, 1907; 7½ pp.) Reply by Albert Ladd Colby to the discussion of his paper of the above title, which was previously mentioned in the index.

3251—ROLLING MILLS—A Feeding Device for Rolling Mills. (Iron Age, April 18, 1907; 1 p.) A description of a new device applicable to mills employed for rolling steel, one of its features being that it makes it possible to roll and edge material at the same [illegible] without changing the rolls. 20c

3252—STEEL INGOTS Piping and Segregation in Steel Ingots. H. M. Howe. (Paper read before the London, 1906, meeting of the A. I. M. E.; 106 pp.) Very detailed discussion of the causes of piping and segregation in steel ingots, with methods of prevention, and proposes certain precautions in engineering specifications concerning these defects.

3253—STEEL PRODUCTION Compound Steel—A Modern Steel Plant Proposition. P. Eyermann. (Electrochem. and Met. Ind., April, 1907; 3 pp.) Describes the construction of a new steel plant proposed by the author, in which [illegible] is to be tapped directly into a compound steel furnace, and in which mixers and bessemer blower engines will be done away with. 40c.

3254—U. S. STEEL CORPORATION, Annual Report of. (Iron Trade Rev., March 21, 1907; 8 pp.) Reviews and comments upon the principal facts contained in the report of this corporation for 1906. 20c.

3255—WROUGHT IRON — The Structure [illegible] Steel. Albert Sauveur. (Electrochem. and Met. Ind., April, 1907; 1½ pp.) Shows how the application of metallography can determine the structure of iron and steel in a definite manner, so that the results of individual observers on the same specimen are always in accordance. 40c.

LEAD

3256—DESULPHURIZATION OF GALENA—Les nouveaux procédés de désulfuration de la Galène. M. Moslard. (L'Echo des Mines, April 11, 1907; 1 p.) Reviews the theories and reactions on which the new process for desulphurizing galena ores are based, and comments on them. To be continued.

3257—KENTUCKY Lead Deposits in Northern Kentucky. R. B. Brinsmade. (Eng. and Min. Journ., April 6, 1907; 1½ pp.) Gives an account of the geology of this district and descriptions of the workings of the deposits and the methods of mining and milling. 20c

MANGANESE

3258—BRAZIL Report on the Manganese [illegible] Morro Mun. Lafayette, Queiroz Minas Geraes, Brazil. M. A. Lisboa. (Brazilian Eng. and Min. Rev. Vol. III, Nos. 6 and 7; reprint; 21 pp.) Contains the results of [illegible] ned these deposits and describes their situation, geology [illegible] and development.

MOLYBDENITE

3259—MOLYBDENITE Deposits in Australia. John Plummer. (Min. Wld., March 30, 1907; 1 p.) Describes briefly the occurrence of molybdenum ore in New South Wales [illegible] upon the [illegible] 20c

NICKEL

3260—NICKEL ALLOYS — Nickel Alloys. Arnold. K. Friedrich. (Metallurgie, April 8, [illegible] chemical and metallographical means the properties of many alloys of nickel and ar[illegible]

3261 — NICKEL ALLOYS — On the Magnetic Behavior of Certain Nickel Alloys. B. V. Hill. (Phys. Review, April, 1907; 16 pp.) Gives the physical, chemical and magnetic properties of various nickel alloys and sums up the results of an extended examination of their properties. 60c.

PETROLEUM AND NATURAL GAS

3262—COLORADO—Natural Gas Wells and Springs of White River. A. Lakes. (Min. Wld., March 30, 1907; 1 p.) Gives a few brief notes on the discovery of natural gas in Colorado. 20c.

3263—ILLINOIS — Petroleum in Illinois. H. Foster Bain. (Eng. and Min. Journ., April 20, 1907; 1½ pp.) Reviews the present status of petroleum production in Illinois, with statistics and prospects of future development. 20c.

3264—INDIA The Asymmetry of the Yenangyat-Singu Anticline, Upper Burma. E. H. Pascoe. (Records, Geol. Surv. of India, Vol. XXXIV, Part 4, 1906; 7 pp.) A study upon the effect of the asymmetry of the anticlinal arch upon the shape and position of the oil-pools of this district, and upon the apparent direction of the axis.

3265—ITALY—The Petroleum Fields of Italy. (Pet. Rev., Apr. 13, 1907; 1 p.) Outlines the petroleum situation in this country, and enumerates the principal producing countries. 40c.

3266—KANSAS—Geology of St. John, Stafford County, Kansas. G. W. Miller. (Ores and Metals, Apr. 5, 1907; 1 p.) Discusses the geological features of this region, and enumerates some of the facts to be taken into consideration in drilling for oil in the field where geological data are limited. 20c.

3267—RUSSIA—The Russian Petroleum Export Trade. (Pet. Rev., Apr. 13, 1907; 2 pp.) Gives statistics of the Russian export trade and comments upon the features which influence its increase. 40c.

3268—SCOTLAND—The Geology of the Oil Shale Fields of Scotland. (Pet. Rev., Apr. 13, 1907; 2 pp.) Describes the principal oil measures of Scotland and their geological relations to one another. 40c.

QUICKSILVER

3269—MERCURY RETORT—Oil-Burning Mercury Retort, Furnace and Condenser. C. F. Brown. (Min. Rep., Apr. 18, 1907; ½ p.) Illustrates and describes very briefly the construction and operation of an oil retort, whose utility and economy have already been demonstrated in California quicksilver fields. 20c.

RARE METALS

3270—NIOBIUM Das Niob, Seine Darstellung und Seine Eigenschaften. W. V. Bolton. (Zeit. f. Elektrochem., Apr. 12, 1907; 4½ pp.) Notes on the discovery of niobium, its physical and chemical properties, and a description of two different methods of producing the metal in a fine state. 40c.

3271—THALLIUM—Contributions to the Chemistry of Thallium. L. F. Hawley. (Journ. Am. Chem. Soc., Mar., 1907; 4½ pp.) Gives the procedure for the volumetric determination of thallium, together with a description of the preparation and properties of thallium fulminate. 60c

SALT

3272—SPAIN—Las Salinas de Torrevieja. (Revista Minera, Apr. 1 and 8, 1907; 9½ pp.) Gives an illustrated account of the Torrevieja salt works in the province of Alicante, Spain, where operations are conducted on a large scale. Methods of exploitation are described, and statistics of production are given. 60c.

SULPHUR

3273—SULPHUR —Note sur les Conditions Economiques de l'Exploitation du Soufre en Sicile et en Louisiane. L. Aguillon. (Ann. des Mines, T. X, 12 livr. of 1906; 19 pp.) Traces the growth and development of the Sicilian sulphur industry, and reviews the effect of the entrance of the Italian government into this business. Gives also some notes on the Frasch process of exploiting the Louisiana sulphur deposits. 60c.

TIN

3274—BOLIVIA—Tin-ore Deposits of Bolivia. G. Steinmann. (Min. Journ., Apr. 6, 1907.) Translated from Proceedings of the Deutschen geologischen Gesellschaft. Contains a few remarks on the genesis and the geological features of these South American tin [illegible] 10c

3275—CORNWALL—Experience with a Cornwall Tin Mine. Edw. Walker. (Eng. and Min. Journ., Apr. 6, 1907; ½ p.) Reviews briefly the financial condition of the Bassett tin mine, with reasons for its past non-success and prospects for future improvement. 20c.

3276—ORE DRESSING—Cornish Methods of Crushing and Ore Dressing. Edw. Walker. (Eng. and Min. Journ., Apr. 13, 1907; 3½ pp.) Describes some of the characteristic methods and appliances used in Cornish tin mills, and compares them with modern methods as to efficiency and elimination of hand labor, which is now very scarce in this district. 20c.

3277—METALLURGY OF TIN. P. J. Thibault. (Aust. Min. Stand., Mar. 27, 1907; 1 p.) Continuation of article previously indexed, taking up in this instalment the matter of designing sluices for concentrating and mining cassiterite and the disposal of tailings. 40c.

3278—TASMANIA—Report on the Renison Bell Tin Field. W. H. Twelvetrees. (Govt. Geologist's Office, Launceston, Tasmania, Dec. 18, 1906; 11 pp.) Describes the geological features of this Tasmanian tin field and enumerates the principal producers in the district.

3279—TIN SMELTING at Banka. J. Koomans. (Min. Journ., Mar. 23 and 30, 1907; 1½ pp.) Translation from the *Jaarback van het Mijnwezen*, describing the smelting operations, with notes on the refining of the residual and slag tin, and the working of the liquation furnaces. 40c.

ZINC

3280—BLENDE ROASTING—The Valuation of Roasted Blende with Regard to Its Sulphur Content. V. Hassreidter. (Eng. and Min. Journ., Apr. 13, 1907; 1 p.) Abstract by A. J. Lotka from *Zeit. f. angew. Chem.*, 1906, p. 522. Tabulates the results of analyzing different blendes roasted at various plants, and discusses the significance of the figures obtained and the conclusions to be drawn from them in regard to the condition of the sulphur after roasting. 20c.

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3282—ROASTING for Magnetic Concentration of Zinc Ores. F. H. Trego. (Eng. and Min. Journ., Mar. 30, 1907; 3 pp.) Compares the efficiency of the ordinary cylindrical furnace and the new circular table roaster as regards economy of operation. 20c.

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3284—ZINC ORE ANALYSIS—Report of the Sub-Committee on. G. C. Stone and W. G. Waring. (Journ. Am. Chem. Soc., Mar., 1907; 6½ pp.) Tabulates the results of analyses made by many different people upon a standardized sample of zinc ore, and discusses their wide variation. Proposes a modification of Waring's method as a means of overcoming the defects of the procedures now in use for zinc analysis. 60c.

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3287—ECONOMIC GEOLOGY and Ore Deposits. F. C. Nicholas. (Min. Wld., Apr 6, 1907; 1 p.) Points out the features which must be taken account of in determining the economic value of a mineral deposit. 20c.

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(Min. and Sci. Press, Mar. 30, 1907; 2 pp.) Gives a simplified and condensed classification of eruptive rocks, based on Rosenbusch's classification. 20c

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3293—MISSOURI—Biennial Report of the State Geologist Transmitted by the Board of Managers of the Bureau of Geology and Mines to the Forty-fourth General Assembly. (Missouri Bureau of Geol. and Mines, 1907; 57 pp.) Contains a report of the work done by the Bureau of Geology during 1905 and 1906, with recommendation for increased efficiency in the Bureau, and a summary of mining developments which have taken place during this period.

3294—NEW MEXICO—Water Resources of the Rio Grande Valley in New Mexico and Their Development. W. T. Lee. (U. S. Geol. Surv., W. S. and I. Paper No. 188, 1907; 59 pp.) Gives the results of an investigation on the water supply of this Territory, with special reference to utilizing underground waters and to storing surface waters.

3295—NEW ZEALAND—The Geology of the Area Covered by the Alexandra Sheet, Central Otago Division, Including the Survey Districts of Leaning Rock, Tiger Hill and Foolburn. James Park. (N. Z. Geol. Surv., Bull. No. 2, new series, 1906; 52 pp.) Contains chapters on the physiography, general and economic geology of this region, together with a few notes on petrography as applied to the characteristic rocks.

3296—ORE DEPOSITION—Formation of Ore Bodies by Aqueous Solutions. E. A. Ritter. (Ores and Metals, Apr. 5, 1907; 1½ pp.) Gives a general discussion on various standard modes of ore deposition, illustrating them by examples of characteristic veins. 20c.

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MINING—GENERAL

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ORE DRESSING

3227 CONCENTRATING TABLE Ueber den "Tafelstoffherd" (System Gröppel. C. Blömeke. (Metallurgie, Apr. 8, 1907; 3 pp.) Describes the construction and operation of the Gröppel percussion table which differs from the Wilfley type in being slung from supports upon the principle of a hammock. Tests of its workings which show good results are included in the article. 40c.

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MINING AND METALLURGICAL MACHINERY

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3353—SAFETY CATCH—The Schweder Safety Catch. K. Schweder. (So. Afr. Mines, Feb. 23, 1907; ½ p.) Describes briefly the construction and operation of this safety catch, in which carbonic acid gas is admitted into two cylinders, causing their pistons to be pushed out and into the guides in case of accident. 20c.

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3356—WINDING—Electrically-driven Winding Gear and the Supply of Power to Mines. A. H. Preece. (Coll. Guard., Apr. 5, 1907; ½ p.) Short abstract of paper read before the Brit. Instn. of Civil Engrs., Mar. 26, 1907. 40c.

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INDUSTRIAL CHEMISTRY

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3364—BROMINE DETERMINATION—On the Direct Quantitative Separation of Chlorides and Bromides. L. W. Andrews. (Journ. Am. Chem. Soc., Mar., 1907; 8½ pp.) Gives a modification of Burgarszky's method of determining chlorine in the presence of bromine, whereby accuracy is secured when the relative percentage of chlorine is low. 60c.

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3370—PORTLAND CEMENT—Die Wirkung der Soda auf die Abbindezeit des Portlandzementes. Rohland. (Tonind. Zeit., Mar. 16, 1907; 3½ pp.) Sums up the results of an inquiry as to the influence of soda upon the time required for portland cement to set. 20c.

The Engineering and Mining Journal

VOL. LXXXIII. NEW YORK, MAY 11, 1907. NO. 19.

Magnetic Separation of Iron Ore in Sweden

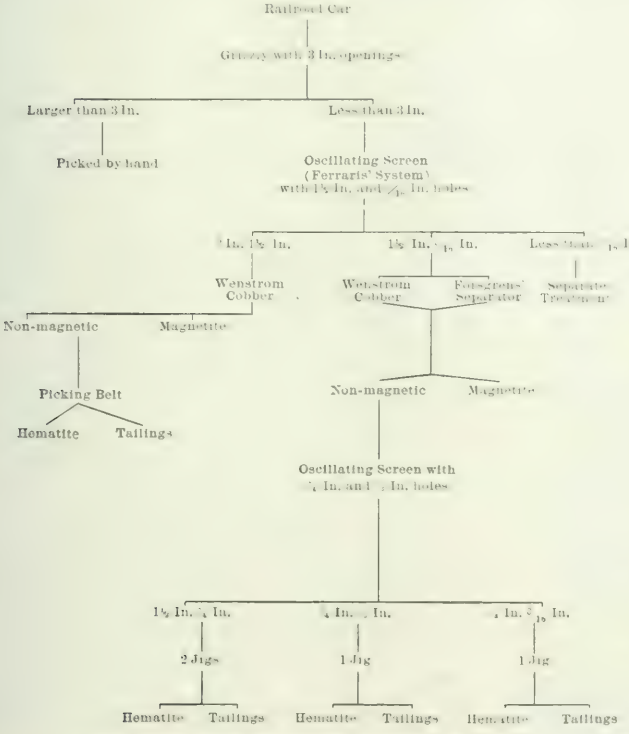
Twenty-one Plants Are in Operation, Producing Concentrates Containing 63 to 65 Per Cent. Iron from Ore Carrying 25 to 30 Per Cent.

BY G. WALFRID PETERSSON*

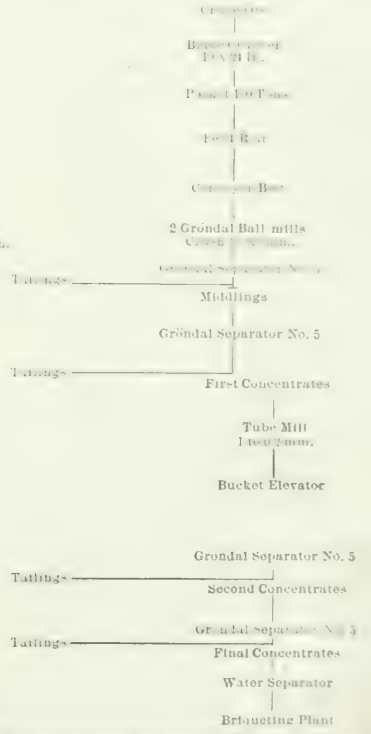
During the last twenty years the magnetic separation of iron ores, for obvious reasons, has become of great importance in Sweden. A great number of the iron-ore deposits in that country consist of magnetic ores, magnetite in a matrix of some combination of several of the following minerals: pyroxene, amphibole, garnet, clorite, talc, feldspar, quartz, and calcite, sometimes also with iron and copper pyrites, apatite, etc. Generally the Swedish magnetic ores are sufficiently rich and pure for direct charging in the blast furnace, but in many places there are, besides these richer beds, large quantities of ore which is lean, or which because of its sulphur or phosphorus content is less valuable, which has been left when the furnace ore was mined or has been stocked in great piles around the shaft openings of the mines for possible treatment in the future.

There are also in Sweden a great many ore fields containing only such low-grade or impure ores, which up to recent years have not been considered of sufficient value to be mined, but which now, with the magnetic separating process, can be profitably worked. It was a long time, however, before magnetic ore dressing obtained extensive use. The Swedish magnetic ores are generally so finely grained, and the magnetite is so intimately mixed with the matrix, that fine crushing is necessary before the separation. The concentrates are thus obtained in a finely pulverized state, not very well adapted for smelting in blast furnaces of the construction generally used in Sweden. As soon as Gustaf Gröndal had worked out his method for briquetting fine concentrates, magnetic concentration began to gain in popularity, and at present there are in operation a great number of magnetic separating plants distributed over the iron-ore districts, and new plants are built every year.

It might be supposed that magnetic separation according to the Wetherill system or some similar method would come into use for the separation of the great deposits of specular hematite which occur in many parts of Sweden in a matrix of quartz, garnet, etc. Yet the many trials



METHOD OF TREATMENT, GRANGESBERG COBBING PLANT



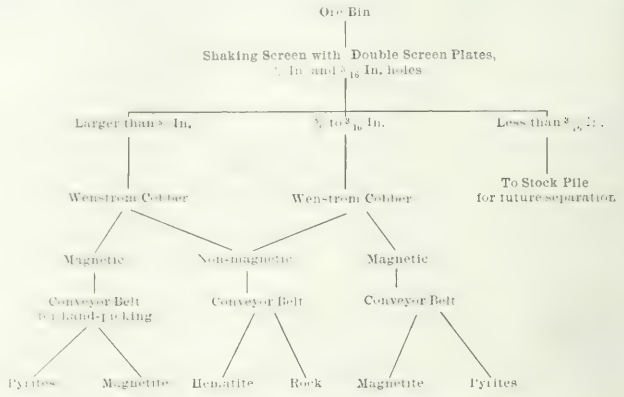
FLOW SHEET OF PLANT AT FLOGBERGET, NEAR FAGERSTA

Note—Translated by N. V. Hansell. No. 29 Broadway, New York.

*Professor of Mining, Technologgation, Stockholm, Sweden.

of such methods have failed, mainly on account of the grains of magnetite, often microscopic, which, mixed with the minerals occurring with the hematite, make them as magnetic as the hematite itself. For this kind of iron ores, the ordinary wet methods with jigs and tables are used, though not yet to any great extent.

In Sweden magnetic cobbing and magnetic separation of iron ores are regarded as separate processes. By the former method, ore pieces more or less magnetic are separated from rock pieces. By the latter, the magnetic particles, which have been freed from the non-magnetic minerals as much as is possible by the crushing process, are magnetically separated from them. In the cobbing process, no crushing takes place, or only a preliminary coarse breaking of the mined ore. In the separating process, on the contrary, fine crushing, approaching as nearly as possible to a "clean crushing," is needed.



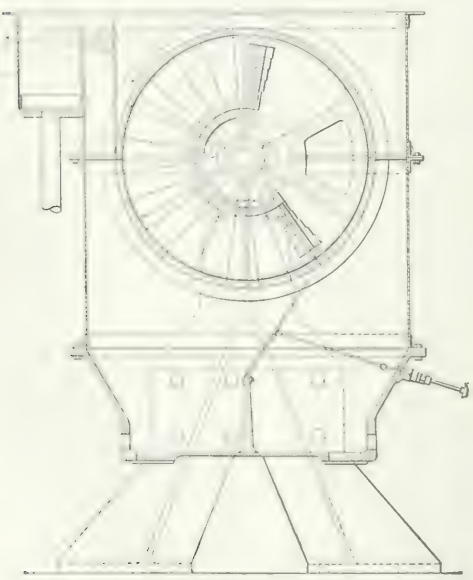
COURSE OF MATERIAL, DANNEMORA COBBING PLANT

Wenström Cobbing

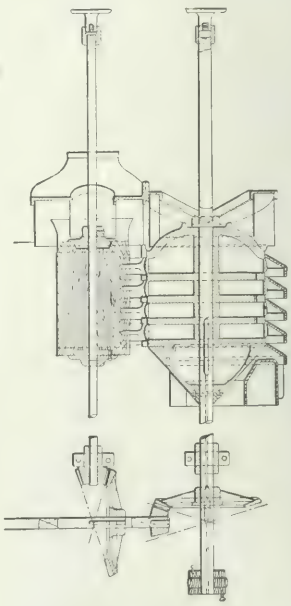
Magnetic cobbing was developed in Sweden in 1884 by Jonas Wenström, who at that time invented his magnetic cobbing machine. It at once obtained wide employment, not only in Sweden, but also in the United States, the East Indies, and other countries, and can still be seen in operation in many mines for the cobbing of ore of sizes from 3 in. to ⅛ inch.

The Wenström cobbing machine consists of a horizontal cylindrical drum built of alternating ribs of iron and wood parallel with the axis of the drum. The ribs are kept together by means of brass rings. Inside the drum a fixed electro-magnet consisting of an iron cylinder with disk-shaped flanges between which the coils are arranged in such a way that an electric current sent through them will produce north and south poles in the outside edges of the disks, is eccentrically arranged. The drum revolves around the electro-magnet. When the iron ribs on its surface enter the magnetic field, a secondary magnetism is induced in them, whereby they attract magnetic ore pieces. As the drum rotates and the ribs pass out of the magnetic field, they lose their induced magnetism and drop the ore pieces. The iron ribs are furnished with lugs opposite either the positive or the negative poles, and so arranged that alternate magnetism is induced in the ribs.

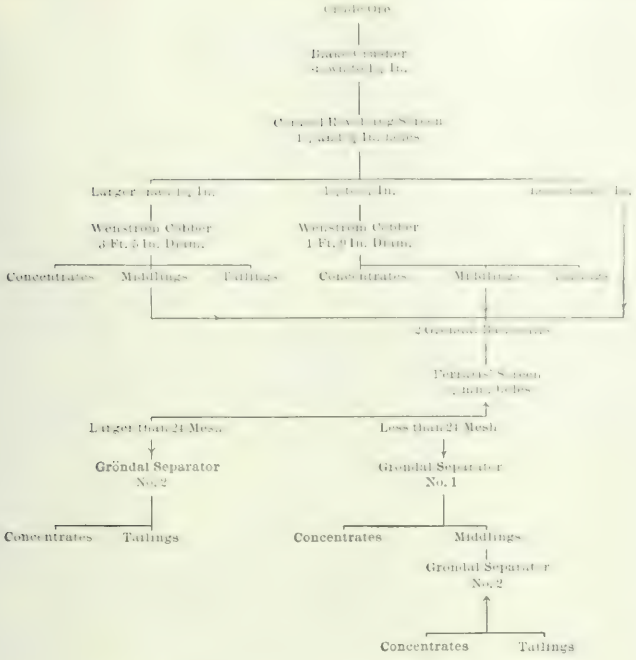
The new cobbing machines are manufactured in different sizes. The distance between the ribs depends upon the size of the material to be treated; the coarser the ore, the greater the distance. For the finer ore, of sizes from 1⅛ to ⅛ in., the drum is often covered with a sheath of zinc or German silver. For coarser material, the machine is usually constructed with a drum of a diameter from 3 ft. 4 in. to 2 ft. 10 in., and a length of 2 ft. Recently, some machines have been built



[illegible] SEPARATOR



GRONDAL, TYPE I



METHOD OF TREATMENT, KLACKA-LERBERG SEPARATING PLANT

with twice this width, divided into two sections, one for coarse, the other for finer material. The drums make from 16 to 20 r.p.m. An electric current of from 15 to 20 amp. and 110 volts is used for the electro-magnet.

The separating capacity of the Wenström cobbing machine is obviously dependent upon the character of the ore fed to it, but it generally varies between 5 and 10 tons of crude ore per hour. The cost of the separation is given as from 24 to 43c. per ton of the finished product. The machine is used either alone, for cobbing the small ore necessarily obtained in mining, or, and this has been chiefly during the last few years, in magnetic separating plants for separating the pure rock in the material coming out of the coarse ore, which is afterward crushed and separated.

The Dannemora mill will serve as a typical example of a cobbing plant. This mill was built in 1903 for the purpose of cobbing the small ore obtained in mining. The crude stuff is lifted by an elevator to the top floor and dumped into a bin with a capacity of 1.5 cu.yd. The subsequent

[illegible] companying flow-sheet.

A similar cobbing plant is built at Grangesberg, also for the treatment of small ore, which is taken in ordinary railroad cars directly to the top floor of the plant.

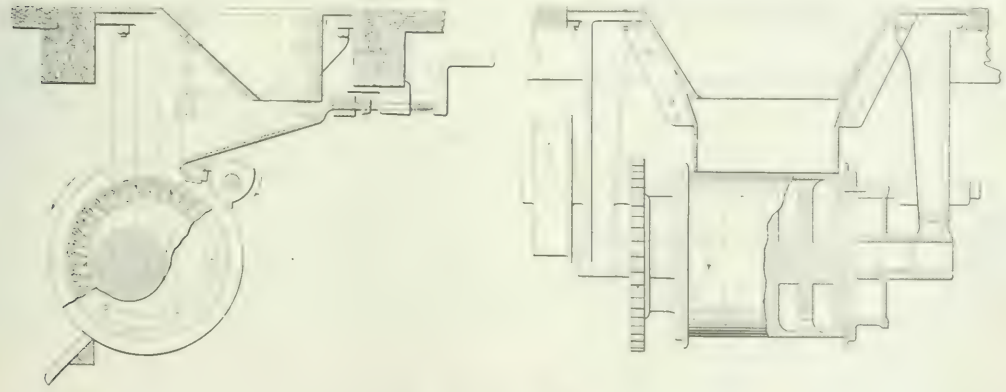
[illegible]

The Gröndal cobbing machine was invented in 1904. It resembles the Wenström machine in the construction of the drum, which is built of alternating iron and brass ribs. The former are ½-in. wide, the latter 3/10 in. The drum revolves around a fixed electro-magnet of the cross-section shown in the accompanying drawing. The method of its operation is similar to that of the Wenström cobber. The speed of the drum is 30 r.p.m. A 220-volt current has been used. The machine is used at some plants after the coarse crusher for the purpose of eliminating pure rock pieces in the crude ore.

Magnetic Separation

Although, as already mentioned, the magnetic cobbing of iron ores has been in use in Sweden since 1884, the magnetic separation of such ores was not seriously considered before 1894. In that year, a small model of the machine which is known in Sweden as the Monarch separator was demonstrated in Stockholm. This separator, which was a modification of the Ball and Norton machine invented in the United States in 1888, was at once received with great interest, and during the same year a company was formed for the exploitation of the invention in Sweden.

As it first appeared, it was constructed for the separation of dry material, and was in this form used at Herräng from 1894 to 1899, and at Lulea from 1897 to 1904. The great disadvantages connected with the separation of dry ma-



WENSTROM COBBER

terial caused a reconstruction of the machine in 1899 in order to make it useful for wet magnetic separation, i.e., for the separation of ore mixed with water. This modified Monarch is furnished with only one drum having a diameter of 2 ft. 6½ in. and a length of 1 ft. 1½ in. It rotates comparatively slowly, 8 to 10 r.p.m., around a system of magnets arranged in the same way as in the older type. Only two products, concentrates and tailings, are obtained. In this form, the machine was used at Herräng from 1899 to 1902; its separating capacity was 25 tons of crude ore per hour, with a current of 8 to 10 amperes and 110 volts. To turn the drum, a little less than 1 h.p. was required.

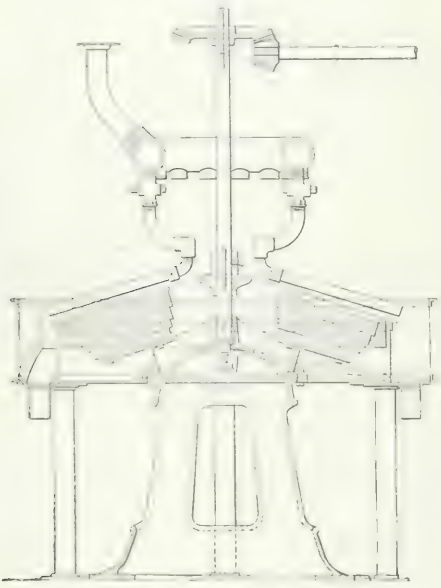
The Gröndal Separators

At the Exposition of Industry and the roller mounted on an iron shaft. On the roller, iron studs of small cross-section, insulated from one another, are placed opposite the magnets on the separator. In their nearest position, they are from ⅛ to 3/16 in. from it. When, during the rotation of the off-taker, they come in the neighborhood of the magnetic disks, they become magnetic by induction. On account of their small cross-section compared with that of the disks, the lines of force are concentrated in them; consequently their attracting power is greater than that of the disks. The magnetic particles attracted to the disks of the separator are by this device drawn over to the studs of the off-taker. When, by the rotation of the roller, the studs are removed from their source of force, they lose their magnetic power and drop the attracted grains.

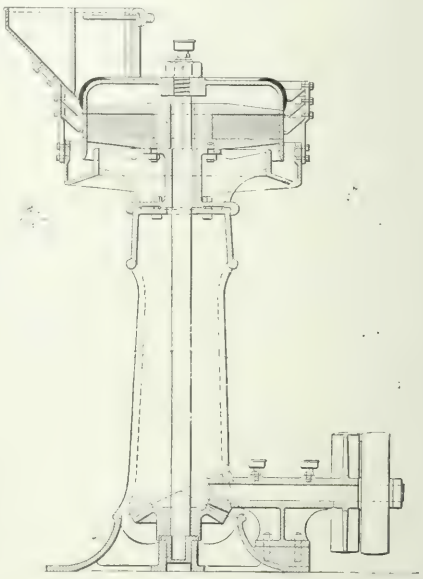
ing capacity, like that of all others of its kind, depends to a certain extent upon the iron content of the crude material. With 30 per cent. iron in the crude ore, the Gröndal No. 1 will treat 30 tons per day of 24 hours.

The Gröndal No. 2

A few years after the invention of his first separator, G. Gröndal brought out in the market his second type, which combines with its small dimensions great simplicity and easy regulation. The machine has a fixed electro-magnet consisting of two semi-circular disks of soft iron attached to a vertical shaft 2⅜ in. apart. Between them the coil is inserted. Around the electro-magnet revolves a bell-shaped sheath of brass, in the outer surface of which a number of iron plates or *lamels* are cast. When the thin *lam-*



[illegible] LABEL SEPARATOR



GRÖNDAL NO. 2

Liberal Arts in Stockholm in 1897, G. Gröndal exhibited a magnetic separator which at once won a great deal of interest and was to be from the beginning a victorious rival of the Monarch. This separator, now known as the Gröndal type, No. 1, consists of two rotating vertical cylinders, side by side—the separator and the off-taker.

On the vertical axis of the separator, five horizontal disks of soft iron are fixed 2⅜ in. apart. Between them, coils of copper wire are arranged so as to give them alternate positive and negative polarity. The number of turns increases downward, by which arrangement, the further down the shaft the disks are located, the more strongly magnetic they [illegible] taker is simply a wooden

The off-taker generally rotates nine or ten times as fast as the separator (about 225 r.p.m., while the separator makes 25 r.p.m.). The crude material, in the form of a pulp, is fed at the top of the separator. What is not attracted by the first magnetic disk runs in a launder to the second one, and so on, the ore in this way passing under continually increasing magnetic influence. By sprinkling with clear water, particles of the gangue sticking to the concentrates are washed away. The coils require 6 amp. of current of 31 volts tension; ¼ h.p. is sufficient for revolving the cylinders.

This machine was used at all the plants erected in the next few years after its introduction, and is still in satisfactory operation in many of them. Its separat-

els enter the magnetic field with the rotation of the bell, they become strongly magnetic. As long as they are in the near neighborhood of the magnetic disks, i.e., during half of the revolution, they keep the magnetism, but afterward slowly lose it. In order that the magnetic intensity of the *lamels* shall increase toward the lower edge of the bell, their upper part is covered with a layer of a lead-antimony alloy, which becomes increasingly thin toward a line near the bottom, below which the bare *lamels* come in contact with the material.

The pulp to be treated is fed at the upper part of the bell at the point where it begins in its rotation to pass by the electro-magnets. The magnetic particles are attracted to the *lamels*, while the non-

magnetic particles are washed off. When the lamels, after half a revolution, pass out of the magnetic field the concentrates can be easily removed. About the same current is needed for this machine as for Gröndal, No. 1, but not so much motive power. The machine soon came into operation at several plants, either alone or with others of the older type.

The Gröndal No. 3

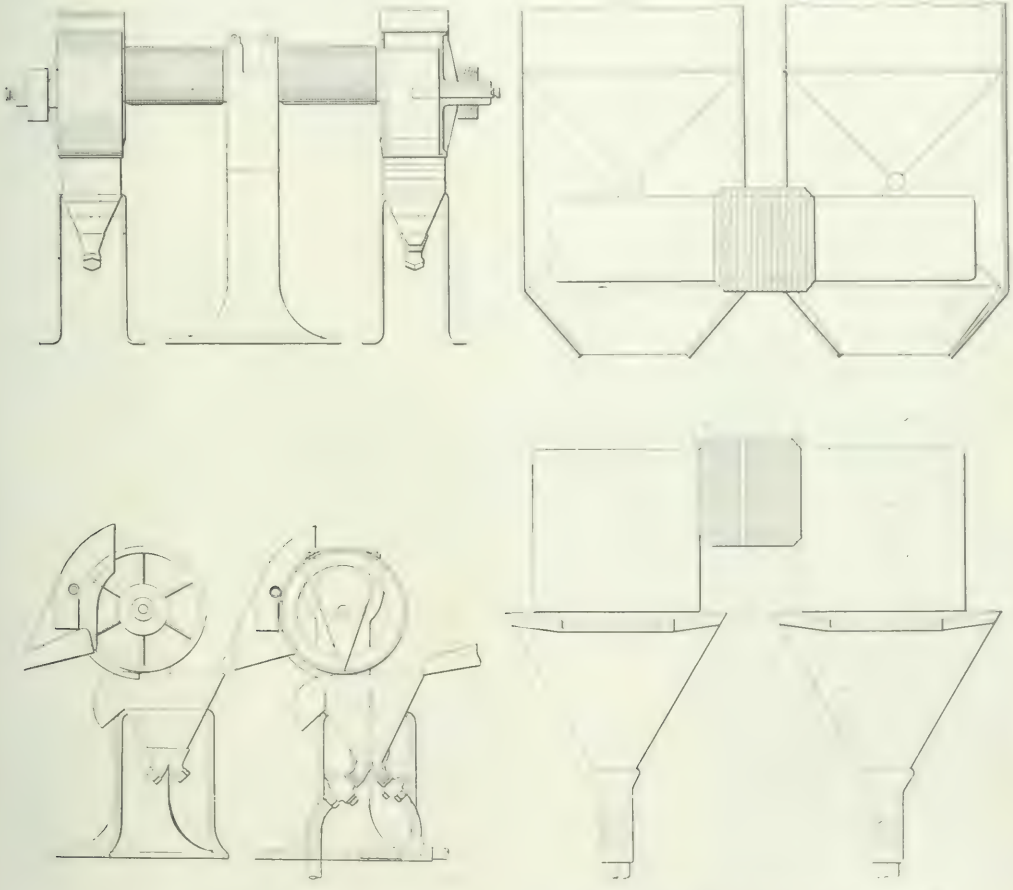
Not much later a Gröndal No. 3 was constructed, and in 1903 it was put on the market. This type is furnished with a fixed electro-magnet with hatchet-shaped pole pieces around which brass drums revolve with a speed of 80 r.p.m. As in No. 2, iron lamels are inserted in the brass. These are alternately magnetic and non-magnetic as, during the rotation of the drum, they pass through or outside of the magnetic field. The magnetic separation, as well as the removal of the concentrates, is thus effected. The characteristic of this separator is that the pulp is not fed directly on the drum, but is brought into the field of the magnetic influence in a weir box under it. On account of the great concentration of the lines of force resulting from the pointed shape of the poles, the most magnetic particles are lifted out of the water, attracted to the lamels of the drum, and carried forward. Once outside of the magnetic field, they are easily washed off.

Less magnetic particles, as, for instance, the middlings, are drawn to the surface of the water and, following the current, are discharged at the further end of the weir box, while the non-magnetic material, the tailings, sinks to the bottom to be discharged. By the lifting of the magnetic particles out of the water, a thorough cleaning from the particles of gangue is effected. Generally, two such separators are combined in a twin ma-

motive power of only 2 h.p. For the electro-magnet, a current of only 3½ amp. and 110 volts is usually sufficient. The separating capacity of this machine is stated to be 50 tons in 24 hours. The Gröndal No. 3 has been operated at only a few plants, for the reason that shortly after its invention it was followed by a new type.

The Gröndal No. 4

At [illegible] operating plants, much trouble had been experienced on account of the high percentage of water in the concentrates produced. Before the product could be briquetted, it was found necessary for the wet concentrates to be stored until the surplus of water had run off, and the concentrates were in a state suitable for the briquetting process. To eliminate this drawback, Gröndal constructed his type No. 4, in which the revolving drum is replaced by a horizontal disk of brass rotating with great speed,



(about 1450 r.p.m.) under a fixed electro-magnet. Each of the pole pieces of this magnet is in the shape of a hollow cylinder, the sides of which, thicker at the top, run to an edge at the bottom.

As in type No. 3, the pulp is fed in a weir box under the magnet. The magnetic particles drawn up against the horizontal disk are immediately thrown out by the centrifugal force and discharged in a nearly dry state. About 1 h.p. is required for the rotation of the disk, and about the same amount of electric current as in the last described type for the magnet. The machine at once went into operation at several plants, and worked quite satisfactorily. The great wear on the rotating disk, however, caused this type soon to make way for a fifth.

The Gröndal Separator No. 5

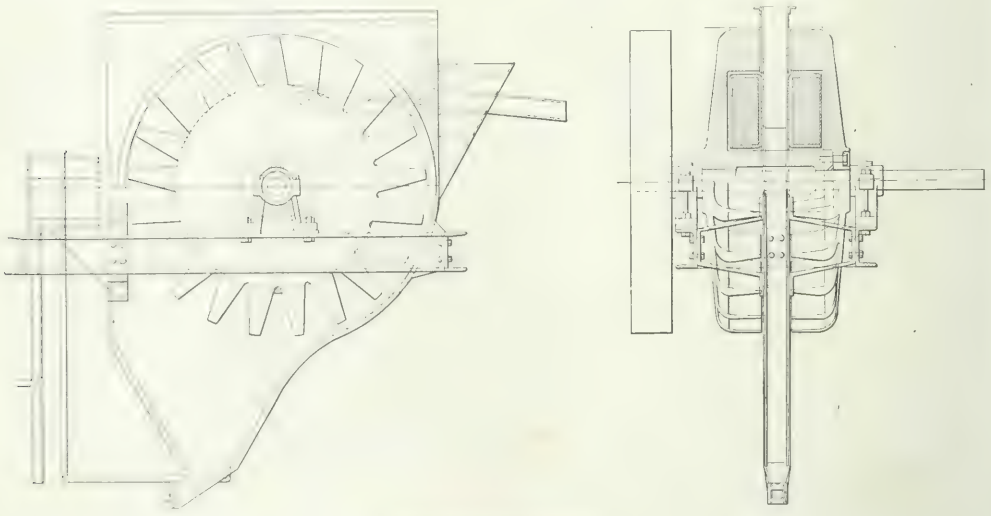
This separator is now either installed or contemplated in a great number of the new plants in Sweden. Inside a horizontally rotating brass drum is arranged a system of electro-magnets of alternating polarity somewhat resembling that of the Monarch separator. The pulp is fed in a weir box, as in the last two types. By the magnets, the magnetic particles are drawn out of the water and against the drum. With a dancing movement caused by the alternating polarity, they are carried past the magnets. Once out of the field, they are washed off by water. The material not lifted from the water is divided into middlings and tailings as in type No. 4. The power required is about [illegible] volts. The separating capacity of this machine is, with Herrang ore, 100 tons crude ore per drum in 24 hours. The concentrates from it are highly saturated with water, which in the more recently built plants, is eliminated by water separators consisting of shaking shoes which allow the water to flow away over the further edge of the shoe.

In connection with the separators already described, an auxiliary apparatus, also of Gröndal's invention, should be mentioned. By this apparatus the finest pulp or mud formed in the crushing is successfully treated. Before its introduction, the magnetite in this fine material was generally lost in the separation. The essential feature of this slime-treater is the suspension of an electro-magnet with hatchet-shaped pole-pieces over two pyramidic boxes. When the pulp passes through these, the magnetic particles are stopped by the influence of the magnet, while the others are carried on. The magnetite, collecting in bunches, slowly sinks to the bottom of the box, from where it can be discharged in any ordinary way.

Other Swedish Separators

Besides G. Gröndal, several other Swedish inventors have directed their attention to the construction of separators suitable for magnetic ores. Shortly after the introduction of the Gröndal No. 1, the magnetic separator of Heberle was brought out in the market. This, being a modification of the Hoffman machine adapted for wet magnetic separation, has gained only limited use in Sweden; mostly as an auxiliary apparatus for the separation of ores other than magnetites.

Another magnetic separator was constructed in 1900 by M. Fröding. This has the form of a small conical table with its brass top about 5 ft. in diameter, and with a pitch of about 27 deg. It makes about 10 r.p.m. over a system of fixed electro-magnets arranged radially side by side, 2 in. apart. They underlie 6/7 of the surface of the table. The pulp is fed at the center over the first magnet. The non-magnetic particles are at once flushed away with the water, while the magnetic particles, retained by the magnets, are carried around with a dancing movement caused by the alternating polarity. This, helped by a sprinkling of clear water under high pressure, cleans the magnetic grains from attached particles of the non-magnetic material. When the last magnet has been passed, the ore is easily washed off. The separator works with a current of 8 amp. at 100 volts, and requires about ½h.p. Of Herräng ore with 25 per cent. iron in the crude state, the machine treated on an average 2 tons per hour in a continuous run of seven months. It is employed at a few plants in Sweden.



KNUT ERIKSSON SEPARATOR

The Eriksson Machine

Simultaneously with the Fröding separator, the Knut Eriksson machine was put on the market. Built on a somewhat different principle, it consists of a system of two spider-shaped or star-shaped electro-magnets of different polarity rotating on a horizontal axis. Between the positive and the negative pole-shoes, which are turned toward one another, there is a narrow chamber inclosed by two vertical brass plates; into this the ore is fed, either in a dry state or in the form of a pulp, of which the latter is preferable. The magnetic particles arrange themselves along the lines of force between the poles, forming bunches between the vertical walls. Traveling forward with the rotating magnets, they are carried along to the other side of the machine, where they are discharged. The non-magnetic material is

washed off as soon as [illegible] ber. In wet separation, the chamber is partly filled with water through which the magnetic ore passes, being thus washed clean from attached dust or particles of tailings. The machine is in use in some plants in the middle part of Sweden.

The Forsgren Separator

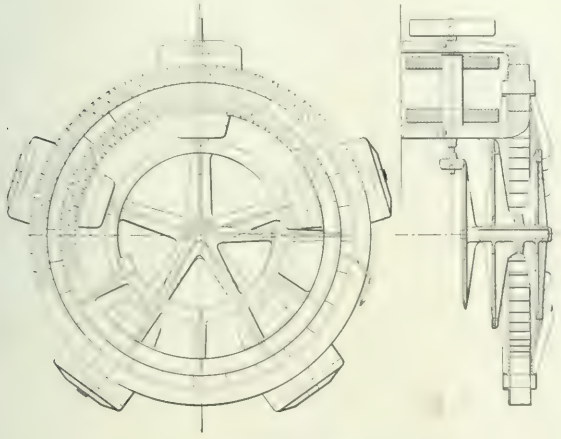
The Forsgren magnetic separator, constructed in 1902, consists of two horizontal concentric rings of brass in which wedge-shaped pieces of soft iron have been inserted with the pointed ends turned toward each other. Attached to the same spider, the two rings rotate with a speed of from 5 to 10 r.p.m. between one or several couples of fixed electromagnets of opposite polarity, which induce secondary magnetism in the wedge-shaped iron pieces when these pass the electro-magnets, thus forming secondary poles.

magnetic concentration, the machine is well worth attention. For the electromagnets a current of from 3 to 3.5 amp. at 110 volts is used. The power required varies from ½ to 2 or 3 h.p., according to the size of the machine. The separating capacity, of course, depends largely upon the character of the crude ore. For instance, a separator with three feed-chutes, working with ore from Lomberget of a size finer than 0.5 mm., treated 5 tons per hour; another with four feed-chutes, built for cobbing Grängesberg ore of sizes from 1⅜ to 3/16 in., treated 10 tons per hour. The machine is employed at the cobbing plant at Grängesberg, and a few other places in Sweden and other countries.

Besides the magnetic separators already described, there are several other Swedish machines worth mentioning; for instance, those of G. Bring, G. Hallberg, and G. W. Lundberg, the Morgardshammar separa-

magnetic particles, thus giving tailings and first concentrates, the latter to be carried to a weaker separator, which separated the particles richer in magnetite from the leaner ones, and middlings, which had to be returned to the ball-mill for regrinding.

With increased experience, there arose a demand for more complete extraction. It had been found that generally the magnetite was more finely crushed in the ball-mill than the gangue minerals. By virtue of this circumstance, it was the practice for a time to feed the concentrates from the double separator just described to a traveling endless sieve cloth with very fine mesh, where it was subjected to sprinkling with water under pressure. The fine grains passing through the sieve consisted chiefly of pure magnetite, while the coarser grains were gangue minerals more or less intermixed with particles of



FORSGREN SEPARATOR

GRONDAL MAGNETIC COBBER

The crude ore is fed between the rings at the places where the primary magnets are situated. The magnetic particles attracted by the secondary poles arrange themselves in bunches between them, as in the Eriksson machine. The non-magnetic grains drop straight down between the rings. When the secondary poles, in the rotation of the rings, leave the magnetic field and lose their magnetism, the magnetic particles fall off sooner or later, the length of time before they do this depending upon their permeability. The middlings drop first, the pure magnetite last.

It is thus possible to separate tailings, middlings, and concentrates, and the grading between the different classes can be fixed to suit the conditions. The number of ores which can be treated in one machine is equal to the number of electromagnets employed. Useful for both dry and wet magnetic separation, and [illegible] was first fed on [illegible]

tor, and others; but they are still either in the experimental stage or have so recently been put in practical operation that reliable data in reference to their work are not yet available.

Magnetic Separating Plants

During the first development of magnetic separation in Sweden, the custom was to make the plants as simple as possible. They usually contained nothing but one crushing machine, generally a Grönd al ball-mill, and one or several magnetic separators. Soon, however, it was found that on the one hand a preliminary coarse crushing in a Blake or Gates crusher was necessary before the ore was fed into the ball-mill, and on the other hand that a finer crushing than had been usual was of advantage. It was also found desirable to treat the fine crushed material by a double separation in such a way that it

magnetite, forming comparatively rich middlings to be reground in the ball-mill. It was not long before this principle was carried yet further by the introduction of fine grinding in tube mills of the first concentrates obtained in the double separation.

Simultaneously with the finer grinding of the concentrates, there was introduced at some works, where the ore showed its fitness, a magnetic cobbing of the ore coming from the first breaker in order to eliminate at once pure rock pieces, the feeding of which into the ball-mills and the separators was undesirable.

In the last few years, the magnetic separating plants have thus lost much of their simplicity while they have gained in efficiency. They are still a great deal simpler than the ordinary wet jigging mills.

Illustrating two somewhat different

[illegible] examples [illegible] of Swedish practice.

ADVANTAGES OF MAGNETIC SEPARATION

By magnetic separation, a product with from 63 to 68 per cent. iron can without difficulty be obtained from a crude ore with from 25 to 30 per cent., if crushed fine enough. The loss of iron with the tailings is generally very small, depending on how much of it the silicates in the gangue contain. It varies, for instance, in amphibole, from 2 to 16 per cent., in pyroxene from 9 to 12 per cent., in garnet from 17.5 to 21.5 per cent.

The phosphorus content is easily reduced, even if the crude ore has a comparatively great amount of it. At Karlsvik, for instance, the phosphorus is lowered from 1 per cent in the crude ore to 0.005 per cent. in the concentrates. The sulphur is also easily reduced, provided it does not exist in the form of magnetic iron pyrites.

LIST OF MAGNETIC SEPARATION PLANTS IN OPERATION IN SWEDEN

No.	Year	Type of Separator.
[illegible]	1894	First Monarch, then Fröding, later Gröndal No. 3; now Gröndal No. 3.
[illegible]	1895	Monarch, Heberle (not in operation).
[illegible]	1898	Gröndal No. 1.
[illegible]	1898	Do. Rebuilt 1906 and furnished with Gröndal No. 5.
[illegible]	1900	Gröndal No. 1 and No. 2.
[illegible]	1901	Gröndal No. 1.
[illegible]	1901	Gröndal No. 2 (not in operation).
[illegible]	1901	First Gröndal No. 1, replaced by No. 2, now No. 5.
[illegible]	1901	Eriksson.
[illegible]	1902	Gröndal No. 2.
[illegible]	1903	Forsgren.
[illegible]	1904	Eriksson.
13 Grängesberg.	1904	Eriksson.
[illegible]	1905	Fröding.
[illegible]	1905	Fröding replaced by Morgardshammar.
[illegible]	1905	Gröndal No. 5.
17 Flogberget.	1906	Gröndal No. 5.
[illegible]	1906	Gröndal No. 5.
19 Karlsvik at Luleå.	1906	Gröndal No. 4 and No. 5.
20 Tuorsberg.	1906	Gröndal No. 5.
21 Vintjärn.	1906	Hallberg.

Of these, Nos. 1, 4, 8, 16, 17, 18, 19 and 20 are combined with briquetting plants according to G [illegible] the subject of a later article by N. V. Hansell.

To give an idea of economic conditions in a plant of this kind, it may be stated that a combined separating and briquetting plant with a capacity of 50,000 tons of crude ore yearly costs for erection about $50,000; about 200 h.p. are required, and about 465 gal. of water per minute. Twenty men are sufficient for operating the plant.

Volumetric Estimation of Antimony

J. B. Duncan (*Chem. News*, Feb. 1, 1907) employs a modification of the volumetric estimation of antimony, using potassium bromate. The potassium bromate solution contains 2.785 grams of the salt in a liter and is standardized by weighing 0.3 grams of pure finely divided antimony, or an antimony salt containing an equivalent amount of antimony, into a 16-oz. beaker, covering with 20 c.c. of strong hydrochloric acid and a few drops of bromine. The beaker is gently warmed and occasionally shaken until [illegible] is complete. The excess of bromine is boiled off, the solution allowed to cool somewhat and 0.75 gram of sodium sulphite added. The solution is boiled down to half its volume to drive off the sulphur dioxide. The beaker and cover-glass are washed down with hot water, a little hydrochloric acid added and the solution heated to boiling. The bromate solution is then added until the antimony is nearly all oxidized, when 3 drops of methyl-orange are added and the titration finished, indicated by the discharge of the color. Arsenic, iron and copper only in large amounts affect the titration.

For hard lead weigh out 0.3 gram of fine lead saw-dust and treat with 20 c.c. of strong hydrochloric acid, boil for a few minutes, add a few c.c of a saturated solution of bromine in hydrochloric acid and shake occasionally until the alloy is dissolved. The procedure then follows the standardization.

Ores soluble in hydrochloric and bromine are treated like hard lead. Insoluble ores are fused with a mixture of equal parts of sodium carbonate and sulphur. Weigh out 0.3 gram and fuse gently with 3 to 4 times its weight of the mixture in a covered porcelain crucible for 15 min. Extract the fusion with boiling water, filter, wash and extract any antimony remaining in the residue by treating the residue and filter paper with hot hydrochloric acid. Nearly neutralize this solution with caustic soda, add sodium sulphide in excess, boil and filter. Precipitate the antimony from the combined filtrates with hydrochloric acid, allow to settle and filter through a Gooch crucible, using asbestos for the filter. The washed sulphide is transferred with the asbestos to a 16-oz. beaker by means of a glass rod and a jet of strong hydrochloric acid, the volume of acid made up to 25 c.c. and the solution boiled until the hydrogen sulphide is eliminated. The solution is slightly cooled, a few drops of bromine added and again boiled until the sulphur separates, when it is filtered, washing with hydrochloric acid and water. The filtrate is boiled to expel the bromine, sodium sulphite added and finished as before.

Broken Hill South Silver Mining Company

The report of the Broken Hill South Silver Mining Company, of New South Wales, for the half-year ended Dec. 31, 1906, announces the discovery of a large body of high-grade ore at a depth of 970 ft. The financial statement showed a balance of £82,016, against £71,015 the previous half-year. The net liquid assets amounted to £119,572, an increase of £19,907.

There were 105,147 tons of ore raised, averaging 15.4 per cent. lead, 11.9 per cent. zinc, and 5.3 oz. silver; this compares with 95,724 tons raised in the first six months. The cost of producing this ore was: (1) mining, 9s. 9.08d.; filling depleted stopes, 1s. 2.52d.; development, 2s. 11.9d., against a total cost, for these items, of 14s. 3d. in the first period. Concentrating costs were 4s. 0.3d. per ton, a decrease of 4.3d.

Development work for the six months consisted of shaft sinking, 245 ft.; drifts and crosscuts, 2170 ft.; raises and winzes, 800 ft.; diamond drilling, 597 ft.; total, 3812 ft.

Eleven 5-ft. Wheeler pans were substituted for the ball mills owing to the high maintenance cost of the latter, and a tube mill 13 ft. long and 53 in. diameter was erected for experimental work. The new concentration mill was nearly completed at the close of the year.

Zinc Strips for Electric Fuses

A. Schwartz and W. H. N. James (*Electrician*, 1906, LVI, 184) have studied the behavior of zinc fuses in the form of strips when used as thermal cutouts in electric circuits. Zinc shows very little deterioration, when run continuously at 90 or even 95 per cent. of the normal fusing current; the oxidation is very slight and the final resistance of the strip is practically the same as its initial resistance. This is a marked advantage in comparison with copper, which becomes red hot with about 75 per cent. of its normal fusing current and above this point oxidizes rapidly. Zinc has, however, certain disadvantages. The mass of the fuse is about 3.5 times, the volume 4.4 times, that of a copper fuse of the same length and for the same fusing current. Moreover, on disruption, the metal is distributed in the form of globules, which are not only red hot, but which continue to burn in air, being accompanied by dense white fumes which deposit heavily on contiguous surfaces.

Colliery Hoisting, Haulage and Power Systems

The Cost of Individual Steam-driven Hoist and Power Units Compared with That of the Central Electric Power-station System

BY FRANZ ERICH JUNGE*

One department which seemed formerly almost exclusively reserved to direct (steam) drive is that concerned with taking the mine workers up and down the pit, also with lifting the broken ore or rock or coal to the surface, to be there screened, and washed, and finally charged into the (blast) furnace or coke ovens, or to be shipped directly to the consumers. Since hoisting service presents perhaps the most fluctuating of factors which constitute the load curve of a colliery, and since we can only arrive at just conclusions regarding the prospects and limitations of gas power as a claimant for recognition in this class of work by understanding the manner of operation of every important branch of application, and its back effect on the prime movers in the central station, it will be necessary to devote a few explanatory words to the operation of hoisting engines.

Steam hoisting engines are very simple, safe and reliable machines and quite excellent but for the one disadvantage that they are extremely uneconomical owing to the severe and fluctuating demands of the hoisting load. By far the majority of engines tested show an average steam consumption of between 50 and 60 kg. (120 to 132 lb.), some obsolete types as high as 100 kg. (220 lb.), other high-class engines only 29 kg. (64 lb.) per shaft (pit) horse-power hour.

This high economy is chiefly due to the improved type of engines, to the employment of high steam pressures and superheating, to the avoidance of harmful clearance spaces by placing the valves on top and bottom ends of cylinders, to improvements in admission-governing devices and last but not least to the greater depth of the pit which allows the engine to develop its capabilities and to utilize the advantages of compounding and prolonged expansion.

Electrically Driven Hoists

The economy of operation of electrically driven hoisting (winding) engines for main-shaft winding service depends chiefly on the mode of current adopted. On account of the many advantages which three-phase current possesses over other systems for operation in mines, it would be most desirable to use it also for driving hoisting engines. However, the speed regulation of alternating-current motors in hoisting service is difficult, depending as it does on so many varying influences. Also it is hard to protect these motors sufficiently against excessive load fluctuations. The use of fly-wheels as equalizers is not satisfactory, while storage batteries with motor generators, though effective, are too expensive in first cost.

Further, it is practically impossible to build three-phase current motors of 100 h.p. for a frequency of 50 periods for a speed of between 40 and 50 r.p.m., while this is possible with direct-current motors, which may therefore be directly coupled to the shaft of the hoisting drum.

Finally, on account of the peculiarities of hoisting service, the consumption of energy in three-phase current motors depends greatly on the skill of the attendant and is usually higher than that of direct-current motors. Therefore the latter type of motors, especially when connected with the Leonard system of regulation-hoisting motor driven by direct-current generator—is coming into almost universal use in Germany.

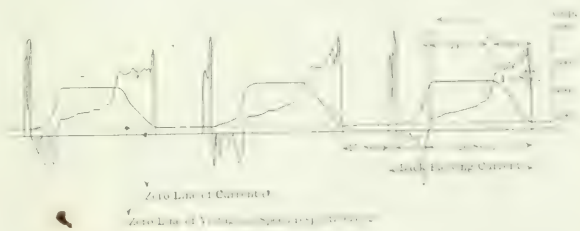


FIG. 1. HOISTING DIAGRAM AT FRIEDRICHSHALL

Leonard System of Regulation

It would go beyond the scope of this study were we to discuss in detail the advantages which this mode of driving embodies over three-phase current work. They may be briefly summarized as follows:

The hoisting speed is independent of the load and can be chosen higher than with either direct steam drive or three-phase current motors. Therefore the rate of output from the pit is increased. The speed of driving is only dependent on the position of the starting lever and the arrangement can be made absolutely safe and controllable.

The consumption of power is not dependent on the skill of the attendant and can therefore be guaranteed beforehand. [illegible] Phillipi in a paper read to the Verein deutscher Ingenieure, shows the relation of the current consumed by the hoisting motor (1) to the varying potential of the armature of the motor (2), the product of both representing the amount of energy consumed by the hoisting motor.

Another great advantage of the Leonard system of regulation is that it offers convenient and perfect means for equalizing load fluctuations. Leaving out of consideration the case that the regulating direct-current dynamo is driven directly by some steam or gas prime mover, though this is often the most economical mode to pursue, we shall here consider what obtains in the majority of cases in modern European practice, viz., that the dynamo is driven by a special motor which works at a constant potential, taking its current from the network of some central station.

A. C. D. C. Transformers

The advantage of having a converter set for transforming the three-phase current delivered by the line into direct current, which is employed for driving the hoisting motor and drum, consists chiefly in that the arrangement allows to connect even the largest main-pit winding engine to any net without disturbing other consumers. It is therefore no longer necessary to provide a power-house for every mine, so long as electric current from some reliable source is available.

The great improvement which Ilgner has introduced in the operation of these alternating-current direct-current converter and hoisting sets consists in that he placed a very heavy fly-wheel, having a weight of from 30 to 40 tons for large work, on the shaft of the motor generator, which absorbs all shocks and fluctuations that are exercised through the direct-current hoisting motor on the direct-current generator, thereby preventing any back effect on the net, which would be harmful to the generators and prime movers in the central station. At

*Consulting engineer, No. 150 Nassau street, New York.

the same time the fly-wheel acts as an accumulator storing the energy which is furnished from the net at a continuous rate also during the hoisting intervals and giving it out again during the starting period of the hoisting motor.

The direct-current drive of hoisting engines combined with the Ilgner buffer system has rendered hoisting service a constant and beneficial contributor to the station load, and the addition of a special safety device, which we cannot here describe, has made the equipment so controllable and reliable that the hoisting speed in German mines was, by sanction of the mining authorities, increased from 6 to 10 m. per second.

Economy of Central Electric Drive

Regarding the economy of central electric drive, the opinions of mechanical and electrical engineers are still diverging. Some hold that the economy of high hoisting speed and the safety of operation are too dearly bought by the higher initial cost of equipment and the higher losses in transmission and operation, especially through bearing friction of the heavy fly-wheel. Others maintain that, considering all the items which contribute to the total cost of equipment, that is, not only the portion represented in the hoisting plant, but also the corresponding portion of the power plant proper, the comparison comes out in favor of straight centralization.

This refers as well to direct drive by three-phase current hoisting motors, which take their energy directly from the line, as to the direct driving of the regulating dynamo by special prime mover. Of the combination employing three-phase current motors operating from the net without transformers, we have in Germany only few examples, the best known being that on the "Preussen" mine, which lifts a load of 2200 kg. 700 m. high (4840 lb. 2296 ft.) at a speed of 16 m. (52.5 ft.) per second. It is even maintained that straight centralization is cheaper in total cost than in the last named case such items as larger boiler plant, steam piping, more spacious building for hoisting engine and the far greater consumption of coal, oil and waste must carry considerable weight. A steam consumption of 10 kg. (22 lb.) per shaft horse-power, as recorded with central electric drive, is twice as good as the best result that has so far been obtained with modern high-class direct steam drive under exceptionally favorable conditions of operation.

Operating Expenses

As regards operating expenses with central electric hoisting service the consumption of power will very largely depend on the losses which occur between prime-mover shafts in the power house and hoisting drum. While for large steam engines operating in the central station as low as 5.2 kg. (11.4 lb.) of steam per effective horse-power hour has been attained, the corresponding consumption in the pit was found to range from 14 to 11 kg. (30.8 ÷ 24.2 lb.), giving for a continuous day and night run of 24 hours a total efficiency ranging from 37.5 to 44 per cent., according to the time at which records were taken. Ilgner gives the efficiency between drum shaft at pit and bus bars in the central station as 55 per cent. for large, and as 45 per cent. for small hoisting plants, which are operated directly from the network of a central station.

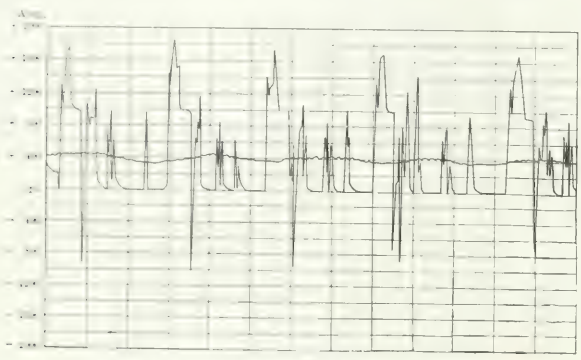


FIG. 2. HOISTING DIAGRAM OF ENGINE AT ZOLLERN II.

That this system has its indisputable merits is best proved by the rapid introduction which it has found in German and foreign collieries. Since 1903, when the first plant was built, 60 large equipments fitted with Siemens-Ilgner fly-wheel sets have been installed, aggregating a combined lifting capacity of 40,000 tons within a period of 8 hours. Most of these plants are designed for very large loads (5000 kg. or 11,000 lb.) and high speeds (14 ÷ 18 m. per second, or 46 ÷ 52 ft.).

Diagram Fig. 2 was taken in the mine Zollern II, at Gelsenkirchen, to the power plant equipment of which the above mentioned data refer. They bring out very clearly, on the one hand, the almost constant power consumption of the motor-generator set, on the other hand, the extreme load fluctuations or demand for current on the direct-current hoisting motor.

On account of the extreme importance which hoisting service occupies in colliery work, being the alpha and omega of operation, I add the views of one of the best authorities on the subject, who has investigated the question of steam versus electric hoisting engine both from the economic and technical standpoint. In addressing the Verein deutscher Ingenieure, Prof. Ad. Wallichs, at the end of a very elaborate examination of the problem, arrives at the following résumé:

"None of the two modes of drive deserves preference for all cases, but on collieries which are equipped with steam-generating plants, modern steam hoisting engines should be installed. Where energy can be derived from blast-furnace works, or where electric current can be generated at low cost from available coke-oven gases, there the electric hoisting engine will preserve and extend its field of usefulness; also at side pits, which are located at great distances from mining centers and where the instalment of special boiler plants would not pay. Further, when hoisting from great depths under conditions such as prevail, for example, in the Transvaal, there electrically-driven hoisting engines are preferable, alone for the reason that the supply of energy can be conducted (in cables) much better to engines doing underground service."

It is seen that for the case under discussion, collieries having coke-oven plants attached to them, electric centralization and generation of current in coke-oven gas-engine generators is advocated as the most economical method to pursue, and one which in all-round reliability is equal and in special phases of operation even superior to direct steam drive.

Electrical Haulage

M. F. Peltier gives the following interesting results of experience with an electrical mine haulage plant installed at No. 3 mine at the Peabody Coal Company, Marion, Ill.

Prior to installing electric haulage, there were sixteen gathering mules and seventeen mules working in spike teams, pulling from the lyes to the shaft, producing 1,400 tons of coal daily. Owing to the size of cars, grade and average haul of 1800 ft. from lyes to bottom of shaft, the output had reached its limit with mule haulage, and it was finally decided to install electrical haulage. Two 15-ton traction locomotives with double-end controller and trolley poles of the reversible type were installed, with No. 4-0 trolley wire, securely fastened to roof with trolley hangers, 8 in. outside of outer rail. Each locomotive is provided with

exerts a draw-bar pull of 8200 lb. on the level. They have pulled seventeen loaded cars up [illegible] ft. long. These cars weigh when empty 1950 lb. and hold on an average of 6600 lb. of coal. So the weight of a loaded train would be over [illegible] tons.

The track gage is 42 in. The track measures 9000 ft. over all and is laid with 40-lb. T rails, bonded and cross bonded for the return current.

The coal is all caged on one side, and the empty cars taken off on the other. The electrical power for operating the motors in the mine is supplied by a 175-kw. generator belted to a 200-h.p. high-speed steam engine, located in the power-house department of the building containing the hoisting engines. The generator also furnishes light for the underground haulage ways. From the switchboard in the power house the current is transmitted over a 400,000 circ. mils. cable running down the manway and to the main haulage way of the mine.

The entire electrical equipment, including generators, costs $20,172.70 [illegible] The average cost of hauling with mules was 2.4 per ton mile, and with electricity is 1.4 cents, the latter figure taking account of interest on investment, depreciation, and taxes, while 2000 tons of coal are daily handled instead of 1400 tons, which was the limit of mine capacity with mule haulage.

Fans and Compressors

Fans, which are now preferably installed underground, and compressors both offer favorable conditions as far as station-load factor is concerned, on account of the continuance in service. When the compressors are operated by three-phase current motors from the high-tension line they must embody provisions to vary the quantity of air output according to momentary requirements, but without varying their speed. This is done by simply arranging an automatic by-pass from the pressure to the suction side of the compressor, through which part of the air is returned during the delivery stroke. A compressor of this type is operating on the "Rheinpreussen" mine, in Germany, having an output of 8000 cu.m. per hour (282,400 cu.ft.).

Conclusions as to Cost

Having analyzed the reasons which have led to the introduction of central electric drive for small as well as for medium size and large machinery in combined collieries and coke-oven plants, we are now in a position to arrive at somewhat more definite conclusions as to the cost of operation and equipment. Obviously the only correct indicator for measuring the consumption of power of both the central and the scattered mode of driving is the feed-water of the boilers, since it is only in this item that all losses are included. With scattered steam drive, or, better, with semi-centralization (since almost all plants possess nowadays a small central station for lighting and small power demands), and modern engines distributed over the works, an average consumption of 17 kg. (37.4 lb.) per effective horse-power per hour can be assumed. For older plants 24 kg. (52.8 lb.) or even higher would come nearer the truth. Electric centralization of the complete power demand will reduce the consumption to an average of from 8 to 10 kg. (17.6 to 22 lb.) per effective horse-power per hour, so that a saving in steam of at least 7 kg. (15.4 lb.) per effective horse-power per hour is attained.

Now comparing the respective operating cost of central versus scattered gas drive, it is obvious that the saving in gas consumption, which in this case is the proper indicator for the efficiency effected through centralization, will be much smaller, indeed almost nil, for the simple reason that there is no marked difference in the economy of large and small gas plants, the difference in favor of the larger being only one of first cost of equipment per horse-power. Condensation and stand-by losses, which constitute such an important factor in scattered steam drive, are also entirely absent. So the greater economy of gas-power centralization is chiefly based on superior reliability of operation and reduced expenditures for skilled labor in the central power house.

It is certainly short-sighted policy to promote the multiplication of the possibilities of break-downs by advocating the installation of gas engines which will give complete satisfaction only when properly cared for, at places where it would not pay to keep high-class attendance. It must be repeated that for operations in the iron and coal industries the proper place for the (large) gas engine will be in the future, and is even now, in the central station. For certain departments, such as hoisting at main pit, the gas engine of standard design, owing to its peculiar working process, is anyhow entirely unsuitable as at present constructed.

Cost of Installation

While it is now generally conceded that electric centralization is cheaper in fuel consumption and other operating expenses, attendance, lubrication, waste, regardless whether gas or steam is employed, there is still the widespread opinion prevailing that the first cost of installation is higher than with direct drive.

We have discussed this phase of the subject in the preceding paragraphs as far as the separate departments, pumping, hoisting, compressing, etc., are concerned. We can now sum up the situation in the entire plant as follows: While the initial cost of electromotors employed in [illegible] drive, and while there is a considerable saving in the size of boiler plant which can be built smaller on account of the [illegible] total first cost of equipment is for centralization still higher than for direct steam drive.

Ilgland estimates that in a colliery with normal water influx and depth of mine the power demand during the day averages 1 or 1.25 h.p. effective per ton of output. Assuming that output to reach 1500 tons a day, and figuring on 1 h.p. per ton, then there are rendered $1500 \times 24 = 3600$ horse-power hours per day, or, counting holidays half, $33.2 \times 3600 = 12{,}000{,}000$ horse-power hours per annum. With the saving realized above, of 7 kg. (15.4 lb.) per effective horse-power hour, and assuming a sevenfold evaporation and boiler coal to cost 8 marks or $1.90 per ton, the annual saving in coal consumption amounts to $\frac{12{,}000{,}000 \times 7.8}{1000} = 96200$ M. or $23,000. To this must be added the saving in firemen, in salaries for engine attendant, lubrication, etc., so that the total saving runs up to at least $25,000 per annum.

The initial cost of a complete central electric equipment for a plant of this size and including full reserves in the power house will run, in Germany, by from $36,000 to $72,000 higher than with direct steam drive of all large machines and central generation of power only for the smaller ones. It is seen that under these conditions the higher first cost of complete centralization will be paid for by the savings realized in operation within one or one and a half years.

When gas engines are employed it is difficult correctly to estimate the gain in operating cost due to reduced attendance, and also to determine what saving in initial capital outlay will result from the elimination of special prime-mover equipments in the different departments and their reserves, which a careful management must provide; further, from the employment of cables instead of gas-supply pipes throughout the works, and last, but not least, from *the elimination of the* [illegible]

Results from Actual Practice

In concluding this discussion reference should be made to the important question of cleaning the coke-oven gas. However, this subject is one so comprehensive in itself that it is hardly susceptible of condensation. So I will merely add a few results which were attained in one of the earliest gas-engine installations on the European continent, namely, that at the Borsig works, of Upper Silesia, Germany, which has been in successful operation since 1902.

In the Borsig works there are altogether 76 coke ovens with a capacity of [illegible]

hours. As the generation of gas per ton of coal amounts to 14,830 cu.ft., the consumption of 320 tons generates in the neighborhood of 4,745,000 cu.ft., of which 205,100 cu.ft. are used for heating the ovens, while about 179,350 cu.ft., or 74,730 cu.ft. per hour, are available for use in gas engines or otherwise.

The gas when coming from the ovens is first subjected to a treatment, whereby the by-products—tar, ammonia, and benzol—are eliminated; then it is dried in two scrubbers, filled with sawdust and *rasenerz*, which have each a grate surface of 376.6 sq.ft., and four grates. The scrubbers are operated alternately, one being cleaned while the other is working. After leaving the scrubber the gas is perfectly free from harmful impurities, so that the engine in question has been running more than a year and a half without being cleaned.

The composition and calorific value of the coke-oven gas varies considerably [illegible] 24 hours. Assuming an average heat value of 370 B.t.u. per cu.ft., there are available 27,500,000 B.t.u. per hour for useful work. Taking the average consumption of a large gas engine as 8333 B.t.u., per brake horse power hour, the total quantity of gas available, when used in a gas engine, will give:

$$\frac{27,500,000}{8333} = 3300 \text{ brake horse-power.}$$

Taking the boiler efficiency in a steam engine plant as 70 per cent., and assuming that 1180 B.t.u. are required to generate one pound of steam, and that the steam consumption per horse-power-hour is 16.3 pounds, then the same quantity of gas [illegible] brake horse-power. In this coke-oven plant the gas is then 3.3 times better utilized in a gas engine than it would be in a steam plant.

Masks of aluminum with breathing holes covered with gauze of the same metal are proposed in *Cosmos*, March 2, for protection against poisoning by mercury vapor.

The French Portland-Cement Industry

By E. Candlot

The French portland-cement industry began in France about 1845. At that time, Mr. Demarles started cement works at Boulogne-sur-Mer. Upon the advice of Vicat he manufactured his cement from marls, which are found in large quantities in that section and which, in fact, are still being used today.

Until 1880, almost the entire portland cement produced was manufactured in the Boulonnais; to the factories at Boulogne were added those of Neufchatel and of Desvres, in the same section.

Mention might also be made of another factory in l'Yonne using the dry process and another factory erected by Vicat's son near Grenoble. The total production was then about 150,000 tons per year. From 1880 to 1890, numerous factories were put up in the Boulonnais; from 1890 to 1900, two factories were built in the vicinity of Mantes, one in Saone-et-Loire, one near Lillie, another one in the east near Nancy; since 1900 two factories have also been erected in the section near Bordeaux.

At the present time the Boutonnais district furnishes about 400,000 tons per year. The Mantes district produces 70,000 tons; l'Yonne 30,000 tons; the Bordeaux district 30,000 tons, which will soon be raised to 40,000 tons per year; the factories in the east, namely, the ones near Lillie, L'Isere, Saone-et-Loire and also one factory near Marseille, produce 80,000 to 90,000 tons.

The present French portland-cement output is from 600,000 to 650,000 tons per year.

All the factories in the Boulonnais district use the wet process and prepare their slurry in practically the same manner. Very nearly all have drying kilns or Johnson kilns. Lately some of the manufacturers have begun installing the rotary kilns. These kilns are now in use in two factories in the Boulonnais, in the two Mantes factories, in the two Bordeaux factories and in the Lillie factory. Generally speaking, these kilns measure 30 meters in length and two meters in diameter. Recently kilns of 35 meters in length and 2 meters 10 in diameter have been erected. All the kilns are fitted with clinker coolers.

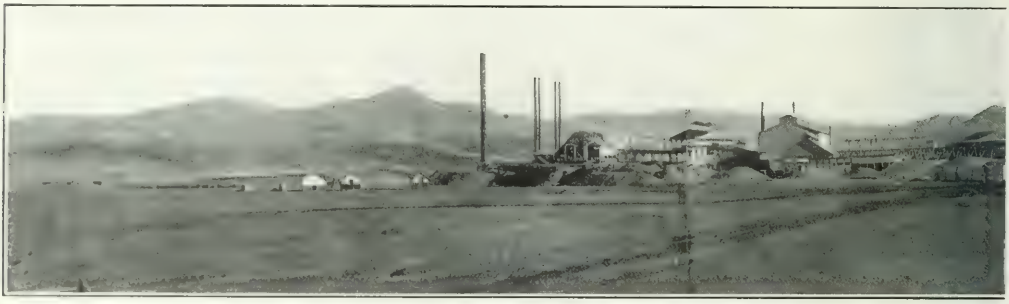
The factories using the dry process are located at Pernes (Pas-de-Calais), at Pagny-Sur-Meuse, at Prangey and Moutot (Yonne), at Palinges (Saone-et-Loire), at Grenoble and at Valdonne near Marseille.

These factories burn their cement in Dietzsch kilns, Hoffman kilns and the old intermittent kilns and the Schneider kiln.

The grinding is still done in several factories with the ordinary millstones, but most of them now use ball and tube mills. These mills are generally supplied by Germany; however, several French factories are now manufacturing mills of a good quality; among others may be mentioned the firms of Dalbouze, Brachet & Co. at Puteaux and Anker at Albert (Somme).

French cement factories export relatively very little of their product; the amount exported barely reaches one-tenth (1-10) of the total production.

In addition to the portland cement manufactured in France, we might also mention that there are two portland-cement factories in the French Colonies; one at Rivet in Algerie, which will soon produce 20,000 tons per year, and the other at Haiphong (Tonkin) which turns out 40,000 tons per year. These factories manufacture under the dry process and are equipped with Schneider-Hauenschild kilns and Krupp ball mills.



GENERAL VIEW OF SMELTING WORKS, CONSOLIDATED ARIZONA SMELTING COMPANY

According to a recent British consular report, the province of Kwangsi, China, is believed to be richer in antimony than in any other mineral, but the export of this ore was made a government monopoly some years ago, and the production, which was once considerable, has since completely ceased. When antimony was at £13 a ton the ore could be laid down in London at a profit. The mines are mostly in very out-of-the-way districts.

The Copper-Smelting Works at Humboldt, Ariz.

The Plant of the Consolidated Arizona Smelting Company Is Electrically Driven Throughout and Employs Fuel-oil Furnaces

BY E. H. HAMILTON*

Ground for the smelting works of the Consolidated Arizona Smelting Company, at Humboldt, was broken on July 13, 1905. Smelting operations were begun in the latter part of March, 1906, the first copper was produced on April 1, and copper has been produced regularly since that time. The ore situation developed more rapidly than was anticipated, and a blast furnace plant had to be installed sooner than was expected.

There is a concentrating plant of two sections for dressing the ore from the company's two mines. The concentrates are roasted in Edwards roasters, smelted in reverberatory furnaces and bessemerized to bullion. The water supply is abundant and is obtained from the Agua Fria, which runs through the Company's property.

SMELTING WORKS CONSOLIDATED ARIZONA SMELTING COMPANY

The track system of the whole plant is standard gage and is laid with 65-lb. rails, all the grades being easy and the curves of sufficient radius to allow trains drawn by standard locomotives to run anywhere in the plant. It is not uncommon for a locomotive with a train to run through the converter room.

Progress of Material Through the Plant

The sampling mill built by Allis-Chalmers consists of two sections capable of handling about 300 tons each. It is built of steel, supplied with Vezin samplers and is thoroughly equipped with driers, Englebach grinders, mullers and all appurtenances of an up-to-date sampling mill.

For unloading the ore, cars are set on two sides of a series of hopper-bottom bins. The ore is unloaded from the cars into the bins, which deliver to a conveyer belt, which delivers it into a crusher in the sampling mill.

The ore after going through the sampling mill is screened, the fine portion being delivered by a belt into bins, from which it is trammed to the roasting and reverberatory furnaces. The coarse ore is delivered by belt conveyers to the blast-furnace bins, from which it is drawn into the blast-furnace tram cars which deliver it into the blast furnace.

The roasting is accomplished in electrically driven, oil-fired, Edwards roasters. The concentrates and fine ores are loaded into electrically driven, hopper-bottom scale cars of a capacity of 17,000 lb., in which the charge is made up and delivered into the hoppers above the roasters. The calcined product is delivered into steel hopper-bottom cars, which carry and drop it into the hoppers over the reverberatory furnaces. The reverberatory furnaces are 100x20 ft.

The waste heat from each reverberatory furnace goes to two Stirling boilers which furnish steam for the power required to run the plant and for the transmission line to the mines.

The slag from the reverberatories is granulated and carried away by water which has previously been used in the condensers and blast-furnace jackets.

The matte from the reverberatory furnaces is tapped into a launder, which delivers it into a ladle in the converter room, where it is poured into the converter by an electric crane. This crane also takes the blast-furnace matte and delivers it into the converter. The crane also takes the hot slag from the converters and pours it into the reverberatory furnaces, and delivers the shells to the place where part of the blast-furnace charge is made up. The total length of the crane runway is 276 ft.

There are two electrically driven converter stands, with six shells, 84x126 in. The material for silicious lining is mixed up in two electrically driven Chilean mills and is tamped by an Ingersoll-Sargent tamping machine. The compressed air for tamping and for other purposes, is supplied by an Ingersoll-Sargent air compressor in the power house.

The Concentrating Mill

The concentrating mill built of steel has concrete floors, and consists of two independent sections. Each section has the following equipment: one Blake crusher, 20x10 in.; two crushers, 10x7 in.; three elevators; two sets of rolls; a 25-ft. Hancock jig; ten Wilfley tables; eight vanners, and four trommells; eight Callow tanks, besides classifiers of Richards, Johnson and Anaconda types, centrifugal pumps, etc.

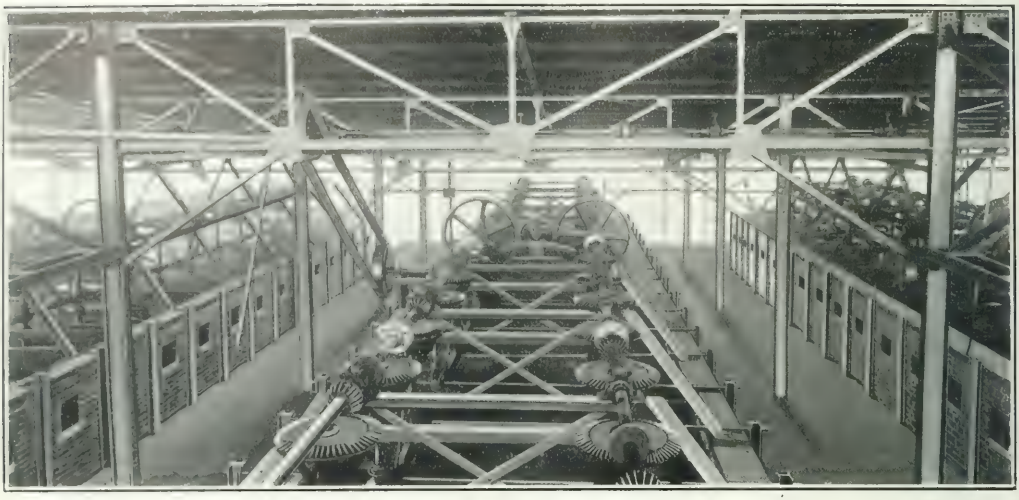
A large slime pond has been installed to recover the slimes. The overflow from the slime pond is returned to the mill, thus saving a large proportion of the water. One side of the mill has been considerably improved of late, and the other side is in process of remodeling. The mill is driven by electric motors, with current from the power house, the generators being driven by steam derived from waste heat.

The machinery of this mill was furnished by the Allis-Chalmers Company.

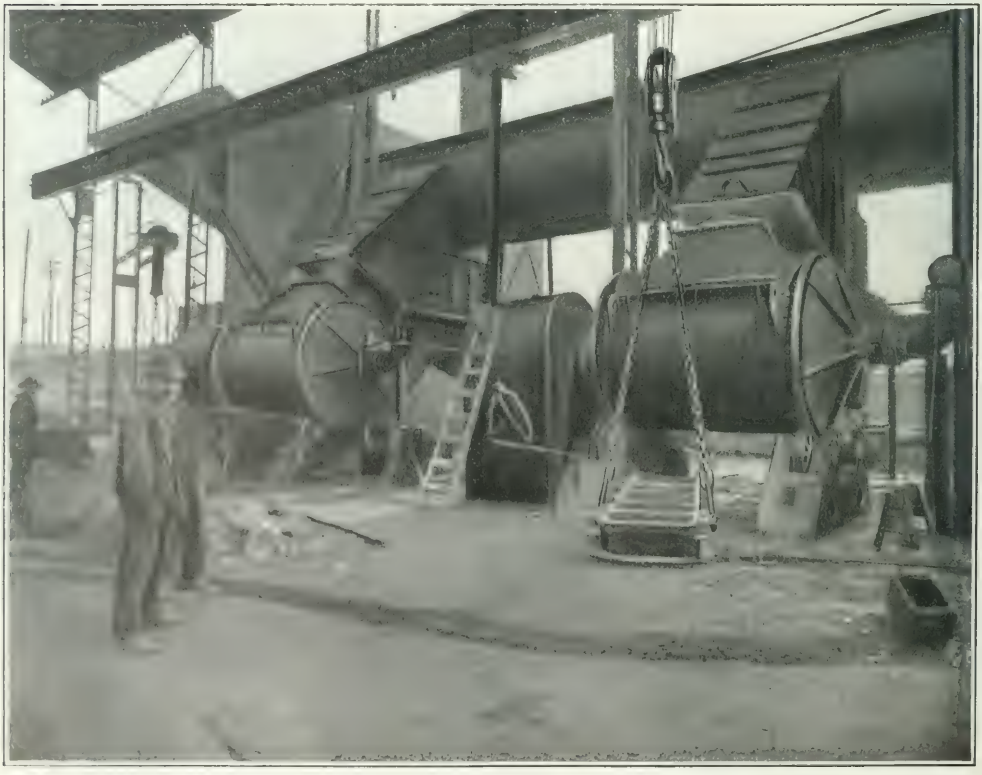
Other Equipment

The chemical laboratory and assay office is built of brick, with especial care to secure the best possible light and ventilation. It is supplied with steam heat, electrical equipment, oil-fired assay furnaces, etc.

*General superintendent, Consolidated Arizona Smelting Company, Humboldt, Ariz.



EDWARDS ROASTING FURNACES, CONSOLIDATED ARIZONA SMELTING COMPANY



CONVERTERS, SMELTING WORKS, CONSOLIDATED ARIZONA SMELTING COMPANY

electrical throughout, including provision for the haulage of blast-furnace slag. Side-dumping cars tilted by a compressed-air cylinder, are used at the blast furnace, the charges being weighed on standard track scales. Hopper-bottom cars are used for calcined material and hopper-bottom cars with weighing attachments for roaster charges.

The miscellaneous buildings include a steel and iron warehouse, a machine shop, a boiler shop and blacksmith shops supplied with the usual equipment, all electrically driven.

All the steel buildings were erected by the Minneapolis Steel Company.

The pumping station, located on the Agua Fria, consists of two electrically driven, four-stage centrifugal pumps supplied by the Platt Iron works, and one steam pump, the water being carried to the various parts of the plant by one 10- and one 8-in. pipe lines. A dam has been constructed across the stream at the pump house.

The plant was designed by and erected under the supervision of Cyrus Robinson. T. H. Oxnam is general manager of the Consolidated Arizona Smelting Company.

The Blast Furnace

The blast furnace equipment consists at present of one 270-ton furnace, supplied by the Power & Mining Machinery Company. The blast is supplied by an electrically driven rotary blower of the Connellsville type. The furnace is also connected with a reserve blower of the same type direct connected to a steam engine.

The charge is drawn from the storage bins into flat, side-dump cars, which are discharged into the furnace by a compressed-air cylinder, and the slag is carried away from the blast furnace in 7-ton pots hauled by electric locomotives.

Power Plant

The power plant receives its steam from the reverberatory waste heat boilers through a 10-in. pipe line, under a pressure of 150 lb. The plant supplies: air at 15 lb. for the converters; compressed air at 90 lb. for air hoists, tools, etc., about the plant; electric current for running all the machinery in the plant and tramming system of the plant, besides lighting the town, power for city water works, and supplying the power at the mines.

The power plant includes a Nordberg Duplex cross compound blowing engine with 40x42-in. air cylinder, and 18x36x42-in. steam cylinder.

The electric equipment consists of two units, each of 300-k.w. revolving field, 150-r.p.m. 480-volts, 3-phase 60-cycle generators, direct-connected to Nordberg 16x32x36 in. cross-compound engines. The field current is furnished by duplicate exciter sets; one set consisting of a single-cylinder, vertical high-speed engine, direct connected to a six-pole 30-kw., 125-volt generator, and an induction motor-driven exciter set, consisting of one 3-phase 60-cycle, 440-volt, 40-h.p. motor connected to a 25-h.p. 900-r.p.m. 125-volt compound generator. A 60-h.p. and a 25-h.p. induction motor, each 1200 r.p.m. drive turbine water pumps in the basement.

There is also an induction-motor generator set, consisting of one 90-h.p. 720 r.p.m., 440-volt, 3-phase motor, direct connected to a 60-h.p. direct-current generator, which supplies current for the railway system, cranes and converters.

With the exception of coke for the blast furnace, the only fuel employed in the plant is oil, for which three steel tanks of a capacity of 350,000 gal. are provided.

Alaska-Mexican Mining Company

This company owns a large low-grade gold property on Douglas island, Alaska. It also works under lease the 700-ft. claim owned by the Alaska-United Mining Company. The property is equipped with a mill of 120 stamps. The report is for the year 1906. The capital stock authorized is $1,000,000; issued, $900,000, in shares of $5 par value.

The statement of earnings and expenses for 1906 is as follows, with the averages per ton milled:

	Amount	Per ton
Free gold	$392,773	$1.0512
Sulphurets	328,696	1.3819
Interest	2,759	0.0116
Total receipts	$724,228	$3.0447
Mining expenses	$372,645	$1.3985
Milling expenses	62,200	0.2615
Sulphuret treatment exps.	25,705	0.1081
Bullion charges	3,229	0.0136
General expenses	12,117	0.0542
Construction	6,424	0.0269
Total expenses	$443,100	$1.8628
Net earnings	$281,127	$1.1819

From these net earnings dividends amounting to $216,000, or 24 per cent., were paid, and $50,000 charged off for depreciation, leaving a balance of $15,128. Adding $111,995 brought forward from previous year, made a total undivided surplus of $127,123.

The mill statement shows that the average value of the tailings was $0.1882, which would bring the value of the ore up to $3.2223 per ton. Of the bullion saved 51.8 per cent. was in free gold from the mill, and 48.2 per cent. in sulphurets saved by concentration and afterward smelted. The quicksilver fed in the mill was 0.2519 oz. per ton crushed; the loss of quicksilver for the year was 18,422 oz., or 30.7 per cent. of the total fed. The distribution of the clean-up in the mill was: Barrel, 6.2 per cent.; vanner, 2.1; tanks and tail-boxes, 11.6; blocks, 2; tables, 75.3; traps, 2.8 per cent. The average duty per stamp per 24 hours was 5.69 tons. The total milled was 237,862 tons.

The running time of the full mill for the year was 348 days, 4 hours, 21 minutes, during which time steam was used for power 125 days, 3 hours, 34 minutes. During the year, 1 lb. of chrome steel in the shoes crushed 2.42 tons of ore, and 1 lb. of iron in the dies (which are made by the Treadwell Foundry) crushed 4.80 tons of ore, at a total cost of $0.0298 per lb. for the iron and steel consumed in crushing one ton of ore.

The mine statement shows 328,627 tons broken, of which 10,800 tons were rejected as waste; 237,802 tons were sent to mill, the balance remaining in stock. Development work included 182 ft. shaft-sinking; 1760 ft. raises; 441 ft. stations and skip-chutes; 4857 ft. drifts and cross-cuts. The ore reserves in sight Dec. 31 were 856,390 tons, of which 240,129 tons were broken in stopes, and 619,261 tons blocked out. All these reserves were below the 440-ft. level.

There was an average of 17.66 machine drills in use. The average work done per drill shift was 36.04 ft. of holes, and 26.28 tons broken; an average of 0.73 ton broken per foot drilled.

A new double-drum, 48x20-in. Allis-Chalmers hoist has been installed at the main shaft. Following out the general plan of substituting crude oil for coal as fuel for the mines on Douglas island, all the piping for pumping the oil to the storage tank and supplying the boilers has been completely installed and the foundation for the oil tank finished. The feed pumps and the steel oil tank are on the ground.

Cobalt Silver Queen, Ltd.

The report of the Cobalt Silver Queen, Ltd., for the year ended March 31, 1907, states that development has been hampered by the non-arrival of machinery. With inadequate facilities 442,141 lb. of ore have been shipped and 109,273 lb. remain on hand. The shaft is down 145 ft., and laterals extend east and west at depths of 75 and 125 ft. respectively. Nearly 900 ft. of underground work has blocked out ore worth about $700,000 and $120,000 was paid in dividends.

Recently the Orford Copper Company has entered the market as a purchaser of cobalt ore and the Silver Queen expects to derive revenue from the cobalt content of the ore. The ore is graded A1, No. 1 and No. 2, the last averaging from 250 to 500 oz. silver per ton. The ore continues to maintain its width and value; no estimate of the total extent has been made.

The balance sheet shows receipts from the sale of ore amounting to $157,915; elsewhere it is stated that returns were received from 387,467 lb. This would indicate a value of $815 per ton. The cost of construction, machinery, etc., was $17,859. and of mining, labor and supplies, $34,191. Cash on hand March 31, 1907, was $32,601.

A Cornish Concentrator and a Spray for Rock Drills

By Edward Walker

In my last article I gave some particulars of the system of Cornish practice and in dealing with the dressing plant I mentioned the Acme slime table made by Holman Brothers, of Camborne. I now give illustrations and particulars of this table. The original concentrators used in Cornwall were, as I have already mentioned, stationary buddles and rag frames. Later revolving tables, designed on similar lines to the German tables, but far cheaper to construct, were adopted for treating the concentrates from the rag frames. Some of these were convex and some concave. The Acme is a combination of the concave and convex tables, the combination effecting economy in construction, space occupied and power used.

Principles of Operation

Two sloping wooden surfaces *A* and *B* are arranged concentrically and fixed to the central vertical revolving shaft *C*. The pulp is fed upon the outside surface *A* by the launder extending from *D* to *E* and *D* to *F*. The feeding of the convex surface *B* is effected by means of the greater part G_1 to G_2 of the launder *G*. From this it runs down the stationary slope to the greater part of the convex revolving surface from *T* to *H*. On the remainder of the concave surface from *H* to *J* pure water flows down from the short part of the launder *G*. At *K* and *J* there are clearing sprays on the outer and inner surface respectively.

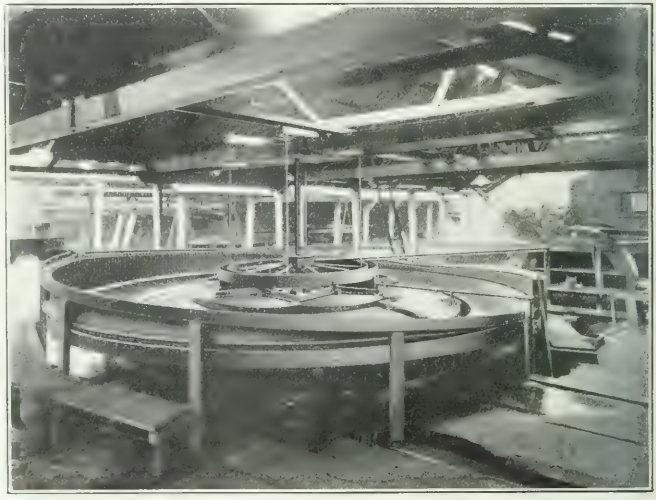
The pulp is first fed to the outer launder and is distributed equally around the surface from *E* to *D* and *F*. The slope is so arranged that the heavier particles adhere to the surface and only the light ones pass over into the circular launder *L*. As the table slowly revolves, in the direction of the hands of the clock, the concentrates adhering to the surface come into the zone *F* to *K* where they are washed by the water running down from the launder *F* to *E*, and are brushed by the brushes *M* and *N*. This water carries down some of the gangue which has adhered to the tables and deposits it in the launder *O*. In some cases the water will also carry down some of the tin oxide as well as the lighter particles, so that it is often profitable to return the contents of this part of the launder for retreatment.

The concentrates still adhering to the surface are removed by the spray *K* into the launder *P* and they are then elevated by a wheel through a pipe to the central receptacle *Q*. From this they are distributed through radial arms to the launder *G* out of which they are distributed down the stationary slope to the inner convex table from *J* around *H*. On arriving at *H* the particles which adhere to the surface are washed by water from *H* to *J* fed from the launder G_2 to G_1 and are finally removed by the spray *J* into the launder *S*. The middlings obtained in the launder *R* may be re-treated if desired. The final concentrates, removed at *J*, are in marketable form.

The outside diameter of the table is 18 feet, and about 0.5 h.p. is required to operate it this includes revolving the table and elevating the pulp. The table will treat about eight tons of slimes in 24 hours. The slimes will pass a 50-mesh screen.

At the tin dressing works it is not considered economical to treat the slimes direct on these tables, but it is preferred to concentrate preliminarily on rag frames. The slimes contain on an average less than five pounds of tin oxide per ton, and the rag frames are used to produce a pulp running 8 or 9 per cent. tin oxide. These concentrates are fed to the Acme table, and the product of the table is stated to be "a marketable product" and I suppose they will run to about 60 per cent. metallic tin. At some of the works the concentrates from the rag frames are put directly on the Acme table and at others they are first calcined. Sometimes the concentrates are first put on the Acme table, then calcined and afterward returned to the table.

It will be seen that the Acme table does not embody any new principle in dressing. It is really only a modification of the ordinary round, revolving table, giving two treatments in one machine. In many cases no middlings are obtained. According to circumstances, the divisions between the launders *L*, *O* and *P* may be moved up or down; similarly with the divisions between the launders *T*, *R* and *S*.



THE ACME SLIME TABLE

The objections may be urged that the slope of the surfaces cannot be varied to suit circumstances, and that the path of the particles down the surfaces is not long enough. The first difficulty is common to all circular tables, and the latter is counteracted by the provision of a gentle slope and the treatment on the two successive surfaces. The work can be varied also by altering the amount and flow of the water and the speed of revolution. Outside critics of Cornish practice are apt to sneer at the Acme table, but considering its comparatively low cost it is as efficient as any slime table. It is largely used in Cornwall with satisfactory results.

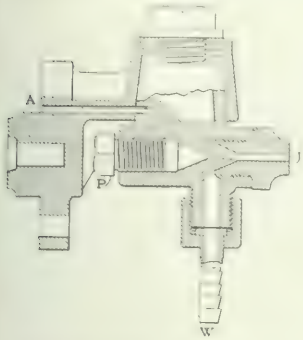
Rope Inspection and Safety Devices

I made inquiries as to whether any safety appliances are used for preventing accidents in case of the breakage of hauling ropes in Cornish mines. I find that the Cornish miner does not pin his faith to any of these automatic appliances, but trusts to the daily inspection of the rope itself. He is skeptical of the value of an appliance which rarely comes into action. His faith in these appliances has also been rudely shaken by failures of experimental tests of more than one of them.

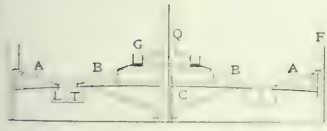
Spray for Rock Drills

The spray adopted by the Holmans on their rock drills is shown in the accompanying illustrations. The apparatus is mounted by means of a swivel joint upon the top of the cylinder of the drill. The air inlet is at *A*, and the air passing up through the conical surfaces draws up the water from the inlet *W*, and forces the spray through the orifice *J*. The air inlet can be opened or closed by simply turning the apparatus round its swivel mount, and the amount of the spray is regulated by

opening or closing the passageway between the conical surfaces by means of the screw *P*. The apparatus does not cause a fog or cloud, but produces a coarse spray. By altering the inclination of the apparatus and by regulating the air inlet the spray can be directed upon the hole.



SPRAY ATTACHMENT FOR ROCK DRILLS



SURFACE PLAN AND SECTION, ACME SLIME TABLE

Dormoy's apparatus for the application of plumbiferous enamels to cast-iron articles consists of a chest with glass walls which can be raised to give access to the interior, and a bottom constructed of small rollers in such a manner that the red-hot casting placed on them is held firmly even when the bottom is tilted (by an external lever). The powdered enamel is dusted over the casting by a sieve which is shaken by electric means, and the excess is returned automatically.

Determination of Sulphur in Roasted Zinc Blende*

By V. Hassreidter

It is generally understood that the sulphur, which determines the quality of a roasted zinc blende is not the total amount present, but this total, minus the sulphur combined with lead, lime, magnesia and barium. This combined sulphur is not available for acid making; but, on the other hand, it cannot be a ground for reasonable complaint on the part of the consumers.

The agreement is often made between producer and consumer, that the "objectionable" sulphur; i.e., the sulphur that can still be expelled, is to be figured as the difference between the total sulphur *a*, and the sulphur *b* combined with the elements named, figured as sulphate. Here the tacit assumption is made that these elements are completely sulphatized in the roast, and cannot be further desulphurized. On this understanding it would follow that the differences $(a-b)=c$ represents the sulphur present as zinc sulphate *d*, and sulphide *e*, so that $(a-b)=(d+e)=c$.

Now the question arises whether it is preferable to determine *c* as the difference $(a-b)$ or as the sum $(d+e)$. Against the former method a number of objections suggest themselves. In the first place, estimations by difference are always liable to give inaccurate results, especially if a number of analyses are involved, and the difference is small as compared with the total material analyzed, as in this case, rarely more than 1 per cent.

There is also a good deal of uncertainty as to the degree of sulphatization of the lead and magnesia in the roast. For example, the percentage of lead sulphate may be considerably depressed by the presence of quartz, which leads to the formation of lead silicate. On the other hand it is very doubtful whether magnesium sulphate is stable at the temperature of the roasters.

One method which has been used, in the endeavor to avoid the sources of error inherent in the estimation by difference, is actually to extract the sulphur present in the form of sulphates. The solvent may be either ammonium acetate in acetic-acid solution, or hydrochloric acid in exclusion of air, to prevent oxidation of the hydrogen sulphide liberated. But here again there are difficulties; while it is safe to assume that gypsum is soluble in ammonium acetate, little is known with regard to the solubility of strongly ignited anhydrous calcium sulphate. On the other hand, if hydrochloric acid is used, the lead sulphate dissolved by the hot hydrochloric acid is re-precipitated on subsequently diluting with water, and thus escapes determination. In either case the zinc sulphate goes into solution along with the other sulphates and must therefore be determined in a separate sample by extraction with water.

Method of Estimation

Evidently then the estimation of "objectionable" sulphur by difference presents serious difficulties. It is more satisfactory to determine directly the sulphur combined with zinc.

The following method serves to determine the sulphur present as zinc sulphate. A 25-grams sample of the roasted ore is extracted with warm water in a ¼-liter flask. The solution is allowed to cool, made up to a measured volume, filtered, and the zinc, together with any cadmium dissolved, is determined in 200 c.c. by Schaffner's method. Every 65.4 parts of zinc present corresponds to 32.06 parts of sulphur as zinc sulphate.

For sulphide sulphur the following method may be used: Two or three grams of the roasted ore is dissolved by boiling in a flask provided with reflux condenser together with hydrochloric acid and zinc chloride[1], 30 grams chemically pure zinc dissolved in 1 liter of hydrochloric acid of sp.g. 1.19. The hydrogen sulphide which is disengaged quantitatively is passed through a ten-bulb tube containing 30 to 40 c.c. of bromine-hydrochloric-acid mixture, by which it is oxidized to sulphuric acid. This reagent is preferable to hydrogen peroxide, as it furnishes a means of observing the progress of the reaction, which is accompanied by a gradual discoloration of the mixture. It is therefore always possible to ascertain whether the bromine is present in excess. After expelling the excess of bromine, and approximately neutralizing the hydrochloric acid with sodium carbonate, the sulphuric acid is precipitated with barium chloride.

In this way it is possible to estimate, rapidly and accurately, the "objectionable" sulphur in the roasted blende; and at the same time some valuable indications are obtained as to the course of the roasting operation. Thus a high percentage of zinc sulphate would show that the temperature was not high enough at the last shelf, or that too much air enters the furnace. A product running high in sulphide would indicate a local fusion of sulphide, which afterward tenaciously resists desulphurization; or that the material was not sufficiently stirred; or, lastly, that there was a deficiency of air in the furnace.

*Abstract from *Zeit. angew. Chem.* 1906, No. 4, p. 137.

[1] Hassreidter and Voigt, *Zeit. anorg. Chem.* (18), 1777, 1905.

The Mineral Industry of New South Wales

The Output for the Year 1906 Shows an Increase in Value of £1,083,000 as Compared with the Production of 1905

BY F. S. MANCE*

The under secretary for mines, E. F. Pittman, has furnished a preliminary statement of the mineral production of this State for the year 1906. The value of the mineral output for the year 1906 is £8,169,624; this is an increase on that for the year 1905, and which previously stood as a record, of no less than £1,083,731. In the course of the years 1905 and 1906 the mineral industry has thus shown an expansion of £1,777,860. The aggregate value of all the minerals won in this State to the end of 1906 is £172,560,382. The total number of persons employed in and about the mines during the year is estimated at 42,546, being 3614 in excess of the number employed in 1905.

Gold

The gold won in New South Wales to the end of 1906 amounts to 12,786,638 oz. fine, valued at £54,314,152. The yield recorded for 1906 is 253,987 oz. fine, valued at £1,078,866; this is 20,280 oz. fine, and £86,147 in value less than in 1905. These figures do not, however, accurately reflect the position of the industry, as gold to the further value of £160,118 was purchased from the mines within this State, but was not lodged at the mint, and could not be included in the official figures for 1906. This gold has therefore to be carried forward to the year 1907. It is thus gratifying to be able to state that the gold-mining industry showed no actual retrogression, and that the results bear favorable comparison with those of previous years. The yield was contributed by the established mines, no new finds of importance having been recorded during the year. The Cobar district may be said to be the chief producing center, and the value of the output for the year amounted to £224,052. The Mount Boppy mine still maintains the honor of contributing by far the largest yield of any gold mine in the State.

The value of the yields from the other more important divisions is as follows: Wyalong, £83,921; Araluen, £57,551; Hillgrove, £52,394; Wellington, £43,987; Stuart Town, £35,445; Adelong, £34,711; Forbes, £27,067; Peak Hill, £26,709; Orange, £21,557.

The value of the yield obtained by the gold and tin dredges during the year was £261,762, an increase of £74,768 over that of the previous year. Since 1900 the dredges have furnished an output valued at £952,474.

The Araluen division is still the chief center of gold-dredging operations, but the yield secured by the fourteen plants at work there during the year is below that of the previous year, the value of the production being £54,478. The deficiency of this division has been more than made good by the other plants, and the total gold yield which amounts to 33,218 oz. fine, valued at £141,101, exceeds that for the previous year by 1180 oz. fine, and £5011 in value.

The dredging for tin has given very gratifying results, the quantity of tin won totalling 1032 tons, valued at £120,661. There were 27 dredges in operation in the Inverell-Tingha divisions during the year, and they secured 943 tons of tin ore valued at £110,582. The dredging for tin is also to be started on a large scale in the Emmaville division. The treatment of the stanniferous gravels by the dredges has proved so successful, that a constant and remunerative production may confidently be looked for. There were 68 dredging plants in operation in the State at the close of the year, valued at £315,537, and some four or five additional plants were in course of erection.

Silver, Lead and Zinc

The value of the exports from the silver-lead mines is as follows: Silver, silver-lead, concentrates ores, etc., £2,862,973; lead (pig), £1084; zinc (spelter and concentrates), £292,866, a total value of £3,156,863. This exceeds the value of the output for 1905 by £438,999, and since the year 1903 the value of the output has increased by £1,530,287. The Broken Hill field stands out as the chief center of mining activity in this State, and the average number of men employed there during 1906 was 8457.

For a portion of the year under review operations were restricted by underground fires, and "creeps" at several of the mines, and the total quantity of ore raised, and concentrates produced, is accordingly less than in the preceding year. The companies, however, secured the full benefit of the increased prices of silver, lead and spelter. Although progress in the matter of the profitable treatment of the accumulated heaps of tailings has not been as rapid as anticipated, still good headway has been made, and from now on, operations may be expected to be conducted on an extensive scale.

The Yerranderie mines furnished an output somewhat below that of the previous year, but a substantial advance is shown in the value of the yield. The Cobar field has for the first time supplied lead-ore in quantity, the output coming principally from the C. S. A. mine. The Conrad Stannite Mines Ltd., at Howell, has carried on active work, and a large tonnage of ore was dealt with. The total value of the production of the silver-lead mines to the end of 1906 is £44,127,033. The number of men employed in this branch of the industry during the year was 9414.

Copper

The value of the output of copper from the mines of New South Wales for the year 1906 is £789,527, an increase of £262,124 on that of the previous year. This result is all the more gratifying when it is considered that the returns for the year 1905 previously constituted a record, and not only is the value of the output for 1906 much the largest but the production also reached high-water mark. The Cobar field furnished an output valued at £516,320, representing an advance of £71,462 on that of 1905. The production, however, from this field does not come up to that of the preceding year, and the result shown is due to the enhanced value of the metal. The great Cobar mine was acquired during the year by a new company, and operations on a larger scale are foreshadowed. The output of the Queen Bee mine has been considerably augmented.

The mines held by the Nymagee Copper Mining Syndicate and the Crowl Creek Company were also actively worked. The Girilambone and Mount Hope mines were reopened during the year, and copper to the value of £11,966 and £14,672, respectively, was obtained.

Great interest was aroused during the year by the discovery made in the Budgery mine, situated about three miles from Hermidale, and 108 applications for mineral leases were made for areas in this district. From the Lloyd Copper mine, Burraga, an increased output is recorded, and the indications are favorable to the production being well sustained.

Among other copper mines which came prominently into notice during the year, mention may be made of the Cadia mine, in the Orange district, and the Cangai mine, in the Grafton district. Much attention is being devoted to prospecting, and in further developing the numerous copper lodes throughout the State, and

*Mining Department, Sydney, New South

altogether the outlook is a very encouraging one. The value of the copper produced in the State to the end of 1906 is £8,472,629. In this branch of the industry 3047 men were employed during 1906, or 876 more than in the previous year.

Tin

The tin and tin-ore recorded as having been produced during the year is valued at £255,744, and is in excess of that of the previous year by £29,634. This output exceeds that of any other year since 1888. The satisfactory returns secured by the dredges are chiefly responsible for the gratifying output recorded, and the industry generally has been greatly helped by the high price ruling for the metal. The dredges as already stated won 1032 tons of tin ore, valued at £120,661, against 532 tons valued at £50,904 in 1905.

The bulk of the yield was drawn from the Tingha-Inverell divisions and the production from these centers for the year the Deepwater, Wilson's Downfall and Glen Innes divisions. The success which has attended the operations of the dredges goes to show that our tinfields are capable of maintaining a large output of ore for some years ahead.

The value of the output from the tinfields of this State to the end of 1906 is £7,744,509, and the number of men employed in this branch of the industry during 1906 was 3795, an increase of 911, compared with the previous year.

Coal, Coke and Shale

The coal raised in New South Wales during 1906 was 7,626,362 tons, valued at £2,337,227, and exceeds that of the previous year by 994,224 tons and £333,766 in value. These figures constitute a record and in the course of the last two years the output has shown an expansion of 1,606,553 tons.

The output from the respective districts is as follows: Northern, 5,336,188 tons,

THE MINERAL PRODUCTION OF NEW SOUTH WALES IN 1905 AND 1906

Minerals.	1905		1906		Increase in Value.	Decrease in Value.
	Quantity.	Value.	Quantity.	Value.		
Metallic		£		£	£	£
Gold, oz. fine	274,267	1,165,013	253,987	1,078,866		86,147
Silver, oz. fine	417,520	52,196	284,994	36,431		15,765
Silver—lead and ore, ton	441,447	2,441,856	471,994	2,826,542	384,686	
Lead—pig etc., ton	240	2,657	59	1,084		1,573
Zinc spelter & conc'trates, ton	103,392	221,155	103,666	292,806	71,651	
Tin ingots and ore, ton	1,057	226,110	1,671	255,744	29,634	
Copper ingots and ore, ton	8,592	527,403	9,755	789,527	262,124	
Antimony and ore, ton	88	5,221	2,451	52,045	47,424	
Bismuth, ton	55	20,763	45	5,700		15,063
Wolfram, ton	84	7,361	132	9,057	1,696	
Scheelite, ton	148	10,122	109	7,647		2,475
Molybdenite, ton	19	2,597	33	4,798	2,201	
Platinum, oz	48	89	205	623	534	202
Iron (made from scrap)		85,693		112,848	27,155	
Non-metallic:						
Coal, ton	6,632,338	2,003,461	7,626,362	2,337,227	333,766	
Coke, ton	162,961	106,306	186,060	110,607	10,301	
Kerosene shale, ton	38,226	21,247	32,446	28,470	7,223	
Alunite, ton	2,702	6,750	1,856	4,637		2,113
Lime, ton	18,018	15,019	21,126	15,573	554	
Limestone flux, ton	14,941	9,519	12,788	7,463		2,056
Portland cement		88,100		128,487	40,387	
Ironstone flux, ton	6,801	4,525	965	723		3,802
Marble		2,420		1,518		902
Diamonds, carat	6,354	3,745	2,827	2,120		1,625
Opal, carat		59,000		56,500		2,500
Sundry minerals		2,919		1,981		938
Total, £		7,085,870		8,169,024	1,083,754	
					Net Increase	

has been estimated at 1481 tons of ore valued at £169,871. Of this quantity the dredges won 943 tons, valued at £110,582, there being 27 plants in operation. The balance of the yield from these divisions represents the result of the efforts of a large number of men, who owning to the sustained price of the metal were able to make a living by mostly reworking ground which had been previously treated. In the Emmaville division several of the areas which in the past have supported numerous parties of working miners were acquired during the year for dredging purposes.

The withdrawal of the men from these areas pending the completion of arrangements for commencing dredging is responsible for a temporary decrease in the output of this division. Satisfactory increases are recorded in the output from valued at £1,718,178; Southern, 1,783,395 tons, valued at £494,871; and Western, 506,779 tons, valued at £124,178.

The coal exported during the year amounted to 4,901,760 tons, valued at £2,076,223. This is much the largest quantity ever despatched from the State, and shows an increase of 1,183,707 tons and £592,245 in value on that for the previous year. The number of persons engaged in the mining for coal during the year was 14,929—an increase of 910 compared with 1905.

The value of the coke manufactured during 1906 is £110,607, being an increase of £10,301 on that of the previous year, the industry having benefited largely by the greater activity in metalliferous mining.

The kerosene shale raised during the year amounted to 32,446 tons, valued at £28,470, which is an increase of £7223 on that of the previous year. The opening up of further supplies of shale is receiving a marked degree of attention, and a largely augmented production should result.

Other Minerals

The value of the other minerals produced during the year is as follows: Alunite, £4637; antimony, £52,645; bismuth, £5700; diamonds, £2120; iron (from scrap), £112,848; lime, £15,573; limestone flux, £7463; portland cement, £128,487; marble, £1518; molybdenite, £4798; opal, £56,500; platinum, £623; scheelite, £7647; wolfram, £9057; sundry minerals, £2704.

The Russian Platinum Industry *

In consequence of the troubles in Russia the exportation of platinum to European markets has been considerably reduced so that at present there is a shortage in the supply. This is felt more seriously because during the last two or three decades 95 per cent. of the world's supply of platinum was drawn from the Ural deposits. The price of platinum, which is now 500 roubles per kg. continues to advance.

Concerning the enormous importance which the Ural deposits have in the world's market it is well to bear in mind that in the Ural the platinum industry has been developed since 1825, when the first discovery of little pieces of platinum was made on the estate of Count Shuwalow, and also on neighboring estates on the river Issa and Wissa, and on the government properties of the Goroblagodatsk district. At that time the occurrence was considered of no importance so that regular prospecting for the metal did not begin until 1869.

Since 1869 the production of platinum has been as follows: 1869, 140 pood; 1874, 120; 1882, 250; 1886, 270; 1893, 310; 1895, 253; 1900, 301; 1897, 344, and in 1898, 368 pood. During the years 1899 to 1904 the average yearly output was 359 pood.

The price of platinum has varied, sometimes in sudden fluctuations. In 1869 the price per pood was 1600 roubles; 1890, 12,000; 1891, 6000; 1894, 13,000; and in 1904 16,000, 19,000 roubles.

The Companhia de Mozambique (main office at Lisbon, Portugal) reports the discovery of a rich gold deposit in schist formation in the Revue valley, very near Winifred, in Manica. The formation can be traced for nearly a mile, but the width has not been proved. The presence of ancient workings leads to the belief that the true source of ancient production has been discovered, free gold untraveled, mostly nugget, being found.

* Translated from "The Russian Mining Journal" (Mining Journal), St. Petersburg, January, 1907, by N. Koeff, Irwin, Penn.

Vacuum-flotation Process for Concentration

The Elmore Process Employs Reduced Pressure to Increase by Expansion the Lifting Power of Gas Bubbles in a Liquid Medium

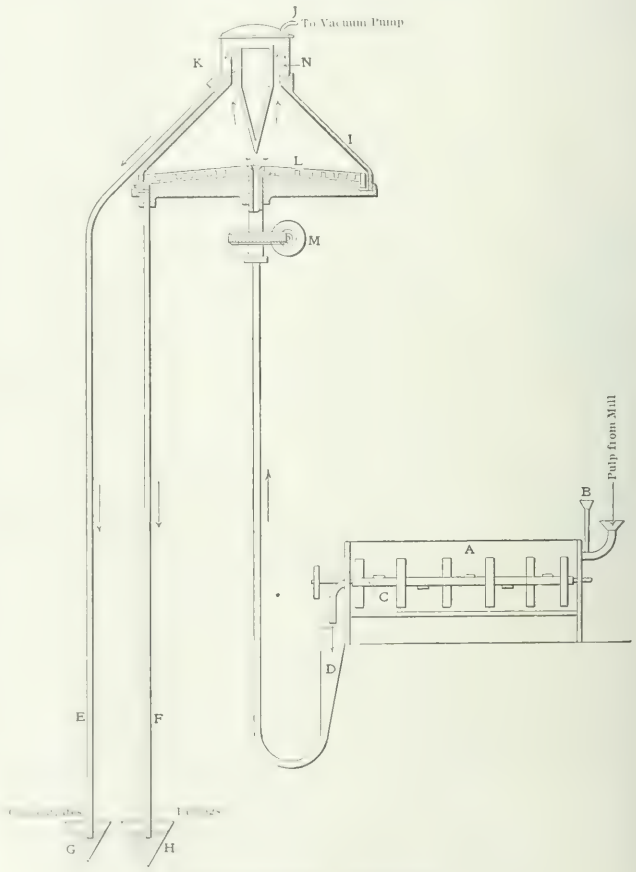
BY ALEXANDER STANLEY ELMORE*

The vacuum process for the concentration of ores, the invention of F. E. Elmore, after exhaustive test and experiment, is about to be installed on an extensive scale, many mines having given orders for large plants. The process is based primarily upon the fact that, in a flowing pulp of crushed ore and water, oil has a selective action for the metallic mineral particles as distinct from the rocky particles or gangue. This selective action is materially increased in some cases by the presence of an acid; and secondly, upon the fact that the air or gases dissolved in water are liberated, partially or entirely, upon subjecting the same to a pressure less than that of the surrounding atmosphere. These liberated gases may be augmented by the generation of gases in the pulp or by introduction from an external source. The gases attach themselves to the greased mineral particles, and being largely increased in volume as a result of the partial vacuum applied, cause the greased particles with their attendant bubbles of air or gas to float to the surface of the liquid.

Method of Operation

The simplicity of the apparatus for carrying out this process is shown in the accompanying sketch. The pulp from the crushing mill flows continuously into the mixer *A*, into which also is introduced small quantities of oil and, if required, of acid also, at the point *B*. The required agitation is brought about by the rotation of the beaters *C*. The agitated pulp flows continuously from the mixer into the funnel *D*. The concentrates discharge-pipe *E* and the tailings discharge-pipe *F* are both sealed with water in the tanks *G* and *H*, respectively.

The upper end of the feed-pipe *D* enters the center of the conical separating vessel *I*. Upon the application of a vacuum through pipe *J*, the pulp from the mixer is caused to ascend the feed-pipe and fill the conical chamber *I*. The rate of flow of the pulp down the pipe *F* being slightly less than the in-flow up the feed-pipe *D*, a small amount of the liquid overflows the lip of the annular space *K*, this quantity of liquid being sufficient to carry the concentrates down the pipe *E* into the tank *G*. The rakes *L* are caused to rotate slowly by means of the worm and wheel *M*, the angle of the rake blades being such as to cause the solid matter in the pulp to travel from the center to the periphery of the conical chamber, whence the tailings continuously discharge down the pipe *F*. The feed-pipe *D* is usually about 25 to 30 ft. long, the tailings and concentrates pipes *E* and *F* being a few feet longer, so that in effect the feed-pipe and tailings pipe form the long and the short leg of a siphon; thus the power required to elevate the pulp into the conical chamber is supplied by the falling column of pulp in the tailings pipe. So long as a continuous flow of pulp is supplied to the mixer, a continuous and entirely automatic discharge of tailings and concentrates is secured. The annular space *K* is surrounded by a thick glass cylinder, or by a metal cylinder with one or more thick glass windows, through which the discharge of the concentrates over the lip of the annular ring may be observed.



ELMORE VACUUM CONCENTRATOR

Construction and Capacity

The apparatus is constructed of metal with the exception of the glass windows, the mixer being a simple wooden trough with wooden beaters.

The power required for a 5-ft. unit of plant does not exceed 2 to 2½ h.p., including that required for driving the vacuum pump, mixer, and separator. The apparatus is usually constructed in standard units the conical separating chamber of which is 5 ft. in diameter. Including the mixer, conical separating chamber, vacuum pump, all piping, etc., complete, it

Ltd., 4 Broad Street place, London, E. C.

costs f.o.b., London, approximately £350.

The capacity of the apparatus naturally varies with the kind of ore to be treated, the fineness to which the ore has to be ground, and other conditions, but a 5-ft. machine will ordinarily treat from 35 to 45 tons of crude ore per 24 hours.

The cost of the plant is low for so large a capacity. No expensive foundations are required, because the beaters in the mixing cylinder only make 30 to 40 r.p.m., and the rakes in the conical separating chamber only one or two revolutions per minute. Vibration is, therefore, entirely absent. No sizing of the pulp is required, and the operation of the plant is entirely automatic.

The quantity of oil and acid required is not the same for all ores, but usually amounts to not more than a few pounds, say, from 3 to 10 lb. per ton of ore treated. A large variety of oils and similar substances has been tried and found suitable. Californian crude oil, Texas crude oil, Texas residuum, fuel oil, Russian crude, Borneo, Sumatra and similar cheap oils, tars, blast-furnace oils, olive-oil residues, oleic acid, kerosene, a variety of light oils and fish oils.

Application of the Process

A large number of trials, both on a small scale and with a full-sized apparatus, have been carried out on a great variety of ores, and although it is not claimed that the process and plant are applicable to all ores the accompanying table shows that its field of application is very wide.

The process has been applied with success to the concentration of ores which because of their peculiar characteristics are quite impossible of concentration by usual methods. For instance, chalcopyrite is readily separated from magnetite and spathic iron gangues; galena and zinc blende, from a gangue of baryta; and copper sulphides, from oxide of tin, leaving the tin in the tailings to be subsequently separated by the usual methods. Zinc copper and lead minerals may be separated from garnets and similar heavy gangues; and such minerals as antimony or molybdenum sulphides which because of their very friable nature suffer prohibitive losses in water concentration, are found amenable to treatment by the Elmore vacuum process. Cinnabar, and iron pyrites carrying gold, are readily concentrated, yielding high-grade products with practically clean tailings. The native metals, gold, silver and copper, when in a fine state of division, are found to concentrate readily, and with very small loss.

At present the company has either supplied or is constructing a total of about 70 machines.

The results obtained in regular work with an installation at a mine in Cornwall where low-grade waste ores from the mine dump are being treated are as follows: Pulp, 0.412 per cent.; tailings, 0.128 per cent.; concentrates, 8.176 per cent. copper.

At one of the copper mines in Scandinavia, a plant has been running for several months. An order for 18 additional machines has been received from the same plant.

The ore treated contained 1.81 per cent. copper; the tailings after concentration 0.037 per cent. and the concentrates 6.83 per cent.

At another mine in Sweden where a plant has been running for five months the ore treated, contains 0.802 per cent. copper; the tailings, 0.123 per cent. and the concentrates, 23.86 per cent.

The various patents covering the process are held by the Ore Concentration Company (1905) Ltd., with offices at 4, Broad Street Place, London, E. C. The company began work about 15 months ago with £50,000 cash working capital.

EXTRACTION OF METALS AND MINERALS BY THE ELMORE VACUUM PROCESS

Description of Ore.	Metals Extracted.	Gold and Silver, oz. per ton. Other Metals, Per Cent. Ore.	Tailings.	Concentrates.	Per Cent Extraction
Graphite ore	Graphite.	56.7	19.3	80.3	86.6
Australian gold ore	Gold.	0.22	0.035	1.04	86.6
Galena with quartz gangue	Silver.	13.20	1.56	55.34	90.6
	Lead.	6.80	0.66	22.50	91.0
Argentite and discolored quartz gangue	Silver.	19.32	0.727	77.15	96.78
	Gold.	0.03	0.005	0.05	85.50
Low-grade "Banket" from South Africa	Gold.	0.150	0.015	2.80	90.7
Banket "Banket," sulphide of iron quartz gangue	Gold.	0.305	0.04	8.00	87.4
Galena and pyrites, barytes gangue	Lead.	4.45	0.28	14.60	93.3
	Silver.	31.60	3.00	139.24	92.5
Cupreous barytes ore	Copper.	3.66	0.25	22.56	94.0
Chalcopyrite, feldspathic gangue	Copper.	1.97	0.188	26.04	91.1
Cupreous barytes ore	Copper.	1.48	0.16	21.99	88.8
Chalcopyrite, granitic gangue					
Chalcopyrite, quartz, feldspathic gangue	Copper.	1.25	0.07	6.92	95.2
	Copper.	0.77	0.11	13.02	87.5
Chalcopyrite, limestone gangue					
Chalcopyrite basic gangue with magnetite and garnet	Copper.	1.45	0.17	21.88	88.5
Copper glance, chalcopyrite, quartz gangue	Copper.	0.92	0.10	26.00	90.2
	Copper.	1.36	0.14	18.20	90.4
Spathic iron with chalcopyrite	Copper.	2.56	0.11	17.60	96.2
Bornite and chalcopyrite	Copper.	1.[illegible]	0.16	17.47	90.1
Spathic iron and chalcopyrite	Copper.	2.56	0.11	17.60	96.3
Chalcopyrite with magnetite schistose gangue	Copper.	2.00	0.[illegible]	14.00	87.4

Description of Ore.	Metals Extracted.	Gold and Silver, oz. per ton. Other Metals, Per Cent. Ore.	Tailings.	Concentrates.	Per Cent Extraction
Chalcopyrite quartz, feldspathic gangue	Copper.	1.[illegible]	0.20	24.25	[illegible]
Spathic iron with chalcopyrite	Copper.	0.99	0.07	14.70	[illegible]
Amber-blende, quartz gangue	Zinc.	28.0	2.25	50.70	95.3
Blende, shale gangue	Zinc.	5.5	0.9	44.80	85.1
Spathic iron ore with blende	Zinc.	5.92	1.25	48.80	81.0
Blende and barytes	Zinc.	18.2	0.49	64.50	98.9
Blende, garnet and rhodonite gangue	Zinc.	10.2	1.47	44.30	[illegible]
Broken Hill, tailings	Zinc.	10.1	2.85	48.45	[illegible]
Broken Hill, tailings	Zinc.	30.60	2.40	48.40	[illegible]
Rhodonite and garnet gangue					
Stibnite, which floats badly	Gold.	[illegible]	[illegible]	26.20	[illegible]
Pyrites and quartz gangue	Molybd'm.	3.40	0.25	40.80	93.2
Molybdenite, feldspar gangue	Lead.	7.95	0.35	38.50	96.4
Galena, pyrites, quartz	Gold.	1.26	0.09	10.51	93.7
Pyrites and stibnite, feldspar	Antim'y	6.33	0.22	54.20	96.9
Stibnite, gold quartz gangue	Gold.	1.20	0.08	19.10	93.8
Molybdenite, gangue containing magnetite and much garnet	Molybd'm.	2.50	0.08	[illegible]	[illegible]
Galena quartz gangue	Silver.	13.35	1.36	138.42	90.0
	Lead.	5.6	1.00	55.70	90.0
Gold quartz with schist, sandstone, some chalcopyrite and tetrahedrite	Gold.	0.38	0.04	4.80	90.0
	Gold.	0.20	0.03	5.29	85.2
Galena, barytes gangue	Silver.	13.35	1.37	138.42	90.1
	Lead.	5.60	1.00	60.90	83.5

Wallaroo & Moonta Mining and Smelting Company, Ltd.

The report of the Wallaroo & Moonta Mining and Smelting Company, Ltd., of South Australia, for the year ended Dec. 31, 1906, shows a gross profit for the year of £160,127, from which £27,978 was written off, leaving a net profit of £132,149. Out of this £80,000 (10s. per share) was paid in dividends. The balance of assets over liabilities was £201,378.

There were 203,167 tons of ore produced from the mines and these concentrated to 53,517 tons, averaging 10.2 per cent. refined copper.

The production of refined copper was 7561 tons, including 875 tons electrolytic; gold, 2326 fine oz.; silver, 8250 oz. (996 fine); copper sulphate, 327 tons; sulphuric acid, 5126 tons. The metallic production resulted from the treatment of 55,882 tons of concentrate, matte and precipitate.

The cost of producing a ton of copper at both mines was £72 11s., consisting of; mining, £54 10s. 9d.; smelting, £16 15s. 10d.; miscellaneous charges, £1 4s. 5d. The profit per ton was £17 7s. 2d.

Mining Exhibits at the Jamestown Exposition

Mineral Products of the South Are Especially Prominent. Geological Survey Will Conduct Fuel Tests and Experiments in Ore Concentration

BY H. CONNOR BROWN*

Prominent among the larger buildings on the grounds of the Jamestown Ter-Centennial Exposition, which was opened by President Roosevelt on April 26 at Hampton Roads, Va., is that devoted to the Department of Mines and Metallurgy. The building consists of two wings and a connecting pavilion. In one of the wings is housed the main exhibit of the Department of Mines and Metallurgy, consisting of an elaborate and comprehensive display of minerals and ores from several States and special and collective exhibits made by private producers. The other wing is devoted exclusively to a dis-

MINES AND METALLURGY BUILDING, JAMESTOWN EXPOSITION

In the pavilion between these two wings is an exhibit of concentrating machinery directed and operated by members of the United States Geological Survey. At two other points on the grounds are exhibits which belong to this department. One is West Virginia's coal monument and the other is the Power and Alcohol building, where tests of coal and denatured alcohol will be made during the summer, also under direction of the Geological Survey.

General supervision of the Department of Mines and Metallurgy is in the hands of Dr. David T. Day. In direct charge of the work of assembling and placing exhibits is Dr. Joseph Hyde Pratt, chief of the North Carolina Geological Survey.

Exhibits of the United States Geological Survey

Although not included technically in the exhibits of the Department of Mines and Metallurgy, the exhibit of the United States Geological Survey installed in the display of the Department of the Interior in one of the Government buildings will be of great value to those interested in this country's mining interests, and the part the Government plays in developing them. It is in three parts, illustrating the activities of the three great branches of survey work, the geologic, the topographic, and the hydrographic.

It is the mission of the Department of Mines and Metallurgy at the Jamestown Exposition to draw the attention of capital to the fact that there are enormous and undeveloped mineral deposits of great value throughout sections of the South. Largely through the exertions of Prof. T. L. Watson, the recently appointed State geologist, Virginia makes on this occasion for the first time a display worthy of her mineral greatness. The exhibits of iron ores and coal from southwestern Virginia are especially emphasized. Of historic interest are several pigs of iron that were manufactured at the old Spottswood furnace, the first blast furnace in the United States. These pigs were found by W. H. Adams in the ground between the Rappahannock river and the battlefield of the Wilderness. A model of this furnace with its primitive blowing apparatus is among the curios of the exhibit.

Virginia also furnishes exhibts of zinc, of copper, and of gold. The gold ores of Virginia ceased to be interesting with the development of Western fields incomparably richer, but the modern methods of extraction recently developed give to the low-grade ores of Virginia an importance they have not enjoyed for many years.

Minerals of the States

Eight States have made appropriations for exhibits of their mineral resources at this exposition. They have been given space around the walls of the Mines building, the individual exhibitors taking, in most cases, space in the center of the hall.

Under the direction of W. S. Yeates, the State geologist, Georgia makes a specially fine exhibit. Besides a systematic collection of the minerals of Georgia, there is an exhibit of the economic minerals of the State, a series of large photographic transparencies of Georgia scenery, and a number of big mineral specimens mounted on pedestals. The most conspicuous object in the exhibit is a marble column 15 ft. high, with a base 18 in. square, which altogether weighs about 4500 pounds.

Maryland's exhibit does not occupy much space. It consists entirely of maps, charts, and models, all made under the direction of Prof. William Bullock Clark, the State geologist.

Ohio's exhibit, which was arranged by J. A. Bownocker, of Columbus, is made up of the individual exhibits of many firms, but all are planned with the idea of bringing out the importance of Ohio as a mining and ceramic State. Maps and charts help to interpret the other exhibits.

Samples of the iron and copper ores of Michigan have been arranged by W. H. Johnston, of Ishpeming. These include a collection of native copper ores and an exhibit of copper plates from the Calumet & Hecla mine.

Alabama's exhibit, which is in the hands of G. H. Malone, of Dotham, consists of samples of building stones, coal, iron ores, and mining machinery. Of picturesque interest is an iron statue of Vulcan, 75 feet high, the first of iron masters, which has done duty at other expositions.

Vermont's exhibit was prepared by George H. Perkins, of Burlington, the State geologist. It consists of marble, slate and other quarry products installed in six glass show cases. A wainscoting of Vermont marbles and marbleized slate surrounds the exhibit.

Kentucky's exhibit, of which C. J. Norwood, of Lexington, has charge, consists mainly of samples of coal, cement materials, asphalt, and building stone. Among the exhibitors is Malcolm H. Crump, of Bowling Green, who has on view samples of rock asphalt and its crude products. The asphalt is arranged in the form of a pyramid 25 ft. high and represents the actual thickness of the stratum. Two pavements made from the crude and prepared asphalt are shown.

Objects for North Carolina's exhibit were collected by Joseph E. Pogue, of Raleigh. They consist mainly of building stones and clay products, including rough and cut stone and crude and finished clay products, monazite gems and gem minerals, corundum and mica, together with manufactured products illustrating their uses; gold and silver ores; and copper ores.

Collective Exhibits

A feature is made of what are called "collective" exhibits, minerals of States not officially represented. An effort has been made to have the building and decorative stones of the Atlantic coast completely represented.

The collection and installation of the cement exhibit is under the direction of E. C. Eckel, the cement expert, of the United States Geological Survey. It embraces cement and cement products, including the raw materials, different brands of manufactured cement, and lime and plaster. The value of all this as an object lesson is greatly increased by the presence in the exhibit of an array of books and papers.

Machinery of the Keystone Driller Company is installed and in operation in one of the center sections of the building. This includes a percussion core drill and machine for operating it, a placer gold-prospecting machine with appliances, a water well-drilling machine with appliances and a blast-hole driller. These items comprise three drilling outfits, each mounted on wheels with boilers and engine complete.

Abrasives and Rare Minerals

In a collective exhibit of abrasives are shown all the various types of abrasive materials on the market. The Pike Company exhibits a series of large photographs which show quarries and works; an obelisk composed of abrasives of all sizes and kinds, and a large block of garnet, weighing 500 lb. Alundum is a feature of the Norton Company's exhibit, which includes a variety of millstones and grindstones. Samples of crude garnet rock are furnished by the Highland Forest Company. The same material crushed as it is ready to be fed to the rolls is exhibited, also jars of rolled material, and jars containing samples of various sizes of garnet as it is marketed. Lumps of crude carborundum are exhibited by the Carborundum Company, also charts showing the growth of the production of carborundum as an abrasive.

Worthy of special notice is an exhibit of coal made by the Pocahontas Coal Operators' Association of Bramwell, W. Va. The exhibit consists of one section of coal that measures 4x4x8 ft., specimens of lump coal, run of mine, nut, steam nut, and slack coal, about 40 specimens of coke, 5 maps and 20 photographs of mines and works.

An interesting and instructive group of exhibits is that of the iron and steel-hardening metals. Tungsten and molybdenum ores and salts, with the metals manufactured from them, are exhibited by the Primos Chemical Company. The occurrences of bauxite and the uses of aluminum, the metal derived from bauxite, are illustrated in the exhibit of the Aluminum Company of America. Rare earths and metals of the platinum group are exhibited by Eimer and Amend, who show how chemical compounds are developed from these different minerals.

One of the interesting installations in the Mines building is the collective exhibit of lighting materials. Prominent among these is platinum, long employed as the filament in incandescent electric lights. Monazite and other rare earths and the chemicals obtained from them and employed in the manufacture of incandescent gas mantles are shown in various stages of manufacture. Samples of zircon and gadolinite, used in the manufacture of the Nernst electric lamp, are shown.

Radium and Gems

A radium exhibit has been prepared by George F. Kunz and Truman Abbe. It contains samples of the various minerals that show radio-activity and samples of radium salts. Photographs made with the aid of radio-activity minerals are exhibited. There is a dark room in which the various radium compounds are exhibited.

In the space allotted to Roessler & Hasslacher are exhibited oxone, which is a preparation of fused sodium peroxide for the production of oxygen gas on contact with water; and an air regenerator, which is a device to automatically maintain the normal percentage of oxygen and to absorb carbon dioxide as well as other toxic parts of air by means of oxone.

In the center of the building is installed the collective exhibit of gems and gem materials, one of the most attractive in the building. An exhibit of silicified wood is furnished by Dr. George F. Kunz and one of agate by J. T. Hayward. This agate comes from Colorado and is shown in the rough, as well as polished and cut and made up into souvenirs.

The Standard Oil Company shows an oil-well derrick modeled to exactly half scale. Besides this, there are collections of crude oils, of oil-bearing rocks, and of transparent photographs illustrating the production, refining, and transportation of petroleum.

The exhibit of the Myles Salt Company contains a statue of white rock salt which represents Lot's wife. Polished crystal white salt bricks and a case containing several grades of crushed and ground salt are also shown.

Mine and Concentrating Plant

The far West finds representation in the Mines Building through the Colorado Gold Mine Company, of Denver, which exhibits a model of a Colorado gold mine, showing the complete surface and underground workings.

The concentrating plant installed in the pavilion of the Mines building is similar to the one erected at Portland, Ore., at the time of the Lewis and Clark Exposition. It consists of various concentrating tables such as the Wilfley, Pinder, and Standard, a Wetherill magnetic separator, a crusher, a classifier, and other apparatus. A complete assay laboratory is maintained in connection with this plant. Investigation will be made here during the summer, of the gravel deposits and sands of the Atlantic coast in the way in which the Pacific sands were studied at Portland.

Outside the Mines building one of the most conspicuous objects on the exposition grounds is a mineral exhibit. It is West Virginia's coal monument. The State appropriated $8000 for the monument, but the cost came to $15,000, the deficit being personally contributed by members of the West Virginia Jamestown Commission

Handling Cars with Rolling Device for Dumping

The Banner Shaft Coal Mine, Ala., Employs a System Which at the Standard Mines, Pa., Handled 3200 Tons of Coal in Eight Hours

BY ERSKINE RAMSAY*

The [illegible] and dumping device shown in the accompanying illustration is used in connection with the Robert Ramsay transfer and rams, an arrangement used at many of the largest and best equipped American mines. It was first installed during 1887 at the Standard mines of the H. C. Frick Coke Company, Mt. Pleasant, Penn., where an output of over 3200 tons of coal has been made in something over eight hours, actual working time.

Method of Operation

The empty mine car on the transfer track *K*, shown in the illustration, is pushed by the piston of the cylinder *L*, against the loaded car standing on the shaft hoisting cage *N*, the stroke of the pusher or ram being just sufficient to move the empty car upon the cage, and at the same time, to push off the loaded car ahead of the empty. The empty by this operation, takes the place of the loaded car on the cage and is ready to be lowered into the mine to be loaded.

The loaded car runs by gravity on track P', into the revolving or rolling dump A^1, and is prevented from moving too far, i.e., running through or partly through the dump, by the bumpers *D D*, and from rebounding by the bumpers D^2. These bumpers are automatically depressed by the car as it passes over them, and, as they are kept up by springs, they immediately assume the normal position shown in the drawing when the car has passed over.

When the loaded car has passed into the dump A^1, and an empty car has passed, by gravity, upon the truck K^1, the man in charge, standing between the tracks P P^1 and the shaft and the transfer truck-pit, moves the valve lever which turns on the steam to the cylinder *J*. In making the complete stroke the transfer trucks *K* and K^1 are moved from opposite the tracks *O* and P^1 to a position opposite the tracks *P* and O^1. The same stroke of the piston, by means of the sheave and rope arrangement, moves or rolls the two dumps *A* A^1 from opposite the tracks O^1 and P^1 to the tracks *P* and *O* respectively, and in moving this distance the dumps and with the in the mine car, make one complete revolution, during which the inverted loaded car empties all of the coal into the hopper *Q*. The tracks *P* and P^1, extending from the shaft hoisting cages to the dumps, are spread apart to give each of the dumps such a distance to travel as will cause both of them to make exactly a complete revolution.

When dump *A* moves from the position shown to track *P* it is ready to receive a loaded car from the cage, and dump A^1 at the same time has moved to track *O*, where the car now empty runs out by gravity, on its way to the transfer-truck K^1. Before it reaches the truck it is automatically stopped by the dog *W* at the point shown, this dog being caused to move across the rails by a suitable shaft and crank arrangement operated by the truck K^1 in such a way as to release the car automatically when the truck is in position to receive it, but as soon as truck K^1 begins to move to a position in line with track *P* the dogs automatically set and prevent the next empty car from passing beyond until the transfer truck is again back in position to receive it.

The dumps *A* A^1 in making a complete revolution each, move a distance twice as great as the stroke of the piston of the cylinder *J*, and while they move this distance one pays off, and the other winds up, an amount of rope equal to twice the distance of the travel of the dumps.

Operating Mechanism

In order to make one motive cylinder move the two transfer trucks and the two dumps at the same time, it is necessary to employ the sheaves *H H*, placed on the ends of the piston rods, and also the stationary sheaves *G G*, located as shown, which arrangement gives a travel to the rope of four times the stroke of the piston. That the transfer trucks may move in opposite directions to the dumps, the ropes passing around these sheaves are carried to the opposite sides of the structure and around the sheaves *F F*, thence to the sheaves *C C* and up over the sheaves *B B* to a grooved ring on each of the dumps. There is also provided a connecting rope which is passed around the grooved ring on the dumps in such a manner as always to keep them the exact distance apart, thus always keeping the tracks in the dumps in exact line with the fixed empty and loaded tracks.

The dump A^1 in the position shown, has its car track on a level, but when it moves from in line with track P^1 to track *O* it takes a position similar to that shown by dump *A*, in which case the track grade is sufficient to cause the car to run by gravity out of the dump on its way to the transfer track. This change in grade is accomplished by placing the rail *E*, upon which the dump travels on a level, while the opposite rail has considerable down grade beginning at a point in line with the centers of tracks *P* and P^1 and extending to the centers of tracks *O* and O^1 respectively.

In case it is desired to pass a loaded car through the dump without dumping, the bumpers *D D* are lowered so as to allow the car to pass over. The same arrangement is provided for passing a car across the transfer trucks.

Adjustment and Control

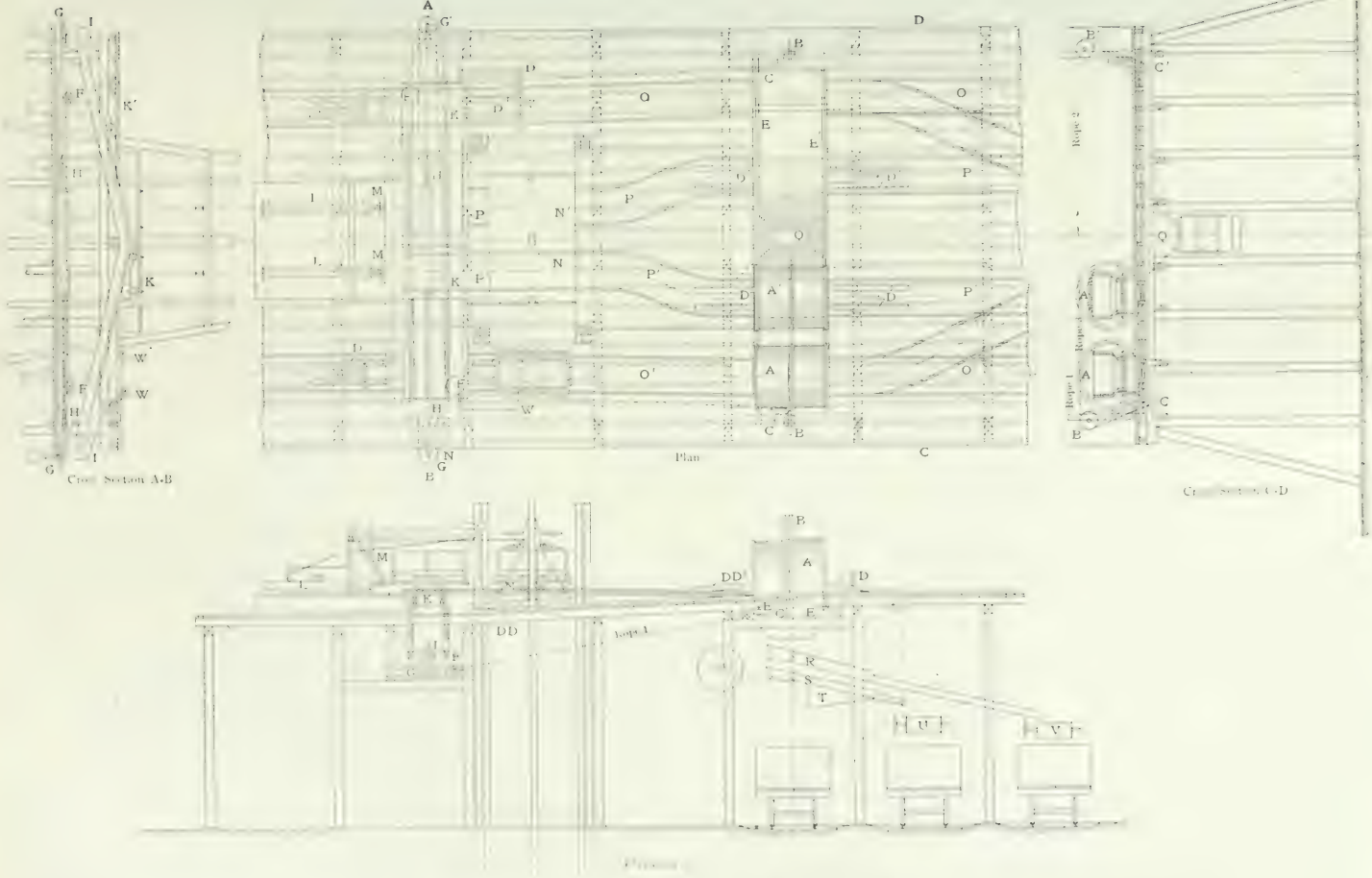
It is absolutely necessary that the dumps *A* A', in making the complete revolution, while moving from one track to another, should not slip, but always move the exact distance required to bring the tracks in line with those on which the loaded cars enter and the empties leave the dumps. This is accomplished by making the tracks *E* E', on which the rings of the dumps roll, somewhat in the form of a rack instead of a plain rail. The tracks have pins projecting at regular intervals, and holes are provided in the rings of the dumps, at corresponding intervals, so that the dump cannot slip.

The rope marked No. 3, connecting the two dumps, acts as a pulling rope on the dump *A* when the dump A^1 is being pulled by rope No. 2 from track P^1 to *O*, thereby insuring the movement or revolution of the dump *A* to an extent which will bring it in the exact required position at track *P*, and at the same time that dump A_1 has reached track *O*. The ropes Nos. 1 and 2 are arranged with proper adjusting screws so they may be adjusted from time to time as stretching may require. They are attached to the cross-heads of the piston-rods at the points where the sheaves *H H* are located. The connecting rope No. 3 is also adjusted by means of screws at the points where it is fastened to the dumps. The proper movement of the dumps is therefore accomplished to a nicety and without any special care other than the movement by the operator of the valve lever admitting steam to the cylinder *J*.

In order to maintain the cars in a fixed relation to the dumps *A* A^1 as the latter revolve and the cars are inverted, guard rails, placed over the tread or hub of the car wheels, are provided, supported by the brackets.

In the plan shown the coal passes from the hopper *Q* to the upper shaking screen *R*. The lump coal passes over the screen and onto the traveling picking band *V*

*[illegible]



CONSTRUCTION DETAILS OF THE CAR HANDLING AND DUMPING PLANT

slack coal passes through the screen *R* and into the screen *S*, over which the nut passes to the traveling band *U* and into the car. The slack passes through the screen *S* and into the slack car or into a storage bin or coal washer.

ADVANTAGES

1. Cars without end-gates (the cars being inverted in dumping) are used.
2. This permits the installation of cheaper cars.
3. The cars are stronger and more substantial.
4. The repairs on the cars are less.
5. Lighter cars.
6. Less dead weight to transport in proportion to coal hauled.
7. Having no end-gates there is less spilling of coal on the tracks and therefore
8. Less expense in keeping the tracks in good condition.
9. There is no accidental opening of end-gates (because there are none), thus doing away, to a large extent, with wrecks on the haulage ways with the consequent knocking out of props and disarranging of haulage appliances.
10. A lighter car for the miner to handle in his room, which means less manual labor.
11. Capacity to handle large outputs expeditiously.
12. Less wear and tear on cars in the dumping operation, as compared with the effects of the jar and shock incident to the old-fashioned "horn," or more modern cross-over tipple.
13. Ability to dump very slowly when desired, furnishing an opportunity to carefully examine the contents of the cars as they are being dumped.
14. A low cost of handling the product of a mine, because one man handles and looks after the entire car-handling and dumping operation, no matter how large the output.

The Mine Mule in Indiana

The Indiana mine mule has caused much trouble, great cost to miners and operators, and serious personal injury to drivers. Strikes have been called because men were discharged for cruelly beating a mule. Others were called because the mules were not well fed, and still others because a mule was not washed after a day's work in the dust of a mine. But the most novel instance of trouble where a mine mule was the direct cause occurred last week when a jury at Linton returned a verdict for $175 against a mine boss, who during the noon hour amused himself by flipping stones at a mine mule. A stone missed the mule and struck a miner in the eye, destroying the sight.

Coal Conditions in the Transvaal

The financial year of most of the mining companies of the Transvaal ended on Dec. 31, 1906. The reports of the coal companies show that many of the collieries are in a bad way, as far as profits are concerned. The dull times have seriously effected some of the mines, and competition has become so keen that the year's operations at many plants show a big loss. The gold mines have, of course, benefited by this competition, and coal is now cheaper than it has ever been before; however, the present state of affairs cannot continue indefinitely. What will probably happen is that the weaker companies will go to the wall, and the big producers will come to some understanding about prices. At the present time there is no money in coal in the Transvaal.

The coal mines hade a most creditable showing, from the technical side, and there seems to be great efficiency in the production of coal. Consumers can buy fuel of good quality, at the pit's mouth, for $1.20 to $1.44 per ton for round, and $0.84 to $1.02 for nut. This compares favorably with prices at coal mines in other parts of the world, and yet the railroad rates are so high that this coal landed at the gold mines costs from $2.64 to $2.88 per ton.

Influence of the Prolonged Storage of Coal on Its Coking Qualities *

BY F. HANNACK

When stored in the air for some time, bituminous coal loses a considerable quantity of gas, the amount so lost being increased when the coal is small and is in a damp state (with 12 to 15 per cent. of water), as is the case in storage towers. From a number of recent experiments, it appears that the average loss of weight sustained by the coal in a week is about 1.7 per cent.

Now in a cokery of 50 ovens to be emptied and refilled daily, each with a charge of seven tons of slack, it is necessary to keep a stock of 700 tons of coal in order to insure regular working. This quantity will lose 10 tons of gas in 48 hours, equivalent to a loss of 1870 tons of gas per annum, and corresponding to a considerable diminution in the output of by-products. The loss of ammonia is especially apparent, the coal used in the experiments containing 1.37 per cent. of nitrogen, about 50 per cent. of which is recovered as ammonia when the coal is used fresh. Moreover, the loss of gas is attended with certain difficulties in the management of the ovens; for instance, the heat can only be uniformly maintained when there is a sufficient volume of gas available, and when this is absent, the fluctuations of temperature cause unequal strains in the brickwork, which then becomes liable to crack. Still another drawback of storing the coal is that the coke is never first-class with regard to size, the presence of an abundance of gas greatly facilitating the caking of the coal in the oven.

Wedding explained the phenomenon of coking by the assumption that the hydrocarbons in the coal are decomposed at high temperature, ethylene, for instance, being split up into carbon and methane, the small particles of this carbon then cementing the small lumps of coke together. When the coal is poor in gas, the formation of these particles of carbon in sufficient quantity is precluded, the coal cracks and powdered coke is the result; more labor being required to sort out the spongy lumps from the hard resonant good coke, to say nothing of the softer coke breaking to pieces in transit and giving rise to complaints on the part of the consumer.

* Abstract of an article in *Stahl und Eisen*.

Electric Blasting in Coal Mines

BY RICHARD LEE

The practice of simultaneous blasting by electricity has recently become more popular in many of our non-gaseous coal mines. When more than one shot is to be fired electrically, the various fuses may be connected to the exploder either in series or parallel. In the former system the current passes from one firing main through all the fuses in turn and back to the other firing main. It is also a fact that when the wires are arranged in this manner, the resistance varies directly as the length, and the total resistance is the sum of the resistance of each fuse added to the resistance of the line conductors.

In the parallel system the resistance of a number of fuses is less than that of a single fuse, and the sectional area of the main conductors must be in proportion to the current required. When this method is employed, each fuse should be connected directly to both mains, so that the current divides among the different fuses.

Although low-tension fuses are commonly arranged in series and high-tension fuses in parallel, the series arrangement is more suitable in practical work than the parallel system. Especially is this true in shaft-sinking where it is often desired to fire a range of side shots without interfering with the work carried on in the sump; with the parallel method, it is necessary to use more wire in order to avoid taking some of the wires across the shaft. As to the efficiency of each system, it may be stated that the number of recorded miss-shots are about the same with both methods

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

In a mine where furnace ventilation is used, it has been found that the exposed metals rapidly corrode. This condition is caused by the action of sulphuric acid, produced by sulphur in the burning coal.

At present but one-fifth of the total forest area of the United States is embraced in national forests. The remaining four-fifths have already passed or are most likely to pass into private hands.

In transmitting electric power over long distances, a current of high tension electricity is used in preference to low tension. The advantages of the former system are: first, less cable is required; second, greater economy in first cost; third, more economy in transmission of power.

One capable engineer, after numerous experiments, says that the lignites of the Northwest, which contain as high as 35 to 45 per cent. ash, when placed in a gas producer, gave a better quality of gas for power purposes than the best West Virginia steam coal produced under the same conditions.

Orders were issued by the Lehigh Coal and Navigation Company, announcing the indefinite suspension of the No. 12 colliery in Panther Creek valley. The faces of the workings in the mine are near the old Green Wood workings which have been flooded for several years. The operation of the No. 12 colliery is practically stopped until this body of water is tapped.

Since the return air current in a mine contains more carbonic acid gas and moisture than the intake, and because mine timbers take up a large amount of carbon and moisture, which two elements set up chemical action that results in decaying the props, it has been found that the timbers used on the return air ways are sooner destroyed than those used in other parts of the workings.

Investigation shows that coal containing 5 and 10 per cent. of sulphur, which would not be put on the market for use in an ordinary steam boiler furnace, can be used in a gas producer where the sulphur is converted into heat units. The gas which is formed from such fuel explodes in the cylinder of the engine and does no injury as long as the engine is kept dry and at a high temperature.

Carefully tabulated statistics prepared by the Baltimore & Ohio Railroad show that during every decade of the past 70 years the amount of coal hauled during any one 10-year period was equal to that hauled during all of the preceding 10-year periods; so that for example, the amount of coal hauled over that railroad from 1895 to 1905 was equal to that which the railroad had hauled during the entire 60 years preceding 1895.

The width of various pillars in coal seams depends principally upon local conditions and the laws governing the question. In the anthracite field those seams above water level have pillars varying in width from 10 to 30 ft., while those below water level are sometimes as much as 300 ft. in width. The general practice is to leave 60-ft. pillars on each side of the property, so that the total thickness of the entire pillar will be about 120 feet.

Professor Brittain, of Strassburg, Germany, has perfected an apparatus which will detect the presence of fire-damp in the air of a mine when the gas is present in the atmosphere in so small a proportion as one two-hundredth of one per cent. The invention consists of a column of metal supported above a cup and below a rod, connected with an electric current. Between the little inverted cup at the top and the rod below is placed a graduated tube, bell shaped, into which is introduced the gas for analysis. It is said that the apparatus will show the existence of fire-damp in small quantities before it becomes dangerous.

As the outcome of the terrible catastrophe at the Courrières colliery the president of the Central Committee for Collieries has informed the French Minister of Public Works that in addition to the laboratory experiments undertaken to investigate the influence of atmospheric dust on explosive mixtures it has been decided to fit up a special subterranean gallery for further tests. For this purpose the colliery owners have subscribed the sum of $60,000 with which to install a suitable testing station and laboratory in a proper locality. About $10,000 will be used to carry on experiments underground, where all the surroundings necessary to reproduce exactly the conditions present in a coal mine will be provided.

The excessive and careless use of timber throughout the United States is resulting in a general advance in the price of our available supply, and is furthermore causing a scarcity that has excited considerable apprehension among mining companies who use millions of feet of timber in underground development each year. It is interesting to note that every person in the United States is using over six times as much wood as each inhabitant is consuming nearly four times as much wood each year as is grown in all the forests of the United States during the same period. Careful investigation also shows that each acre of forest lays up a store of only 10 cu.ft. annually, whereas more than 30 cu.ft. are being taken from it.

The highest degree of fuel combustion is only attained by perfect firing, and for this reason it is important to know what degree of efficiency is taking place. In order to provide this information, an automatic self-registering gas-analyzing apparatus has recently been introduced in Europe. This arrangement is attached to the stack, and its method of operation is to draw the products of combustion of a big amount of fuel into the machine, where the gases are passed into a strong solution of potassium hydroxide, which absorbs all carbonic acid gas (CO_2). The volume of the remaining gases is measured and the percentage of CO_2 is thus determined and plotted on paper. The firemen are paid premiums according to the efficiency of combustion, as shown by the carbon dioxide content of the waste gases.

In considering the adaptability of mining machines to thin coal seams where operations by pick mining could not be successfully carried on, one instance may be cited where a seam only 16 in. thick was mined with machines, actually producing 45 per cent. of large coal, when the best previous estimate considered that only 10 per cent. could be obtained. Although mining machines are best adapted for level seams, the statement that a steep seam is an insurmountable obstacle is not true. At several mines in the United Kingdom there are instances where machines are successfully cutting up and down on gradients having a pitch of from 20 to 30 deg. In cutting down hill, when the gradient is steep, it is often necessary to use a back balance, or a brake, on the wheels of the machine to retard its forward motion; otherwise the pressure on the disk is too great. In order to retard the travel of the machine in cutting down hill on a heavy gradient, it is sometimes the practice to substitute sledges instead of the usual wheels on rails; in this case, however, a hard floor is required. One of the disadvantages attending the use of mining machines in steep seams is the extra power required

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Notice

Hereafter the subscription price of the ENGINEERING AND MINING JOURNAL, weekly, to Canada will be $6.50, and the monthly $1.50, postage paid. This raise of price is made necessary by the new postal treaty, which increases the cost of mailing papers to Canada a matter of 400 per cent.

What Defense Have the Lambs?

We receive many letters from persons, most of whom evidently are unacquainted with the mining business, inquiring as to certain mining companies in which they have made investments. These are straws wafted from the cyclone of fraudulent or exaggerated mining promotions that are consuming the savings of many thousands. In most cases the inquiries that we receive relate to enterprises of which we have never heard, although we are distinctly in a position to know what is going on in mining; in many cases they relate to concerns of which we have reasons to be suspicious. In almost no case does it appear probable that the investment will come to any other result than the loss of the money. What can be done to protect such persons against the mining sharks and against themselves? We have repeatedly pointed out several desirable things that can be done, but the most important of all, namely, the education of the public, is not easy to accomplish.

The average investor does not know how to protect himself against his own stupidity. The communications which we receive are the gropings for information by the more intelligent, although the latter class in most cases apparently parted with their money previously. For example, we receive letters like the following: "They make great claims for their property (such as an average of 20 per cent. copper ore, and millions of tons of it). I should like to get some information other than the company's own. I cannot afford to pay the expenses of an engineer to visit the property. Mr. A.B.C. has reported very favorably upon it. Can you not obtain for me some corroborative information?"

This correspondent asks for professional advice, which it is not our function to give. We can give him the news as is commonly reported; if the importance of the case is sufficient justification, we can, and frequently do, make special efforts to secure the information; but we cannot give advice as to whether a particular investment is good or bad. That is the professional function of the practising engineer. It is perfectly true that the majority of these investors cannot afford to pay the expenses of an engineer to visit the property, but they can afford to pay the moderate fee for which many good engineers would examine the reports presented by the promoters and pronounce them to be probable or improbable, reasonable, suspicious or dangerous, as the case might be. This is a perfectly feasible way whereby any person who is tempted to listen to the siren songs of the promoters can protect himself if he sees fit to do so.

The Guilt in Colliery Accidents

If the history of colliery accidents during the last decade were written, it would appear that a great majority of the disasters have been directly due to gross carelessness and criminal neglect. In some instances they are attributable to ignorance on the part of the cosmopolitan labor employed; in many cases, however, the facts compel the belief that all excuses are misplaced, and sympathy is deserved only by the unfortunates who have suffered through the carelessness of others.

At a large anthracite colliery, not long ago, some of the miners had tampered with the locked safety lamps there used, and by means of a hole drilled in the rim of the body had succeeded in making it possible to open the lamps while underground and thus endanger their own and the lives of all the other men in those workings. If mine managers can in any way punish such men by imprisonment, and fail to do so, the blame for disasters resulting from such criminal recklessness falls back upon them (the managers).

The coroner's inquest on the six men killed at the recent Genwen colliery explosion in England brought forth the startling evidence that a pipe lay near one of the dead men, and another victim had a pipe in his hand and a match in his pocket. These men may have been smuggling such forbidden articles into the mine time and again without causing any fatal accident, but at last they paid the penalty. The misfortune is that it is not always the guilty alone who suffer.

Last week we were reading of the rescue of the six men in the Berwind-White mine at Foustwell, Penn., where for six days those unfortunates were imprisoned underground, not knowing what minute the water would rise and drown them. In this case two miners were carelessly blasting in dangerous ground, where an immense volume of water was dammed back.

Neither education nor preaching will wholly eliminate such disasters, and the greatest good must come from stricter laws, which, after more careful investigations into the causes of all accidents, will administer severe justice by punishing any and all who are proved neglectful or careless. If we attack the problem in this way, sparing neither operator nor superintendent, nor miner, much good is sure to result, and the present practice of investigation and inquests—useless mockeries, with conclusions often framed according to the quality of the cigars furnished by the operating company—will be done away with.

Cement Dams in Floods

In a recent issue our San Francisco correspondent noted the failure of the large restraining dam on the Yuba river at Daguerre point in California. This dam was built to hold back tailings from the mines; it was chiefly of cement, and gave way during the heavy floods of early April. The wreck has now been examined by the Government engineers who have decided that the cause of the break in the barrier was the action of the large amount of cobble stones, gravel and coarse sand that was washed over the cement work during the recent flood. The attrition of these coarse materials acted as an abrasive on the cement work and ground it away like chalk. At first it was thought that the back-wash of the waters had caused the dam to break, but this was a mistake.

Copper Production of Mexico in 1906

In our issue of Jan. 5, 1907, we reported the copper production of Mexico in 1906 as having been 135,800,000 lb., this figure being based on the net imports into the United States (assuming those in November and December to have been at the average of the 10 months previous) to which was added the Boleo production. Computing the production in the same way, but with the statistics of net imports for the full year, we obtained the figure of 135,425,846 lb. In the meanwhile, however, we have received reports from all the smelters, showing a total of 138,208,000 lb., which figure is adopted as representative of the copper production of Mexico in 1906. The production in 1905 was 144,350,962 lb. The decrease was due chiefly to the smaller output of the Greene company. However, the latter continued to be the largest producer of Mexico, the other large producers being the Boleo, Moctezuma, and Teziutlan companies. It is probable that the copper production of Mexico will regain its lost ground in 1907.

The Elmore Vacuum Process

The article by Mr. Elmore, which is published elsewhere in this issue, is particularly valuable, being the first authoritative account of the new process which is now attracting widespread attention. The subject is of particular interest to American readers, because we understand that an installation of this process is contemplated at Ely, Nevada, by the Nevada Consolidated Mining Company. At all events, an extensive series of tests on ore from its Ruth and Eureka mines has been made. One of these ores works very readily by the usual vacuum-flotation method, giving an extraction in the neighborhood of 90 per cent., while the other ore contains a rather large percentage of soluble matter, and requires special treatment; however, it appears that it also will give a satisfactory extraction.

Unfortunately, we have not yet received any data as to the cost of treatment of ore by this new process. When a process is applied to the treatment of low-grade ore, differences of only a few cents per ton multiply themselves enormously when referred to the basis of the concentrated product. It is well recognized that an extraction of 90 per cent. by a rather costly process may give an inferior economical result, as compared with a process that extracts only 70 per cent. of the mineral at a lower cost. This was the prime cause of the failure of the original Elmore oil process, which in many respects was a beautiful process. However, it was decidedly more costly per ton of ore than ordinary jigging and tabling, and its promoters made the mistake of applying it to the treatment of crude ore in which it could not successfully compete with the older and ordinary processes, whereas if it had been applied to the treatment of a semi-concentrated product, very likely it would have resulted successfully. No doubt Mr. Elmore and his associates have carefully considered this experience in the development of their new process. We have had no opportunity to study the details of its cost of operation, but we are informed by independent engineers who have, that in their opinion it will be a comparatively cheap process. We wish that data on this subject could be communicated from some of the plants in Europe and elsewhere, at which it is actually in operation.

The Production of Broken Hill

At the semi-annual general meeting of the Broken Hill Proprietary Company, at Melbourne, Feb. 22, 1907, the chairman of the company, Harvey Patterson, communicated some highly interesting information as to the record of the mining of Broken Hill. He stated that the approximate total output of the Barrier Fields (Broken Hill) from the beginning of mining had been 20,000,000 tons of ore, yielding 2,500,000 tons of lead, and 250,000,000 oz. of silver. The total value of the production has been £60,000,000, of which £13,750,000 has been paid in dividends, bonuses, etc. It certainly is a grand record when a mining district as a whole yields approximately 23 per cent. of its output as profit. Out of the total dividends paid, the Broken Hill Proprietary Company alone has paid £9,152,000, a total which is exceeded by only a few mining companies of the world.

As illustrative of the part which the daily press have played in the mine-promotion evil, it may be remarked that the L. M. Sullivan Company, of Nevada, an extensive and spectacular advertiser which came to grief early this year, received as high as $140,000 in a single day from the sale of the stocks it was promoting. Yet these great receipts were overbalanced by the expenses, of which advertising was the largest item, and eventually the company found itself out of funds and had to be reorganized.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Collecting Black Sand

The article in a recent issue of the JOURNAL, suggesting and inviting correspondence on the subject of "Treatment of Black Sand," is interesting and I submit a few suggestions. I have been actively engaged in gold and tin dredging for a number of years, both here and in Australia and Borneo. The question of concentration, on a dredge, has always been an absorbing one to me, more especially in river dredging, where there is usually a large percentage of black sand and the gold is of a thin, scaly character. It is when situated in this way that the dredge master gets to thinking and trying out his ideas, how and in what way to arrest these thin scales of gold that will persist in traveling over the black sand.

Take the ordinary cocoa matting and expanded metal on tables, for example. If much black sand is present the matting is filled after 10 minutes' run, after which scaly gold will not remain on the tables, but will travel with the current. The same applies to riffles; much of the scaly gold gets away with the black sand unless it happens to get amalgamated. But frequently—I know of one case in Borneo—nearly half the gold is foul, covered with a thin film of arsenic or sulphur, which, although to the eye perfectly clean, will not amalgamate. It then becomes necessary to clean up often, and it is this part of concentration that I wish to bring before your readers.

[illegible] Hancock Jig.

I recently witnessed the Hancock Jig in operation on copper sulphides and saw it handling the same quantity of material that was previously sent to 20 ordinary jigs, and it was handling the material without any trouble, making quite as clean a concentrate. Here, then, is a step in the right direction for handling the black sand, or for concentrating the tailings or silt after it has been sized as fine as, say, ¼ in. through trommels or reciprocating screens.

Hitherto the main trouble with handling tailings by concentration has been the limited space available on the dredge, but the Hancock jig only requires floor space of about 23x5 ft. and will handle up to 700 tons per 24 hours. I think the ideal to aim for is a rough concentrate which could be removed as it accumulates to a small concentrating plant of one or two vanners situated ashore in the vicinity of the dredge, where one man could attend to the product.

There are many points in favor of the Hancock jig for this purpose, among others its large capacity, the small floor space covered, the small amount of horsepower required (5 h.p.), and its clean concentrate. It is automatic in the delivery of its concentrates, so that there would be no delays, and no further water supply would be needed—in fact, this would have to be reduced.

Anyone familiar with dredging will appreciate these points. A modern dredge handling, say, 2000 cu.yd. of ordinary gravel, using, as in California, a revolving or reciprocating screen, would probably deliver about 800 tons of fine material sized to ¼ in. This amount could easily be handled by two Hancock jigs and all the concentrates would be saved and handled ashore. Much of the fine gold now known to escape would be caught in these concentrates.

MARTYN'S DEVICE

Thus far I have never heard of any other machine that would work successfully on a dredge and handle the amount this machine will, with the exception of a machine used on two tin dredges in Stanthorpe, in Queensland, Australia. The features of this machine are covered by the patent of W. H. Martyn, of Sydney, N. S. W. The device has been in operation for about two years and consists of an endless belt of rakes traveling against the current on the tables and thus constantly stirring the heavy concentrate of tin and iron that accumulates. It appears to give satisfaction, handling all the fine material of 4-cu.ft. bucket dredges. Whether this machine would save the thin, scaly gold usually associated with black sand I cannot say, as there is not any appreciable amount of gold in the tinfields around Stanthorpe.

There is no doubt that if we are to save the light particles of thin gold, and the rusty gold, concentration in a more automatic manner than the usual tables with matting or flumes with riffles now in general use will have to be employed, and for this purpose the Hancock jig offers many possibilities. It might be necessary to alter it in some respects, but I think it bids fair to be one of the machines for the proper equipment of the dredge of the future.

[illegible] of Platinum.

The fact that Dr. Day discovered that platinum will amalgamate if sodium is used in the mercury recalls an experience I had in Borneo about three years ago. I had cleaned up in an amalgamating barrel, as usual, nearly 50 per cent. of the gold being foul. Having used sodium to prevent the mercury from sickening, on this occasion, I found on smelting the retorted cake, which was very dirty, that it was very pale. Thinking that some lead or other impurities had perhaps become amalgamated, I melted the bar four different times, adding niter each melt. To my disgust, however, it remained pale. I sent it to the Chinese merchant who purchased our gold. He reported that he could do nothing with it, that it was "too hard" and brittle. One of the Chinamen suggested that I had dropped a few dollars in and made "Maas Putti," white gold (Malay). Since I alone had handled the clean up I suspected platinum. I later found it in the residue.

Butte, Mont. W. BRAZENALL.

Cornish Method of Crushing and Ore Dressing

I have read with some interest an article by Edward Walker, which appeared in the JOURNAL of April 13. It seems to me that Mr. Walker does not go far enough back in history to "locate" the origin and development of the methods. The "everlasting credit" to the Cornishman is that after importing stamps and other means and methods from Germany (about 300 years ago, when lode mining in Cornwall was in its infancy, while in Germany lode mining for tin was in full operation), and keeping up the Phœnician methods introduced into Cornwall about 3000 years ago, he has conscientiously stuck to the same thing and practically all the improvements made are on the same old lines of working. Otherwise, the Cornishman has escaped the gradual development in mechanical dressing, and now many enginters call this standstill Cornish methods.

CAUSES AND EFFECTS

The facts are well known and fully admitted by Cornish engineers, but they assert, and they are in many respects right, that under the conditions then existing, both as to abundance of cheap labor and cheap water power, it paid better to adhere to their methods, especially since modern plants in many cases could not prove a closer saving at equal or lower cost.

The old commercial system of working had a lot to do with the starting and working of a mine, because any good prospect on a lode was immediately taken up and worked for the recovery of tin. The fact that all tin smelters bought any size parcel of tin oxide from a few pounds upward enabled a prospector to work alone, with members of his family, or with outside helpers and not only to make his work pay but in many cases to earn large profits. This he could do because his stamping, tying and buddling was mostly worked automatically by water power and did not require any attention until his drags, tyes and buddles were filled. Meanwhile he would work his lode and periodically have his "clean-up" by means of buddling, vanning and kieving. As he could take his produce immediately to the smelter, and receive his check or cash within a few hours of delivering the mineral, he did not require any working capital.

In a great many Cornish mines the entire dressing plant has grown up from the prospector's first outfit by simply adding a number of appliances of the same kind to cope with a larger output. The old dressing floors both in East and West Cornwall, cover acres of ground with simple and effective old appliances, and bear evidence to these facts.

The Cornishman was right in adhering to what he had under the circumstances then prevailing, abundant cheap labor of men and women, and of boys and girls down to the age of 10 years. Boys and girls received as little as three, four and five cents per day at the beginning, and that within the memory of present workers. Without proof of greater saving of mineral at a lower cost of production, Cornishmen were justly averse to discarding their working plants and erecting new ones at great cost.

Changed Conditions

Conditions have changed now in Cornwall; labor is dearer, and good miners and dressers are scarce while female labor on the dressing floor has almost disappeared. Mines abandoned for years have no assets in old plants. When they resume operations they can and must employ modern methods of machine dressing. As for the statement that no capital was devoted to experimental work, the books of several mines prove that large sums of money have been spent in testing chemical processes for the separation of wolfram from tin, which, however, all proved unprofitable.

The same applies to the separation of pyrites from tin oxide which is now being carried on by magnetic separation in many mines outside of Cornwall. Magnetic separation has proved a failure in some places, but a great success in others, and the main reason for failure was that ore from dumps or concentrates which had been exposed to atmospheric influence for a considerable time were treated. Freshly mined complex ores containing two or more minerals of different magnetic affinity, and receiving the exact amount of roasting can be successfully treated by magnetic separation which then gives excellent results.

Mr. Walker's description of the Cornish buddle is somewhat vague. His reference to "a concentrator on which the heavier particles are caught and kept in position until a thick bed is formed that can then be dug off and removed," applies to all the old appliances. Drags, strips or tyes are really buddles. Buddling ore is the process of counteracting the force in flowing water and distributing and thereby reducing such force to the requirements for washing over the lighter particles and allowing the mineral to settle.

The square buddle was in existence before the round buddle and the latter is an improvement on the former to obtain the largest area possible, namely, the circumference of a round cone for distributing the pulp. The sizes of cone in round buddles vary according to the nature of material and are smallest for coarse and larger for finer sand. These buddles are called convex or center feed buddles.

In slime treatment the size of the cone required is necessarily large and this naturally led to the invention of the concave or periphery-fed buddle. It is only a small step from the concave stationary to the Borlase (Cornish) concave revolving buddle.

Many improvements have been made in the automatic self-discharging buddle. These are nearly all linked with the inventor's name in describing them. They are divided into two classes: The stationary-feed and clear wash over a revolving surface, and the revolving-feed and clear wash over a stationary surface. The "Acme" mentioned in the article is one of the numerous varieties and has no special features apart from being a two-deck combination concave and convex buddle.

Mr. Walker has not found the true reason for the failure to make frequent chemical analyses. Such analyses are made, but owing to the time required for a chemical assay of tin, and the fact that the difference between the chemical and the vanning assay is known to be 22½ per cent. (with very slight variations) and also that the smelters purchase the mineral on a smelting test, and not on a chemical assay, the vanning assay is a good method for a quick determination of value and for a close estimation of actual results in dressing.

I may add that a close study of the so-called ancient methods is of great value to the engineer. When followed step by step through all the improvements it enables him to make his preliminary test in a simple form and assists him in arriving at a correct decision in selecting his plant and in working it to the best advantage.

J. F. C. Abelspies.

Holguin, Cuba, Apr. 27, 1907.

Resistance and Ventilating Fans

in your correspondence columns the following statements which were made by a prominent engineer, in addressing the members of a mining institute:

"Let me state that a fan and its engine are performing their greatest work in foot pounds when the fan is running free and open to the atmosphere, and the greater the mine resistance, the easier the work is on the fan and its engine at a given speed.

"We need never fear that a fan will run away if some accident should cause the doors in the mine to be blown out, and short-circuit the air. The fan will slow down instead of running away. The fear of a fan running away is all imaginary."

I trust that other mine managers and engineers who are interested in the subject will express their opinions concerning this phase of ventilation.

Mining Engineer.

West Virginia, April 28, 1907.

Moisture in English Chalk

I am anxious to ascertain the average moisture content of English chalk, imported into the United States. W. C.

Chicago, March 29, 1907.

English chalk is usually shipped without precautions against exposure to weather, and 90 per cent. is received wet, containing about 30 per cent. moisture. Ordinary drying will remove all but about 10 per cent., and kiln-drying will remove practically all of the contained water.

Preparations are being made at the Great Cobar copper mine, New South Wales, for doubling the present output. The new plant will consist of three large blast furnaces, each of 500 tons daily capacity. Each furnace will have a blower capable of delivering 30,000 cu.ft. of air per min., up to a pressure of about 3 lb. per sq.in. The slag from the furnaces will be handled by electric locomotives hauling cars of 25 tons capacity. The cost of the new plant is estimated at £160,000, its nominal capacity being 1000 tons of ore per day, the intention being to have one blast furnace always in reserve.

The weight and fineness of the new dollar in the Straits Settlements and the Federated Malay States has been fixed at 312 and 900 respectively. The 50c. piece is to be of the same fineness, but exactly half of the weight of the new dollar.

New Publications

CONCRETE FACTORIES. An illustrated record of recent examples of construction of reinforced concrete buildings, including reports of the Sub-Committee on Tests, the United States Geological Survey and the French Rules on Reinforced Concrete. Compiled by [illegible] W. Lesley. Pp. 152; illustrated. 7x10 in.; board covers. Price, $1. New York, 1907. Published for the *Cement Age* Company by Bruce & Banning.

This book contains reports of a subcommittee on tests of the joint committee on concrete and reinforced concrete appointed by several engineering societies, together with the French rules on reinforced concrete and several articles on reinforced concrete construction, concrete in factory construction, the value of concrete as a structural material, etc. The book embraces much that is of interest and much that is valuable in the way of information on the present state of the art of concrete and reinforced construction.

"[illegible] THEIR CHEMICAL AND PHYSICAL CHARACTERS AND THEIR DETERMINATION IN THIN SECTIONS." By Joseph P. Iddings. Pp. 548; illustrated. 6x9 in.; cloth, $5. New York, 1906: John Wiley & Sons.

Contents. Chemical principles and characters. Physical principles and characters in part. Optical properties. Description of the rock minerals according to groups.

This is especially a book for the student of petrology. Its treatment of the abstruse subject to which it pertains is considerably beyond the limits of the practising mining geologist; it is far beyond those of the ordinary mining engineer. Among specialists in petrology it will be highly esteemed, and to the student of that science it will be a particularly valuable guide. Indeed, the first part of the work, relating to the chemical and physical principles that underlie the science of petrology, will be valuable to all geologists, the presentation of those principles being clear and concise.

"THE GEM CUTTERS' CRAFT." By Leopold Claremont. Pp. 296; illustrated. 6½ x9½ in.; cloth, $5. London, 1906: George Bell & Sons.

This is a handsome book, that deals with a subject of general interest. Who is there who is not interested in the beautiful stones that are cut for gems? What is more fascinating than a visit to a lapidary's shop, where the various processes of cutting can be observed? Mr. Claremont's book is the next best thing to such a visit. In many respects it is decidedly superior, because he tells many things that the casual visitor would not observe even if he had the opportunity [illegible]

There are many books upon the subject of precious stones, but the present one is the first to be written by a practical gem-cutter. I have frequently been asked: What do certain gems look like before they are cut? How can one tell one kind of precious stone from another? What gems are likely to be found associated with such and such minerals?"

Mr. Claremont, who is a well-known gem-cutter of London, and also an experienced author (having been a contributor to the JOURNAL and "The Mineral Industry") has answered these questions, and many others, in a popular way in his book. We think the latter will be found to be a useful assistant. There will be no question that it is interesting.

Palmarejo and Mexican Goldfields, Ltd.

In the report of the Palmarejo and Mexican Goldfields, Ltd., for the year ended June 30, 1906, the financial statement is condensed as follows:

Receipts:	
Concentrates	£14,494
Cyanides	41,650
Slimes and export ore	10,886
Stores, rents and exchanges	2,221
Transfer fees and interest	449
Total	£69,700
Expenses:	
Salaries, wages, etc., in Mexico	£56,529
London expenses	8,016
Difference in years' stocks	1,835
Total	£66,380
Balance for 1906	£3,320
Previous balance	6,184
Carried forward	£9,504

No costs of mining, milling, supplies, etc., are separately enumerated in the report, nor is there a specific statement of underground operations.

Tennessee Coal, Iron and Railroad Company

This company owns extensive coal and iron properties in Alabama and Tennessee. It also owns and operates 16 blast furnaces, of which 6 are at Ensley, 5 at Bessemer, 2 at Oxmoor, 1 at Birmingham, Ala., and 2 at South Pittsburg, Tenn.; steel works at Ensley, comprising eleven 50-ton basic open-hearth furnaces, one 250-ton primary furnace, one 15-ton Bessemer converter, blooming mill, rail mill, etc., and in process of construction two 20-ton Bessemer converters, four 65-ton open-hearth furnaces and a 36-in. rail mill of 25,000 tons monthly capacity; rolling mill at Bessemer, having 24 single puddling furnaces, muck mill and bar, guide, plate and fire bed mills. At the coal mines there are 2974 coke ovens in operation. The report is for the year 1906.

The company has outstanding $124,500 preferred and $25,931,018 common stock. The bonded debt amounts to $14,269,000 in all.

The financial statement for the year is as follows:

	1905.	1906.	Changes.
Gross earnings..	$10,951,979	$13,265,971	I. $2,313,992
Work'g expenses	8,467,840	10,512,811	I. 2,044,971
Net earnings..	$2,484,139	$2,753,160	I. $ 269,021
Depreciation and renewals.....	$ 625,090	$ 770,678	I. $ 145,588
Interest, etc.....	830,765	895,145	I. 64,380
Total charges	$ 1,455,855	$ 1,665,823	I. $ 209,968
Net income....	$ 1,028,284	$ 1,087,337	I. $ 59,053

From the net income in 1906 there were paid dividends of $9964, or 8 per cent., on preferred, and $950,492, or 4 per cent., on common stock. The working expenses last year were made up as follows: Labor and material, $8,439,505; repairs and maintenance, $1,541,218; general expenses, taxes and insurance, $532,088. The net surplus for the year was $126,881, after paying dividends.

The production statement for the year is as follows:

	1905.	1906.	Changes.
Coal mined.....	2,231,659	3,007,657	I. 775,998
Coke made.....	890,634	1,186,872	I. 296,238
Iron ore mined.....	1,436,282	1,483,476	I. 47,194
Pig iron made.....	529,036	641,887	I. 112,851
Steel rails, bars, plates and billets..	402,318	401,882	D. 436

The unfilled orders on the company's books, as of Jan. 1, 1907, called for 467,114 tons iron and steel; 201,700 tons of coke and 1,200,000 tons of coal. The number of men employed was 10,414 in 1905, and 11,857 last year.

The total expenditures for additions to property in 1906 were $1,553,883. These included large expenditures on the iron ore properties at Red Mountain and a new dolomite quarry. New iron ore mines known as the Potter property, heretofore under joint lease to the Tennessee Coal, Iron and Railroad Company, and the Republic Iron and Steel Company, were during the year acquired by joint purchase with the Republic company at a price and on terms exceedingly favorable to the Tennessee company. Valuable acreage was also acquired near the Ketona dolomite property that will approximately double the dolomite or limestone reserves. Large appropriations have been authorized for the construction of seven modern coal washers, and within a few months the entire coal requirements for coking will be properly washed, and the coke produced will then be of a superior quality. In addition to new washers, new mines are being opened and the facilities at old points strengthened. The coking capacity has not been extended, but has been increased by liberal repairs to old equipment, and further increases may be expected from this policy of rigid maintenance.

The labor situation has not been good, and there is much difficulty in securing the needed supply of efficient men in all branches of the work.

Personal

Mining and metallurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Thomas Cole, of Duluth, was in Calumet, Mich., recently.

Edwin E. Chase has left Denver, Colo., for a trip to Nevada and Arizona.

Hon. Richardt McBride, minister of mines for British Columbia, has gone to England.

J. A. Davis, of Denver, Colo., is traveling through Mexico in search of low-grade zinc ores.

Anthony Blum, president of the Laurentian Gold Mines, Ltd., was at Manitou lake, Ont., last week.

Leo Goldsmith, of New York, is in Virginia, examining manganese deposits for a New York company.

R. A. Hadfield, of Sheffield, England, president of the Iron and Steel Institute, is a visitor in New York.

Fred G. Farish sailed from New York, May 6, on his way to Amsterdam, Holland, on professional business.

John McLain has been appointed supervisor of mines of the Westmoreland Coal Company at Irwin, Penn., and other points.

F. E. Schoonmaker, geologist and mining engineer, of Detroit, Mich., has returned home from a trip to Larder Lake, Ontario.

A. B. Cockerill, of Nevada, Mo., president of the Cockerill Zinc Company, has returned home after a trip through northern Mexico.

Woolsey McA. Johnson, metallurgical engineer, of New York, has gone to Kansas, New Mexico and Colorado on professional business.

C. M. Van Law, general manager of the Guanajuato Reduction and Mines Company, is on his way to Europe for a much needed rest.

Prof. Willet G. Miller, Provincial geologist of Ontario, has received the honorary degree of LL.D. from Queens University, Kingston, Ontario.

Prof. Robert H. Richards has returned to Boston from Pennsylvania, where he has been advising in regard to iron and copper concentration.

R. B. Brinsmade is conducting the classes in geology at the University of Kansas, Lawrence, Kan., for a few weeks, during the absence of Professor Haworth.

Bernard MacDonald, of Guanajuato, has opened an office at No. 40 Wall street, New York, as mining engineer. He will make Mexican mines a specialty.

A. A. Hassan, of New York, is going to visit Cobalt, Ont., Larder lake, and the Montreal river country, to examine several mines and explore the territory generally.

James McEvoy, of Fernie, East Kootenay, B. C., geologist and chief engineer for the Crow's Nest Pass Coal Company, is recovering at Victoria from an attack of pneumonia.

M. E. MacDonald has resigned from the active management of the Guanajuato Consolidated Mining and Milling Company, Guanajuato, Mexico, to look after his own private mining interests in Mexico.

Mrs. Harriet Connor Brown, who has prepared the press bulletins issued by the United States Geological Survey for over three years past, has resigned that position and removed from Washington to Chicago.

Walter S. Brown, of Wiard & Brown, Denver, is at present in Mexico on professional business. Upon his return he will remain for some time at the Cleveland-Arizona property, near Red Rock, Arizona.

Thomas R. Williams, for 38 consecutive years foreman of the Susquehanna Coal Company, has retired from the position he had held so long. A dinner was given him in Scranton, Penn., at which there were 147 fellow employees and friends.

George Ames, for several years cashier of the Utah Consolidated Mining Company, with headquarters in Salt Lake City, has resigned to accept a position with the Bamberger mining interests. He will have his headquarters at Park City, Utah.

Capt. Henry Guyer, of Lima, Peru, for many years connected with the Backus & Johnston Smelting Company, of Casapalca, and representative for the Allis-Chalmers Company, has been obliged to give up all further business on account of failing health.

G. A. Richards, general manager of the Mount Morgan Gold Mining Company, of Queensland, Australia, is visiting in New York, where he is making his headquarters during a study of American metallurgical practice. He starts for home this week, by way of Vancouver.

G. D. Delprat, general manager of the Broken Hill Proprietary Company, of Broken Hill, New South Wales, is visiting in Europe, where he is studying the methods of zinc smelting, with reference to the operation of his own company at Port Pirie, South Australia.

Hon. W. Templeman, Canadian Minister of Inland Revenue, has resigned the presidency and directorship of the Airgold Cobalt Company for the reason that, being a minister and responsible for the administration of the mines branch, his name ought not to be used in connection with any mining venture.

Janin, Stebbins & Smith announce the dissolution of the firm. Mr. Stebbins opened an office at 1201 Chronicle building, San Francisco, on May 1, 1907. Mr. Janin and Mr. Smith will continue as associated engineers at 804 Union Savings Bank building, Oakland, Cal., until suitable offices can be obtained in San Francisco.

W. C. Thomas, for some time past superintendent of the Dominion Copper Company's smelter in the Boundary district in British Columbia has been appointed resident general manager, in succession to T. R. Drummond. George Williams, for several years superintendent of the British Columbia Company's smelter in the same district, is now filling a similar position at the works of the Dominion Copper Company.

T. A. Jaggar, Jr., professor of geology in the Massachusetts Institute of Technology, Boston, is at the head of a party which arranged to leave Seattle, Wash., on May 1, for the Aleutian Islands, Alaska, to study seismic and volcanic conditions. The party was to include Prof. H. V. Summers, of Drexel Institute, Philadelphia; Prof. A. S. Eakle, University of California; Dr. E. C. Van Dyke, and several scientists associated with Professor Jaggar in Boston.

Dr. George F. Kunz has received through the French consul-general the decoration of Chevalier of the Legion of Honor, conferred upon him in recognition of his scientific work. Dr. Kunz, who is head of the diamond department at Tiffany's, is a native of New York and is 50 years old. He has received honorary degrees from Columbia and the University of Marburg, has done special geological research work for the Government, and is president of the New York Mineralogical Club, vice-president of the American Institute of Mining Engineers. In 1889 he received from the French government the decoration of *Officier d'Instruction Publique*, and he is an honorary member of various foreign scientific societies. His book, "Gems and Precious Stones," published by the ENGINEERING AND MINING JOURNAL, is recognized as authoritative, and as a masterpiece in its field.

Obituary

Georges de La Bouglise, a prominent mining engineer of wide experience, died at his residence in Paris, France, April 15, aged 65 years.

Thomas Phillips, of Scranton, Penn., superintendent of the washery department of the Delaware, Lackawanna & Western, was killed, last week, by being struck by a passenger train, near the Brisbin colliery.

Henry B. Curran, for many years a member of the well known coal firm of Castner, Curran & Bullitt, of Philadelphia, died suddenly, May 4, at Hot Springs, Ark., where he had gone for treatment for certain heart symptoms.

Charles C. Swart, for 14 years in charge of the advertising and catalog business of the Gates Iron Works, Fraser

& Chalmers, and the Allis-Chalmers Company, of Chicago, and later occupying a similar position for over two years with the Union Iron Works and for the past year with the Fulton Iron Works, San Francisco, died in St. Luke's Hospital, in that city, April 9, the result of an operation for appendicitis. He was an acknowledged expert in his work.

Robert S. Mercur, general manager of the Kingston Coal Company, met his death last week, while at No. 4 colliery, Wilkes-Barre, Penn., inspecting some repair work. Mr. Mercur was seen to suddenly fall forward and when some men went to his aid he was dead. For some days he had complained of pains in the region of the heart and death was believed to be due to heart trouble. He was formerly superintendent of the Centralia division of the Lehigh Valley Coal Company, and succeeded the late Gwilym William as superintendent of the Kingston Coal Company, in 1904. He was the son of Frederick Mercur, who was the general superintendent of the Lehigh Valley lines up to the time of his death in 1888. Mr. Mercur was a graduate of Lehigh University and leaves a widow and two children.

Thomas B. Riter, president of the Riter-Conley Manufacturing Company, Pittsburg, died at his home in that city on April 23. He was born at York, Penn., in 1840. He went to Pittsburg when quite young and secured employment with Marshall Brothers, with whom he remained many years. James M. Riter, an elder brother, founded the present company, starting in 1858 a steel construction shop. Thomas Riter began to work for his brother as a blacksmith and learned the details of steel construction. When in the later sixties the oil production in Pennsylvania assumed great proportions the Riters launched into the tank-building business, and soon had a practical monopoly in this class of steel construction. After the death of James M. Riter, in 1873, Thomas B. Riter and W. H. Conley bought the plant from the widow. In 1878 Mr. Conley died and Mr. Riter incorporated the Riter-Conley Manufacturing Company, becoming the president and taking into partnership with him several young employees who had distinguished themselves in their several departments. The firm built practically all the blast furnaces in Allegheny county, and has for years been represented all over the world. Among its important foreign contracts was the erection of three blast furnaces and the open-hearth steel plant for the Dominion Iron and Steel Company, at Sydney. The company has done much work in South African mining camps. All over Mexico and South America may be found work planned and directed by Mr. Riter. At present the company is engaged on the construction of the blast furnaces of the United States Steel Corporation at Gary, Ind. It built the great refinery of the Gulf Refining Company, at Port Arthur, Tex., and the Burke refinery at Beaumont, Tex., with tanks that are among the largest in the world. Mr. Riter was a member of the Engineers' Society of Pittsburg. He leaves a widow and a son, Joseph Riter.

Societies and Technical Schools

Stevens Institute of Technology—This school, at Hoboken, N. J., has made a special feature of the section of its library devoted to patent literature. Prof. W. H. Bristol has contributed largely to the support of this section. Miss E. M. Hawkins has recently been placed in charge of the library.

Colorado Section, Western Association of Technical Chemists and Metallurgists—This association gives notice that the program for an early meeting of the section shall be a symposium on the cyanide treatment of ores. A number of papers by prominent cyanide men are promised and each phase of the subject will be thoroughly discussed. Every member interested in cyanide work is urged to help this program. If any member wishes to submit a question it will be presented for discussion at this meeting. The next meeting of the section will be held May 14. The subject of the evening is the "Determination of Silica, Iron and Lime."

Industrial

The Epping Carpenter Company, Pittsburg, Penn., manufacturer of pumping machinery, has opened an office in the West Street building, 90 West street, New York. T. B. Slocum and George B. Ferrier, Jr., are in charge.

The Midvale Steel Company, Philadelphia, on May 1 moved the general sales office for the Pacific coast to the Monadnock building, San Francisco, where it will be permanently located. Jas. C. H. Ferguson is Pacific coast sales agent. This company has also recently occupied the new steel warehouse on Folsom street, San Francisco, Cal.

In a fire at the works of the Indianapolis Switch and Frog Company, at Springfield, Ohio, April 23, the main building of the machine shop was entirely destroyed excepting the walls. This building was 400x225 ft., and will be rebuilt at once as a fireproof structure. There was practically no loss of material or work in course of erection, and temporary arrangements are being made to complete, as far as possible, unfinished orders.

Trade Catalogs

The W. Gerhardi Works at Lüdenscheid, Westphalia, Germany, are desirous of receiving manufacturers' catalogs of machinery, tools and power-plant equipment for rod, bar, wire and tube rolling mills, and for stamping and drop forging.

Receipt is acknowledged of the following trade catalogs and circulars:

Monarch Road Roller Company, Groton, Tompkins County, New York. Monarch. Pp. 18, illustrated, paper, 6x9 in.

Allis-Chalmers Company, Milwaukee, Wis. Leaflet No. 2002. Valve Gear, Piston Details and Governor of the Reynolds Corliss Engine. Pp. 4, illustrated, paper, 8x10½ in. Bulletin No. 1421. The Overstrom Table for Concentrating Ores. Pp. 20, illustrated, paper, 8x10½ in.; February, 1907.

Construction News

Central City, Colorado—New machinery is to be put in by the Hampton Consolidated Mines Company. N. I. Hughes, Central City, Colo., is manager.

An air compressor is to be installed at the Grand Central mine. D. McMasters, whose address is the Pleasanton, Denver, Colo., is manager for the company.

Idaho Springs, Colorado—The Sterling Mines & Tunnel Company is preparing to put in a plant of machinery at its mine. J. Hobson, Idaho Springs, Colo., is manager.

Holmes, Wyoming—The Medicine Bow Mines Company proposes to build a 50-ton concentrating mill for copper ores. G. S. Simmons, Holmes, Albany county, Wyoming, is president.

Ute Creek, Colorado—Arrangements are being made to install an air compressor and other machinery at the Humboldt mine. Frank C. Smith, Idaho Springs, Colo., is manager.

Steamboat Springs, Colorado—The Hyatt-Verde Mining Company is preparing to install an air compressor and other machinery. D. C. Hazelbacker, Steamboat Springs, Routt county, Colo., is manager.

Greenville, California—The Indian Valley Mining Company contemplates the erection of a cyanide plant at the Indian Valley mine, during the present year. E. J. Franz, Greenville, Plumas county, Cal., is superintendent. The company also has an office at 114 Liberty street, New York.

Rusk, Texas—The Rusk Iron Company has bought the old Star and Crescent furnace and will make extensive additions to the plant, requiring new machinery. W. H. Oatley, Hartford, Conn., is president; W. F. Knox, Rusk, Texas, is a resident director.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

May 4—It is now apparent that an aggressive fight against the gold-dredging industry is to be waged by the Anti-Debris Association and certain farmers of Sutter and Yuba counties. Funds have been raised, attorneys have been employed and a test suit is to be commenced at once. The dredge owners will thus be placed on the defensive in the steps being taken to force them to protect the farming lands from the encroachment of the debris. Injunction suits are to be brought, as was done in the case of the hydraulic miners in the famous suits against the North Bloomfield Mining Company, in which the farmers were successful. The Dredge Miners' Association, at a meeting in Oroville last week, agreed that the dredger "Pennsylvania" should be secured to throw up a barrier of tailings at Gold Run, a point below the city, upon the left bank of the river. After throwing up the barrier of rock tailings it is the purpose of dredge operators to make a fill of dirt so that a perfect retaining wall will be formed.

There is no change in the condition of affairs in the Mother Lode mines at Angels, in Calaveras county. The mines still remain closed and the men idle. The demand for an 8-hour day was refused by the mine owners, and between 900 and 1000 men are out of work in consequence. Thus far the trouble with the miners on this question has not spread into Tuolumne and other Mother Lode counties, but there are signs of discontent and controversy. The trouble has been mainly brought about by the men from eastern and southern Europe, who have no interest in this country and no sympathy with the local conditions. Numbers of men have left for the prosperous mining camps in Nevada. For fear of a general desertion the officials of the union threaten to blacklist any member who leaves the section where the strike is being enforced. The different properties affected are being protected by armed men for fear of damage by men who have voluntarily quit work. The mines will doubtless remain closed until men can be obtained who will work for $3 with a 10-hour day.

The independent oil producers of Coalinga and Kern-river fields in the San Joaquin valley are planning to build a pipe-line from Kern river through Coalinga to tidewater near San Jose at the southern end of San Francisco bay. The distance is 225 miles and the estimated cost is $7500 per mile. The expense will, therefore be heavy, but the independent producers will be freed from the domination of the corporations now controlling the prices of the oil in the valley field. The Santa Maria producers, in Santa Barbara county, are threatening similar steps unless conditions improve and they get a better price for their product.

The Southern Pacific Company has authorized its agent at Reno, Nevada, to make the announcement that in the future all deeds made by the company there will not have a mineral-reservation clause. This clause, which has been inserted in all deeds conveying the lands originally granted the Central Pacific, has been used for the past four years, its effect being to reserve for the company all minerals contained in the lands. The recent action, which originated with Land Agent W. H. Mills, will prove beneficial to prospectors and the mining industry at large, as the reservation clause formerly used was very broad and sweeping in effect. No announcement has been made as yet concerning the future policy of the company in regard to permitting exploration and location of the patented lands of the company by miners. The California Miners' Association has for years been trying to get the railroad company to let prospectors enter the patented lands, with some guarantee that if they found anything they would not be charged exorbitant prices for it. But more to the point have been the efforts of the association to have all the railroad sections examined before patent is issued, so that such portions as were mineral might be reserved for the prospector and miner. In this they have been uniformly unsuccessful, though the laws plainly state that all minerals are reserved for the people.

Capt. J. W. Morrell is trying to make a consolidation of the mining interests around Alleghany, Sierra county, to take in some 1500 acres of mineral ground, both placer and quartz.

The maximum capacity of the new railroad being built to connect the Mammoth smelter, Kennett, Shasta county, with the mine, will be 3600 tons of ore daily. This is determined by the section of the road over which the ore is conveyed in a gravity tram, where an elevation of 1600 ft. is overcome in 4000 ft. distance.

Having completely lost his residence and winery by fire about a year ago, E. Kiegel has come to the conclusion that he had better work his vineyard for all the wealth there is in properly cultivating both sides, and therefore while the grapes are [illegible] on the other side and working a quartz ledge that has already showed assays of from $40 to $60 a ton. The property is located on Lost hill, Nevada City, and Kiegel had already pushed his tunnel along under his vineyard quite a distance in the direction of the ledge when the fire came and swept away his possessions. That disaster caused him to cease work for a while, but now he intends to make up for the delay. The tunnel will be run as a crosscut to intersect the ledge, about 700 ft. of which is on his property and which is believed to be an extension of the Reward mine on the other side of Deer creek.

Creditors of the Squaw Valley Mining Company, of Gazelle, Siskiyou county, have filed a petition in the United States District Court in San Francisco asking that the company be declared an involuntary insolvent, the creditors being Boston men. The petition sets forth that at a meeting of the directors held in Boise City, Idaho, the corporation admitted that it was insolvent. The company owns among other mines the famous Dewey group, which at one time paid handsomely. What they really need up there now is a good electrical power plant.

Salt Lake City

May 4—The Gold Mountain Consolidated Mining Company, of which Albert Carr, of New York, is a controlling factor, has acquired the Annie Laurie mine in the Gold Mountain mining district, in Piute county, and several adjoining properties, which gives it possession of an area approximating 2500 acres. The Annie Laurie mine was formerly a dividend-payer, and is equipped with a mill, which is to be remodeled and enlarged.

The first unit of the Utah Copper Company's new concentrating mill at Garfield is practically ready for operation. The bins are being filled with ore. The ore transportation facilities are not yet of a character entirely satisfactory to the management.

Jesse Knight, of Provo, and associates, have acquired the old Emma mine, at Alta, which was once quite a noted producer. A new company will be formed to operate it.

The Daly Judge Mining Company, at Park City, has issued its annual report to shareholders covering the operations of the company during the year 1906. An indebtedness of $230,977, consisting of

$200,000 worth of outstanding bonds and an overdraft at the bank of $21,978.68, was liquidated and at the beginning of the current year the treasury contained a balance of $200,038. The total net earnings amounted to $500,015, or 61.2 per cent. of the gross earnings. A total of 63,322 tons of ore was mined, 13,011 tons of which was of a shipping grade. The mill treated 58,845 tons, the result of which was 9838 tons of lead concentrate, and 8320 tons of iron and zinc middlings, showing one ton of concentrate produced from each 3.2 tons of crude ore. The mill handled an average of 165 tons per day. A recent examination of the mine was made by President John J. Daly, and in a statement accompanying the report he says that there has been an impoverishment of the orebody opened on the 1500-ft. level last year, with a corresponding decrease in earnings. He believes, however, that the vigorous development now in progress will result in the opening of other important ore channels. About 2000 ft. of exploratory work was performed last year. The total production of the mine since the incorporation of the company has amounted to 1,068,346 oz. silver; 3,544.74 gold; 28,961,777 lb. lead; 12,188,260 lb. zinc; 156,110 lb. copper, all of which sold for $1,279,076.24.

Scranton

May 6—Letters have been sent out by the Fulton Coal Company to the minority stockholders stating that the Philadelphia & Reading is willing to take over their holdings at $2.05 per share. The latter company owns 63,537 shares of the total of 71,129, leaving 7682 in the hands of the public. The Fulton Company owns land in the Shamokin region, and the only colliery on the land is the Enterprise, leased to W. L. Connell, of Scranton, and others.

The commissioners of Luzerne county have finally settled the assessment problem by placing the valuation at $67 per acre for every foot in thickness of coal. This means that the coal 50 ft. in thickness will be assessed at $3350 an acre. The average valuation in the county was $ [illegible]

The Hickory Swamp breaker, one of the pioneer structures in the anthracite region has been abandoned, and the coal from the Swamp mine will be taken to Hickory Ridge breaker, near Shamokin. The latter has been remodeled.

The washery of the old Plymouth Coal Company, at Plymouth, was destroyed by fire last week. The plant was formerly known as Delaware & Hudson breaker No. 5, and was recently bought by Rissinger Brothers.

The Reliance Coal Company, of Pittston, has commenced an action against the Pennsylvania Coal Company, to recover $20,000 damages for the flooding of the workings with water, due, it is alleged, to the negligent manner in which the Pennsylvania Coal Company conducted mining operations, permitting a stream of water to flow into the Reliance workings.

The Northeast Coal Company, which operates a new colliery between Carbondale and Forest City, has had a strike on its hands for some time. The company made a proposition to the miners that the matter be submitted to a board of arbitration, the decision to date from May 1. The men refused to accept the offer.

Toronto, Ont.

May 4—The Montreal river silver area is being rapidly extended as prospectors take up locations farther inland. The townships of Tudhope and Truax, adjoining James township, are nearly all staked. Native silver has been discovered in Truax.

The Ontario Department of Mines has decided upon an exploration of the Larder Lake district during the summer. Considerable attention will also be devoted to the Lady Evelyn and adjoining areas, the geological conditions of which will be fully investigated. Owing to the continual reports of new discoveries and the enlargement of the known mineral area the season will be a very busy one for the officials.

London

April 27—During the last two months or so, a great deal has been heard in London about a new fuel called "coalite," which it is claimed will solve the smoke problem. In London the local laws governing the discharge of smoke into the atmosphere from factories and workshops are very severe, anything like a black smoke being prohibited, under penalty of heavy fines. No regulation has ever been made, however, in connection with the discharge of smoke from houses and other dwelling places, presumably because of the absence of any practicable alternative to bituminous coal. Considerable improvement has taken place in recent years by the substitution of gas fires, but for ordinary heating purposes these are out of the reach of poor people. The promoters of coalite are confident that their fuel will be an effective substitute for bituminous coal, and be within the means of the poorest. They have not yet issued any technical description of their fuel, but an inspection of it leads me to the belief that it is a partially coked bituminous coal. It is probably treated at a temperature just sufficient to make the carbon swell up into a porous mass, but apparently very little of the bituminous matter is actually extracted, for the fuel burns with a pleasant clear flame in the open grate. It is stated also that in the process of manufacture smalls and fines can be employed. If the claims of the promoters are fulfilled, and if the fuel can be prepared and sold at a reasonable price, there will be an opening for coalite. I may say that Thomas Parker, a well known engineer, is the inventor, and that the financial backers of the scheme include many influential coal owners and coal users.

At the present time the only producer of aluminum in this country is the British Aluminum Company, the progress of which has been noted in the JOURNAL from time to time. The success of this company and the increase in the demand for aluminum and its alloys, especially among motor-car designers, has caused another group of electrical engineers to undertake the manufacture of this metal. The new scheme provides for the construction of works in Carnarvonshire, North Wales. Away up in the hills not far from Snowden, but out of the beaten track of tourists, are a number of lakes admirably adapted for the generation of water power. It is one of these lakes with a Welsh name, unspellable and unpronouncable to the Saxon, that is to be employed for this purpose. The new company is called the Aluminium Corporation Ltd., and though the prospectus has been nominally advertised, the negotiations have all been conducted privately, so that scientific and technical details have not been made public. I am therefore unable at the present time to say what process is to be used or where the raw material is coming from. The company starts with £250,000 cash resources. The first plant, which should start operations by the end of this year, will provide 800 h.p., and the larger plant to produce 6000 h.p. will be in operation in about two years. The whole of the cash above mentioned will be required for the acquisition of the land and the erection of the plant. Later on, additional money will be required for working capital. The names of engineers connected with the venture include Beardmore, Manville, Harpers, Bruce Peebles, and others.

Johannesburg

March 25—Lion Hills, one of the favorite "horses" on the stock exchange for a week, has had a big drop. A report came out some time ago, stating that a diamond pipe had been found. This sent the shares of this company "sky high." Much was expected from the trial wash, and the shares mounted to 120 each. Then the results of the trial wash were made known, and it was found that there were no diamonds, the shares came down with a run, and today stand at £4 15s. This venture is only a sample of many others that the Johannesburg public has gone into. There is an inveterate gambling spirit in this place, and promoters are kept busy getting up ventures. It makes little difference whether the proposition be gold, copper, tin, silver, or diamonds; although at the present time diamonds appear to be the most popular gambling counter.

Of course there is a big element of chance in diamond mining, but the mining engineer cannot keep wishing that there was more conscience.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

California

AMADOR COUNTY

Oneida Mining Company—The property of this company between Jackson and Sutter Creek, has been closed down, the men discharged, and the machinery will be removed. After several years of prospecting the mine is found to be a failure.

Lucas—This mine, near Big Bar bridge, has been closed down indefinitely. The recent storms did so much damage that it was decided to cease operations.

BUTTE COUNTY

United States Diamond Mining Company—This company has been formed to develop the Cooney property above Groveville, with the following directors: M. J. Cooney, C. A. Moore, A. G. L. J. A. Christie and F. M. Ballard.

Indiana Dredging Company—This company, which lost two dredges during the floods last month, has decided to build two new ones to replace those lost.

DEL NORTE COUNTY

Low Divide District—The 300-ft. tunnel in the Zaar mine shows up a 4-ft. ledge of good-grade copper ore, and shipments to a smelter are to be made.

ELDORADO COUNTY

Delwisch—Men have been set at work on this gravel mine, near Georgetown, and the mill has been started up.

INYO COUNTY

Greenwater & Death Valley Mines and Smelting Company—The respective shafts are reported to improve with depth, in the opinion of Malcom MacDonald, manager of the Schwab interests. The smelter will be located at Ash Meadows, where there is plenty of water. The machinery has been ordered and will be delivered when the railroads are finished.

MONO COUNTY

Standard Consolidated Mining Company—President Westheimer and Secretary Lassen of this company, at Bodie, are arranging for the purchase of machinery to increase the capacity of the power plant and add materially to the reduction works.

NEVADA COUNTY

Conlin—This mine at Grass Valley has been unwatered and has been started up with a full crew. The new 10-stamp mill be ready for operation in two weeks.

Sultana Group—These mines, which have been filled with water since the recent storms, have been unwatered and work resumed.

SHASTA COUNTY

Shasta King Mine—The skipway of this mine to the top of the hill to connect with the tramway to the Balaklala tram is virtually completed and will handle 500 tons of ore daily.

Mammoth Mining Company—The smelter of this company, at Kennett, now of 1100 tons daily capacity, is installing two new furnaces.

Great Western Company—The smelter of this company at Ingot is of 500 tons daily capacity. A railroad is to be built from the plant to the Pitt river to join the Sacramento Valley Eastern Railroad. This will furnish the transportation facilities which are much needed for the smelter, and which are now lacking.

Corner Group—This group of mines on Salt creek in Lower Springs district has been sold to the Stauffer Chemical Company, of San Francisco. The ore will be shipped to local smelters.

SIERRA COUNTY

Plumbago—At this mine the flume conveying power water was carried away by the recent storms, causing a cessation of work.

Alleghany-Forest District—Several quartz ledges at American Hill are now to be worked. The Pilgrim is to be operated by an English-American company, T. A. Patterson, manager. The Humboldt is to be reopened by W. H. Wheeler, of Nevada City, and Los Angeles men. The Keller, an extension of the Pilgrim, has been bought by T. Garver and others, of Los Angeles. The Independence, owned by Mrs. B. Latrielle, of Downieville, is to be developed at once. Development work has been commenced on the Olivet.

SISKIYOU COUNTY

Mono—This mine, formerly the Punch Creek, has been sold to C. C. Broadwater, of Montana, who has made a good payment on the purchase price and is to sink 200 ft. deeper before paying the balance of the $180,000. The mine has been paying well for some years and formerly belonged to G. W. Grayson, of San Francisco.

Sheba—The electric plant established at this mine to furnish power is now working satisfactorily.

[redacted] COUNTY

Copper Mountain—Thomas Donohue and others are opening this mine, 10 miles east of La Grange on the Tuolumne river.

TRINITY COUNTY

Golden Jubilee—A wide ledge of high-grade ore is reported struck in this mine at Carrville. Wm. Chapman, superintendent.

TUOLUMNE COUNTY

Lumsden Group—A strike of high-grade ore was made in this mine at Jawbone while assessment work was being done.

App—The shoot of ore recently found in this mine in the 1100 level is proving strong in body and of good value.

Santa Ysabel—This mine has been unwatered and a force of men set at work.

YUBA COUNTY

Mount Hope—This property in New York township has passed into the control of an Eastern company, with Paris Bean as superintendent. The mine has not been worked for some years.

Colorado

BOULDER COUNTY

Marquette—This company has secured a long-term lease and option on the Richmond property at Salina. W. B. Leveque, Boulder, Colo., is manager.

Rogers Tungsten Tract—Philip Bauer & Co., of New York and Hamburg, Germany, have taken a long lease on this property in Boulder Cañon, near Nederland. They have let a contract to the John A. Traylor Machinery Company, Denver, for designing, furnishing all machinery for, and erecting a modern tungsten concentrating plant on the tract. The ore will first be crushed on two No. 4 Traylor fine crushers, to pass ¼-in. opening screen. The product between 20 mesh and ¼-in. will be jigged on Traylor standard all-iron jigs. The tailings from these jigs will be reground on an Elspass triplex roll to pass a 20-mesh screen. This product will be screened on five Imperial ore screens, being successively treated on four Wilfley tables and two Traylor improved frue vanners. The smaller product will first go to a Traylor slimes settling tank, and be drawn off to the two vanners. This plant will be in operation the latter part of June.

CLEAR CREEK COUNTY

International—F. H. Beers and Eastern

associates have become interested in a lease and bond on this group on Soda creek. Mel Crosson, Idaho Springs, has been appointed manager.

GILPIN COUNTY

Eureka—A strike of free gold ore has been made in the 300 west level, alongside of which is a good body of milling and smelting ores. J. C. Jenkins, Central City, Colo., is owner.

Gunnell Hill—Denver people are interested in the recent purchase of the O. B. Joyful mine, on Gunnell hill, for $10,000, and have formed this company, intend to install machinery and carry on liberal operations.

Pay Rock Consolidated—Denver people are interested, having secured a lease and option for two years for $50,000 on the Frances group, in Eureka district. D. Munday, Central City, is to be manager.

Perigo—This group of nine claims, together with the Perigo tunnel, 35 rapid-drop stamp mill and two mill sites, situated in the Independent district, owned by Potter & Lightbourn, of Central City, has been sold to J. K. Richardson, of Denver, associated with Massachusetts capitalists, consideration being $200,000. Property is credited with production of $3,000,000. J. K. Seaman, Rollinsville, Colo., is manager.

Pewabic Consolidated Gold Mines Company—The last quarterly production of this group of mines, in Russell district, is given as $32,000, notwithstanding the fact that a large amount of development and sinking work was carried on. Company has made the last payment on the Pewabic group, besides purchasing the New York stamp mill for $50,000. John C. Fleschhutz, Central City, Colo., is manager.

Virginia—Ore running high in gold has been opened up in the 500-ft. workings. George W. Mabee, Central City, Colo., is manager.

LAKE COUNTY—LEADVILLE

Hoffer—This shaft, in lower Big Evans gulch, and north of Poverty flats, is 304 ft. deep; the formation passed through is 40 ft. of wash, 200 ft. gray porphyry, 25 ft. of contact and mineralized matter, and now the shaft is 35 ft. in the lime. The pitch of the formations is to the southeast and one drift run 45 ft. got into the mineralization. The material that is coming out of the shaft shows small values, not only in silver and lead, but in gold as well. Another interesting feature is the fact that in connection with the oxidized matter is to be found distinctively sulphide ore. Work is being pushed in this material with every prospect of breaking into an orebody. The opening of a mine in this section would mark a new era in the history of the district. The great drawback in the past was the heavy flow of water, but since the Leadville basin has been practically drained by the Coronado and Penrose no water was struck in the Hoffer shaft until after the first contact was passed.

Little Evelyn—This company is operating the Boulder claim, South Evans, and during the week succeeded in lowering the water to the bottom of the shaft. A little work has been done showing a body of ore of fair proportions. A station is at present to be cut at the bottom of the shaft, 400 ft., and when this is completed the shaft will be sunk a few feet deeper to determine the extent of the orebody. The shaft is making water at the rate of 500 gallons per minute. The strike is a most important one not only to the company, but to the district, as it opens up virgin territory, and will undoubtedly be the means of starting other properties in the neighborhood. Timothy Kyle is manager of the company, and has owned the ground for 29 years.

Matchless—This old producer, Fryer hill, is once more coming to the front as a producer of rich ore. The turn in the affairs of the mine took place when the McNeil lease, in one of the lower levels, broke into a good body of high-grade lead ore a few weeks ago. Development work has seen the ore channel widen out into a substantial orebody.

Indiana

W. H. Abbott, a representative of the Southern Indiana Railroad, appeared recently before the State tax board and pleaded for a decreased assessment. He said the earnings of the road had been affected because of difficulty experienced last winter in getting connecting roads at Terre Haute to take its coal for delivery in the Indianpolis and gas-belt markets. Had the connecting roads handled this business, Mr. Abbott said, the road would have hauled 200 cars per day to Terre Haute. The Southern Indiana, he said, now owned the Southern Indiana Coal Company and its 30 mines in Indiana. This coal company owns the Indiana Southern Railroad, so that now the Southern Indiana road owns all this property.

The coal-mine operators are still turning their attention to oil mining. They say they are confident that within two years there will be great oil developments in Vigo, Knox, Greene, Sullivan, Daviess, Clay, Owen, Gibson, Vanderburg, Posey, Clark, Washington, Jennings and other coal-bearing Indiana counties. The Princeton territory is proving good The land owners are making fortunes and do none of the work. They lease the land at prices varying from $1 to $100 an acre and get from one-eighth to one-sixth of all the oil produced.

Missouri

MORGAN COUNTY

Ouachita Pottery Company—This company is preparing to work coal and fireclay deposits near Versailles. The company owns about 1800 acres, and will work on a considerable scale. R. E. Bradford, of St. Louis, is president.

Montana

BUTTE DISTRICT

Anaconda—The shaft on the High Ore has reached a depth of 2700 ft. and is going to the 2800, which will make it about 300 ft. deeper than any other in the district. The vein has been crosscut at the 2400 and is yielding ore. It will be crosscut at the 2600 and 2800, but the work has not yet begun at the former. The Little Mina shaft is sinking to the 1000 and is below the 800. Drifting is progressing at the 2400 of the Anaconda mine and openings are going toward the Belmont from some of the lower levels. The company is mining considerable ore on the 800- and 900-ft. levels of the Belmont, but it is low grade and would hardly pay if copper were low in price. The Belmont is only 900 ft. deep and is of two compartments, but in about a week the work of enlarging it to three will begin. It is the intention to equip this property with heavier machinery, sink the shaft to 2000 ft. and make it the main outlet for Anaconda mine ore. It will be used also as an avenue for timbers used in the lower levels of the Anaconda and Neversweat mines.

North Butte—The management reports a daily output of about 1400 tons of ore, which is the present capacity of the property with only one shaft through which to operate. For the year ending March 31 the average monthly production of copper by North Butte was 2,738,825 lb., but in the last month nearly 3,000,000 lb. were turned out.

Trenton—Sinking in the Gagnon shaft has been suspended for the present, the opening having reached a depth of 2100 ft. This mine, which was supposed about a year ago to be an uncertain quantity as a producer in the future, is yielding more copper ore now than it has in several years. The output of the mine is about 400 tons of ore per day.

Coalition — The double-track tunnel from the surface of the Tramway toward the Rarus shaft will tap the Rarus opening at 210 ft. A large station will be cut at the shaft. All timber used in the lower workings of the Rarus will be framed near the entrance to the Tramway end of the tunnel, and hauled through the tunnel by an electric motor. All underground employees in the Rarus will use the tunnel as a means of ingress and egress to the mine. In opening the Tramway the company is receiving assistance from the Boston & Montana. The latter is crosscutting from the 1600 of the West Colusa, with a view of getting directly under the new shaft on the Tramway, now 1000 ft. deep,

and raising 200 ft. This raise will connect with one which Boston & Montana is making from the 1400, and when the work is finished the Tramway shaft will be 1500 ft. deep, there being a difference of 100 ft. in the elevation of the Tramway and West Colusa surface. With the Tramway shaft finished, Coalition will be in shape to increase its ore production greatly. The Snohomish, which adjoins the Tramway, will be worked through this shaft. Coalition owns half of the Snohomish and a third of the Tramway, the Butte & Boston owning the other interests.

Nevada

NYE COUNTY—BULLFROG.

Gibraltar—The main ledge continues to carry ore of uniform grade and a force of 30 men is engaged in sacking regular shipments to the smelters.

Great Western Sampler—The Great Western Mining, Milling and Reduction Company has commenced the erection of a sampler and experimental cyanide mill at a site on the Tonopah Railroad at a point 10 miles north of Rhyolite. It is the intention of the company to erect a 600-ton mill if the experimental plant proves capable of dealing with the Bullfrog ores. The sampler will largely benefit local miners, particularly those interested in leasing and the development of new claims.

Lee Bonanza—A strike has been made in the main workings at a point 200 ft. from the incline shaft. This shaft has been sunk to a depth of 60 ft. and when the 100-ft. level has been attained, drifts will be run to intersect the new strike at that depth. The vein at the bottom of the incline is 5 ft. in width and carries a little gold and silver. The new strike is most promising and will be developed at once by the sinking of an additional shaft.

Mayflower—The recent strike in this property appears to be of even greater importance than was at first recognized. The vein is 18 ft. in width and carries large quantities of ore of milling grade. The property promises to become one of the greatest on the Bullfrog field.

Montgomery-Shoshone—Shipments averaging between 1000 and 1200 tons per month are being made to the Salt Lake smelters. The ore is coming from the main dump, which was collected during the early development operations. The dump is estimated to contain 15,000 tons of shipping ore. The stoping reserves in the Shoshone and Polaris mines are at present intact and will not be drawn upon until the company's own mill, now in course of construction, is in operation. A new hoisting plant, two 100,000-gal. water tanks and numerous surface buildings are rapidly nearing completion.

Tramp Consolidated—Development operations are being carried on by a force of 40 men under Superintendent Blackmer. A station in the Denver winze has been prepared for a new hoist and the work of erecting the plant has commenced. This will greatly facilitate mining.

NYE COUNTY—MANHATTAN.

Hindocraft—The main tunnel is in a distance of 100 ft., and its face is in ore of milling grade. It is proposed to continue the tunnel a further distance of 300 ft., with the view of intersecting other orebodies known to traverse the company's claims, and contracts will shortly be let for extending the work.

Independence—Development work continues to result favorably. Several ore-bearing ledges have been opened up and values are increasing as sinking proceeds.

Manhattan Crater—This mine has been purchased by a new company, in which a considerable amount of stock is held by prominent Pittsburg investors. A vigorous development plan has been decided on and a contract has been let for sinking the shaft a further depth of 200 ft. A hoist has been ordered from California and contracts for the surface plant and buildings will be placed shortly.

Pine Nut—The northeast drift, at a point 320 ft. from the 200-ft. level, has penetrated a large orebody of milling grade. The tunnel lower down the hill has been driven in 420 ft. and is expected to reach the vein system soon.

Thanksgiving—A 9-ft. ledge has been cut in a recently opened prospecting shaft which carries free gold and assays well. The strike was quite unexpected. The find promises to have important results in causing the owners of adjoining claims to enlarge their development operations. The mine is attracting a large amount of attention locally.

Mustang—Drifting has been started from the 255-ft. level with the view of picking up the Thanksgiving ledge, which has every appearance of striking into the Mustang within 30 ft. north of the main shaft. Developments will be watched with interest.

Otero—The shaft has been sunk to a depth of 50 ft., and has opened a wide body of porphyritic ore, which assays well. The manager has completed arrangements for expediting the sinking of the shaft to the 100-ft. level, so that the vein can be properly developed to enable the ore to be broken for shipment.

Thanksgiving—A 9-ft. ledge of ore has been struck in the main shaft. Assays have indicated that the average value is above $200 per ton, while picked parcels may be obtained for shipping that will assay over $1000 per ton. The shaft has reached a depth of 230 ft., and levels will be run as rapidly as possible to enable ore being shipped. This strike has caused renewed attention to be given to the field.

Zanzibar—The tunnel has been driven 500 ft. from the surface. The tunnel has intersected a number of quartz veins, some of which yield good assay values. The Consolidated vein is 5 ft. in width, and is all of milling grade with rich streaks of shipping ore in places.

NYE COUNTY—TONOPAH.

Ore Shipments—Shipments of ore over the Tonopah Railroad for the week ending April 27 were: Tonopah Company, 1020 tons; Belmont, 515; Montana Tonopah, 135; Midway, 45; miscellaneous, 235; Nevada-Alpine, Lone Mountain, 30; total, 1980 tons. The Tonopah Company also sent 2855 tons to its mill.

New Mexico

SANTA FÉ COUNTY.

The lead smelter at Cerrillos and its tributary mines are still closed, in spite of the rumors of early resumption of production. The Tiffany turquoise mines also, 9 miles north of Cerrillos, are idle, but south of the railroad mining is reviving. At the Madrid coal mines, the coal washer and mine are quiet, though some prospecting is going on, and some coal is being extracted for local use.

In the Tuertos range activity prevails. At the New Placers, near Golden, the Gold Bullion Company is the successor of the Monte Cristo Company in the ownership of 480 acres of the best located ground. The dredge owned by the latter concern was brought from Washington gulch, Montana, but was overwhelmed by a cloudburst after a short trial. A new dredge, built by the Marion Steam Shovel Company, has just been started. It is of the dipper type, with 75 cu.yd. per hour capacity and runs on four trucks, set on two tracks. Water, for washing the screened gravel from the dredge, is got from five artesian wells, yielding some 25 gal. per minute, when pumped by rods, actuated by electric motors run from a central power plant.

Down the gulch from the New Placers, on a mesa, are the beds of gold cement which are owned by the Interstate and sister mining companies, of which Capt Farley is manager. The 30-stamp mill on them is now idle, but it is planned to erect a supplementary cyanide plant soon, and to start milling again. For a water supply, these companies have a spring and three artesian wells.

Across the valley from the New Placers, in the Ortiz mountains, the Old Placers are shut down and even the Mexican hand-fanners have now been stopped by the Galisteo company, which holds the lease of the Ortiz land grant.

The Santa Fé Copper Company is now running both mine and smelter at full capacity, with Mexican labor. The San Pedro mine's daily output is about 100 tons of chalcopyrite-garnet ore, and this

is smelted in a single blast furnace. The fuel is Colorado coke, hauled for 20 miles by wagon from Cerrillos, and the shipment through the same point is copper matte, running 50 to 75 per cent. A new Franklin 15-drill compressor is being installed in the smelter power house, to run rock drills and two hoists in the mine. William Tudor, Jr., is superintendent.

North Carolina

Moore County

It is reported that coal has been found on the Bibb property, about 20 miles north of Sanford. It is thought to be an extension of the Deep river coal seam, and is to be prospected thoroughly.

Oregon

Lane County

Bohemia Seven—This property will be developed this spring. It consists of nine claims near Mineral post office and Lewis Hartley, the manager, has sent supplies to the mine, and a force of men will be put at work. The property is owned by Corvallis, Oregon, capital, and is a close corporation, and no stock has ever been offered for sale. Values are principally in gold and silver, and the mine is developed by several tunnels, the main tunnel being a crosscut, which is in 200 ft. and cuts the lead. About 100 ft. of drifting has been done on the ledge.

Star Consolidated—A force of men is employed at this mine running a crosscut to tap the several ledges on the property, which is patented and consists of 13 claims. One ledge was struck at 50 ft., and men are now in 190 ft., with over 100 ft. yet to go before they strike the main or Star ledge, which is free milling.

Comstock—This property is being developed by the owners, A. F. Peterson and Lewis Hartley. The development consists of a shaft and crosscut to the lead.

Vesuvius—F. J. Hard is employing a force of men at this mine, and is getting his 10-stamp mill in shape to run after a winter's shut down.

Boston Tunnel—This property is being developed by contract and is owned by Boston capital. Men are under ground about 600 ft., and are drifting on a ledge which is showing up fairly well.

Douglas County

Oregon Securities—The Champion mill is running on this property. This company has mined some very rich ore recently. G. B. Hengen is on the property; he, with other New York parties, has a mortgage on the property, and is trying to foreclose, but is having rather strenuous times as some of the stockholders have pooled their interests and are fighting

Pennsylvania

Anthracite Coal

Philadelphia & Reading Coal and Iron—This company makes the following statement for March and the nine months of the fiscal year from July 1 to March 31:

	March.	Nine Mos.
Earnings	$2,562,234	$27,889,082
Expenses	2,497,925	26,418,729
Net earnings	$ 64,309	$ 1,470,353

For the nine months there was an increase of $968,126 in gross earnings; an increase of $1,337,644 in expenses; and a decrease of $369,518 in net earnings.

This company contemplates stripping the southern portion of the Mine hill, near St. Clair, for the purpose of taking out the coal from the Mammoth vein, which is a very thick deposit. It is also probable that a similar plan of mining will be placed in operation on the site of the old Milnes colliery, where it is stated there is a seam of coal of great thickness, which lies sufficiently near the surface to be accessible by stripping. The product from the two strippings will be taken to the Wadesville breaker.

Delaware, Lackawanna & Western—This company will on May 15 let contracts for the sinking of two shafts, each 1020 ft. deep, near the Truesdale colliery. One will be on the site of the old Dundee shaft, which will be widened out to 14x37 ft. in dimension. The other shaft will be 14x42 ft. Work will be commenced about June 1.

The breaker at the Bliss colliery is being torn down to make place for a more modern structure.

Lehigh Valley Coal Company—This company has decided to work a tract of 16 acres located between Dupont and Avoca in Luzerne county. The Marcy vein is so near the surface that it will be less expensive to strip and then mine the coal open-cut. The overburden will average about 15 ft. in depth. The company has awarded the contract for the stripping to Contractor McGowan, of Pittston. Contractor John Pugh, of Kingston, has been given the contract to sink two slopes near the tract in question. These slopes will be sunk through rock a distance of about 200 ft. to the Clark vein. The coal from the open pit and the slopes will be taken to the Heidelberg breaker.

Mt. Jessup Coal Company—This company is rebuilding the breaker destroyed by fire at Jessup, in Lackawanna county.

Mott Haven Coal Company—This company is building a breaker at its colliery in Mott Haven, Lackawanna county. The coal will be principally sold to local trade and the surplus will be shipped over the Delaware, Lackawanna & Western Railroad.

Bradley Coal Company—This company's washery at Peckville, near Scranton, is again in operation, after a stoppage of several weeks, for the purpose of putting in new machinery.

South Dakota

Lawrence County

Homestake—The water is flowing into the mine at the rate of 1500 cu.ft. a minute. It is estimated that it will take 48 days to flood the mine, which will complete the work about June 10. The water has now reached the 800-ft. level, one of the largest in the mine, and is rising rapidly with but little loss from seepage. All the works continue idle. Additional filter-presses are being put in at the slime plant, so that its capacity will be increased by the time the mills are running again.

Globe—The open-cut work at the mine is showing up an orebody larger than was expected. The ore is porphyritic and the assays continue to increase with depth. In the tunnel, there is almost 400 ft. of ore overhead. Work on the mill is being pushed rapidly.

Pennington County

Burlington—At the annual meeting of this company, J. B. Taylor and Chris Miller were re-elected directors. The superintendent's report showed that the shaft had been re-timbered, and the drift on the 100-ft. level extended. Also, shallow shafts have been sunk and trenches dug to locate an expected break in the formation.

Snowie—A rich strike was made on the Snowie claims, while doing assessment work. The shaft has now been put down 14 ft. and has encountered a ledge of gold ore. The ground is located a mile west of Keystone, and has timber and an excellent mill site. There is also sufficient water for all purposes.

Tennessee

Maury County

Middle Tennessee Phosphate Company—This company has leased rights on the Kittrell property near Mount Pleasant, and is putting in mining machinery, washers and dryers, besides a tramway. W. B. Alexander, Mount Pleasant, Tenn., is concerned.

Utah

Box Elder County

Century—This company is operating its mill again, and making regular shipments of gold bullion. P. W. Madsen, of Salt Lake, is president and manager of the company.

Salt Lake Copper—This company is carrying on a campaign of development and production. Richard McCaffrey, of Salt Lake, is manager.

Juab County

Uncle Sam Consolidated—This company has encountered a large body of shipping ore in a cross-cut off from the bottom of a shaft sunk 250 ft. below the tunnel level. The disclosure is one of the

most important in the history of that camp.

Ore Shipments—The output of the camp last week amounted to 163 carloads, the mines contributing being: Alta, 4; Beck Tunnel, 12; Bullion Beck, 6; Carisa, 5; Centennial Eureka, 51; Colorado, 6; Eureka Hill, 2; Eagle & Blue Bell, 5; Gemini, 5; Godiva, 4; Grand Central, 6; Lower Mammoth, 7; Mammoth, 18; May Day, 2; Ridge & Valley, 3; Scranton, 6; Shoebridge Bonanza, 2; Tintic Iron, 4; Uncle Sam Consolidated, 4; Victoria, 3; Yankee Consolidated, 8 cars.

IRON COUNTY

Jennie—The mill placed in commission by this company recently is taking care of about 40 tons of ore daily. The property is located at Gold Springs.

Independence—This company has secured title to some adjoining ground. It is the intention of the management to push development in the future.

TOOELE COUNTY

Cliff—This company owns the old Buckhorn mine in the camp of Ophir, and is shipping about 50 tons of ore per day. The aërial tramway recently installed is working satisfactorily.

Washington

FERRY COUNTY

Iconoclast—This property, idle for several years, in the Sans Poil district, is soon to be reopened. A vein of silver-lead and antimonial silver ore was opened by a tunnel and some ore was extracted several years ago.

STEVENS COUNTY

Napoleon—The British Columbia Copper Company owns 46 claims on the Napoleon group, in Pierre Lake district. Plans are afoot for a 500-ton cyaniding plant, to be located near Boyd's station, on the Washington & Great Northern Railway, to cost, with other improvements, about $200,000. A deposit of iron-oxide ore, said to average about $9 in gold per ton, about 1000 ft. in length and 500 ft. in width, is to be treated by cyanidation. A steam shovel will be used in mining it. A gravity car tram system will be established for conveying the ore from the steam shovels to ore bunkers, an aërial tramway will be built, for conveying the ore from the bunkers a mile to the mill. The railway company will build a spur from its main line at Boyd's station to the mill. The copper company has a six-drill compressor at the mine, which will be reinforced for a total of 10 drills, to be used in mining the big iron-oxide deposit.

West Virginia

MINGO COUNTY

Mason Coal and Coke Company—This company has been organized to open a large tract of coal land near Dingess. Z. T. Vinson, of Huntington, W. Va., is [illegible]

Wyoming

ALBANY COUNTY

The Laramie & Hahn's Peak Railroad is completed from Laramie to Centennial and began running trains to that place April 13. This will furnish transportation and give an impetus to mining around Centennial and Holmes.

Medicine Bow Mines Company—This company owns the Cuprite mine, comprising 1500 acres, near Holmes. An adit, now in 1000 ft., has gone 200 ft. on an orebody 20 to 30 ft. wide, at a depth of 200 ft. from the surface. This is believed to be the same body which outcrops 500 ft. from the adit, and from which some shipments have been made. Dr. Ralph W. Morse, Lansing, Mich., is president; G. S. Simmons, Holmes, Wyoming, vice-president; S. C. Downey and G. L. Wright, Laramie, Wyoming, directors; Wm. Benton, Centennial, Wyoming, secretary and treasurer.

Topeka Copper Company—This company has been for some time at work on a tunnel on its property, near Centennial. About the end of March the adit struck an orebody; it has entered it 35 ft. and is still in the ore, which is a copper sulphide. The company is building orebins at the mine and at Centennial, with the expectation of beginning shipments in June. The company also owns the Lake Creek property, one mile away, on which 600 ft. of tunnels have been driven, opening a vein 8 ft. wide, 30 in. of which has been shown to carry up to $11 per ton in gold. Wm. Benton, Centennial, Wyoming, is president of the company.

Canada

ONTARIO

An amendment to the assessment act has been introduced in the Ontario legislature which, if adopted, will render many mining properties in the older settled parts of the province, that are now exempt, liable to municipal taxation. Many corporations and private individuals, dealing exclusively in land, have sold only surface rights, reserving a title to any minerals which might be discovered. In assessing such property for municipal taxation the holder of surface rights only has been assessed. As a result the surface owners are interested in preventing or concealing mineral discoveries, which would only impair the value of their interests, and the owners of valuable mineral rights of this charcter are able to hold them indefinitely for speculation, retarding actual development. It is proposed to render these mineral rights subject to assessment. The measure at this stage is only a tentative one and not at all likely to become law at present, but it has served the purpose of calling attention to the question.

The Ontario Bureau of Mines reports the staking of a number of copper claims [illegible] Falls on the main line of the Canadian Pacific, where discoveries of chalcopyrites and bornite have been made. No development work has so far been done.

North American Cobalt Refining Company—All doubt as to the intention of the company to proceed with the erection of a smelter at Thorold have been set at rest by the commencement of work by a large force of men. President Leonard states that work will be pushed forward rapidly.

ONTARIO—COBALT DISTRICT

Right-of-Way—This company is bringing an action for damages against La Rose Mining Company, charging hat company with drifting on its property. As the government, under the conditions of the lease, claims a 25 per cent. royalty on the output, it is represented that government interference is clearly called for, in the interests of justice.

Ore Shipments—Shipments of ore from Cobalt over the Timiskaming & Northern Ontario road for the week ending April 27 were: Coniagas, 53,500 lb.; Green-Meehan, 67,200; O'Brien, 65,570; total, 186,270 pounds.

Railway Reserve Mining Company—Fifty-two veins of varying sizes have been discovered on this property which covers 14 miles of the railway right-of-way. Three shafts have been put down, one at mile 97 to a depth of 20 ft., where calcite carrying native silver has been struck; one at mile 99, where smaltite was found at 15 ft.; and one at mile 100, where niccolite and smaltite were encountered at 30 ft. depth.

Wabo—On this mine at Cobalt a 60-h.p. boiler, five-drill compressor and steam hoist have been installed and two shafts are down 90 and 50 ft. respectively, the latter following a vein 6 in. wide.

Mexico

GUERRERO

Mitchell Mining Company—This company informs us that neither the mine nor plant at La Dicha, nor the material yards and terminal and grading of the railroad at Port Marques, 12 miles from Acapulco, were damaged in the recent earthquake. Only 12 persons were killed at Chilpancingo. The only loss the company suffered was in the latter place, where its offices were destroyed. All the records and plans were saved. Grading on the terminal of the railroad at Marques is being pushed rapidly, 850 men being employed on the work. As rapidly as possible this force will be increased to 2500. Ties are already at the Port and advices as to shipping of the rails rolled in Germany are expected almost daily.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

[illegible] May 8—The coal trade in the West has been helped by the unusually cold weather, which has started up a demand not common at this season; while the call for steam coal is still strong. Railroad conditions are good, and coal is moving freely on most lines. Lake navigation is open at last, and shipments to the Northwest will be pushed, shippers desiring to make the best of a season which may possibly be short.

It is announced that the Dering Coal Company, of Chicago, is arranging to compete for the Mississippi River Trade. Coal will be shipped by barge line from its mines in Illinois, which can furnish a large quantity. A terminal yard will be established at New Orleans, with yards at other river points.

In the East the coal trade is generally quiet and steady, both in anthracite and bituminous. The demand for steam coal continues strong. The coastwise trade is improving, and vessels find plenty to do.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to April 27 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	1,474,430	1,750,265	I. 375,835
Bituminous	10,884,419	11,961,807	I. 1,077,388
Coke	4,141,742	4,513,252	I. 381,520
Total	16,490,581	18,225,324	I. 1,834,743

The total increase this year was 11.2 per cent.

Coal and coke tonnage of the Chesapeake & Ohio Railroad for the nine months of its fiscal year from July 1 to March 31, is reported as follows, in short tons:

	Coal.	Coke.	Total.
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Connecting lines...	321,460	91,286	412,746
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Deliveries of tonnage originating on the line were: To points west of mines, 3,205,024 tons coal and 176,497 tons coke; points east, 1,369,106 tons coal, and 58,544 tons coke; tidewater, 2,394,602 tons coal. The total increase in tonnage this year was 465,735 tons, or 6.5 per cent.

New York

[illegible] May 8—The business situation shows signs of dullness, except among the small sizes. The demand was only fair and shipments have been coming along quite regularly. Car supply has improved and shippers are able to transport all the coal necessary to take care of their customers. Water trade is considerably hampered by lack of vessels and this class of business has been necessarily restricted. Prices are as follows: Broken, $4.35; egg, stove and chestnut, $4.60; small sizes are quoted nominally: Pea, $3; buckwheat, $2.50; rice, $1.85; barley, $1.50.

Bituminous

The Atlantic seaboard soft-coal trade shows a slight improvement on certain lines, there being a good demand for the better grades of coal, although the market will hardly permit shipments unless there are orders on hand to take care of them. Contracts are calling for fair amounts of coal and the limitation seems to be vessel supply, which is very scarce for both sailing vessels and barges; winter rates are practically maintained at the present time.

Trade in the far East is calling for fair shipments of coal, although the tonnage being discharged at most ports makes berths scarce; this is apt to cause demurrage. Trade along the Sound is inquiring for soft coal and asking for shipments in a moderate way. This business is tied up by lack of barges, which are mostly in the East loaded with coal.

New York harbor trade has not yet straightened itself, and there are large blocks of coal awaiting shipment at tidewater. Prices continue low, $2.35@2.40 being asked for the lower grades, and $2.60@2.65 for good grades of steam coal.

All-rail trade is quiet and seems to have sufficient coal for all requirements. Car supply is fairly up to the demand; transportation from mine to tide is up to schedule.

In the coastwise vessel market vessels are extremely scarce and in demand. We quote current rates from Philadelphia to Boston, Salem and Portland, $1.25 and discharge; to Lynn, Newburyport, Portsmouth, Saco and Gardiner, $1.25; to Bath, $1.15; to Bangor, $1.30; to the Sound, $1; loading and discharging clause included where usual.

Birmingham

[illegible] The opinion is expressed by prominent coal men in this district that there will be no need for any shut-down or even slack work at the mines during the summer. The demand promises to hold well up through the whole year. Prices are strong. The Birmingham Iron Company, a subsidiary organization of the Atlanta, Birmingham & Atlantic Railroad, now building to Birmingham, is pushing work on several coal mines, and even before the railroad is completed to the district the company's output will be large. The coal will be used exclusively by the railroad, and its steamship lines out of Brunswick, Ga., and if there is any surplus, after the two furnaces of the company have been supplied, the product will be placed on the market on the coast. Two mines are being opened by this company on Mulga creek, in the southern portion of Jefferson county, while mines at Short Creek and at Blossburg mines, already under operation, will be improved and the output increased.

The railroads are still furnishing good facilities for a prompt handling of almost the full capacity of the mines.

Chicago

May 6—The wholesale coal market continues unusually strong, and dealers are in hopes that the cool weather of the last month will continue. Anthracite business is especially good, and sales of domestic bituminous have increased in the last week. Throughout the upper Mississippi valley—Chicago teritory—this condition exists, and there is a possibility that the domestic supplies of the bituminous operators may be worked off at a good profit.

Through a general feeling of strength in the market, production at the mines has been increased at the mines of Illinois and Indiana in the last month, with the result that the increased output has been taken up satisfactorily. Eastern coals are even, with the demand good and supplies fairly balanced.

Illinois and Indiana lump and egg bring $2.10@2.75; run-of-mine is $1.75@2.50 and screenings are firm at $1.40@1.60. Hocking is quoted at $3.15 for 1¼-in.; smokeless at $3.35 for run-of-mine; Youghiogheny, at $3.15 for ¾-in. gas; Pittsburg No. 8 at $3.15 for 1¼-in. Contract business is increasing very slowly in the face of the present conditions.

Cleveland

May 7—Coal rates on the Lakes are steady. Large shipments will be made this week. Coal market continues steady, with increasing supplies.

Coke market is firmer, with spot delivery quoted at $2.50@2.60 at ovens for

furnace, foundry [illegible] deliveries rule 40c. higher.

The new [illegible] "Hons. Phipps" will be launched in this city May 11. The full carrying capacity [illegible] 12,000 long tons.

Indianapolis

May 5—Trade and manufacturing conditions are so favorable that the mining industry is partially stimulated thereby. In spite of the lull in the demand for coal by local dealers usual at this season, the mines have been running regularly and the production for April will average with preceding months. The demand for steam coal of all kinds has been greater than ever before in Indiana. This, coupled with the fact that April proved to be as good as a winter month to the local dealers, who were forced to order a number of carload lots for the unusual domestic consumption, made business quite satisfactory at the mines.

The State Railroad Commission has notified the railroads that section 6, of the new shippers' law would be put into effect June 6. This law requires railroads to furnish cars within 48 hours after they are ordered. The law provides that the railroads shall provide a special book for the ordering of cars, and shippers cannot demand a car or cars except by this order book, to be kept at all stations.

Pittsburg

May 7—The mines in this district are being operated to about 80 per cent. of their capacity, owing to a scarcity of railroad cars. It is explained that this is due to the absence of lake vessels at the Cleveland docks and inability to unload the cars. According to reports received at the office of the Pittsburg Coal Company, a number of vessels are bottled up by the ice and may not reach the lower ports for over a week. When navigation is clear, shipments to the lakes, it is believed, will go forward more satisfactorily. The Pittsburg Coal Company has suspended its shipments from independent operators until there is an improvement in the car supply. As a result of the scarcity prices are decidedly firm on a basis of $1.25 for mine-run coal. All the coal loaded and ready for shipment to down-river ports went out on the rise last week. The rivers are navigable again this week, but there is no coal ready. All the river mines are being operated to capacity.

Connellsville Coke—There was a further decline in coke prices owing to the surplus for early delivery. Furnace coke is quoted at $2.25@2.35, and foundry at $3.25@3.40. For last half prices are stronger and furnace coke is quoted at $2.85 and foundry at $3.50. The *Courier* in its summary for the week, gives the production in both regions at 416,217 tons. The shipments amounted to 14,877 cars distributed as follows: To Pittsburg, 4699 cars; to points west of Connellsville, 9264 cars; to points east of Connellsville, 914 cars.

Foreign Coal Trade

May 8—Shipments [illegible] Nova Scotia mines for the three months ended March 31 are reported as follows:

Company	1906	1907	Changes
Dominion	[illegible]	[illegible] D	11,000
N. S. Steel	[illegible]	[illegible] D	1,593
Cumberland	[illegible]	[illegible] D	19,574
Acadia	[illegible]	61,949 I	6,600
Intercolonial	64,407	[illegible] D	3,595
Inverness	21,449	38,078 I	16,629
Total	[illegible]	[illegible] D	76,780

The total decrease shown this year was 8.5 per cent.

Iron Trade Review

May 8—In the pig-iron market there has been more activity. Contracting for foundry iron for second-half delivery has been on a scale which shows that consumers believe it policy to be prepared for a heavy business. There has also been a good deal of inquiry for basic pig, supplies of which are not large. Some Southern iron has been taken for the first quarter of 1908, which is remarkable, as the Southern furnaces are not usually willing to contract so far ahead.

Finished material also shows more activity than recently. A good deal of business has been done in bars and plates, and there is also more contracting for structural steel.

The late freeze on the Lakes is over, and the first ore-boats came through the Sault this week. This is a late opening of navigation. There is some delay, owing to the crowd of vessels at the Sault, and matters will hardly be running smoothly for a week. The docks at the lower Lake ports are nearly bare of ore.

The act providing for the continuance of the existing iron and steel bounties and the giving of additional bounties for the manufacture of iron and steel, the details of which have previously been given, has been passed by the Canadian Parliament, in spite of strong opposition on the part of the agricultural interests. The settlement of this question together with that of the tariff is expected to give a considerable stimulus to the iron and steel industry and to insure the establishment of electric smelters.

Baltimore

May 7—Included in exports for the week were 2700 tons of rails to Panama and Central America.

Imports of spiegeleisen for the week were 50 tons; of ferromanganese, 453 tons. Arrivals of iron ore were 6200 tons from Cuba; 4250 tons from Spain; 9343 tons from Algeria; a total of 19,793 tons. There were 3232 tons iron pyrites and 200 tons copper pyrites received from Spain.

Birmingham

May 6—[illegible] and $19@19.50 for fourth quarter, there is a strong demand and already intimation is given that the Alabama manufacturers are likely to withdraw from the market altogether, on account of having covered the probable make. One furnace company the past week made a quotation on a 2000-ton lot of iron for delivery during the first quarter of the coming year. The price was under $18.50 per ton, No. 2 foundry. Other deals for iron to be delivered in 1908 were completed before this. One of the larger concerns of the Birmingham district announces that sales so far this month equal a larger amount than the production.

Furnaces which were reported last week as nearing completion are still being worked on. The fact that the Tennessee Coal, Iron and Railroad Company will do without the skip-hoist on one of the furnaces at Bessemer and make an effort to get it in shape for an early resumption shows how anxious the company is to increase the output. The home consumption of iron is greater now than it has been in months.

Chicago

May 6—The local iron market is very strong. Prices are advancing, and there is apparent a tendency toward general contracting for supplies for the last half. Pig-iron sales for the last week have been of large tonnage on contracts and spot sales. For the second and third quarters $19.50@20 for No. 2, Birmingham, is asked on Southern; and for quick deliveries $22@23 Birmingham obtains. Probably the most significant feature of the market is this strong demand for contract iron.

Northern No. 2 iron brings $24.50@25 for delivery in the second half and deliveries in the second quarter of the year bring $27 or more. In general, Northern iron is very scarce and seems bound to advance for several months.

Demands for structural steel and other products of the iron and steel industry continue strong. Heavy orders will be placed for the reconstruction of the street railroads in Chicago.

Cleveland

May 7—April movement of iron ore to lower lake ports has been 800,000 tons less than in April 1906. The Sault canals are now open and receipts next week will be heavy. A local shipper turned down orders for 100,000 tons, being tied up by contracts. Wild tonnage will be in strong demand this year, with large orders to fill and a short season to do it in.

Pig iron is strong and higher. Ohio furnaces have little tonnage left for sale [illegible]

advanced last week from $22.50 to $23, and contracts for first quarter of 1908 are being made.

Last half deliveries on pig are quoted: Bessemer, $23.85; No. 1 foundry, $23.50; No. 2, $23; No. 3 $22.50; No. 2 Southern $23.85; gray forge $22 per ton, Cleveland.

Railroads in the Pittsburg district have advanced freight rates effective July 1. This will affect the local iron market, as rates on all iron and steel finished products are increased 10c. and on pig iron and billets 7½c. per 100 pounds.

Philadelphia

May 8—Disturbing influences are evident in eastern Pennsylvania territory, more as a reflex action from other territory than from actual local causes. The pig-iron market has developed a good deal of excitement, without resulting in large transactions, or in any decided modification of the situation. The situation is a surprising one to our people, and they are at a loss to account for it on any other grounds than that very heavy requirements have been held back to the very last minute, and then precipitated upon the market. It is difficult to give exact quotations of pig iron today because large transactions have not been closed and both buyers and sellers are higgling over prices. Foundry and forge irons are likely to sell in large blocks within three or four days. Quotations are, therefore, at present writing nominal and may be given at about 50c. above the figures of last week. No. 2 X foundry for third quarter is quoted at $24.50@25, basic at $23@24 and for fourth quarter $23.

Steel Billets—The market is unsettled. Business has been done in large lots at $33 and in two or three instances at 50c. less. Sales of forging steel have been made at $38. These are regarded as bottom figures.

Bars—Refined iron in a general way is quoted strong at 1.83½ for car-lots. Steel bars are selling for early delivery and the demand is good.

Sheets—The trade is not affected by the turbulence apparent in other quarters and manufacturers report a steady demand.

Pipes and Tubes—Merchant pipe is quoted high and strong and a further advance is in line. The rush for boiler tubes still continues and premium quotations are to be recorded this week.

Merchant Steel—Quotations are strong under a moderate demand.

Plates—Nothing calling for special comment has occurred. Buyers know that premium quotations will have to be paid when they come into the market, and they are simply biding their time.

Structural Material—Considerable material for construction purposes is due in this city within the next 30 days and the projects for additional buildings point to the placing of orders for these structures at an early date.

Scrap—There are no developments in the scrap-iron market excepting that heavy melting scrap continues to be in strong demand, as it has been for some weeks.

Pittsburg

May 7—About the only event of interest in the steel market during the week was the booking of 46,000 tons of standard steel rails by the Carnegie Steel Company for the Savannah, Augusta & Northern Railroad, 2500 for another road, and 3000 tons of light rails. With these sales the Carnegie company has booked for delivery this year over 900,000 tons of rails, or within 200,000 tons of its capacity, but so far has not taken on any orders for 1908 delivery.

An increasing demand is noted for structural material, and when pending contracts are closed, the mills will be filled up for the rest of the year. In April, it is estimated, the total structural contracts awarded amounted to fully 115,000 tons, and May opened with about 100,000 tons still pending. The McClintick-Marshall Construction Company, the Riter-Conley Manufacturing Company, and the John Eichleay, Jr., Company, large Pittsburg erecting concerns, booked a number of new contracts within the past few days. Plates for delivery within a month easily command premiums of from $2 to $3 a ton as the mills in this district are sold up for four or five months ahead. Eastern mills are still able to supply plates for early shipment at 1.80@1.85c.

Agricultural implement makers continue to place orders for steel bars at the established prices of 1.60c., but outside of the Crucible Steel Company of America, mills are not promising deliveries before the last quarter. The Crucible company is able to make early deliveries on steel bars and has no difficulty in obtaining 1.80c., or $4 a ton over the regular rate.

Crude steel continues scarce, and some independent finishing mills are crippled for a lack of material. One of the largest producers during the past two weeks sold about 75,000 tons of billets, sheet-bars and tin-bars for delivery in the second half, and is out of the market for the rest of the year. A sale of 5000 tons of sheet-bars was made during the week to a Western mill, at $30.75, f.o.b. Youngstown, for delivery in the last half, which is an advance of 75c. over all previous sales for forward delivery.

Pig Iron—There has been another advance in prices for second-half delivery and $23, Valley furnaces, is now regarded as the minimum price for bessemer and basic iron. Two lots of basic of 7500 tons each, and one lot of 2500 tons of bessemer sold at that price late in the week. Other sales of bessemer and basic previously made aggregate over 30,000 tons and at prices ranging from $22.50 to $22.75, Valley furnaces. These sales practically dispose of all the steel-making pig iron for the year, except odd lots that may come out. A sale of 200 tons of prompt bessemer was made today at $25, Valley. Foundry iron is well sold up, and it is doubtful if better than $23 can be done for late shipment for No. 2. For prompt delivery the price is nominally $25, Valley furnaces. Some sales of gray forge aggregating about 5000 tons for second-half delivery were made at prices ranging from $22.35 to $22.85, Pittsburg. According to the official report the sales of bessemer iron in April amounted to 230,000 tons, and the average price was $21.36, Valley furnaces. This would indicate that some heavy sales for second half were made at $21 and less, and also, as intimated in last week's report, that some large transactions were not made public. Who the purchasers were is merely a matter of conjecture, but they are supposed to be large steel interests.

Steel—Sales of bessemer billets have been made at $31.50, Pittsburg, for prompt shipment, but the tonnages were not large. Open-hearth billets cannot be had at any price. Steel bars remain firm at 1.60c., and plates at 1.70c.

Sheets—There is no change in the market. Mills are still months behind in deliveries, and prices remain the same, black sheets being quoted at 2.60c., and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—For prompt delivery prices remain about the same as named a week ago, $70@71 per ton.

Cartagena, Spain

April 20—Messrs. Barrington & Holt report shipments of iron ore for the week: Great Britain, 6550 tons; Rotterdam, 9350; total, 15,900 tons. Freights are easier.

Quotations for iron ores are: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; low phosphorus, 10s. 9d.; specular ore, 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganiferous ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 14s. 6d. No higher grades on the market.

Pyrites—The quotation for iron pyrites, 40 per cent. iron and 43 sulphur, is 11s. 9d. per ton, f.o.b. shipping port.

Stockholm

The agitation in Sweden over Government limitation of exports of iron ore has resulted in the presentation by the crown to the Swedish Parliament of a proposition that the State acquire an interest in three of the largest iron-ore deposits in the kingdom, situated in Lapland and now controlled by private companies. The cablegrams do not name the mines, but presumably they are the Gellivaara, the Kiirunavaara and the Luossavaara, in

Swedish Lapland. The plan provides for the acquisition of a one-third interest by the State in these mines for 25 years, with the option to acquire another third after 30 years. In return the Government permits the mines to export ore without any restrictions as to quantity. Heretofore the quantity to be exported each year has been fixed by the Government, and no excess permitted.

London

One of the interesting developments now taking place at the Broken Hill Proprietary, in New South Wales, is the exploitation of the iron ores of Knob hill. Hitherto these ores have been used only as flux in the smelting operations, but more recently they have been developed, with the object of using them for the production of iron. Experiments are now being carried on with the idea of erecting a blast furnace on the spot, and, in addition, shipments of ore have been made to other countries. The largest shipment thus made was a cargo of 2000 tons to Bairds, the Scotch ironmaster.

Readers of the JOURNAL may possibly remember the Darien Gold Mining Company, which has been trying for 20 years, by means of French and Manchester capital, to make money out of the Espiritu Santo and adjoining mines, at Cana, Darien, Colombia. Sometimes the mine has been well managed, and sometimes the reverse, but no money has ever been made out of it. The third reconstruction has just been carried out successfully, and it speaks volumes of the courage and hopefulness of the directors and their supporters. Arthur Coventry, the chairman, has been on the board from the start. He is a partner in a Manchester firm of machine tool makers, Smith & Coventry. At one time Lord Charles Beresford was on the board, and inspired shareholders with his breezy optimism. By means of the new reconstruction, the company will come into possession of over £120,000 working capital, half of which is being subscribed by the old shareholders, and the other half by a new group of people. The company has a 40-stamp mill, which was put up in 1900, and another 20 stamps, which were reconstructed out of the old mill used in earlier days. All that is wanted now is a visit from Dame Fortune.

Perth, Western Australia

Lead mining at Northampton is looking very hopeful, and should the metal maintain a fair price this district must become a big producer. Numbers of the old abandoned mines are re-opened and many new leases have been applied for. The lodes are usually of good size and of high grade but contain no silver. The Smelting Company has started sinking a new shaft and is erecting necessary machinery.

Copper will undoubtedly be one of our big productions in the near future. The Phillips river field is opening up well; good returns are being made by the old mine on the North Coolgardie fields, at Murrin Murrin. New finds are being worked at many other points, but it will be some months before any great increase can be made.

Metal Market

NEW YORK, May 8

Gold and Silver Exports and Imports

At all United States Ports in March and year:

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1907..	$2,126,174	$ 5,007,319	Imp. $2,881,146
" 1906 .	5,918,627	5,630,940	Exp. 287,687
Year 1907..	5,703,304	11,607,691	Imp. 5,904,387
" 1906..	20,146,522	10,316,087	Exp. 9,830,535
Silver:			
Mar. 1907..	5,058,461	3,936,139	Exp. 1,122,322
" 1906..	5,213,811	3,509,838	" 1,703,973
Year 1907..	14,669,396	11,315,168	" 3,354,228
" 1906..	19,165,608	12,676,998	" 6,488,610

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending May 4 and years from Jan. 1.

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week....	$ 5,000	$ 44,055	$ 756,142	$ 10,081
1907	1,796,536	5,352,432	13,215,628	608,471
1906	4,300,036	21,051,103	23,217,624	701,805
1905.....	32,881,125	4,050,256	11,137,981	1,212,281

Exports of gold for the week were to the West Indies; of silver to London and Paris. Imports, both gold and silver were from Central and South America.

The joint statement of all the banks in the New York Clearing House for the week ending May 4 shows loans $1,140,320,300, an increase of $16,902,700; deposits, $1,120,599,900, an increase of $14,416,600, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	$188,110,000	$212,884,900
Legal tenders..	74,971,300	74,090,100
Total cash	$263,717,900	$286,974,000
Surplus.....	$ 5,899,525	$ 6,824,625

The surplus over legal requirements shows a decrease of $5,522,150, as compared with the previous week this year.

Specie holdings of the leading banks of the world, May 4, are reported as below, in dollars:

	Gold.	Silver.	Total.
Asset New York	.....	.....	$212,584,500
England	$178,789,870	.....	178,789,870
France	510,174,000	$196,942,500	714,216,660
Germany	168,460,000	56,155,000	224,615,000
Spain.....	77,345,000	120,000,000	197,345,000
Netherlands ..	25,020,000	28,158,000	54,258,000
Belgium.....	20,350,000	3,675,000	24,025,000
Italy.....	161,085,000	24,915,500	186,000,500
Russia	587,035,000	30,625,000	617,660,000
Aust.-Hungary.	227,670,000	62,615,000	290,590,000
Sweden.....	20,740,000	.....	20,740,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to April 25:

	[illegible]	[illegible]	[illegible]
India	£ [illegible]	£ [illegible]	D. £ [illegible]
China.....	.....	.....	[illegible]
Straits..	[illegible]	[illegible]	£ [illegible]
Total	£ [illegible]	£ [illegible]	D. £ [illegible]

Receipts for the week were £170,000 in bars and £46,000 in Mexican dollars from New York; £216,000 in all. Shipments were £22,826 to India and £61,250 coin to the Straits; £84,076 in all.

Indian exchange continues steady, the Council bills offered in London being taken at an average of 16.09d. per rupee. The tone of the market is weaker, however, and the amount of bills offered has been reduced from 70 to 50 lakhs of rupees. Shipments of silver to India have been light.

The Treasury Department estimate of the money in the United States on May 1 is as follows:

	In Treasury.	In Circul'n.
Gold coin and bullion in Treasury)	$ 254,075,403	$ 691,481,469
Gold certificates.	41,965,030	630,471,839
Silver dollars.....	3,391,236	82,528,304
Silver certificates.....	[illegible]	469,829,163
Subsidiary silver.....	[illegible]	121,549,701
Treasury notes of 1890..	11,932	6,108,758
U. S. notes..	4,701,774	341,578,242
Nat. Bank notes..	11,516,291	588,397,549
Total	[illegible]	[illegible]

Population of the United States, April 1, 1907, estimated at 85,838,000; circulation per capita, $34.16. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the treasury as assets of the Government does not include deposits of public money in national-bank depositaries to the credit of the treasurer of the United States, amounting to $167,445,244. The total in circulation showed increases of $25,706,157 over April 1, and $211,855,722 over May 1 last year.

Prices of Foreign Coins

	Bid	Asked
Mexican dollars.....	$0.50	$0.52
Peruvian Soles and Chilean	0.4[illegible]	0.4[illegible]
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.85	3.90
Spanish 25 pesetas...	4.78½	4.80

SILVER AND STERLING EXCHANGE

	Silver.					Silver.			
May.	Sterling Exchange.	New York, Cents.	London, Pence.		May.	Sterling Exchange.	New York, Cents.	London, Pence.	
2	4.8620	65[illegible]	30[illegible]		6	4.8650	6[illegible]	30[illegible]	
3	4.8640	6[illegible]	[illegible]		7	4.8[illegible]	6[illegible]	30[illegible]	
4	4.865	65[illegible]	30[illegible]		8	4.8620	64[illegible]	29[illegible]	

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

	Copper			Tin	Lead	Spelter	
	Lake, cts. per lb.	Electrolytic, cts. per lb.	Casting, cts. per lb.	cts. per lb.	cts. per lb.	New York, cts. per lb.	St. Louis, cts. per lb.
Apr. 25	24			42	6.00	6.55	6.40
" 26	24			42	6.00	@6.60	@6.45
" 27	24			42	6.00	6.55	6.40
" 29	@24¼			42	6.00	@6.60	@6.45
" 30	24						
May 1	@24¼	@24½		42	6.00	6.55	6.40
" 2	24						
" 3	@24¼	@24½		42	6.00	6.55	6.40
" 4	24						
" 6	@24¼	@24½		42	6.00	6.55	6.40
" 7	24						
" 8	@24¼	@24½		42	6.00	6.55	6.40

[illegible] quotations are per long ton (2240 lb.) of copper, which is now the equivalent of [illegible] cents. The New York [illegible] copper are for [illegible] and represent the [illegible] as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special [illegible] command a premium.

Copper—The market has relapsed this week into nearly complete stagnation, such small buying as there has been having been chiefly from abroad. The unsettled conditions are still reflected in the great disparity between the prices for casting and for Lake. The close is nominal at 25@25½ for Lake copper; 24⅜@24½c. for electrolytic in ingots, cakes and wirebars; 23c. for casting copper.

After the bears had covered their commitments in the London standard market, the buying ceased to be aggressive, in consequence of which a gradual decline in quotations set in. The close is cabled as steady at £103 for spot, £101 17s. 6d. for three months'.

Refined and manufactured sorts we quote: English tough, £110@111; best selected, £114@115; strong sheets, £122@

Exports of copper from New York for the week were 531 long tons. Our special correspondent reports no exports for the week from Baltimore.

The Electrolytic Refining and Smelting Company of Australia, Ltd., has been [illegible]rmed with a capital of £150,000, privately subscribed, for the purpose of erecting an electrolytic copper refinery in Australia. The Mt. Morgan Gold Mining Company of Queensland is a prominent factor in the new company, it having relinquished the intention of erecting its own electrolytic refinery at Mt. Morgan. Associated with the Mt. Morgan Company is the firm of Aron Hirsch & Sohn, of Halberstadt, Germany. The new works will be erected at Port Kembla, about 40 miles from Sydney, which is a central location (near the coalfields of New South Wales), chosen with a view to handling the blister copper product of a large part

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The feature of the market is an almost total absence of spot supplies, and buyers were forced to pay a heavy premium for such quantities as were needed promptly. Although there are some consignments in port, the strikes prevalent among the longshoremen have delayed the unloading of the same, so that the scarcity of near-by metal still continues. At the close from 42@42¼c. is being paid. No interest whatever is shown among consumers in purchases for forward delivery.

The London market has not shown any special features, but moved within narrow limits, closing steady at £192 5s. for spot, £188 for three months'.

Statistics of tin on May 1 show the following visible supplies, in long tons:

	In Store.	Afloat.	Total.
Great Britain	3,026	2,800	5,826
Holland	470	183	653
United States	1,398	2,052	3,450
Total	4,894	5,035	9,929

The stocks in the United States do not include those at Pacific ports.

Exports of tin from the Straits for the two months ending Feb. 28 were as follows, in long tons:

	1906	1907.	Changes.
United States	3,244	2,772	D. 472
Great Britain	5,776	5,458	D. 318
Other Europe	1,375	1,065	D. 310
China and India	237	300	I. 63
Total	10,632	9,595	D. 1,037

The decrease in the total this year was 9.6 per cent.

Lead—The price for desilverized remains unchanged at 6c. per lb., New York; 5.92½c., St. Louis. In each market corroding brands sell for 10c. per 100 lb. higher.

The urgent demand which was apparent in the European market has evidently been filled, in consequence of which prices declined and close at £19 12s. 6d. for Spanish lead, £19 15s. for English lead.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull, but firm. Quotations are 5.92½c. for both prompt and forward delivery.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 20, that the price of pig lead has been 92.75 reales per quintal; silver 13.50 reales per ounce; exchange, 28 pesetas to £1. The price of lead, on current exchange, was equal to £18 10s. 10d. per long ton, f.o.b. Cartagena. Shipments for the week were 400 tons argentiferous and 300 tons desilverized lead to London; 56 tons desilverized to Marseilles; 775 tons in all.

Spelter—The continuous decline in prices has developed a somewhat larger business, but sellers appear to be still more eager than buyers. The close is easy at 6.55, New York; 6.40, St. Louis.

London reports a very quiet market, quotations being £25 17s. 6d. for good ordinaries, £26 2s. 6d. for specials.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of April 20, that the market remains quiet. Shipments for the week were 600 tons blende to Swansea.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The market is again lower, with Cookson's at 23c., Hallett's at 20½c., and ordinary brands at 20c.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is $32 per ounce for ordinary metal and $35 for hard. Scrap is quoted at $24 per ounce.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

The plan to establish a metal exchange in Germany seems to have fallen through, the great metal houses of Frankfurt and Halberstadt, together with the leading zinc producers of Silesia having been unwilling to enter the scheme. Inasmuch as those concerns do the bulk of the business in copper, spelter and lead, a metal exchange conducted by the small brokers of Berlin and Hamburg would have been distinctly non-representative. Probably nothing further will be heard of the proposal to establish a German metal exchange in opposition to that of London.

Missouri Ore Market

Joplin, Mo., May 4—The highest price paid for zinc ore was $51 per ton, the assay-base price ranging from $46 to $48 per ton of 60 per cent. zinc; the average price was $46.70. The highest price paid for lead concentrate was $82 per ton, medium grades selling at $77 to $80 per ton; the average price was $80 per ton.

The Underwriters' Land Company has taken off the night shifts at the Yellow

Dec. 31 inc., reducing the output 150 tons per week, owing to the threatened demand of ground men for higher wages. The inequality between 25c. per hour for machine-drill men and $1 per hour to $15 per eight-hour day for shovelers, is causing a growing unrest among the machine men and hookers. Mine owners are beginning to realize that they are likely to have the first trouble this district ever knew, as labor agitators are here from unionized sections inciting the men to demand higher wages.

Following the shipments of zinc and lead from the various camps of the district for the week ending May 4:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,901,130	1,015,550	$134,249
Joplin	2,161,800	410,440	69,381
Galena-Empire	1,670,440	187,170	46,741
Alba-Neck City	792,000	85,500	23,248
Duenweg	599,960	189,000	21,959
Prosperity	331,260	207,150	16,236
Badger	399,040	4,580	10,159
Aurora	468,240	6,650	9,095
Granby	445,900	56,000	8,200
Oronogo	225,180	870	6,101
Spurgeon	236,950	24,320	5,430
Baxter Springs	62,400	77,500	3,738
Carl Junction	143,960	7,870	3,641
Zincite	116,960		2,807
Carthage	61,920		1,548
Wentworth	54,920		1,625
Sarcoxie	92,400		1,232
Sherwood	50,330		1,207
Totals	11,817,680	2,261,550	$366,487
18 weeks	216,761,470	34,107,030	$6,533,835
Zinc value, the week, $275,994; 18 weeks, $5,129,038			
Lead value, the week, $90,493; 18 weeks, 1,404,797			

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51		May	78.40	
June	43.83		June	80.96	
July	43.25		July	74.31	
August	43.56		August	75.36	
September	42.58		September	79.64	
October	41.55		October	79.84	
November	44.13		November	81.98	
December	45.68		December	81.89	
Year	43.24		Year	77.40	

Wisconsin Ore Market

Platteville, Wis., May 8—The past week was satisfactory to producers and buyers alike. The price paid for 60 per cent. ore was as high as could be expected and the buyers got all the ore they wanted. Some of the producers suffered in consequence of a shortage of labor.

The shipment of the district, by camps, for the week ending May 4 is as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	225,640	50,890	
Highland	400,550	50,560	
Benton	261,250		
Buncombe-Hazel Green	187,000		
Linden	161,360		
Livingston	102,000		
Mineral Point	89,800		
Galena	85,000		
Cuba City	64,800		
Rewey	64,000		
Total for week	1,701,302	107,300	
Year to May 4	31,028,099	1,417,670	149,160

The production continues at about the same average tonnage monthly, notwithstanding the number of plants that are handicapped through lack of competent [illegible].

Chemicals

[illegible] May 8—The [illegible] markets generally are showing a good degree of activity, and in most lines demand is fully up to supply.

Copper Sulphate—The market continues strong, with a good demand and moderate supplies. Quotations are unchanged at $7.50 per 100 lb. for carload and larger lots; $7.75 per 100 lb. for smaller parcels.

Nitrate of Soda—Messrs. Mortimer & Wisner, of New York, give the statistics of nitrate in the United States on May 1 as follows, in long tons:

	1906.	1907.	Changes.
Stocks Jan. 1	13,100	13,500	D. 400
Imports, 4 mos.	82,900	68,334	D. 14,566
Total supplies	96,000	81,384	D. 14,616
Deliveries 4 mos.	83,000	81,384	D. 1,616
Stocks, May 1	4,740		D. 4,740
Afloat for U. S.	88,300	130,000	I. 41,700

The quantity reported afloat includes all cargoes due to arrive by Aug. 15 next. There were no visible stocks on hand at the opening of May.

Heavy Chemicals — Imports of heavy chemicals into the United States for the three months ended March 31 are reported as follows, in pounds:

	1906.	1907.	Changes.
Bleaching powder	41,064,872	41,058,668	D. 6,204
Potash salts	39,480,335	66,510,772	I. 27,030,437
Soda salts	5,098,400	2,985,185	D. 2,113,215

Exports of acetate of lime were 17,851,473 lb. in 1906, and 24,886,284 lb. in 1907; an increase of 7,034,811 lb. this year.

Sulphur—Imports of sulphur and pyrites into the United States for the three months ended March 31 were, in long [illegible]:

	1906.	1907.	Changes.
Sulphur	25,500	12,640	D. 12,860
Pyrites	142,467	142,400	D. 67

Estimating sulphur contents of pyrites, the total sulphur imported was 78,487 tons in 1906, and 69,506 tons in 1907; a decrease of 8,981 tons.

Mining Stocks

[illegible] May 8—The [illegible] markets continue uncertain and rather dull, showing strong evidence of professional trading. Money has been rather easy, but this does not seem to have helped speculation. Apparently no general movement for an advance is yet in sight.

The curb market, where most of the dealings in mining stocks still are, has been quiet and rather dull, but prices have been fairly well sustained. They have been variable, with small fluctuations, but no decisive movement. The copper stocks have been more active than any others.

On the exchange there was one sale during the week of Homestake, of South Dakota, at $55.50 per share for a 100-share lot. This is the lowest price yet recorded.

Boston

May 7 — Notwithstanding the general lack of interest in the market, prices have hardened for mining stocks in this market, although they were not at their best tonight. The continued firmness of the metal market has had to do with this fact. The high-grade copper stocks have been in the best demand, which acted as a support to the entire list. Quincy was the leader in this line. On Wednesday it spurted from $126 to $132 and subsequently sold at $136, closing above $130 tonight. There was some expectation that the quarterly rate would be increased, but no deviation was made from the $4.50 rate. On the same day Tamarack spurted from $111 to $122.50, subsequently touching touching $127 and closing tonight at $120. Osceola, on slight transactions, rose $10 to $150. Calumet & Hecla is up $30 to $870, and Calumet & Arizona rose $7 to $180, reacting $4. Wolverine rose $10 to $170, closing within $4 of it.

Amalgamated Copper touched $98.12½ during the week, closing about the same as a week back at $94.62½. American Zinc, on concentrated buying, is up $3.25 to $43. Boston Consolidated spurted $2.62½ to $31.50, although the final today was $29.87½. This company plans to retire its debenture bonds at the rate of £105 per £100. About one-half this issue has already been converted into stock.

The Stock Exchange list has been enlarged by taking in Arizona Commercial, heretofore traded in on the curb. The price holds just above $27 per share. Balaklala, lately listed, has been heavy around $10. Copper Range spurted $1.75 to $83.75, losing $1 of it, and Franklin moved up $1.62½ to $18.50, losing most of it. Isle Royale rose $2.25 to $21, but did not maintain the advance, and Mohawk spurted $4 to $90, with a $2 reaction.

North Butte has been to the fore, advancing $6.50 to $93.25, although the close tonight was $91.75. Old Dominion moved up $1.75 to $56.50, reacting to below $55. Utah Consolidated advanced $2.62½ to $65.62½, reacting to $63.50, and Victoria became active, touching $9.62½, against $8 a week back. United States Smelting sold up $2 to $56.50, losing $1 of it. This company has issued a very comprehensive report.

The Osceola annual meeting has been

further adjourned to July 1. The Tamarack at its annual meeting voted to sell 5000 acres of timber land, by which the company profits about $35,000.

Colorado Springs

May 3—Trading has been light during the past week, but steady prices have prevailed. A big "boosters' excursion" from Denver, Colorado Springs and other points to Cripple Creek will take place on May 11 to celebrate the formal opening of work on the drainage tunnel. The brokers are predicting a rapidly rising market in the near future, but the outsider wonders what can produce it. The output of the Cripple Creek mines was $1,177,575 for April.

STOCK QUOTATIONS

NEW YORK	May 7	BOSTON	May 7
Name of Comp.	Clg.	Name of Comp.	Clg.
Adams & Main		Adventure	4
Am. Agricultural		Allouez	52
Am. Arsenic pfd.	94	Am. Zinc	43
Atlantic		Arcadian	
Bay State Gas		Atlantic	14
British Col. Cop.		Bingham	18½
Buffalo Cobalt		Boston Con.	29⅝
Butte & Balaklala		Calumet & Ariz.*	156
Butte Coalition*	27	Calumet & Hecla*	805
Butte & Zenith		Centennial	33½
Cobalt Contact		Con. Mercur	8
Colonial Silver		Copper Range	82¼
Cum. Ely Mining		Daly West	16¼
Davis Daly		Franklin	17
Development Co.		Greene—Can. cffs.	16
El Rayo		Isle Royal	19
Foster Cobalt		La Salle	17
Furnace Creek		Mass	7
Giroux Mines		Michigan	14½
Gold Hill		Mohawk	88
Granby, New		Mont. C. & C.(new)	9
Greene Gold		Nevada	16
Guanajuato		North Butte	91¾
Greenw'r & D. Val.		Old Colony	1
Guanajuato		Old Dominion	55
Guggenheim Exp.		Osceola	115
Hancock		Parrot	24⅝
Mc Kinney Dar		Phoenix	1⅜
Mexico		Quincy	140½
Mines Co. of Am.		Rhode Island	6
Mitchell Mining		Santa Fe	3⅜
Mont. Sho. C. (New)		Shannon	18
Nev. Utah M. & S.		Tamarack*	120
Newmont M. & S.		Trinity	22⅞
Nipissing Mines		United Cop., com.	61⅝
Old Hundred		do. pfd.	
Ohio Copper		U. S. Smg. & Ref.	55⅝
Stewart		U.S.Sm.& Re.,pd.*	45⅝
Tennessee Copper		Utah Copper	64
Tonopah Ext.		Victoria	3⅝
Tonopah Min.		Washington	1½
West Columbus	12	Winona	9
NEW YORK CURB		Wolverine	196
		Wyandotte	13½
Am. Agricl. Chem.			
Am. Smelt. & Ref.			
Am. Sm. & Ref., pf.			
Bethlehem Steel			
Colo. Fuel & Iron			
Federal M. & S., pf.			
Inter. Salt			
National Lead			
National Lead, pf.			
Pittsburg Coal			
Republic I. & S.			
Republic I. & S. pf.			
Sloss-Sheffield			
Standard Oil			
Tenn. C. & I.			
U. S. Red. & Ref.			
U. S. Red. & Ref., pf.			
U. S. Steel, pf.			
Va.-Car. Chem.			
Va.-Car. Chem., pf.			

*Ex. Div. †Ex. Rights.

SAN FRANCISCO	May 7
Name of Comp.	Clg.
Andes	
Belcher	
Best & Belcher	
Caledonia	
Challenge Con.	
Chollar	
Con. Cal. & Va.	
Crown Point	
Exchequer	
Gould & Curry	
Hale & Norcross	
Mexican	
Ophir	
Overman	
Potosi	
Savage	
Sierra Nevada	
Union	
Utah	
Yellow Jacket	

TONOPAH STOCKS	
Golden Anchor	
Mc Namara	
Montana-Pitts. ex.	
North Star	
Reserve	

GOLDFIELD STOCKS	
Black Ants	
Blue Bull	
Columbia Mt.	
Combination Fr.	
Conqueror	
Daisy	
Florence	
Frances-Mohawk	
Goldfield Con.	
Grandma	
Great Bend	
Red Hills	
St. Ives	

BULLFROG STOCKS	
Amethyst	
Bonnie Claire	
Mayflower Con.	
Montgomery Mt.	
Original	

MANHAT'N STOCKS	
Gold Wedge	
Manhattan Mg.	
Pine Nut	
Ruby Wonder	
Stray Dog	
Yellow Horse	

NEVADA (Weir Bros. & Co., New York)	May 1
Name of Comp.	Clg.
TONOPAH STOCKS	
Tono'h Mine of N.	17 87½
Tonopah Exten.	2.87½
Montana Tonop'h	3.35
Belmont	4.37½
Tonopah Midway	1.45
West End Con.	1.20
Jim Butler	.94
GOLDFIELD STOCKS	
Sandstorm	.62
Kendall	.98
Red Top	4.00
Jumbo	4.00
Goldfield Mining	1.45
Dia'dfield B. B. C.	.91
Atlanta	.65
Mohawk	16.00
Silver Pick	.86
Laguna	1.45
BULLFROG STOCKS	
Mont. Shoshone C.	9 62½
Tramps Con.	.75
Gold Bar	.96
Bullfrog Mining	.17
Bullfrog Nat. B.	.24
Homestake Con.	1.15
MANHAT'N STOCKS	
Manhattan Con.	.68
Manhat'n Dexter	.16
Jumping Jack	.15
Stray Dog	.19
Indian Camp	.13

COLO. SPRINGS	May 4
Name of Comp.	Clg.
Acacia	90
Black Bell	
C. C. Con.	5
Dante	5
Doctor Jack Pot.	8
Elkton	55
El Paso	46
Findlay	65
Gold Dollar	7½
Gold Sovereign	6¾
Isabella	25
Index	
Jennie Sample	
Jerry Johnson	6¾
Mary McKinney	60
Pharmacist	6½
Portland	1.17
Un. Gold Mines	8¾
Vindicator	87
Work	19¼

LONDON	May 7
Name of Comp.	Clg.
Bed Jacket	£1 1s 0d
Stratton's Ind.	0 2 6
Camp Bird	7 4 6
Dolcoath	7 15 0
Esperanza	2 0 0
El Oro	1 1 3
Oriental	0 17 6
Stratton's Ind.	1 1 6
Utah	1 1 6
Ariz. Cop., pfd.	3 6 6
Arizona Copper	3 3 0

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	May 27	$2.00	$8,061,758
Am. Smelters Sec., pf., B	June 1	1.25	375,000
Bunker Hill & Sullivan	May 4	0.60	180,000
Doe Run Lead	May 15	0.50	79,531
Lehigh Coal & Nav.	May 27	2.00	395,110
New Central Coal, Md.	May 1	0.40	20,000
Penna. Steel, pfd.	May 1	3.50	588,749
Philadelphia Co.	May 1	0.75	434,296
Pocahontas Collieries, pfd.	May 1	1.50	22,500
Quincy, Mich.	April	4.50	180,000
Tenn. Coal, Iron & R.R.	May 1	1.00	225,536
Tenn. C. I. & R.R., pfd.	May 1	2.00	4,960
Tonopah Co., Nev.	Apr.	0.35	350,000
United Copper	Apr. 29	1.75½	787,500
United Copper, pfd.	May 15	3.00	150,000
U.S. Cast Iron Pipe & Fdy.	June 1	1.00	150,000
U. S. C. I. Pipe & Fdy, pfd.	June 1	1.75	262,500
U. S. Steel Corp.	July 1	0.50	2,581,543
U. S. Steel Corp., pf.	May 31	1.75	6,201,919
U. S. Cast Iron Pipe & Fdy.	June 1	1.00	125,000
U. S. C. I. Pipe & Fdy., pfd.	June 1	1.75	218,375
United Verde	May 1	0.75	1,500,000
Vindicator Con., Colo.	Apr. 25	0.03	45,000
Yellow Aster, Cal.	May 4	0.10	10,000

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.	Apr. 30	May 21	$0.10
Benson, Cal.	June 9	June 29	0.10
Chollar, Nev.	Apr. 22	May 16	0.10
Con. Imperial, Nev.	May 7	May 29	0.01
Con. St. Gothard, Cal.	Apr. 24	May 14	0.10
Daly, Utah	May 1	May 24	0.25
Little Chief, Utah	May 14	May 30	0.01
Lyon, Utah	May 13	June 3	0.02
Lost Packer, Idaho	May 6	May 27	1.00
Lucky Dutch'n, Nev.	May 1	May 25	0.01
N. Y. Bonanza, Utah	May 1	May 21	0.03
Overman, Nev.	May 17	June 7	0.10
Potosi, Nev.	May 13	June 5	0.10
Union Con., Nev.	May 8	May 29	0.10
Utah & N. Y., Utah	Apr. 27	May 16	0.01
Wabash, Utah	May 11	June 3	0.05
Yellow Jacket, Nev.	Apr. 13	May 22	0.10

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65 288	68 673	30 118	31 769
February	66 108	68 835	30 464	31 852
March	64 597	67 519	29 854	31 325
April	64 765	65 462	29 984	30 253
May	66 756		30 968	
June	65 394		30 185	
July	65 105		30 113	
August	65 949		30 529	
September	67 927		31 483	
October	69 523		32 148	
November	70 813		32 671	
December	69 050		32 003	
Year	66 791		30 868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18 310	24 404	18 419	24 825	78 869	106 739
February	17 869	24 869	18 116	25 236	78 147	107 356
March	18 361	25 005	18 641	25 560	81 111	106 594
April	18 375	24 224	18 688	25 260	84 793	98 625
May	18 475		18 724		84 867	
June	18 442		18 719		83 994	
July	18 190		18 585		81 167	
August	18 380		18 706		83 864	
September	19 033		19 328		87 831	
October	21 203		21 722		97 269	
November	21 833		22 398		100 270	
December	22 885		23 350		105 226	
Year	19 278		19 616		87 282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36 390	41 548	July	37 275	
February	36 403	42 102	August	40 606	
March	36 662	41 313	September	40 516	
April	38 900	40 938	October	42 852	
May	43 313		November	42 906	
June	39 260		December	42 750	
			Av. year	39 819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5 600	6 000	16 850	19 828
February	5 464	6 000	16 031	19 531
March	5 350	6 000	15 922	19 703
April	5 404	6 000	15 969	19 975
May	5 686		16 725	
June	5 750		16 813	
July	5 750		16 625	
August	5 750		17 109	
September	5 750		18 266	
October	5 750		19 350	
November	5 750		19 281	
December	5 900		19 609	
Year	5 657		17 370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6 487	6 732	6 337	6 582	28 225	27 125
February	6 075	6 814	5 924	6 664	25 844	25 938
March	6 209	6 837	6 056	6 687	24 563	26 094
April	6 078	6 685	5 931	6 535	25 781	25 900
May	5 997		5 846		27 000	
June	6 096		5 948		27 728	
July	6 006		5 856		26 800	
August	6 027		5 878		26 938	
September	6 216		6 056		27 563	
October	6 222		6 070		28 075	
November	6 375		6 225		27 781	
December	6 593		6 443		27 338	
Year	6 198		6 048		27 020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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Production and Consumption of Spelter in 1906

The Production of Spelter Was 225,494 Tons. The Consumption Was 225,500. The Production of Zinc Ore Was 905,175 Tons

BY WALTER RENTON INGALLS

The production of virgin spelter in the United States in 1906 was 225,494 short tons, that figure being the total of reports received from all the producers. The details of the production in 1906, compared with 1905, are as follows:

PRODUCTION OF SPELTER IN THE UNITED STATES.
(In tons of 2000 lb.)

States.	1905.	1906.
Colorado	6,599	6,260
Illinois	45,357	48,238
Kansas	114,348	129,741
Missouri	11,800	11,088
South and East	23,044	30,167
Total	201,748	225,494

The above statistics include only virgin spelter, i.e., spelter produced from ore. There is an additional quantity, estimated at 3000 tons, from the marketing of scrap zinc and the resmelting of galvanizers' dross and other waste products. Some of these are converted into spelter of very good quality. Also there is a considerable exportation of dross to the European smelters.

Several new plants were in course of construction in 1906, but the only one to go into operation was the works of the Mineral Point Zinc Company, at DePue, Ill. Among the others, the works of the Lanyon-Starr Smelting Company, at Bartlesville, Ind. Ter., and the new works of the Caney Zinc Company, at Deering, Kan., went into operation early in 1907. The works of Hegeler Bros., at Danville, Ill., which have been under construction for a long time, are also to go into operation in 1907. Several other new works are planned for 1907, but none is likely to be in operation before the end of the year. In 1906 another one of the old smelters at Pittsburg, Kan., was put in operation, making two now running at that place.

New Smelting Capacity

Among the older companies, the Caney Zinc Company added a new furnace of 300 retorts to its plant at Caney, Kan. The Cockerill Zinc Company added three blocks of furnaces, with a total of 672 retorts, to its plant at Pittsburg, Kan. The Matthiessen & Hegeler Zinc Company, of LaSalle, Ill., added 300 retorts, while the Illinois Zinc Company, of Peru, Ill., added 40. The United Zinc and Chemical Company, of Iola, Kan., added two furnaces, each having 240 large retorts (muffles). The Sandoval Zinc Company, of Sandoval, Ill., added two furnaces. The Mineral Point Zinc Company, of DePue, Ill., started with two furnaces, having an aggregate of 1600 retorts. In the East the New Jersey Zinc Company added to its Palmerton works six new furnaces with a total of 1200 retorts. The total of the additions in 1906 was 4560 retorts and 480 muffles. Consequently there was a large increase in the smelting capacity, although only one new plant went into operation.

Miscellaneous Statistics

The production of zinc oxide (including zinc-lead pigment) in the United States in 1906 was 77,800 tons, against 72,603 tons, in 1905. It is no longer possible to report the production of zinc oxide alone, because certain manufacturers now produce both zinc oxide and zinc-lead pigments, and a further analysis of the statistics would disclose individual business. There is a small production of zinc oxide by the combustion of spelter, but the great bulk of the American product is made directly from ore. If the zinc content of this oxide be added to the spelter production, the United States is by far the largest producer of zinc in the world. Early in

ENG. HOUSE AND ELLE, ZINC OXIDE WORKS, BARTLESVILLE, KANSAS

1906 the Ozark Smelting and Mining Company completed and put into operation a new oxide plant at Coffeyville, Kan., making a total of six works in the United States engaged in the manufacture of oxide directly from ore and one in the manufacture from spelter.

The exportation of zinc ore from the United States in 1906 was 24,750 long tons, against 27,630 in 1905, and 32,063 in 1904. The exports were chiefly of New Jersey willemite. In addition to the exports of ore, 15,887 short tons of zinc dross (galvanizers' waste) were exported in 1906, against 5318 tons in 1905.

A feature of considerable interest in connection with the American zinc industry is the increasing production of lead obtained as a by-product from the smelting of zinc ore. In 1906 smelters in Colorado produced 542 tons of pig lead from residues received from zinc smelters in Kansas, and I estimate that they must have produced also 600 tons of lead from residues smelted in Colorado. Moreover, one smelter produced 75 tons of pig lead as a by-product in the refining of spelter.

Production of Zinc Ore

The production of zinc ore in the United States in 1906 was 905,175 tons, against 795,698 tons in 1905, and 693,025 tons in 1904. The statistics for 1906 are not strictly comparable with those for 1905, because while the latter omitted the zinc ore used for the production of zinc oxide and zinc-lead pigment, the statistics for 1906 include zinc ore consumed for all purposes. These statistics are based chiefly on reports from the smelters of the ore which they actually received, and partially on reports of miners of their shipments to smelters. Consequently, they represent the concentrated marketable product, and show the actual supplies of raw material that were available to the smelters. In the case of one smelter which operates a concentrating mill in connection with its works a reduction in the figures reported has been made in order to put all the returns upon a uniform basis. Discrepancies among the statistics of zinc ore production reported by various authorities are to be explained by differences in the bases, the production of crude ore (which must be concentrated or separated into zinc ore and lead ore) being frequently confused with the final product of marketable zinc ore, in which only is the smelter interested.

It will be observed from the table that a large part of the production of ore in 1906 was due to New Jersey, of which the product is used to only a small extent for making spelter in the United States, the bulk of it being employed for the manufacture of oxide and for export to Europe as a spelter ore. Omitting the New Jersey production it appears that the Western spelter and oxide manufacturers received 590,000 tons of ore in 1906. The production of the Joplin district accounts for about 137,000 tons of spelter, against 124,000 tons in 1905. Consequently that district more than held its own in so far as percentage of the production of Western spelter is concerned.

PRODUCTION OF ZINC ORE IN THE UNITED STATES.

(In tons of 2000 lb.)

State.	1904.	1905.	1906.
Arkansas	g	g	4,200
Colorado	*a* 93,000	105,500	114,000
Idaho	Nil.	1,700	2,150
Kentucky	*d* 958	*d* 414	975
Missouri-Kansas	*b* 273,208	*b* 258,500	*b* 283,500
Montana	Nil.	2,000	4,900
Nevada	Nil.	Nil.	7,080
New Mexico	*c* 21,000	17,800	30,000
New Jersey	*d* 280,029	*d* 361,829	404,690
Utah	Nil.	9,295	10,700
Wisconsin	*c* 19,300	32,690	42,130
Other States	*a* 4,500	*e f* 6,000	*h* 850
Totals	693,025	795,698	905,175

a, Estimated. *b*, Production of Joplin district, plus output of southeastern Missouri. *c*, According to H. F. Bain, "Contributions to Economic Geology," 1904. *d*, Report of State geologist. *e*, Partly estimated. *f*, Arizona, Nevada, Arkansas, Illinois, Iowa, Tennessee and Virginia. *g*, Included in "other States." *h*, Indian Territory, Tennessee, Arizona and California.

MINE AT ORONOGO, JOPLIN DISTRICT, MO.

IMPORTS OF ZINC ORE INTO THE UNITED STATES.

Source.	1904.	1905.	1906.
British Columbia	2,100	8,561	600
Mexico	?	*a* 32,164	*a* 88,900
Totals	?	40,725	89,500

a, The actual tonnage of ore imported was somewhat greater than this figure, but it included some mixed ore, which for statistical purposes has been reduced to the zinc ore equivalent.

California

This State appeared in 1906 for the first time as a producer of zinc ore, the Western Zinc Company, of San Francisco, having operated the Silverado mine in Orange county. The company has works at San Francisco, at which it manufactures the sulphate and chloride of zinc, and contemplates the production of spelter. In the meanwhile it is planned to export the surplus of ore to Europe. The company has a concentrating mill at the mine. The ore is blende and pyrites, the latter mineral being gold-bearing.

At the Afterthought mine, in Shasta county, some experimental work was done on the production of zinc oxide from the mixed sulphide ore, which is mined and smelted there primarily for copper. The mines of Shasta county, especially the Bully Hill mine, contain large bodies of zinky ore of similar character. The association of the sulphides is extremely intimate, rendering mechanical separation highly difficult, if not impossible.

A little development work was done on a zinc prospect near Wawona at the western side of Yosemite park, but the deposit is not now available on account of lack of transportation facilities, which, however, will probably be supplied in the near future. The ore at this place is a sulphide. A small amount of development work was done on some zinc prospects, near Victorville, San Bernardino county, but no shipments were made. The ore is said to be of good quality, but of small development.

Colorado

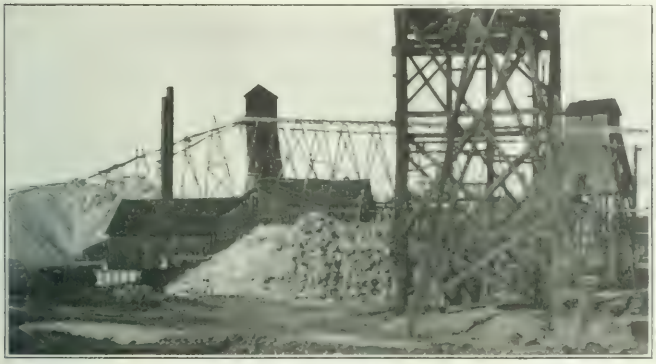
As a producer of zinc ore, this State ranks third. Its importance as compared with New Jersey is much greater than appears from the statistics of ore production, because the ore of Colorado assays nearly twice as high in zinc as the New Jersey ore. And in previous years, the largest part of the output of Colorado was obtained from Leadville. According to the Leadville *Herald-Democrat*, the production of that district in 1906 was 228,565 tons, of which the Iron Silver Mining Company produced 111,500 tons, the Western Mining Company, 51,170 tons, and the Ibex Mining Company, 24,870 tons. These figures refer to the production of crude blende-galena-pyrites ore before concentration or separation.

Besides Leadville, zinc ore was produced at Georgetown, Red Cliff, Creede, Rico and Kokomo, and at several places in Chaffee and Pitkin counties, but their total was comparatively small. According to the State commissioner of mines the zinc content of the ore produced in Colorado in 1906 was 42,744 tons, of which the Leadville ore contained 35,100 tons.

The United Rico Mines Company is now engaged on plans to develop the extensive deposits of mixed sulphide ore at Rico, where the Stallman-Germer process of separation—a species of flotation process—is to be introduced.

Missouri and Kansas

With the exception of a small quantity of calamine mined in southeastern Missouri, the entire production of these States is obtained from the Joplin district, which showed a great increase in 1906. Activity was naturally stimulated by the high price for ore prevailing throughout the year, but the increase in production is largely attributable to the improvements in the method of milling. Whereas, only a year or two ago, the average extraction of mineral from the crude ore was probably not more than 67 per cent., at present it is probably in the neighborhood of 75 per cent. This alone is sufficient to account for a large part of the increase in production in 1906.



MINE AT BRONCO, JOPLIN DISTRICT, MO

Another important factor in increasing the production in the Joplin district is the recent erection of mills of much larger capacity than formerly. Whereas the standard mill used to be of 10 tons nominal capacity per hour, mills of 20 to 30 tons capacity are now becoming common. The new mills are equipped with rolls of larger size (up to 42 in. diameter) and have in addition to the jigs, slime tables of the Wilfley, Standard and Neosho patterns. By virtue of these improvements, the tailings now contain less than 1 per cent. of mineral, which accounts for the higher extraction noted above. The improvements in these particulars have been made possible by the mining of the "sheet" ground, which comprises extensive orebodies, justifying the installation of larger and more expensive plants than formerly. In other words, mining in the Joplin district is being put upon a more permanent basis than ever before in its history. It is estimated that approximately 40 per cent. of the present output is obtained from sheet ground, some of the latter being mined which yields as little as 3 per cent. of mineral.

The mining of such low-grade ore, of course, has been rendered possible only by the high prices obtained for the product. Although the introduction of improved mining and milling machinery, and the prosecution of operations on a larger scale than formerly, have led to many economies, which have been helped also by the piping of natural gas into the district and the general use of the latter, either under the boilers or in gas engines, the advantages gained in those respects have been largely offset by the increased cost of labor. Drill runners now receive $3 per 8 hours, while muckers get $2.50 per 8 hours. Jig-men obtain $3.50 to $4 per 10 hours, while surface laborers in general receive $2.50 per 10 hours. These are heavy increases over the rate of a few years ago, and even under the present conditions, labor in the district is scarce. Steel and other mining supplies also commanded advanced prices in 1906. The only supplies which did not increase in cost were coal, which was obtainable at $1.75 per 2000 lb. of mine run; and dynamite which cost $4.25 per box of 40 per cent. grade. The cost of delivering ore to the railway cars was somewhat reduced, because of the further extension of railway switches to the mines. On the other hand, royalties are somewhat higher than a little while ago, the present terms to first lessee being 10 to 15 per cent. on blende, probably averaging more nearly the latter figure than the former. The miner is assisted, however, by a somewhat larger yield of lead ore from the sheet ground, the ratio of lead ore to zinc ore being in the neighborhood of 1 to 6.

Other States

Arkansas—The production of zinc ore in this State showed a gratifying increase in 1906.

Idaho—The production of zinc ore in this State was made chiefly by the Success mine in the Cœur d'Alene. The only other production was in the Wood River district, where the output was insignificant.

Kentucky—The output of this State showed a good increase in 1906, although the total is still small. However, a further increase is to be expected, inasmuch as a successful method of separating the mixed blende-galena-fluorspar ore has been developed by W. M. Sanders, who has organized the Sanders Separating Company, which has a small plant at Marion. The system of separation is a form of flotation process, which differs from that in use at Broken Hill in that no acid is employed in the bath, the agent in the latter being aluminum sulphate. Moreover, instead of effecting the separation in a deep pointed vat, a shallow pan, with stirrers, is employed.

Montana—The production of zinc ore in this State showed an increase in 1906, but not so much as was expected, because the separating works of the Montana Zinc Company, at Butte, were destroyed by fire in June, after which no zinkiferous ores were treated in the State, except at Corbin, where an experimental plant was put in commission in October to test the Baker-Burwell process.

Nevada—This State appeared in 1906 for the first time as a producer of zinc ore, its output being chiefly calamine from the Potosi mine in the southwestern part of the State. It is testimony to the remarkable development of the zinc industry west of the Rocky Mountains that it is possible to work a mine of comparatively low-grade ore at so remote a place. Zinc ore was also produced by the Nevada Commonwealth Mining and Milling Company, of Washoe, Washoe county, which has a mixed sulphide ore carrying lead, zinc, copper, arsenic and gold. A mill of 150 tons capacity per day was erected, but no shipments of zinc ore were made in 1906; they were begun in 1907, the ore going to Iola, Kan.

New Jersey—The entire output of zinc ore credited to this State is from the Franklin mine of the New Jersey Zinc Company. The statistics represent the production of crude ore. It is, however, utilized entirely for one purpose or another, there being no waste except an insignificant proportion of calcite tailing, but even that is a marketable product. The ore is separated magnetically into a franklinite product which is employed for the manufacture of zinc oxide and spiegeleisen, and a willemite product, which is used for the production of spelter, a portion of this ore being exported to Europe.

New Mexico—The increase in the production of this Territory was due chiefly to the more extensive exploitation of the Kelly and the Graphic mines, at Magdalena. The successful manufacture of zinc-lead pigment at Coffeyville, Kan., led to a greater demand for ore from the Graphic mine, and some was taken also from the

Kelly mine. The ore shipped from the Graphic mine contained from 20 to 25 per cent. zinc, and about 15 per cent. lead. The ore shipped from the Kelly mine consisted of calamine assaying 36 to 37 per cent. zinc, first-class sulphide ore assaying 34 to 35 per cent. zinc, and second-class sulphide ore assaying 30 to 31 per cent. zinc. A considerable tonnage of the second-class sulphide ore was exported to Germany. The Tri-Bullion Smelting and Development Company, which owns the Kelly mine, is now erecting a smeltery and oxide plant at Albuquerque.

Utah—The production of zinc ore in this State was made by the Daly-Judge mine, of Park City, the Scranton mine in the Tintic district, and the Horn Silver mine at Frisco, Beaver county.

Wisconsin—The increase in the production of zinc ore in this State in 1906 was decidedly more important than the statistics show, because the more general introduction of magnetic separating plants resulted in an increase in the average grade of the ore. Consequently while the production of ore increased from 32,690 tons in 1905 to 42,130 tons in 1906, the increase in the total zinc content was in considerably greater ratio. The best ore produced in the Wisconsin field is now on even terms with the average ore of the Joplin district in respect to zinc content and freedom from objectionable impurities.

Consumption of Spelter

The stock of spelter in the hands of the smelters at the beginning of 1906 amounted to 4000 tons. The production of virgin spelter during the year was 225,494 tons. The imports amounted to 2203 tons. The total supply was consequently 231,697 tons. The exports of spelter during the year were 4670 tons. The stocks in the hands of smelters at the end of the year amounted to 4550 tons. The domestic consumption of virgin spelter was consequently 222,477 tons. The figures for 1906, in comparison with those of 1905, are given in the accompanying table.

In addition to the production of virgin spelter there is a considerable production of spelter from the resmelting of zinc dross obtained from galvanizing. This together with scrap that is remarketed, is estimated to amount to about 3000 tons per annum. Consequently, the total consumption of spelter in the United States in 1906 may be assumed to have been about 225,500 tons.

CONSUMPTION OF SPELTER IN THE UNITED STATES.

(In tons of 2000 lb.)

	1905.	1906.
Stock, Jan. 1	6,500	4,000
Production	201,748	225,494
Imports	521	2,203
Total supply	208,769	231,697
Exports	5,515	4,670
Stock, Dec. 31	4,000	4,550
Consumption	199,254	222,477

In order to distribute the consumption according to the principal purposes, reports were obtained from the consumers. It is never possible to check closely in this way the computed consumption, because there are many small consumers, whose use of metal is nevertheless large in the aggregate, from whom it is impossible to obtain reports. The reports actually received for 1906, including a few trade estimates, which could be safely considered as close approximations, footed up to a total of 208,479 tons. In the case of the galvanizing industry, wherein the consumers are chiefly large concerns, practically complete reports were received, which reduces the uncertainty in this investigation to the matter of the consumption of spelter for brass-making, sheet-zinc rolling and miscellaneous purposes. The consumption of spelter for the desilverization of lead is estimated on the basis of the desilverized lead produced, a consumption of 0.8 per cent. of spelter being reckoned. The statistics of consumption according to use are summarized in the accompanying table.

USES OF SPELTER IN THE UNITED STATES.

(In tons of 2000 lb.)

Purpose.	1905.	1906.
Galvanizing	100,000	124,000
Brass-making	52,000	57,000
Sheet zinc	34,000	36,000
Lead desilverization	2,400	2,500
Other purposes (*a*)	10,854	6,000
Total	199,254	225,500

a. The apparent falling off in the consumption of zinc for "other purposes" in 1906 is explained by a more complete itemization of the consumption in 1906; in other words, there was probably more spelter used for brass making in 1905 than the above table shows.

Reducing the consumption to a percentage basis, the figures are as follows:

Purpose.	1905.	1906.
Galvanizing	50	55
Brass-making	26	25¼
Sheet zinc	17	16
Lead desilverization	1¼	1
Other purposes	5¾	2¾
Total	100	100

It will be observed that the largest percentage of increase in 1906 was in the galvanizing business. The consumption of spelter for brass-making shows an increase, but the percentage with respect to the total consumption was a little less than in 1905. Incidentally this figure gives a rough idea of the consumption of copper for brass-making. If 57,000 tons of spelter were used for that purpose, there must have been employed at least 114,000 tons of copper for the same purpose. This figure corresponds to about 33¾ per cent. of the domestic consumption of new copper in 1905. The estimated consumption of copper for brass-making in 1905 was 104,000 tons, which was 34 per cent. of the domestic consumption of new copper that year.

DISTILLATION FURNACE HOUSES, CANEY ZINC WORKS

ZINC OXIDE WORKS, COFFEYVILLE, KAN.

Assay of Barium Sulphide

According to L. Wessely (*Chem. Zeit.*, 1907, XXXI, 71-72), the sample is finely pounded, and 10 grains are very gradually introduced into 500-700 c.c. of boiling water, with continual shaking. Any lumps which form must be taken out and powdered again. When solution is complete, the whole is poured and rinsed into a liter flask, cooled, made up, and filtered. Of the filtrate, 25 c.c. are titrated with N/10 hydrochloric acid and methyl orange, then 300 c.c. of water, 2 c.c. of dilute hydrochloric acid, and a measured volume of N/10 iodine solution nearly equal to the volume of acid required in the first titration are placed in a roomy flask, and 25 c.c. of the barium sulphide solution allowed to flow in with shaking. The slight excess of barium sulphide is now titrated by iodine solution and starch. If more than a few tenths of a cubic centimeter are needed, the experiment should be repeated using a correspondingly greater amount of iodine solution in the first instance. One c.c. of N/10 iodine = 0.0084745 gram of barium sulphide.)

Tin Ore Dressing Plant, East Pool, Cornwall

Tin Oxide, Wolframite, Arsenical and Copper Pyrites are Separated by Stamps, Concentrating Tables, Calciners and Magnetic Separators

BY EDWARD WALKER

It is commonly supposed that modern ore-dressing methods have been introduced into Cornwall by outside engineers financed by outside capital. No doubt in some cases Cornish managers and directors have been impatient of outside advice as to improvements in methods of dressing, but to say that Cornishmen generally are not keenly alive to the necessity of drawing on the experience of the whole mining world for improvements in the method of dressing tin is very far from the truth. As an example of the remodeling of a plant and the adoption of every possible improvement, undertaken solely by Cornish men and with Cornish money, indeed out of the profits of the mine itself, I wish to draw attention to what has been done at East Pool.

[illegible] been done to show the course adopted [illegible] It will not be many months before the alterations and substitutions are complete. The money for the alterations has come entirely out of the mine, and was not provided by reconstruction and the subscription of new capital, so the substitution has been gradual instead of a clean sweep.

It would be invidious to give credit to any particular individual or individuals for this excellent work of reorganization, but J. M. Holman and J. H. Collins, directors, Joseph Tamblin, manager, and Amos Treloar, manager of the dressing works, deserve special mention.

In the accompanying illustrations are shown the location of the property, a general view of the dressing works, the Wil- [illegible] assays of the ore as it is mined. I suppose they represent about 70 per cent. of the contents of the ore, which is a very good result in tin dressing.

In the old days of buddles and rag frames, it was impossible to separate the tungsten and copper. The arsenic was collected when the first concentrates were calcined, and the copper was changed into oxide or sulphate by the same operation. The sulphate and some of the oxide was lost in subsequent dressing, and the remainder went into the tin concentrates and was not paid for by the smelters. The tungsten remained with the tin and caused the tin concentrates to fetch a correspondingly lower price when sold to the smelters.

DOLVADDEN ORE DRESSING PLANT, EAST POOL, CORNWALL.

The mine is situated about half way between Camborne and Redruth. It has been worked since 1834, and since 1896 it has been worked in conjunction with the adjoining Wheal Agar. The company operating the two is called the East Pool & Agar United Mines, and it is still a "cost book" company. There are 6400 shares on which £4 13s 3d. has been paid up, and the total profits since 1834 have amounted to £71 per share.

Reconstruction by Replacement

Up to within four years ago the profits were divided up to the hilt, as was usual in Cornish mining, but in 1903 it was decided to make a radical change and to introduce all possible modern and improved methods. The profits were, therefore, allowed to accumulate, and one improvement after another has been gradually introduced, as funds allowed, without interrupting operations. The overhauling is not yet finished, but sufficient has already

fley tables and a Humbolt-Wetherill magnetic separator. The dressing works are located at some distance from the mine. The ore is broken in rock breakers at the shaft head and then trammed to the dressing works. There is no great amount of slope, if any, between the two, and the wagons are hauled by electric locomotives, the power being supplied by a company which operates the public car service between Camborne and Redruth.

Character of the Ore

The ore at East Pool contains tin oxide, wolframite, arsenical pyrites and copper pyrites. These are so evenly and finely distributed throughout the veins that the ore cannot be hand-picked or sorted into different grades. The ore will average about 22 lb. of tin oxide, a similar quantity of arsenic, 7 lb. of tungsten and one or two pounds of copper per long ton. These figures relate to the

New Methods and Equipment

In the new dressing plant, all this has been altered. In the first place the pulp as it comes from the stamps is sized in classifiers into sands and slimes. The sands are treated on either Frue vanners or Wilfleys, both of which were bought at the time of reorganization for the purpose of experimenting. The percentages of recovery on these two tables are about the same, but as the Wilfley is far more rapid in action, the extensions of the installation have been entirely Wilfleys. The concentrates from the Wilfleys contain the tin oxide, tungsten and arsenical pyrites, and there is a middling product containing most of the copper pyrites, together with some tin oxide. This middling product is subsequently passed to Frue vanners, where the copper pyrites is quite separated from tin oxide.

The concentrates containing the tin oxide, tungsten and arsenical pyrites are sent to the burning house where the ar-

senic is removed and collected in flues. The residues from the calciner are classified and the sands passed over a second installation of Wilfleys. The concentrates from these are in very fair shape and comparatively free from gangue. They consist approximately of three parts of tin oxide to one of tungsten, together with about 5 per cent. iron oxide. They are now ready for treatment on the magnetic separator.

CAMBORNE, EAST POOL DISTRICT, CORNWALL

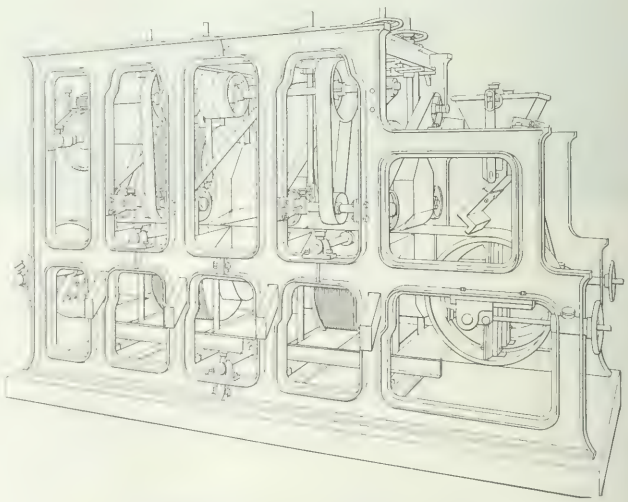
Treatment of Slimes

The slimes, from the classifiers in front of the stamp battery, are treated on rag frames in the orthodox Cornish manner, and when they have been brought up to, say, 8 lb. of tin oxide per ton are passed over Acme tables. The concentrates from these tables are then sent to the burning house to remove the arsenic, and the calcined residues are again passed over Acme tables. The final concentrates are mixed with the concentrates from the sands and the other slimes, and the mixture treated by the magnetic separator.

This plant is a good example of the principle of classifying the stamp mill pulp. At Dolcoath, there is no preliminary classification, the whole of the pulp being passed over Frue vanners. Mr. Treloar, of East Pool, contends that as the Frue vanners have no effect on slimes, it is only overburdening them with work to send the slimes over them, and that it is harder to recover the tin oxide from the slimes when the latter are mixed with the tailings from the sands, than when a preliminary separation has taken place.

Magnetic Separation

The mixture of final concentrates from the sands and slimes is treated by a magnetic concentrator for the separation of the tin oxide, tungsten, and iron oxide. The concentrator is of the type made by the Humboldt Company, of Cologne, and employs the Wetherill system. The material is fed from the hopper at the right upon a horizontal belt which passes round the two large drums at the ends of the machine and travels rapidly from right to left. The material on the belt first passes under the poles of a feeble electro-magnet. The highly magnetic iron oxide is attracted up to the under surfaces of smaller belts which travel at right angles to the main belt. As these belts pass out of the magnetic field they deposit their iron oxide into chambers from which the side chutes, shown in the front of the illustration, deliver the iron oxide into bins. The material on the main belt then passes under a second and more powerful magnet, which removes the tungsten. This is dealt with similarly, and delivered by the second pair of chutes into another bin. The tin oxide and other non-magnetic material passes over the end of the main belt into another bin.



HUMBOLDT-WETHERILL MAGNETIC SEPARATOR

Difficulties of the Process

During the two years that this magnetic concentrator has been at work, much careful study has been necessary in order to adjust details. The greatest difficulty of all was to prevent some of the tin oxide from going over with the tungsten. The tungsten concentrate contained as much as 25 per cent. of tin oxide. As the latter is non-magnetic this phenomenon was puzzling. Eventually it was surmised that particles of iron oxide adhered to the tin oxide, and so carried it over.

The Stamp Mill

The crushing plant at East Pool is the part of the plant that has still to be reorganized, The old Cornish stamps continue in operation. There are altogether 156 of them, each capable of crushing 24 cwt. per 24 hours to a mesh of 25 holes to the linear inch. In February two heads of Holman pneumatic stamps were erected and the power house and other new plant were nearly complete. The substitution of the present Cornish stamps by modern mills will depend to some extent on the results obtained by these pneumatic stamps. The objections to these stamps are that they require highly skilled superintendence; when they are hung up for repairs a much larger unit is out of work than is the case when a California stamp is hung up. It is claimed that the ad-

vantages obtained [illegible] counteract these two drawbacks.

Another improvement to be introduced in due course will be a treatment plant for the copper pyrites. At present this product is sold to the smelters. Probably a partial roast and lixiviation will be adopted.

The Diamond Drill as an Ore Finder

By James Holmes

There are diamond drills throughout this country, abandoned because ore was not struck in the first or second drilling and for no other reason. Objections to these drills for prospecting purposes are mostly due to ignorance. It is the man-

WILFLEY TABLES, IOLA ORE DRESSING WORKS.

manager who deals in figures and is looking out for methods to facilitate his mine operations or reduce costs who looks with favor on this valuable tool. In many cases ore has been found in old workings by means of a drill after that part of the mine had been abandoned.

The Diamond Drill at the Smuggler Mine

The Smuggler mine at Aspen, Colo., is an example of the value of the diamond drill. In 1891 and 1892 this mine was not shipping any crude ore; all the ore mined went through the 100-ton concentrator and it was "nip and tuck" for the concentrates to pay mining and milling expenses. The property was in debt; there were 100,000 shares of stock outstanding at $1050 per share.

The Mollie Gibson, which joined the Smuggler, found bonanza ore with a diamond drill, so the manager of the Smuggler mine purchased a small drill of about 300-ft. capacity, and I was placed in charge.

The machine was driven by an electric motor. I believe it was the second one operating with electric power, and it gave us considerable trouble before we got it running properly. It was comparatively expensive for the first two months, but when the drill worked satisfactorily we found it to be the best motive power for work of this kind. The operations consisted in drilling horizontal holes 90 deg. to the trend of the vein; the holes were short, for it was not expected to find ore outside of the contact line in which the drifts were run.

A number of holes were drilled without finding ore, and this, with the trouble we had had with the machine, was becoming ing; the manager became irritable. He indicated a place to drill and we did as directed, boring through and beyond the mineralized zone without discovering any signs of ore. He was not satisfied, having no confidence in our operations, and ran a cross-cut in the same direction, keeping the drill hole in the center of the opening, with no better results.

Discovery of Ore

Our next field of operations was on the adit level of the same mine and about 500 ft. back from the face of the tunnel. We had drilled one hole and had started the second when, after drilling through exactly 10 in. of gangue, we bored into what proved to be 5 ft. of first-class ore. This shows how near a drift can be run to an ore shoot without exposing it. A diamond-drill hole may encounter the same luck.

We were then transferred to one of the lower levels of the mine which was opened up, as before, with a crosscut, run from the shaft, throught the Carboniferous limestone, and into the gray shales, the drifts being started east and west from this crosscut in the limestone without having exposed ore. The drill was started at the Mollie Gibson line, and the holes were drilled north and south, 20 ft. apart.

Nothing was found until we reached a point 20 ft. from the crosscut. Here at 11 ft. ore was cut so rich in wire silver that it held the core together. We drilled 80 ft. up, then down from the same position. At 60 ft. in this hole we drilled into a band of pure silver, which was so tough that the cuttings gummed around the bit and we could not dislodge them. We afterward examined this band of pure silver when the miners had opened up the stope, and found that it was in about the center of the orebody and was surrounded by high-grade ore, averaging from 6 to 10 ft. in thickness.

One of the most useful applications of the diamond drill in mine work, is to determine geological conditions, more especially where there is considerable faulting.

Timber Tests by the Forest Service

Extensive tests to determine the strength of the commercial timbers of the United States are being made by the Forest Service. The tests are made on large beams. The material is generally tested while green, since timber is weakest in the green condition. The strength of a beam is indicated by the greatest fiber stress developed during the test. Technically speaking, this breaking strength is termed the modulus of rupture. In the table below the first column gives the green breaking strength of our principal commercial timbers. The second column gives the greatest load that a timber 5 in. wide and 12 in. high, with 15 ft. between the supports, would hold if the load were concentrated midway between the supports.

STRENGTH OF TIMBERS

Species	Breaking [illegible] Lbs. per Sq. In.	Load Midway Between Supports 5 x 12 In. x 15 Ft. Lbs.
Longleaf pine...	7,772	20,700
Douglas fir	7,300	20,600
Western hemlock	5,78[illegible]	14,[illegible]
Loblolly pine	5,58[illegible]	14,[illegible]
[illegible]	4,5[illegible]	12,[illegible]
Norway pine...	3,975	10,600

If, instead of being concentrated at one point, the load were uniformly distributed over the entire length of the beam, the beam would hold twice as much. In order to insure safety, in practice beams are seldom allowed to carry more than one-sixth of their breaking loads.

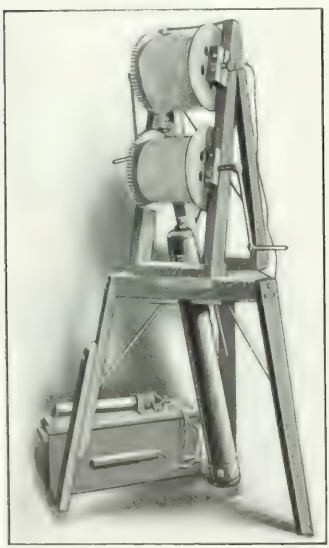
*Basin, Mont.

Camera for Photographing Walls of Bore-holes

Views of a Continuous Strip of the Formations Pierced by the Drill Show the Character and the Distribution of the Ore

BY J. T. ATWOOD*

Before the apparatus here described was constructed an underground camera for photographing the sides of well holes had, so far as I know, never been made. However, it seems probable that such a camera has been used, because of the value of photographs of the earth's strata at levels reached only by drill holes. With the belief that such photographs would be of value in scientific research and in mining, the camera herein described was designed and built.



CAMERA WITH TRIPOD AND REELS FOR [illegible]

The Camera

The camera is mounted in the lower end of a water-tight tube, 5 in. outside diam. and 43 in. long. Near the upper end of the tube is a plate-glass window with a mirror back of it, so mounted as to reflect the image of an object placed before the window, directly down the tube and into the camera. On each side of the mirror is mounted an electric lamp with a reflector, which sends the light through the window and also prevents any light from shining directly into the camera.

This iron tube, or camera tube, is lowered and raised in the well by a cable winding on the lower of two drums shown in the illustration. The upper drum carries an electric cable to operate the lamps and to turn the camera film.

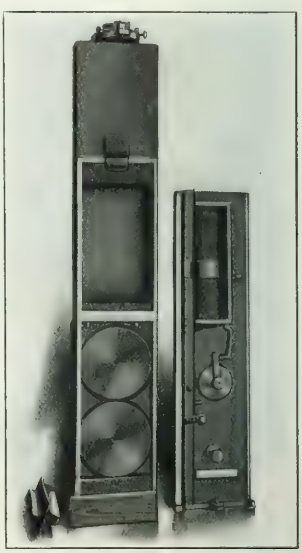
The cable is so fastened to the tube that the window will come close to the wall of the well, and, with the lights burning, the wall is brightly illuminated. In making an exposure with a No. 10 stop the lights are turned on for about 20 seconds. Before making a second exposure the camera tube is lowered or raised 4½ in., the distance covered by one photograph, and a new part of the film is turned into place by making and breaking the circuit of an electro-magnet acting upon the roll of film. In this way a series of 50 or more photographs can be taken at the rate of one a minute, and they will show a continuous strip of the wall of the well for a distance of 20 ft. or more.

The window, which is 1½ by 5¼ in., is set in litharge cement. A guard strip is riveted to the tube on each side of the window. The hoisting cable is attached to the hook 4 in. behind the window, so that in the ordinary 6-in. drill hole the window always hangs near the wall. The mirror, lamps and reflectors are mounted on an oak plate, which can be adjusted to bring the mirror in the right position behind the window. The two lamps are 10 volts and 5 c.-p. each. The camera is 32 in. long and 3 3/16x1⅝ in. in cross section. It is fitted with a 9-in. Bausch & Lomb rectilinear lens. The camera is so placed in the tube as to photograph the 4½ in. of wall reflected in the mirror upon 3⅝ in. of film, the maximum length obtainable with a width of film of 1¼ in. This reduction gives a photograph eight-tenths full size.

Adjustment

The camera is fastened in the tube by two thumb screws. One side of the camera is fitted in grooves and is easily removed for changing the film. The film winds from the end roll across the flat plate, where the exposure is made, and is wound upon the other roll by the operation of the electro-magnet acting through an arm and pawl upon a ratchet wheel. The wires for the coil have a plug connection at the bottom end of the camera. A three-conductor cable of No. 14 wire and 250 ft. long carries the current from four small double storage cells. A resistance coil is used to adjust the voltage for the lamps before lowering the camera tube. Connection from the cable to the battery and switches is made by a triple plug in the end of the shaft of the winding drum.

The hoisting cable is a heavy clothesline of small twisted wires, tested to over 500 lb. tension. The drum is wound with 300 ft. of this cable, and has length tags soldered to it at 5-ft. intervals. The ratchet on the drum has a double pawl permitting of ¼-in. changes in the position of the camera tube. The hoisting frame is made in two parts, partly to facilitate handling, but primarily to permit



CAMERA WITH SIDE REMOVED

of an easy means of untwisting the two cables when raising the camera tube. A ring on the bottom of the upper part fits into a corresponding recess in the top of the adjustable tripod or stand. After the first untwisting of the cable there is little need for this turning device. No attempt has been made to record the direction in which the camera hangs. This could be done by using a light stiff rod carefully joined and allowed to stand without any weight or torsion upon it. Another way might be to use a brass camera tube, and to mount a magnetic needle to show in the photograph.

Method of Operation

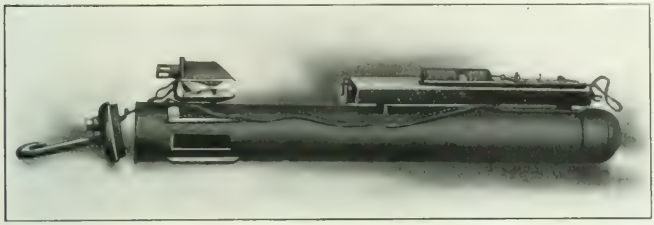
The field work done with the camera has been limited to a little over a week's

*[illegible] Wauseon, Mich.

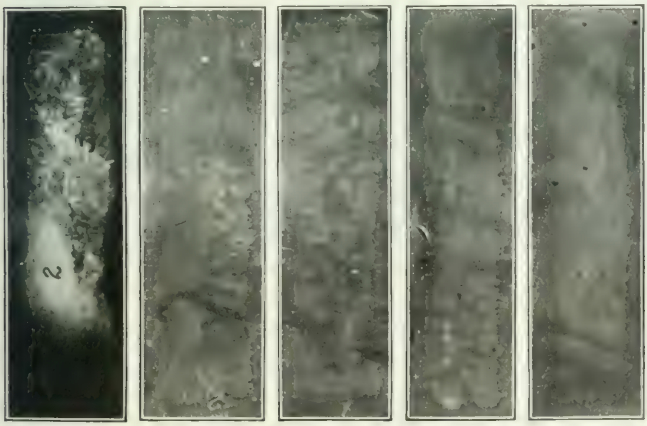
time. Because of unexpected difficulty in effectively drying the air in the tube, the results obtained are incomplete, but satisfactory in showing that good photographs can be taken in a well hole both above and below water. The camera was operated in a 200-ft. 6-in. prospect hole upon the Vinegar Hill Mining Company's property, about seven miles north of Galena, Ill. A very careful sludge record had been made of this hole, and zinc ore was shown in different amounts at several levels from a depth of 162 ft. to 200 ft. Water stood at about 85 ft. from the surface.

The first attempt in taking photographs under water was entirely successful. The camera was filled with air dried by forcing through sulphuric acid. After lowering the camera tube into the water it was raised to the surface to see if in cooling any moisture had been precipitated on the inside of the window. The window was found dry and clear, and upon lowering the second time, the exposures were made without any regard to the location of orebodies.

Other attempts to take photographs under water were made at the first lowering of the camera, instead of at the second, and were unsuccessful because of a precipitation on the inside of the window which invariably disappeared before the camera came to the surface, and which did not appear upon the second lowering into the water, as was the case when the first photographs were taken. This fact was proved later in experimenting in water at the surface. That the unsuccessful results were not due to cloudy or muddy water was clearly shown by the clouded effect on the negative being a little uneven, and the same in exposures at different levels. Also a little opening in the precipitation on the window showed the wall of the well in one or two of the photographs.



CAMERA TUBE WITH PARTS REMOVED AND PLACED IN THEIR RELATIVE POSITIONS OUTSIDE THE CASE



SPECIMEN BORE-HOLE PHOTOGRAPHS
The first shows limestone and jack. The second was taken 86 ft. under water.

Advantages of Bore-hole Photography

Prospecting for copper, lead and zinc is generally carried on by so-called churn drilling, or by diamond core drilling. The principal information given about the orebodies encountered is found in the material taken from the hole. In churn drilling this material is removed in the form of mud or sludge, and in diamond drilling in the form of a broken core.

When a piece of land is thought to be underlaid with lead or zinc ore it is common practice to drill a large number of test holes and by the information secured, determine the advisability of sinking a shaft. Much depends upon the information given by the drill holes. The ore is generally found in horizontal and inclined deposits, called flats and pitches, or in small particles widely distributed throughout the limestone. The sheet formations are, as a rule, more extensive, and where a flat or pitch is cut in drilling it is more indicative of large orebodies than a strike of disseminated ore. If in drilling it were possible to recover all the material in the path of the drill, the sludge would give a good indication of the character and amount of ore passed through. However, the sludge often amounts to no more than 2 or 3 per cent. of the volume of the hole, because of crevices and pockets, and the consequent loss of sludge. The 2 or 3 per cent. of sludge may be largely mineral, but because of a lack of knowledge concerning the missing 97 or 98 per cent., uncertain and unsatisfactory information is obtained.

Again, in drilling through solid formations, when the sludge is brought up from one, two or three feet of drilling it may be that it shows a fair percentage of ore. The question naturally arises whether the deposit is disseminated or sheet ore. The question is not answered by further drilling because for a considerable distance after cutting a sheet, pieces of ore are knocked down by the drill and mixing with the sludge give the impression that the drill is passing through a body of disseminated ore. In a like manner, when the sludge shows that a sheet of two, four, six or more inches has been cut it is impossible to determine its real thickness, and the indication shows it thicker than in reality.

When a drill cuts or follows a pitch the indications as to the real amount of ore are magnified and unreliable, because of the slope, in addition to the other causes. In diamond drilling, the largest part of the core is often lost in passing through orebodies. The core, however, shows whether the deposit is sheet or disseminated ore, and in case of a sheet deposit the core shows its slope and some indication as to its thickness. Although the information is more satisfactory than with the churn drill, the cost is at least three times as great.

The photograph reveals information which can be obtained in no other way. It shows: the nature of the deposit, whether sheet or disseminated ore, and, in case of a sheet deposit the exact thickness and pitch. This information will be of the greatest value in connection with the sludge record, which combination lowers the cost of locating the ore, and what is of greater importance, gives the iron properties of the ore.

To an inexperienced person, a photograph of ore or orebodies shows little of the physical and mineral properties. Much of the information given by colors, or by differences in light and dark surfaces as seen in the ore by the eye is lost in the photograph. It is in the crystalline struc-

the nature of the rock or ore and by study and experience, positive information can be obtained. The character of the surface of the wall of the well is favorable for photographic examination. The roughness is largely dependent upon the character of the material, and makes easier the detection of ore at the juncture with rock.

Dmitri Ivanovitch Mendeleeff *

Dmitri Ivanovitch Mendeléeff was born Feb. 7, 1834, at Tobolsk, in Siberia, the youngest child of a family of seventeen. He received his early education at the Tobolsk gymnasium, of which his father was director, and continued his studies at the University of St. Petersburg, where he obtained the M.A. degree, for which he prepared a dissertation on specific gravities and volumes, and problems involving these.

After teaching at Simferopol, in the Crimea, and at Odessa, he went in 1860 to Heidelberg, where he established a private laboratory. In 1861 he published investigations on the absolute boiling points of liquids. These fundamental experiments were afterward amplified, and further explained by Andrews, who termed the absolute boiling point, "the critical temperature."

In 1863 he returned to St. Petersburg as professor of chemistry at the Technological Institute, and three years later was appointed to the chemistry chair in the university. Soon after this appointment he began to write his "Principles of Chemistry," of which seven editions have appeared in Russian and three in English; the work was also translated into German. It was while engaged in writing the first edition of this work (1868-1870) that the Periodic Law occurred to him, and in March, 1869, he laid his ideas on the subject before the Russian Chemical Society. Arguing upon the basis that the two signs or manifestations of matter are (1) mass, and (2) individuality, and that both matter and the chemical elements are indestructible, his deduction was that there must be some bond of union between mass and the chemical elements, and hence also between the properties of an element and its atomic weight. This conception led him to compare the atomic weights and typical properties of the elements, and the result was a paper read before the Russian Chemical Society in March, 1869, "The Correlation of the Properties and Atomic Weights of the Elements." This paper included practically all the points of the Periodic Law as now generally accepted, and in subsequent articles only further applications of the same principles are to be found.

In his text-book, Mendeléeff stated that, although, when arranging the Periodic System, he made use of the previous researches of Dumas, Gladstone, and Pettenkofer on the atomic weights of allied elements, he was unacquainted with the work of De Chancourtois and of Newlands, the latter of whom, five years previously, had called attention to the periodicity of the properties of the elements ("Law of Octaves") when arranged in the order of their atomic weights, and had suggested that the unoccupied spaces in the table might be filled by elements then undiscovered, or by known elements the atomic weights of which had not been accurately determined (*Chem. News*, 1866, 113 and 130). It was, however, reserved for Mendeléeff to arouse the genuine interest of the scientific world. This was practically due to the fact that he had such a profound belief in the universality of the principle he had enunciated that he did not hesitate to prognosticate from it, and even to correct accepted atomic weights. He foretold not only the existence, but also the general properties and chemical behavior of new and then undiscovered elements, to fill up blanks in the table he had constructed, and when gallium, scandium, and germanium were isolated, it was found that they fulfilled these predictions in a most striking manner. Moreover, the researches of Roscoe and Zimmermann have shown that he was correct in altering the atomic weight of uranium from 120 (which was generally accepted in 1869) to 240, and thus making it correspond with the Periodic System.

Mendeléeff was also fully alive to the importance of the application of chemistry to manufacturing industry, and his work on the "Principles of Chemistry" contains many details of industrial chemical processes, together with various suggestions for the practical utilization of minerals contained in Russian soil. He published a work on "Naphtha production in America and the Caucasus" (1877), for the purposes of which he visited Pennsylvania. He also made investigations of the nitro-compounds, with the view of providing a smokeless powder for the Russian Government.

An essay of singular originality and power was published by Mendeléeff in 1902, entitled, "An Attempt toward a Chemical Conception of the Ether." Starting with the assumption that the ether possesses both mass and materiality, and by extrapolation inserting a zero group in the Periodic System and a zero series of elements lighter than hydrogen, he deduced that in this series one element should have an atomic weight many times less than that of hydrogen, i.e., less than 10^{-6} if $H = 1$; it should have a monatomic molecule like argon and helium, and its exceedingly small density, or, in other words, the exceedingly rapid motion of its molecules, should enable it to permeate and penetrate all matter and space. This gaseous element he believed to be the ether, and he was satisfied that the recently discovered physico-chemical phenomena connected with radio-activity could be satisfactorily explained by assuming the emission of a portion of this ether and the entrance of new ether into the sphere of attraction of particles of normal mean velocity, if it were supposed that uranium and thorium, having the highest atomic weights among the elements, would have in the highest degree that power of attraction which lies between gravity and chemical affinity, and which would cause the accumulation of ether atoms round their molecules.

In 1882 Mendeléeff, jointly with Lothar Meyer, was awarded the Davy medal of the Royal Society for his researches on the periodic classification of the elements, and 10 years later became one of that society's foreign members. In 1889 he was the Faraday lecturer to the Chemical Society, on which occasion he delivered a memorable discourse on his Periodic Law; and in 1905 he received in person the crowning honor at the disposal of the Royal Society, in the shape of the Copley medal. Mendeléeff died, Feb. 2, 1907, of inflammation of the lungs. The Tsar directed that the cost of the funeral should be defrayed by the State.

The Midnight Mine, Joplin, Mo.

By Evans W. Buskett*

The Midnight mine, located near Bellville, 6 miles west of Joplin, is one of the show places of the district. The mine is owned by Dr. G. E. Ladd, director of the Missouri School of Mines, at Rolla. The lease comprises 10 acres, which was formerly considered of no value, as it had been prospected extensively. Consequently Dr. Ladd secured a very favorable lease and started to prospect by drilling.

The ore was first struck at 65 ft. and continued to a depth of 110 ft. The drillings showed nearly one-half "jack." Several other holes were then drilled in the vicinity, all showing good ore.

A shaft was sunk and two drifts started and the erection of the mill begun. The mill is now in operation. In spite of numerous shut-downs always accompanying new mills, the first week's run was something more than 35 tons of 60 per cent. ore and about 5000 lb. of lead.

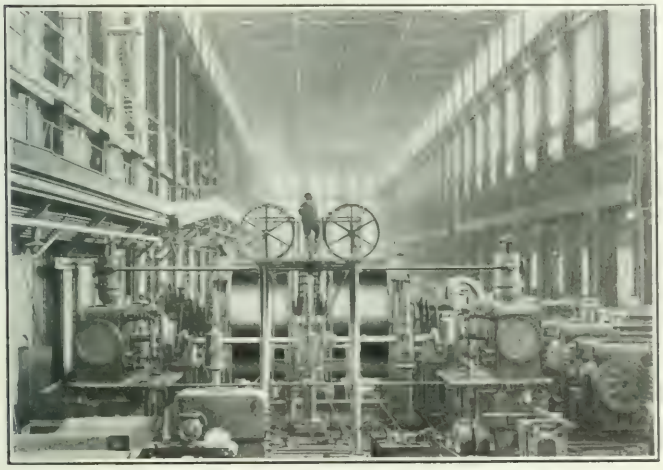
The shaft is 110 ft. deep and is dry, except for a little drip from the pond. The drifts are about 15 ft. wide and the same in hight and are run in solid ore. The ground is loose, requiring much timbering, but very little drilling. The water for the mill is pumped from Turkey creek. Here a two-stage Harris centrifugal pump driven by a 25-h.p. Bessemer gas engine forces the water through a half mile of 5-in. pipe against a 120-ft. head.

*Metallurgical engineer, Joplin, Mo.

Duplex Corliss Hoisting Engine

The accompanying illustration shows one of the two new 32x72-in. duplex direct acting Corliss hoisting engines built by the Allis-Chalmers Company, Milwaukee, Wis., for the Boston & Montana Consolidated Copper and Silver Mining Company, Butte, Mont.

The two hoisting engines are duplicates and weigh approximately 250 tons each. They are of the first-motion type, fitted with automatic cut-off gear and governor, and also with complete steam reversing gear. Each crank shaft carries two steel hoisting drums, both provided with heavy friction clutches and powerful post brakes, all operated by individual steam cylinders and hydraulic oil controlling cylinders, so that either may be handled independently of the other, or both operated in balance, as desired.



DUPLEX CORLISS HOISTING ENGINE IN ERECTING SHOP

They will each have a lifting capacity of 34,000 lb., from a depth of 3500 ft., and will be operated at 140 lb. steam pressure. This load includes the weight of the rope, which is over six tons. When working regularly at full capacity the engines will develop approximately 2500 h.p., and will be required to make from six to seven trips per hour, night and day.

Consul Albert Halstead reports that the Birmingham corporation has awarded its contracts for gas fittings for the ensuing year. These contracts show an increase, due to the higher cost of materials, of from 3 per cent. on the lower grades of brass and copper fittings up to 25 per cent. on the highest grades, of about 0.75 per cent. on iron tubing, of 50 per cent. on jute, of 10 per cent. on the finer qualities of glass, while the lower qualities remain the same in price.

Mason & Barry, Ltd.

The Report [illegible] a large deposit of copper-bearing pyrites in Portugal. Its report is for the year 1906.

The total quantity of ore broken and raised at the mine during the year was 218,217 tons, as against 176,843 tons in 1905, and the shipments during the same period, inclusive of ore from the cementation works, amounted to 353,273 tons, as against 351,094 tons in the previous year. The quantity of ore sold and invoiced for its sulphur value during 1906 amounted to 350,759 tons, as against 373,287 tons in 1905. After writing off in the mine books for depreciation of works, plant, etc., the sum of £9000, which is approximately the value of new works and plant added during the year, and allowing for the variation in the estimated value of the stocks on hand in England, on the Continent, and in Portugal on Dec. 31, 1906, and after deducting management expenses, income tax and depreciation in value of investments, the net profits on working account have amounted to £56,497, to which has to be added £8148 received as dividend on La Sabina shares, and of £3680 from sundries, making together a total profit for the year of £68,325.

The stocks of ore and copper precipitate broken, raised, and on hand, Dec. 31, 1906, are valued at £55,057, against £67,680 Dec. 31, 1905. The mine assets in Portugal, after writing off for depreciation stood at Dec. 31, 1906, at £81,356. These assets embrace works, buildings, land, plant, railways, shipping piers, tug boats, mine stores and cash assets, stocks of ore and copper precipitate.

As shown by the profit and loss account, the profit realized on the year's working amounts to £68,325, to which has to be added the balance, £10,502, brought forward from 1905, making together the sum of [illegible] and the directors having written the sum of £1000 off La Sabina shares, there remains a balance for appropriation of £83,827. From this balance the directors recommend the payment of a dividend of 35 per cent. or 7s. per share, the appropriation of £1000 to the staff pension fund, and to carry forward the sum of £18,017 to the next account.

New York & Honduras Rosario Mining Company

The report of the New York & Honduras Rosario Mining Company of San Juancito, Honduras, C. A., covers mining operations for the year ending Sept. 30, and contains the financial statement for the year ending Nov. 30, 1906.

Development resulted in blocking out 10,170 tons of ore reserve having an estimated value of $887,364. Mining operations were carried on along three veins, the old Rosario vein having been exhausted some years ago.

Many improvements were made including electric power plant, a large storage-battery, cyanide plant, pebble-tube slimer and a pipe line from the Rosario tunnel to the cyanide plant.

The total cost per ton of ore crushed was $44.51 derived from the following data:

TONS OF ORE CRUSHED, 31,451

	Total	Cost per Ton
Milling, labor	$97,833	$3.11
Milling, supplies	246,453	7.83
Mining, labor	536,734	17.07
Mining, supplies	141,072	4.48
Tramming, labor	35,777	1.13
Tramming, supplies	15,230	0.49
Surface plant, labor	198,607	6.31
Surface plant, supplies	23,824	0.76
Freight charges	104,731	3.33
Total	$1,400,261	$44.51

The year's development was as follows: Drifts using timber, 5194 ft.; drifts untimbered, 3025 ft.; raises and stope raises, 1926 ft.; crosscuts, 1038 ft.; prospect drifts, 374 ft.; total, 11,557 feet.

The cyanide plant proved successful but handled only one-half of the mill slimes.

The treatment of 30,944 tons of ore resulted in a production of 1,618,800 oz. silver and 3062 oz. gold valued at $1,112,172. The net profit of $427,192 was applied as follows: dividends, $285,000; increase in equipment, etc., $97,483; increase in cash assets, $32,970; reduction of bills payable, $11,739.

Though nearly all the metals have risen in price, mercury has fallen. This is due to the decline of the process of pan amalgamation for working silver ore. Gold mines utilize very small quantities of mercury. The two great consumers are China and Japan, where it is utilized for manufacture of vermilion and explosives of secret composition.

Mineral Production of Eastern Australia

By F. S. Mance*

The official returns for 1906 of the mineral production of the several eastern States of Australia, which are so far to hand, show that the results actually achieved are far in excess of expectations. The following are the figures: New South Wales, £8,100,624; Queensland, £4,198,647; Tasmania, £2,257,147; total, £14,625,418.

This is an increase of £2,084,846 on the returns for 1905, of which amount New South Wales is responsible for £1,083,731, Queensland £472,377 and Tasmania £528,738. The advance in the price of metals is almost wholly accountable for this result, although New South Wales has benefited to the extent of £333,766 by the increase in the output of coal.

Copper

It is in connection with the production of copper that the most noteworthy results are recorded.

VALUE OF COPPER PRODUCTION FOR 1906, IN THREE STATES.

	Value	Increase
Tasmania	£934,924	£177,698
Queensland	916,546	412,999
New South Wales	789,527	262,124
Total	£2,640,997	£852,821

In Tasmania the production from the Mount Lyell mines has been most satisfactory, and the grade of the orebody opened up at the 850-ft. level in the North Lyell mine is of such a nature as to insure a continuance of profitable operations.

The feature of the year, however, is the progress the copper mining industry has made in the State of Queensland. This State bids fair to become the largest producer of copper in the commonwealth. The Mount Morgan Company is now engaged in the treatment of sulphide ores, and during the half-year ended November 30, produced 1923 tons of copper, in addition to 72,716 oz. of gold, as compared with 358 tons copper and 54,916 oz. gold for the previous year. It is stated that the quantity of auriferous copper ore so far smelted is 62,870 tons, and represents only 5.1 per cent. of the high-grade ore shown by the diamond drills to exist, and but 2.2 per cent. of the total quantity of both high and medium grade. The completion of the railway lines now in course of construction to the Hampden-Cloncurry and Etheridge fields will lead to the development of the numerous cupriferous lodes on an extensive scale.

In New South Wales, the value of the output for 1906 constituted a record. The reports from the established mines show that they have been placed in a position to contribute a greatly augmented output during the present year, while not only have many new deposits of promise been opened, but most of the mines which had suspended operations for years past have been re-opened and are yielding well.

A company with a capital of £150,000 has been formed with the object of refining blister copper electrolytically, and for the general purpose of smelting copper ores and mattes. It is intended to erect large metallurgical works in a central position. The controlling interests are represented by the Mount Morgan Company, and Aron Hirsch & Sohn. Captain G. A. Richards, the general manager of the Mount Morgan Company, will act as technical director to the new company.

Tin

The value of the output of tin by the three principal producing States during 1906 was as shown in the accompanying table:

PRODUCTION OF TIN

	Output 1906	Increase
Tasmania	£557,266	£194,596
Queensland	490,283	192,829
New South Wales	255,744	29,634
Total	£1,303,293	£417,059

It is doubtful if the yield from Tasmania will make such a satisfactory showing during the present year, as the output from the Mount Bischoff mine has fallen from 100 to 60 tons of tin concentrate per month. This is due to the sudden decrease in the value of the ore in three of the more important working places, and there is little prospect of any immediate improvement. In Queensland the yield from the mines on the Wales and Tinaroo field is being well maintained; another mine, the Dalziell, at Reid's creek, has been added to the list of producers, a good lode, said to average 8 per cent. tin, having been opened. In New South Wales the operations of the dredges continue to be attended with marked success, and the yield recorded for 1906 should, judging by present appearance, be well exceeded.

Silver-Lead

The chairman of the Broken Hill Proprietary Company, at the recent annual meeting of the company, estimated the production of the Broken Hill field to the end of 1906 as: Lead, 2,500,000 tons, and silver 250,000,000 oz., representing a total value of £60,000,000. The dividends are given as £13,750,000, of which the proprietary company alone has paid £9,152,000. The year 1906 has certainly proved a satisfactory one for the companies on this field despite the drawbacks occasioned by fires and creeps, as shown by the fact that the value of the output amounts to £3,539,596, out of which dividends totaling £868,327 were paid. Although the several companies are producing a large quantity of zinc concentrate, it is evident that the general results have not come up to expectations, and that much yet remains to be done before matters can be placed on a remunerative basis. It is understood that a highly satisfactory recovery of metals has been achieved, but that working costs and charges leave an insufficient margin of profit.

On the subject of the Potter process it may be mentioned that the action against the Broken Hill Proprietary Company, for infringement of patent by the use of the Delprat or salt cake process, has failed, but the matter has been taken on appeal to the High Court.

Gold

The final returns show that the gold yield of Australasia for the year 1906 was 3,978,579 oz., fine, a decrease of 177,615 oz., fine, as compared with the production for 1905. At the present time the industry is in anything but a flourishing condition, and the yield for the States of Queensland, Victoria, and New South Wales for the first two months of this year amounted to only 199,915 oz., fine, which is less by 53,263 oz., fine, than the yield for the corresponding months of 1906. This, perhaps, is not to be wondered at when it is considered that the demand for competent miners at high wages in the other branches of the industry far exceeds the supply, and that interest is largely centered in the mining for copper, tin, lead, etc. A discovery reminiscent of the early history of gold mining was made near Tarnagulla, Victoria, toward the end of last year, and has been named the Poseidon Rush. The gold was found in shallow alluvium; the largest nugget weighed 960 oz., and realized £2879. Other nuggets weighing 675 oz., 502 oz., 387 oz., 373 oz., 253 oz., 206 oz., 156 oz., 120 oz., 105 oz. (three), 88 oz. (two), 87 oz., and numerous others ranging from 20 oz. to 30 oz. were unearthed.

Imports of Steel Ingots in 1906

The United States imported in 1906, 21,337 long tons of steel ingots, blooms, slabs, billets and bars of steel, having a value of $3,010,589 or $141.10 per ton. This compares with 14,641 tons ($2,072,606) in 1905 and 10,807 tons ($1,537,531) in 1904.

More than half of the imports of these materials in 1906 were entered at the port of New York and were mostly classified as special or high-grade steel having a value of 13½c. or more per pound.

The Russian Gold and Platinum Congress, which recently adjourned, has asked that the gold-mining industry be freed from all taxation for 10 years, except a land tax which should be as low as possible. The taxes on the industry at present amount to $1,250,000 per annum, which is a large percentage of the net profits from the operation of the mines.

* Chief Inspector of Mines, Sydney, New South

Electrically Operated Copper Converter

At the plant being erected by the Orford Copper Company at Constable, N. J., the converter equipment consists of three electrically operated stands and nine shells 48 in. dia. x 126 in. long, built by the Allis-Chalmers Company, Milwaukee, Wis.

The shell has a peculiar shape. The bottom half is 84 in. dia., and from the center up to the joint both sides of the shell are formed in a tangent to a width at the top of about 6 ft. 8 in. This eliminates unnecessary curvature above the center line and permits of a more secure lining. The parting joint between the bottom and top halves is higher so as to avoid the extreme action of the molten copper. The bottom section of the shell is made of flange steel plate, and at both ends it is secured to a solid cast-steel head provided with a riding ring completely encircling the head.

Each head is spherical and reinforced with six ribs to reduce expansion and contraction, thus avoiding trouble and expense in fitting new shells into stands which had the air connections bolted to the heads.

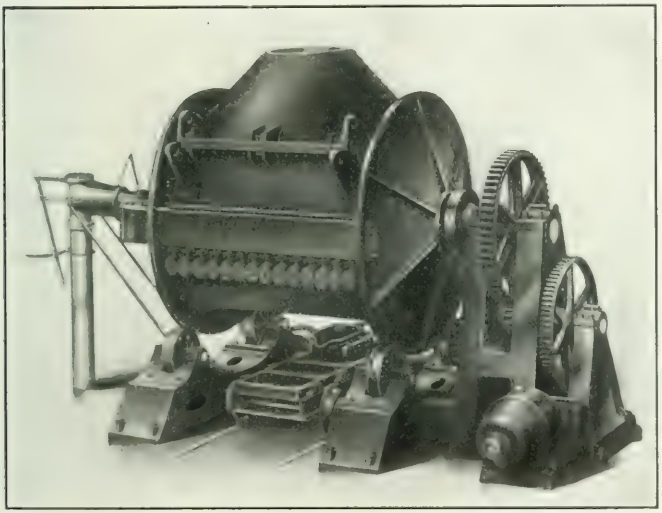
The top half is slightly different from that shown in the illustration, the new converters being furnished with an independent removable pouring nose which is bolted to the cast-steel top, which permits of removal when corroded by molten metal.

The wind box is rectangular and consists of a plain casting which lies close to the shell and underneath the riding ring.

Another feature of the self-contained wind box is the absence of the long flange and cover usually used where the air valves of tuyeres are fitted on the inside of the wind box.

There are 14 Repath individual tuyeres and each tuyere is fitted with a Dyblie ball valve, and is secured to the wind box by swing bolts; and the discharge end, which is at right angles to the inlet, projects several inches inside the shell and through a cast-steel stuffing box, bored out to suit the projection on the tuyere and arranged for holding asbestos packing; the projection permits a lining of brick to be fitted securely around the end.

Each tuyere is arranged so that the ball valve and its seat are self contained and the valve can be taken out and replaced. The pipe distance-piece is also independent and accessible.



ELECTRICALLY OPERATED COPPER CONVERTER

On the air end of each shell the cast-steel head is arranged to receive the end of the wind box, which is fitted with a ball-joint concave flange and receives the stationary air nipple of the patented blast connection. This joint is especially adapted to converters and air joints where it is not possible to bring flanges in line, due to the difference in centers of shells. This connection consists of a cast-iron tee, having the horizontal cylinder fitted with a ball joint and piston. When the shell is moved into position the lever is pushed forward, and this moves the nipple into the concave flange on the head. The air is then turned on and the pressure upon the piston holds the joint in place.

Each stand is provided with a 30-h.p. Allis-Chalmers direct-current, variable-speed, multi-polar, inclosed-type, series-wound motor for 110 volts and 600 r.p.m., which is geared to the main drive shaft so that the maximum speed of the shell is reduced to 1.5 r.p.m. If alternating current is available, induction motors are used to turn the converters.

The motor shaft is connected to the worm shaft by a coupling which also acts as a brake wheel for the solenoid brake, and on this extension is keyed a single-thread steel Hindley worm that runs in an oil bath and meshes with a solid worm wheel, thus making the first reduction. On the worm steel shaft is secured a cast-steel pinion, which in turn transmits its energy to a cast-steel gear, both having shrouded teeth. The gear is keyed to a hollow steel shaft which has fitted to the driving end a universal coupling, arranged so that the shells will lie true on the rollers and at the same time the drive will adjust itself to suit the alinement.

On the head of the shell is a groove, which matches a tongue on the universal drive. When placing the shell in position on the stand, the motor is turned around until the tongue is vertical; the shell is then placed, and there is clearance enough on each side of the tongue for keys, which are tapped into place by a light hammer.

The "A" frame for supporting the motor and carrying the gears consists of a massive box-frame casting with all bearings lined with babbitt.

A Bennetts pouring spoon is hung on a steel arm on one side of the roller stand, with the arm so arranged that the spoon can be adjusted to suit the pour of copper from the shell and the position of the molds, which rest on the truck directly underneath.

The three stands are operated from a pulpit and may be manipulated by one operator.

The shell weighs 13 tons and the lining 28 tons. When newly lined the converter holds 5.25 tons of 40 per cent. matte and with a shallow lining the capacity is 9 to 10 tons. The average charge is 6.25 tons. The first slag is skimmed after 45 minutes' blowing, the second 60 later, and the total time from the start to pouring blister copper is 4 hours.

A pressure of 10 to 12 lb. is required. Under these conditions each 84x126-in. converter will produce about 780,000 lb. copper per month of 26 days.

Consul Albert Halstead, of Birmingham, reports that the wages of the coal miners of England and Wales are to be increased by 5 per cent. from the first "making-up day" in May. This applies to all underground labor and to the wages of surface labor engaged on the pit banks and screens in manipulating the coal. This will be the second advance of 5 per cent. this year, the previous one going into effect on the first "making-up day" in January. The two increases are said to add about 9c. per ton to the cost of mining the coal.

Mines of the Utah Antimony Company

The deposits of antimony ore on Coyote creek, Utah, have been known for a long time, and were first described by Prof. W. P. Blake, in 1883. Attention has again been directed toward them by the present high price of the metal.

The mines are situated in Garfield county, on Coyote creek, which is a tributary of the Sevier river. The valley of the creek is about five miles long and leads into Grass Valley, at its southern end. From the east fork of the Sevier, where it cuts across the valley, good roads run to the junction of the south fork and turn north from that point to Marysvale, a station on the Rio Grande Western Railroad.

Character of the Formations

The rocks of the district are soft, gray, granular sandstone underlain by a thin bed of limestone and conglomerate boulders. The beds are of Eocene age, and are almost horizontal, forming perpendicular cliffs on both sides of the narrow valley and its branches. The conglomerate is about 100 ft. thick. Above it, in the sandstone, which contains some gypsum, the antimony deposits are found. The ore is disseminated through a band about 5 ft. thick, and rests directly upon the conglomerate. The ore is found both in regular sheets, ½ to 2 in. thick, and in lenticular masses approximately 2 ft. thick in the center and 20 ft. in diameter.

Operations

In recent years these properties have been worked intermittently by leasers who paid the owner a royalty of $75 per ton of stibnite extracted. The stibnite shipped contained on an average 71 per cent. antimony, and during mining operations several thousand tons of 20 per cent. ore was thrown on the dumps.

In September, 1906, the Utah Antimony Company was incorporated by persons in Butte and Salt Lake City, for the purpose of working over the dumps. Twenty-three claims were acquired which virtually includes all the ground known to contain the antimony deposits. In addition the company owns about 6000 ft. of placer claims in the bottom of the cañon, and the water rights at the head and foot of the gorge from a creek that has a flow of approximately 2000 miners' inches of water.

It is the purpose of the company to work only the low-grade ore which is now lying on the dump. For this purpose bunk houses, offices and other buildings are being built, dams, a 2200-ft. ditch, and buildings for concentration and volatilization are under construction, and the necessary machinery is being bought.

The ore is unique in that it is absolutely free from lead, differing in this respect from other antimony deposits in the United States, and making the concentration and smelting of the ore relatively inexpensive. It is proposed to use a method of volatilization, the details of which the company is not as yet ready to disclose, but the success of the process, it is stated, has been thoroughly proved by commercial tests.

The Centralization of Power Production on the Rand

By Edward Walker

After many years' debate and negotiation the scheme for supplying the gold mines of the Rand with power from huge central stations has taken definite shape with startling suddenness. Such a development would be of interest in itself, but its importance is intensified by the fact that all the various propositions have united and come within one control. At the present time there are two companies actually supplying electric power in bulk: the Rand Central Electric Works, controlled by the Siemens people and supplying about 4000 h.p.; and the General Electric Company, a branch of the Allgemeine Electricitäts Gesellschaft of Berlin, which supplies 5000 h.p.

The two great schemes which have been discussed as probabilities for the future are the utilization of the Victoria Falls on the Zambesi, 600 miles away, and the establishment of a steam power station at Vereeniging, on the Vaal river, in proximity to the coalfields, and 35 miles from the Rand. The former of these is in the hands of the British South Africa Company and the latter is a proposition made by the Lewis and Marks group.

Victoria Falls Power Company

It is not necessary here to discuss the diplomacy required to bring all these four conflicting interests into line; I simply record the fact that a company has been formed by the British South Africa Company, called the Victoria Falls Power Company, which will absorb them all and in the near future control the whole of the power supply of the Rand. The name of the company brings into prominence one of the sources of supply, but from the force of circumstances several years must elapse before the company lives up to its name. The revenue for the first few years will come from the works of the Rand Central Electric and the General Electric Companies.

The program of the company provides for the immediate construction of a steam plant capable of producing 24,000 h.p. somewhere in the neighborhood of Johannesburg in addition to these two already in operation. It is not probable that the Vereeniging scheme will be proceeded with at once, but the work in connection with the Victoria Falls will be put in hand immediately. At first, provision will be made for a plant generating 50,000 h.p.

It will be seen that the company takes up three separate systems of production and distribution. The steam stations at Johannesburg have the drawback of dear water and moderately dear coal; the proposed station at Vereeniging will have cheap water and cheap coal, but will have to transmit the electric power 35 miles; while the Victoria Falls scheme will obtain power from a water fall, but will be saddled with an immense outlay of capital spent on hydraulic works and transmission lines. Also it must be remembered that for a transmission of 600 miles, the generating plant will have to produce twice as much power as will be delivered at the Rand, and a large margin will also have to be provided for the consumption in the transformers. The Victoria Falls scheme also has the drawback of not obtaining its water power for nothing, for a million shares in the new company have to go to the representatives of the British South Africa Company to pay for the privilege of using the water.

Further information is required before justice can be done to the relative merits of the three different systems but I must confess that the relative economy of the Victoria Falls plant is not very obvious.

There can be no doubt that this new scheme will help to consolidate the interests and methods of working of the goldfields of the Rand. No general law can be laid down as to the relative benefits of individual efforts and combinations of financial and professional resources. Prospecting is done better by the efforts of needy individuals. A great number of mines and prospects yield better results without expensive boards of directors and technical advisers, while other mines are not poor men's propositions.

It has always seemed to me that the Rand deposits were the furthest removed from the poor man's propositions, and that they would be most profitably worked by adopting "trust" methods. In order to make the deposits, especially the unopened deep levels pay, it is necessary to cut down costs by reducing the charges for technical services, skilled and unskilled labor, and power. The problems to be worked out are almost the same at all the mines, so a central board of engineers and metallurgists would work more economically than a series of staffs for each mine or each group. "Trust" methods are often open to objection, but in this case the chief objection, the conspiracy to artificially raise the price of the article produced, would be absent.

It is probable that no actual amalgamation of the various groups and companies could ever be effected, but in the manner outlined their interests might be consolidated.

The Tungsten Deposits of Boulder County, Colo.

An Old Gold and Silver Camp, Which Now Produces More Than 80 Per Cent. of the Tungsten of the United States

BY WILLIAM E. GREENAWALT*

The tungsten deposits of Boulder county, Colo., which furnish more than 80 per cent. of the tungsten of the United States, were discovered more than 25 years ago, but at that time the discoverer, Samuel Conger, did not know what the heavy black mineral was. He was aware, however, that it did not carry gold or silver, for which he was then prospecting, and hence it had no value to him. About five years ago, after an absence from Colorado of 20 years, he learned what the mineral was, and that it had some value for the tungsten which it contained. On learning this he returned to the State and located the first tungsten claims in Boulder county.

From this beginning the present thriving tungsten industry has been developed. Its possibilities were slow in being recognized, and it was not until Morris J. Jones, of the Great Western Exploration Company, developed the first mine and built the first mill, that the industry was firmly established. The town of Nederland, the center of the district, and now a tungsten mining camp, was once the center of a gold and silver mining industry which had dwindled down to a defunct stamp mill, a dilapidated smelter, a town of empty houses, and one or two inhabitants.

Limits of the District

The tungsten district of Boulder county is not large. Its present limits of profitable working are not more than eight miles long and three miles wide, although good prospects have been found outside of this limited area. There are good indications that the camp will ultimately extend further south into Gilpin county, but the large areas of patented agricultural land have discouraged prospecting in that direction. Good tungsten has been found as far south as Rollinsville, as far west as Eldora, as far east as Sugar Loaf and Magnolia, and as far north as Ward, where the tungsten occurs more in the nature of hubnerite.

All of the tungsten about Nederland, found in commercial quantities, occurs as Wolframite (Fe, Mn) WO_4, which contains, when pure, about 76.5 per cent. tungstic acid (WO_3) 9.5 per cent. ferrous-oxide, and 14 per cent. manganous oxide. The concentrate, as produced at the mills in Boulder county, will vary from 60 to 70 per cent. tungstic acid, which is made the basis of settlement in purchasing the ore.

*Metallurgical engineer, 154 W. Cedar street, Denver, Colo.

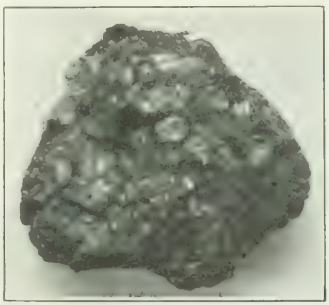
CHARACTERISTIC ANALYSES OF CONCENTRATES

	Leavitt Creek. Per Cent.	Nederland. Per Cent.	Gold Run Gulch. Per Cent.
WO_3	66.11	63.20	60.84
FeO	24.31	20.56	18.7
MnO	3.26	1.10	1.7
Si	0.80	15.00	16.28
P	Trace	Trace	0.05
S	0.02	0.50	0.20
As	trace	trace	trace
Mg	1.2 (est.)	2.4 (est.)	3.1 (est.)

It will be seen from these analyses that the iron is high and the manganese low, as compared with the theoretical composition of wolframite.

Geological Formation

A peculiar characteristic of Boulder county wolframite is its brecciated appearance. There is no exception to this rule, but in some mines it is more pronounced than in others. The breccia consists of wolframite and feldspar; sometimes the



CHARACTERISTIC BRECCIA, BOULDER COUNTY WOLFRAMITE

feldspar is partially replaced by quartz. This peculiarity is shown in the illustration, which is of a characteristic specimen of the ore. The feldspar frequently has the appearance of being floated in the wolframite, and would suggest igneous conditions in the formation of the deposits. Frequently the mineral at the surface is beautifully crystallized, but the brecciated appearance is always in evidence. The crystals are usually grouped around the feldspar, and sometimes completely inclose it. Such ore gives a high-grade concentrate usually containing 70 per cent. tungstic acid. Some of the ore has the appearance, as if the breccia, of feldspar and wolframite, had been subjected to enormous heat, so as to partly fuse the ore and obliterate the sharp lines of demarkation between the constituent minerals; such ore gives a low-grade concentrate and high tailings.

[illegible] nection with enormous andesite dikes which traverse the country in roughly parallel lines. No prospects of any consequence have been discovered in the intervening country between these dikes, and the working mines are all confined to their immediate vicinity. The prevailing country rock is schist and granite. The float from the outcrops is particularly rich, and much of the surface wash, adjoining some of the mines, has been shoveled over to recover the float. Many of the orebodies do not outcrop, but are found usually 10 to 60 ft. below the surface. Prospecting is made easy on account of the peculiar black tungsten stain which pervades the joints and cleavage planes of the mineral veins where tungsten occurs, and which is very pronounced. As the orebody is approached these stains take the form of stringers of wolframite in the dike rock, apparently without the accompanying vein matter.

It has been demonstrated beyound doubt that the orebodies are reasonably permanent. While the ore-shoots are not strictly continuous, no failure of the ore at depth has yet been recorded. The deepest shaft in the district is 400 ft. and several are almost 300 ft. In one of the mines the best ore was encountered at the lowest level, and in all the working mines the ore is practically as good at the bottom as it was nearer the surface.

Concentration

The treatment of the ore at the mines is not elaborate. In consists of simple concentration, as follows: (1) Crushing in rock breakers; (2) reducing in stamps or rolls to 10 or 20 mesh; (3) hydraulic classification; (4) concentrating on tables; (5) treatment on Frue vanners or slime tables.

In this way 70 to 80 per cent. of the mineral in the ore is saved as concentrate, containing 60 to 70 per cent. tungstic acid. Since wolframite is one of the heaviest known minerals, having a specific gravity of 7.5 as compared with 2.5 for the quartz matrix, it would be thought to make an ideal concentrating ore, and that a saving of 70 to 80 per cent. is quite low. The great difficulty in concentration lies in excessive sliming. As the concentration of the ore becomes better understood, the necessity of thorough clasification before concentration becomes more and more evident. There is a field for a solvent process, if one could be found which is commercially applicable.

Most of the mills treating tungsten ore were originally built for the amalgamation and concentration of gold and silver ores. It took some experience and not a little experimenting to find out that the conditions that were ideal for one were fatal to the other. Most of these mills have been entirely remodeled, and it is probable that the average extraction will soon be increased to 80 or 85 per cent. The weight of the stamps in these mills varies from 750 to 850 lb. Careful experiments have been made with rolls to reduce sliming and to obtain a higher saving, but the results, while slightly improved, were not what was anticipated. The wolframite and matrix are frequently so intimately associated that a high recovery by mechanical concentration is practically impossible.

ORE PURCHASING

There are at present operating in the district one 20-stamp mill, three 10-stamp mills and several 5-stamp mills. All of these are operated in connection with the larger mines, but most of them also buy custom ore. At one of the mills a milling charge of $4 per ton of ore is made, and the concentrates are purchased on the basis of $9.50 per unit for concentrates containing 60 per cent. or more, and $8.50 for concentrates containing between 50 and 60 per cent. tungstic acid. Concentrates containing 50, 60 and 70 per cent. tungstic acid are therefore worth $425, $570 and $665 per ton, respectively.

At another mill the ore is bought outright on the following schedule of prices:

BASIS FOR PURCHASING TUNGSTEN ORE.

Percentage of WO_3.	Value Per Ton.	Percentage of WO_3.	Value Per Ton.
	$10	20	$100
4	15	30	180
5	21	40	280
10	45	50	400
15	71	60	570

Ore containing less than 2 per cent. tungstic acid is profitably handled when the mine and mill are controlled by the same interests.

The total output of the district for 1905 was 721 tons of tungstic acid (WO_3) and in 1906 it was approximately 820 tons. The output for 1907 will probably reach 1200 tons. The largest producers are the Wolf-Tongue Mining Company, the Stein-Boericke Company, the Boulder County Mining Company and the Colorado Tungsten Company. These are energetically developing their various holdings, and at Beaver creek, at the Ebony mine, a tunnel is being driven to encounter the ore at a depth of 400 ft. Recently the "Rogers Patent," representing more than 2000 [illegible] tungsten mineral land, taken up [illegible] ultural patents before the advent of tungsten mining, has been acquired by German interests and will be thoroughly exploited and developed.

The economic conditions of the Boulder county tungsten deposits are satisfactory. There is an abundance of water and wood, and two railroads pass through the district. They are the Colorado & Northwestern, a narrow-gage road passing over the northern extremity, and the Denver, Northwestern & Pacific Railroad in the southern extremity at Beaver creek. Nederland is 30 miles from Boulder and 60 miles from Denver via the Colorado & Southern Railroad, and 45 miles from Denver via the Denver, Northwestern & Pacific. Its altitude is 8000 feet.

The Purchase of Zinc Ore

The zinc smelters of Belgium, Holland, France and the west of Germany for the purchase of ore employ generally the formula $0.95\ P\left(\frac{T}{100} - \frac{8}{100}\right) \cdot R$, in which P is the price of spelter (good, ordinary brands) at London, T the units of zinc in the ore, and R the returning charge per ton of 1000 kg. This formula gives the value of the ore per ton of 1000 kg. The value is given in pounds sterling, marks, francs, or dollars according as P, the value of spelter at London, is reckoned in pounds sterling, marks, francs or dollars.

This formula is scientific and fair. The freights and cost of smelting per ton of ore are substantially the same irrespective of the grade of the ore (within certain limits). The returning charge R is therefore constant, as it should be. The percentage of metal extracted falls off as the grade of the ore falls off, because the losses in smelting are to a large extent constants, i.e., a ton of certain ore may contain 1000 lb. of zinc and a ton of another ore 800 lb. of zinc, but the loss of metal in smelting will be approximately 125 lb. in each case. The formula takes account of this by the uniform deduction of eight units from the zinc content of the ore as shown by assay. If the ore assay 60 units of zinc, the payment is for 52 units, or 86⅔ per cent. of the zinc in the ore. An ore assaying 50 units, with eight units deduction, returns 84 per cent.; and an ore assaying 40 units, with eight units deduction, returns 80 per cent. These percentages are not very much below the actual metallurgical extractions. In being a little under the actual extraction it tends to increase slightly the smelter's margin as the value of spelter rises, as does also the discount of 5 per cent. from the London price, but this is equitable.

Sometimes, in the case of a desirable ore, the smelter will propose to buy the ore with a deduction of only seven units from the assay, instead of eight, as usual. The percentage of zinc paid for, on different grades of ore, becomes then as follows:

60 units	:	88.33 per cent.
50 units	:	86.00 per cent.
40 units	:	82.00 per cent.

Sometimes, if it be anticipated that lower grades of ore than contemplated in the returning charge named in the contract will be offered, it is provided that the returning charge be increased with decrease in the grade of the ore. For example, it may be provided that for each unit of zinc below 50, the returning charge shall be raised 2.5 francs per 1000 kg. of ore, which is equivalent to 43.86c. per 2000 lb. If therefore the returning charge were named at $11.50 per 2000 lb. for ore assaying 50 to 55 per cent. zinc, with increase of 43.86c. per unit below 50, the charge on ore assaying 48 per cent. zinc would be $12.38 per 2000 lb.

Electrolytic and Lake Copper

The fact that certain mines in the region of the Great Lakes yield a mineral so free from objectionable impurities that a high-grade copper is obtainable directly by a simple furnace scorification, early gave Lake copper a premium in the market that electrolytic competition even yet has not entirely wiped out. For almost all purposes there should be no hesitation whatever today in specifying electrolytic copper. In conductivity it is superior to nearly all brands of Lake, and in mechanical properties it leaves little to be desired. There are a few classes of work in which the metal is subjected to very severe stress, such as in the making of cartridges, where Lake seems to stand up better than electrolytic, although even here it is a question how much to allow for the trade prejudices of the older generation of mill foremen.

Any advantage in Lake copper must be attributed to the fact that it is not so clean as electrolytic. A small quantity of arsenic, for example, while exceedingly detrimental to the conductivity, will appreciably improve the mechanical properties of copper; at one time, arsenic was considered necessary in English specifications for firebox copper. Each year a greater proportion of the world's output is electrolytically refined, and it seems probable that before long there will be but two grades of copper on the market—high-conductivity copper, which will include electrolytic and picked brands of Lake, and casting copper, covering all material which will not pass a conductivity requirement of 98 per cent. annealed.

According to *Min. Journ.*, March 30, 1907, the six leading companies exploiting manganese in Brazil exported 201,500 metric tons in 1906, officially valued at 6,716,660 francs.

Phosphate Rock in Utah, Idaho and Wyoming

The Utilization of the Deposits in These States Promises to Create a Market for Sulphuric Acid in the West

BY CHARLES COLCOCK JONES*

Investigations [illegible] interests of the Mountain Copper Company, Ltd., and [illegible] own account have demonstrated the existence of a large phosphate field in the high intermountain country of northeastern Utah, southeastern Idaho and western Wyoming. The occurrence appears as stratified deposits in the upper Carboniferous, lying above the Weber quartzite of the 40th Parallel Survey, or an analogous formation. The principal rich deposits so far as found [illegible] that arm of the Carboniferous sea bounded on the north and east by the granite backbone of the Rocky mountains in Wyoming, with a few islands of the same granite lying to the west. It must have been a shallow sea, devoid of currents, so far as we can judge from the bedding of the limestones, with the waters highly charged with phosphoric acid, which by animal, vegetable and chemical means was concentrated into beds of oolitic character.

The Carboniferous formation is exposed in the area under consideration in a series of north and south mountain ranges, as a result of faulting on a large scale, resulting in limited monoclines, anticlines, synclines and close folds.

In the phosphate formation we seem to have a gradually enriched series of beds from the bottom upward, the top bed being the most uniform and practically workable one. I feel convinced that future search will greatly enlarge the field. [illegible] mercially inaccessible.

The striking fact is that the Carboniferous is coal-bearing in the Appalachian, and phosphate-bearing in the Rocky mountains region. The one was probably a swamp accumulating vegetable material and the other a shallow sea receiving deposits by animal, vegetable and chemical means of phosphoric acid from the surrounding land areas.

The Deposits in Rich County, Utah

In the summer of 1897 R. A. Pidcock while on a prospecting trip camped on "12 mile," a branch of Woodruff creek, Rich county, Utah. Finding some old workings in a soft black formation and believing that he had a gold mine, he and others took up a number of claims. A sample was sent to San Francisco for analysis. The returns showed no gold or silver, but revealed the fact that the material was phosphate rock.

Composition of Rich County Rock	
Phosphoric Acid	32.44 per cent.
Iron and Alumina Oxides	1.52
Iron Sulphide	1.72
Calcium Oxide	43.02
Magnesium	[illegible]
Carbon Dioxide	[illegible]
Sulphur Trioxide	[illegible]
Fluorine	1.56
Organic Matter	5.83

In May, 1903, I examined the deposits of phosphate rock on Woodruff creek, 11 miles west of the town of Woodruff in the Bear River valley. This phosphate formation extends for about 2½ miles, and dips from nearly vertical to 45 deg. to the west.

An examination of a series of fossils from the apparently underlying limestones, by Dr. G. H. Girty, of the U. S. Geological Survey, proved the formation to be upper Carboniferous.

The higher-grade phosphate occurs as brownish black oolitic stratified rock with a highly fetid odor, the oolitic structure being very regular with only a minimum amount of interstitial matter. The rock weathers readily to individual grains except a few layers of hard oolitic phosphate.

A study of Hayden's Report of 1871 and the text of the 40th Parallel Survey by Clarence King caused me to examine the Ogden and Echo Cañon regions. The remarkable *Z* contortion in the lower Carboniferous limestones spoken of by these writers consists of a series of black limestones and shales 16 ft. or more in thickness bearing lime phosphate from 2 to 24 per cent., with a black oolitic band of one inch carrying 48 per cent. lime phosphate.

A like occurrence at this same horizon is also found in a cañon several miles south of Logan, Utah. There is nothing commercially valuable about it, but it has a great significance in being the earliest occurrence of oolitic bedded phosphate I have been able to find from the Cambrian to the Carboniferous.

ROCKY POINT, NEAR COKEVILLE, WYO., ARROW INDICATES STRIKE OF STRATA

[illegible]

In August, 1903, I learned of work being done near the town of Montpelier, Bear Lake county, Idaho, for coal, and upon visiting the locality I found that an incline shaft had been sunk 250 ft. deep in

*Consulting mining engineer and metallurgist, 120 N. Broadway, Los Angeles, Cal.

the geologically lower black shaly limestone strata of the phosphate formation. The phosphate formation is exposed in [illegible] the town for a distance of one mile south and two miles north of Montpelier creek.

The strata composing the mountain [illegible] occupy an inverted position with the geologically upper rich bed of phosphate lying at the bottom, the mountain representing an immense reverse fold. The strata strike in a general north and south direction with a dip to the west of from 20 to 40 deg. Fossils submitted to the Geological Survey for identification showed that the horizon is without much doubt high in the Upper Carboniferous, probably not Permian, though not far below it.

At the bottom, geologically, it consists of a series of black phosphatic mud beds, [illegible] coal bed, from the upper, harder, and more blocky phosphate of an average thickness of 3 ft. The whole bed can be classed generally as a black oolitic phosphate in appearance like the black phosphate of Tennessee and averages 70 per cent. bone phosphate.

Beds at Rich Hot Springs

From developments at the Hot Springs on Bear Lake 15 miles south, and Thomas Fork, 15 miles east, and at Cokeville, 20 miles southeast of the Montpelier deposit, the workable bed described above has held its character and relative position with a definiteness similar to a coal bed over such an area, especially as regards the parting.

The next determination of the bed was made near Rich's Hot Springs. The Woodruff Creek and Montpelier deposits. The openings showed a considerable width of material running from 20 to 56 per cent. bone phosphate, with intercalated lime ledges. In the spring of 1904 I discovered the south extension of the formation 1 mile south of the Union Pacific Railway, and followed it between the two points at the Weber river and on Dry creek.

The phosphate formation to the south of this is covered by the later formation unconformably, and its next appearance is just east of Salt Lake City, north of Fort Douglas. It shows about 100 ft. of phosphatic limes, and cherty beds, with a few thin oolitic bands, but apparently no workable bed of commercial value. It is probable that other areas in the Wasatch mountains will contain phosphate in commercial quantities.

[illegible] PHOSPHATE CREEK

PHOSPHATE WORKINGS NEAR COKEVILLE

FACE OF TUNNEL, SOUTH OF MONTPELIER CREEK

black or brown phosphatic shaly limes, lime concretions and more or less pure beds of limestones, about 60 ft. thick containing from 10 to 53 per cent. bone phosphate, the amount of phosphoric acid in any one bed being seemingly subject to rapid changes in a short distance. A large part of this measure will undoubtedly be found capable of concentration when needed.

Sharply divided from this lower member by a band of hard black limestone 20 in. thick, at places very full of omphalotrochus shell casts and other fossils, [illegible] layer of phosphate rock 5½ to 6 ft. thick. This bed is made up of two members, a lower (geologically) slaty member, averaging 2 ft. thick, separated by a thin shaly workable bed is slightly different from that at Montpelier, and the richest bed yet found in the field occurs as a separate one of 18 to 22 in. in width, composed of hard black oolitic phosphate with a layer of curious saucer or disk-shaped concretions, from ⅛ to ¾ inches in diameter.

The formation has been traced for several miles outcropping nearly north and south with a dip to the west of 45 to 70 deg. A black chert bed, overlying the phosphate formation forms a prominent feature, standing up like a volcanic dike for 3 miles, and throughout the field a chert bed is characteristic of the top of the upper Carboniferous.

Upon examination of the phosphate formation north of Croyden Station I found that it corresponds in position with the

Western Wyoming and Eastern Utah

In the summer of 1904 I was directed to some workings that had been prospected for coal in the Sublette range of mountains of Wyoming, just east of the Idaho line, on Thomas fork of Bear river. From this I determined the phosphate formation for three miles running nearly north and south dipping from vertical to 65 deg. to the east. The east bed is the commercially workable one, and the similarity to the Montpelier deposits is marked, even to the shale or mud partings separating the two members of the bed.

Finding the Carboniferous to outcrop in two sharp peaks, one mile east of Cokeville, Wyoming, I entered negotiations to examine the lands. The result of the ex-

SECTION OF COKEVILLE FORMATIONS

amination showed the quartzite about 1000 ft. thick to form the ridge in the form of a close fold. The phosphate formation follows to the east and dips under the valley of Smith's fork of Bear river, in a broad syncline showing exposures of the rocks from the Carboniferous to the Cretaceous with the phosphate formation again exposed, eight miles east of Cokeville, in Sublette cañon, dipping to the west.

Later investigations showed the continuation of the latter exposure to the south on Rock creek, but so far without commercial beds being opened.

In July, 1905, I discovered a small exposure of the Carboniferous in the low hills 1½ miles east of Sage Station, Wyoming. The occurrence here is on the west side of a gentle anticline, the west side of which has been abruptly faulted in the making of the Bear River valley. Compared with other exposures the phosphate formation is thin. So far as developed there seems to be a workable bed from 7 to 10 ft. thick showing a top member of 4 ft. hard, jaspery red and green oily looking rock averaging 74 per cent. bone phosphate separated by a 5-in. shaly parting from 6 ft. of soft gray oolitic rock running as high as 80 per cent. phosphate. The continuation of this formation was located in the River Hills, east of Bear river, in Utah, 6 miles further south of Sage Station.

At Bennington, Idaho, 3 miles north of Montpelier, a disconnected and faulted portion of the phosphate formation is shown. The material runs from 25 to 50 per cent. bone phosphate, and further work will be necessary to determine its position and relation to the other deposits.

Two miles west of the town of Bloomington, Idaho, a phosphate formation about 75 ft. thick, has been opened by a tunnel prospecting for coal. It consists of beds of brownish porous material devoid of oolitic structure or casts. In value it runs from 12 to 45 per cent. bone phosphate with only a few feet of the latter.

North of Montpelier I have found the phosphate formation in a cañon east of Soda Springs, Idaho, and at a number of points between the two places locations have since been made. From a great number of analysis, the following are the general characteristics of the rock: moisture rarely exceeds 1 per cent., the rock disintegrates readily by weathering without absorbing moisture to any appreciable extent; insoluble runs from 5 to 7 per cent.; and iron and alumina below 3 per cent.

Regular shipments can be made of material from 65 to 73 per cent. lime phosphate, and higher by separating special beds up to several feet thick. The specific gravity is from 2.85 to 2.98. There is considerable organic matter which will be a slight detriment in making superphosphate.

At present there are three concerns active in developing and shipping: The San Francisco Chemical Company, operating department for the Mountain Copper Company, Ltd., which latter is an English concern, shipping to the coast from Montpelier, Idaho; the Union Phosphate Company, of San Francisco, shipping from Cokeville, Wyoming, to the coast; and the Bradley interests, shipping at Sage Station, Wyoming, from Utah deposits.

The exposures in highly tilted beds render mining above water level a simple matter for a long time to come.

OPEN CUT PIT AT COKEVILLE, WORKABLE BED

Conductivity of Electrolytes

The conductivity of an electrolyte depends upon the number of ions present, the speed of migration and the charge of electricity each carries. The charge carried is a constant for the various compositions, as the valency does not change. In copper refining, the ions concerned are copper, hydrogen and sulphion. Hydrogen is much the swiftest; hence, the effect of the free acid present in lowering the resistance. The number of ions present depends upon the concentration and the degree of dissociation. In electrolytic copper refining we have a mixture of two electrolytes with a common anion, SO_4, and the proportion of one present controls the degree of dissociation of the other. Starting with a fixed percentage of free acid present, additions of copper sulphate at first increase the conductivity due to the increased number of ions present. After a certain quantity of copper is reached, however, further additions have the reverse effect. This is due to the driving back of the dissociation of the acid by the increased proportion of the SO_4 ions claiming a copper mate in accordance with the laws of equilibrium. It will be seen from these data that the copper should not exceed 3 per cent. at the most, or 12 per cent. if figured as sulphate. The acid may advantageously be run up to about 13 per cent. If carried higher, polarization troubles are likely to offset the gain in conductivity. These figures are for pure electrolytes. In practice, impurities cause the resistance to be 10 to 15 per cent. higher.

Extensive deposits of anthracite are said to have been discovered about 30 to 40 versts from Kharbin in Eastern Siberia.

Note on the Adiabatic Volume-change on Mixing Two Gases

By Alfred J. Lotka*

In regard to certain chemical processes it is of interest to know what is the change in the total volume of two quantities of gases which are originally at different temperatures, and which are then mixed, without chemical action, so as to acquire one common temperature. It is of course a simple matter to work out the result as the need arises in each particular case, but a general investigation presents some points of interest.

Consider two gases, both at the same pressure, P mm. of mercury; let v_1 be the volume of the first; t_1 deg. C. its absolute temperature; and s_1 its specific heat at constant pressure and at the temperature t_1 deg. Also, let its density at 0 deg. C. and 760 mm. be d_1, so that its actual density at t_1 deg. and P mm. will be:

$$\frac{P}{760} \cdot \frac{273}{t_1}.$$

Similarly let v_2 be the volume of the second gas; t_2 its absolute temperature; s_2 its specific heat at constant pressure and at the temperature t_2 deg.; d_2 its density at 0 deg. C. and 760 mm.; hence its actual density at t_2 deg. and P mm. will be:

$$\frac{P}{760} \cdot \frac{273\, d_2}{t_2}.$$

Then, if the two gases are mixed in such manner that no heat either enters or leaves the system, and if T is the final temperature reached, we have for this adiabatic process the condition:

$$\frac{P}{760} \cdot \frac{273\, d_1}{t_1} \cdot s_1 (T - t_1) + v_2 \frac{P}{760} \cdot \frac{273\, d_2}{t_2} \cdot s_2 (T - t_2) = 0,$$

$$d_1 \cdot v_1 \frac{T}{t_1} s_1 - d_1 s_1 v_1 + d_2 s_2 v_2 \frac{T}{t_2} - d_2 s_2 v_2 = 0 \qquad (1)$$

The Volume Change

Let us now consider the volume change. This will evidently be the same as if each gas had been separately brought to T deg. at constant pressure, and the two had then been mixed; for in that case no further change in total volume would take place on mixing.

The change in volume v_1 corresponding to the change in temperature from t_1 to T, we have:

$$\Delta v_1 = v_1 \frac{T - t_1}{t_1} \qquad (2)$$

Similarly, the change in v_2 is given by:

$$\Delta v_2 = v_2 \frac{T - t_2}{t_2} \qquad (3)$$

If Δv is positive this means [illegible] expansion; if negative Δv means contraction.

The change in the total volume $(v_1 + v_2)$, of the gases is given by:

$$\Delta (v_1 + v_2) = \Delta v_1 + \Delta v_2 = v_1 \frac{T - t_1}{t_1} + v_2 \frac{T - t_2}{t_2}. \qquad (4)$$

From (1) we have

$$v_2 \frac{T - t_2}{t_2} = \frac{d_1 s_1}{d_2 s_2} \cdot v_1 \frac{T - t_1}{t_1}. \qquad (5)$$

Substituting this in (4):

$$\Delta (v_1 + v_2) = v_1 \frac{T - t_1}{t_1} \left(1 - \frac{d_1 s_1}{d_2 s_2}\right). \qquad (6)$$

We may solve (1) for T:

$$T = \frac{t_1 t_2 (d_1 s_1 v_1 + d_2 s_2 v_2)}{t_2 d_1 s_1 v_1 + t_1 d_2 s_2 v_2}, \qquad (7)$$

and substitute this in (6):

$$\Delta (v_1 + v_2) = v_1 \frac{(t_1 - t_2)(d_1 s_1 - d_2 s_2)}{t_2 d_1 s_1 v_1 + t_1 d_2 s_2 v_2}. \qquad (8)$$

It is evident from (6), or more readily from (8), that if $t_1 > t_2$, i.e., if v_1 is the hotter gas, $\Delta (v_1 + v_2)$ will be positive, zero, or negative, according as:

$$d_1 s_1 \gtrless d_2 s_2; \text{ or, } d_1 s_1 = d_2 s_2; \text{ or, } d_1 s_1 < d_2 s_2.$$

In other words, there will on the whole be expansion, no change, or contraction, according as the product ds for the hotter gas is greater than, equal to, or less than that for the colder gas. The same conclusion is, of course, reached on the supposition that $t_2 > t_1$.

A table, given herewith, shows in round numbers the value of the product ds for some of the principal gaseous elements and compounds:

The Value of ds for Some of the Principal Gaseous Elements and Compounds

Substance	ds
Mercury, Hg (monatomic)	2.4
Argon, A (monatomic)	2.4
Helium, He (monatomic)	2.5
Hydrogen, H_2 (diatomic)	3.4
Nitrogen, N_2 (diatomic)	3.4
Oxygen, O_2 (diatomic)	3.5
Hydrochloric acid, HCl	3.4
Hydrobromic acid, HBr	3.3
Hydriodic acid, HI	3.5
Nitric oxide, NO	3.5
Carbon monoxide, CO	3.4
Chlorine, Cl_2 (diatomic)	4.4
Bromine, Br_2 (diatomic)	4.4
Iodine, I_2 (diatomic)	4.2
Iodine monochloride, ICl	4.1
Water vapor, H_2O	4.3
(s at 130-250° C.)	
Hydrogen sulphide, H_2S	4.1
Nitrous oxide, N_2O	4.9
Carbon dioxide, CO_2	4.3
(s at 0° C.)	
Carbon dioxide, CO_2	4.7
(s at 100° C.)	
Sulphur dioxide, SO_2	4.9
Ammonia, NH_3	4.3
Marsh gas, CH_4	4.7
(Density of Hydrogen = 1.)	

[illegible] only two gases [illegible] the laws of Boyle and Charles, and that s is constant. It is independent of the units employed, so long as the [illegible] are measured from absolute

It will be seen from the table, that the product ds, is approximately the same for a number of gases whose molecules are similarly constituted (Neumann's law); and that, as a rule, the gases with more complex molecules have also a greater value for ds, though this is not by any means invariably so. It must be borne in mind that the specific heat s, is in general a function of the temperature, its variation with the latter becoming marked when the gas is approaching liquefaction, or is undergoing dissociation or association.

The case where $d_1 s_1 = d_2 s_2$ (e.g. hydrogen and nitrogen), and where therefore (practically) no change in volume takes place on mixture, deserves brief consideration.

In this case, since the heat lost by the hot gas is equal to that gained by the cold gas, while at the same time the volume-pressure energy lost by the first is equal to that gained by the second, it follows that the fraction of the total heat-change which appears or disappears in the form of volume-pressure energy, is the same for each of the two gases. Or, in the language of the kinetic theory of gases, the ratio,

$$\frac{\text{change in translational energy}}{\text{change in total energy}},$$

is the same for the molecules of either gas. This is in accordance with the fact that for a gas which obeys the laws of Boyle and Charles (as was assumed for the gas under consideration), the value of the produce ds fixes that of the ratio between the two specific heats. For such a gas the ratio of the two specific heats is given by

$$\frac{s_p}{s_v} = \frac{2\, ds}{2\, ds - 1.98}.$$

A report from Vice-Consul Rea Hanna, of Amoy, gives an American mining engineer's account of some mineral deposits in Fukien province, China. It is stated that a mountain of magnetite exists near Amoy, and zinc blende is also reported in the same neighborhood, while the natives bring in samples of rich antimony ore and graphite.

At Monkwearmouth colliery, Durham, England, a 6-ft. seam of coal at a depth of 1800 ft. is being successfully worked by the longwall system.

Mescal Canyon Coalfield, New Mexico

By Charles R. Keyes.*

Mescal canon extends along the eastern foothills of the Sierra de los Caballos, in Sierra county, New Mexico, and opens out into the Rio Grande valley at the northern end of the range. The recent discovery of important coal deposits in this locality is of special interest for the reason that it is the most southerly known fuel deposit occurring in the Southwest. The discovery also has an economic bearing which is of great value in that the deposit is 100 miles nearer the markets of Arizona and Mexico than any other known.

Extent and Quality

The coal-bearing section is now known to be at least several hundred feet in thickness, one dark shale bed alone being nearly 400 ft. thick. This section is composed of dark colored clay shales and shaly sandstones, and contains more than a dozen important coal horizons. Only one seam has as yet been opened up to a sufficient depth to determine its commercial value. At the point referred to a thickness of over 4 ft. of good coal is exposed. The coal at this mine is being used for a large power plant, from which electric wires are stretched several miles to supply the lead mines and concentrating mills lying to the southwest.

The quality of the coal is good. It is rather hard, clean and easily handled. The coal of this seam appears to have good coking qualities. Other seams are a foot or more in thickness on the outcrop. With development, some of these may prove to be of workable thickness. Diamond-drill prospecting has produced valuable data. The field is easily accessible to the railroad, being only 10 miles distant, and no heavy grading will be necessary.

At the present time the exact extent of the coalfield cannot be told. The geologic structure indicates that it is one of considerable area. It is not probable that it is a continuation of the Carthage field, nearly 100 miles to the north, although probably at nearly the same geological horizon. The present developments are on the west margin, where the strata are rather steeply upturned on account of proximity to a profound fault line. Eastward the rock layers rapidly assume a horizontal position. This opens up many square miles of promising ground for diamond-drill prospecting.

Geology of the Field

The exact geologic age of the coal-bearing section is believed to be the Laramie division of the late Cretaceous. Fossil plants found in the beds associated with the coal seams fully indicate this conclusion.

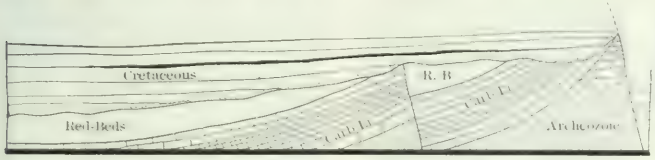


FIG. 1. GEOLOGICAL SECTION, MESCAL CANYON COALFIELD.

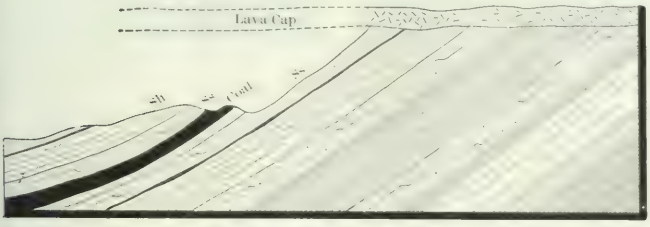


FIG. 2. MESCAL CANYON COAL SEAM.

On the other hand, extensive oyster and inoceramus beds occurring both above and below the horizon of the principal coal seam would suggest the Montana series. It may be, however, that the records of the terrestrial plants and marine animals are quite discordant, as it has recently been proved to be in other parts of New Mexico and as is rather to be expected.

The geological history and geologic structure of the immediate vicinity is rather complicated and puzzling. The Cretaceous beds are laid down over an old land surface, the substructure of which had been already profoundly faulted. These conditions have caused to be preserved a considerable thickness of Carboniferous red beds in close relationship to the Cretaceous.

There are everywhere in New Mexico extensive beds of Cretaceous and even Tertiary ages, showing marked red coloration, but these are readily distinguishable from the true red beds, which are of Permian or Triassic ages. Eliminating the effects of the most recent erosion, the stratigraphic relationships of the various geological formations as clearly displayed a short distance south of the coal outcrops, are represented in Fig. 1. The structural details of the coal seam are shown in Fig. 2.

*Consulting engineer, Socorro, N. M.

The Lovejoy Culm Briquet

A new fuel, composed of a mixture of culm and tar, and compressed into blocks about the size of an egg, is being manufactured at the Lovejoy coal briquet plant, in Scranton, and is so successful that the Lackawanna Railroad Company has made a contract with the manufacturers to take the entire production. The process is a secret which is closely guarded, and the company will be unable to manufacture sufficient of the fuel to meet the demand of the Lackawanna railroad alone. It is understood that it is cheaper for the latter corporation to use this fuel than to burn its own culm, when it is taken into consideration that the Lovejoy company will pay royalties on the culm taken for the manufacture of the briquets.

The Reading Company's New Development Work

The Philadelphia & Reading Coal and Iron Company is about to begin work on what promises to become one of the largest coal operations in the world. The mine is to be located in the Reevesdale basin, about 5 miles east of Tamaqua. This region is known to contain some of the richest anthracite coal seams in Pennsylvania, which fact has been thoroughly proved by recent bore holes that have been put down. It is stated that the prospect work here carried on has cost upward of $75,000. The breaker that will be erected will be the largest and most modern that is operated by the Reading Company. Plans are being made to construct several mining towns in this region in order to care for the miners and laborers who will be employed.

Streams for operating hydraulic mines are ordinarily used under a head varying from 150 to 300 ft. (Los Angeles *Mining Review*, March 30, 1907.) A much heavier pressure is extremely dangerous. Under all high pressures the nozzle or giant, as it is called, is securely anchored. A stream under 300 ft. head would instantly kill a man should he be so unfortunate as to be struck by the solid portion of it. Nozzles for hydraulicking vary in diameter from 2 to 10 in.—6 or 7 in. being the most common.

Conveyer-system for Loading at the Coal-face

Certain Thin and Dirty Seams Can Be Worked Profitably by This Method When Other Systems Would Result in Loss

BY FLOYD W. PARSONS

Recent developments in the coal-mining industry are forcing operators to recognize the fact that former extravagant methods of development can no longer be practiced with success. This condition is brought about by the decrease in the available area of clean, thick coal seams. Especially is this true in the older districts where the operators are now compelled to work thin seams containing a large percentage of bone and slate.

The introduction of mining machines has come as a direct result of these new conditions, and such progress has been made that nearly three-fourths of the entire coal output of some States is machine mined.

Advantages of Mining Machines

The chief advantages of coal-mining machines are first, a more regular line of face is obtained, which facilitates ventilation and leads to more systematic timbering; this also causes the waste to be more uniform and permits the roof to be more easily supported. Second, greater rapidity of working is obtained which tends to keep down costs, causes the surface to subside more evenly and prevents the coal from deteriorating excessively from exposure. Third, thin and dirty seams can be worked with machines when no other system would result in any profit. Fourth, holing is less frequently done in the coal, and as a consequence there is not so much slack produced. Fifth, there is a larger percentage of lump coal obtained.

The disadvantages of machines may be stated as follows: First, machines are not advisable where the coal is very soft or where there is danger of falls of roof. Second, they are not adapted where there are numerous faults or dikes. Third, they cannot be used to advantage when the seam is highly inclined. Fourth, mining machines often mix considerable of the bottom rock into the coal that is loaded at the face.

Where Underground Conveyers are Suitable

In working these thinner seams, it has been found that the costs of production are so high that the ordinary methods of mining cannot be profitably used. This has resulted in several companies both in this country and on the continent, providing underground conveyers for carrying coal from the coal face to the cars in the nearest haulway. These conveyers are so constructed that they can be moved with little expense and great rapidity, so that the conveyer is kept close up to the working face.

Especially is this conveyer system adapted to a coal seam where the vein is so low that cars can only be gotten to the face by the expensive method of taking down roof. It is also most essential that some system similar to the longwall method be adopted in working the seams. The conveyers can be driven either by electricity or air, and it is proved by experience that in many cases the loss of efficiency in the use of air is largely compensated by the greater simplicity of the air-engine, especially in the hands of more or less untrained men.

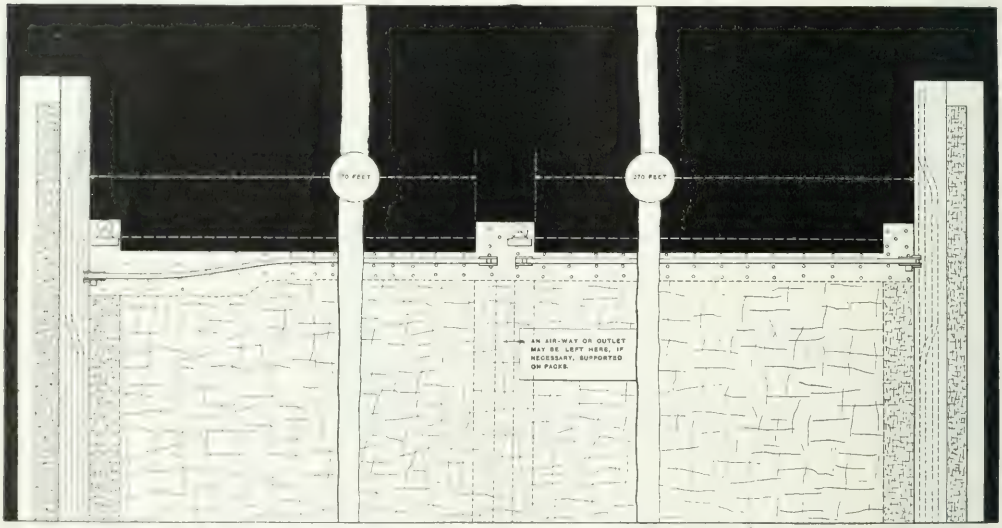


FIG. 1. PLAN OF ALTERNATIVE METHODS OF WORKING LONGWALL ON THE CONVEYER SYSTEM

The Vintondale Installation

The principal example of this underground conveyer system in America is probably that installed at the Vintondale colliery in Pennsylvania. At this mine, the system has been in use for several years, and has resulted in greatly reducing the cost of production, and providing a profitable system where ordinary methods would certainly fail.

At this operation, the coal averages about 3 ft. 6 in. in thickness, is free from slate partings, and is soft and friable. The coal is bound tightly to both roof and floor, which makes it necessary to use a considerable amount of powder in blast-

blue slate, about 12 ft. thick, overlain by a layer of shale sand-rock. There are marked slips or crevices in the slate, making an angle of about 22 deg. with the line of the main heading. It is therefore necessary, that the line of the longwall faces be relatively perpendicular to the slips of the roof-rock; in this way the roof is more easily controlled.

cation of the longwall method, and is partly advancing, and partly retreating. Instead of pack walls being used, it is found cheaper and better to use timber cribs to support the haulage road. The coal territory in the mine is divided by a main heading and an air-course running practically with the pitch of the coal seam; this pitch is variable, the average being about 8 per cent. Coal pillars 80 ft. thick are left on each side of the main heading.

When the work of extracting the coal is started, timber props are used to support the space made vacant, and a considerable distance in the advancing direction is cleared before the roof becomes heavy enough to fall. This varies from 70 to 120 ft. When it is found that the roof is weighting heavily on the props, they are removed, and good solid break-rows are set along the lower side of the conveyer; the roof is then allowed to fall in sections until the slate cover above the coal is all down. From this time until the heavier rocks above the slate begin to settle, great care has to be exercised and good break-rows maintained. It usually takes from one to two weeks for the heavier rocks to settle.

Plan of Development

In preparing the mine for longwall faces, pairs of cross headings are turned off from the main heading at intervals of 500 ft., and these headings are driven to the outcrop. A barrier pillar 80 ft. thick, is left to protect the main heading, and at intervals of 270 ft. block headings are driven at right angles to the cross headings. It is important that these headings be driven on an absolutely straight line, for if they are driven crooked, considerable trouble is entailed in having to shift the conveyer forward or backward.

When the blocks of coal for the longwall development have been formed, the conveyer is installed, first in the block adjacent to the outcrop, the face is advanced up the hill, and the roadway for the cars is protected by timber cribs until the block has been worked out to about 18 ft. from the upper heading. Then the adjacent block of coal near the main heading is attacked, and so on until the entire coal between the upper and lower heading has been exhausted.

When the work of the conveyer has been completed in any section, the heading rib, and the 18-foot pillar, left to protect the roadway, are drawn back by hand to the main heading.

Method of Operation

The conveyer here used is of the pan type, 12 in. wide at the bottom, 18 in. at the top and 6 in. high. In the pan is run a malleable drag chain. This chain passes over a sprocket wheel at the head end, which does the driving, and returns over another sprocket at the rear end. Both front and rear ends are inclined; at the front to obtain hight enough to allow the mine cars to pass under, and at the rear end to compensate for the necessary size of the sprocket wheel.

The conveyers are driven by a small double-cylinder air engine. The engine and gearing are mounted on a frame, separate from the conveyer proper, and power is transmitted by means of a steel roller chain to a sprocket wheel on the drive shaft of the conveyer. The power for operating the conveyer and the longwall machines is brought through a compressed-air pipe, 2 in. in diameter, from the heading above. Connection to the pipe is made by means of a 10-ft. length of a 2½-in. wire-wound hose from the pipe running down the heading to a second pipe, which runs the entire length of the face, and is attached to the conveyer. This conveyer pipe has outlets with 2-in. stop cocks at intervals of 48 ft. The hose of the compressed-air longwall machine is arranged so that it can be attached to these cocks.

After a specified length of coal face has been cut and loaded, and it is then desired to move the conveyer laterally to its new position on the face against the new line row of posts, which have been set by the machine men by the time that the loading is finished, the plan is to use any suitable kind of pulling-jack, of which several types are in use. As soon as the moving

min., some of the men are set to putting

the lower side of the conveyer. At the head end the conveyer runner fills the timber crib in the heading and assists with the timber when he has finished this.

By the use of this conveyer the overhanging ledge has been materially reduced, inasmuch as the conveyer occupies less space than the track rails previously used, and thus the weight of the gob-timber is reduced. The hight of the conveyer is small, and the work of shoveling into the same is easily accomplished. It is also possible, with this system, to have the conveyers distribute timber along the face. One further advantage in this method is that the mine cars used for the work can be of large capacity, as they travel in relatively high headings.

The work of the men where such a method is employed is concentrated and the maximum returns can be obtained from each laborer. It has also been noted that the percentage of large coal is materially increased, and that the men working at this kind of work make higher wages per month than the men working by

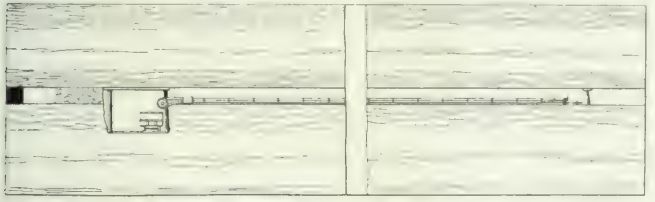


FIG. 2 LONGITUDINAL SECTION OF CONVEYER FACE

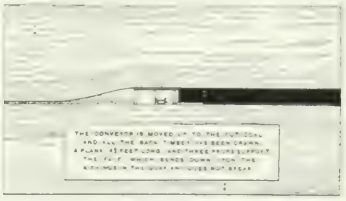


FIG. 3. CROSS SECTION OF CONVEYER FACE

As to the pecuniary advantages of this system over any other method of working thin seams, it may be said in conclusion that the record at one mine, for the past three years of the cost of coal, loaded into mine cars in comparison with the previous price for pick work, showed a saving of 48 per cent. over the latter method. Figs. 1, 2 and 3 show a plan and section of the general system. Several modifications which have recently been added to this general system have resulted in greatly increasing the efficiency of operations.

Open Lights Prohibited

In the Allegheny county, Penn., courts recently, Judge Young sustained the decision of the State mine inspectors that open lights and electric haulage could not be used in the Harwick mine of the Allegheny Coal Company, where 185 lives were lost by an explosion in 1904.

The Wolt Safety Lamp

By L. H. Hodgson

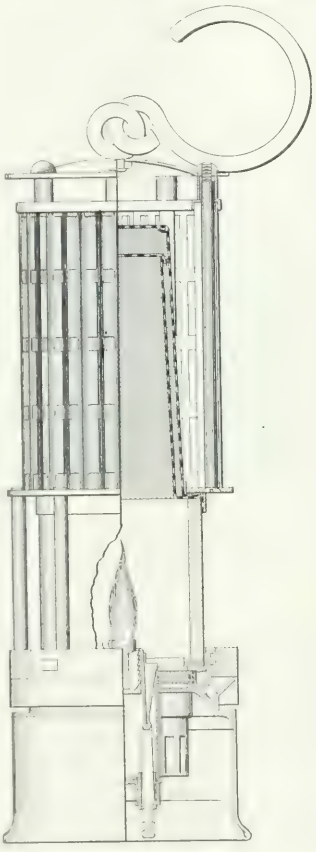
use, the oil vessel is made of one piece of steel pressed cold, and when finished it [illegible] which the top cover containing the wick, igniter and filling apparatus is fixed, and the vessel filled with specially prepared cotton-wool (2½ ounce, which has a maximum absorption of 30 drams). The wick is brought to the bottom of the vessel, and is so regulated by the wick adjuster that it is impossible to obtain a smoky flame. It is necessary, before this can be attained, to burn a lamp, when first it is used, for a few minutes, and then the lamp attendant will determine how much wick should be left above the wick tube, so as to afford the maximum of light without smoking.

The friction igniter consists of a metal box fitted with a scratcher and a hinged door, to the outside of which is attached a thumb spring for fixing it into position. The pull bar, to which a scraper is connected, is placed (after the igniting strip is fitted into position) so that the scratcher and scraper come together, causing an ignition of the cap on the strip, and thus the wick is lighted.

Oil Supply

To fill the oil vessel, so that only sufficient benzine is absorbed by the cotton-wool (so that no [illegible] be left unabsorbed in the vessel, an automatic filling apparatus has been introduced; it is fitted with one or more taps, as may be found necessary. A glass reservoir is placed above the tap, with a capacity of 2 oz. (slightly more than the maximum absorption of the cotton-wool), and at the top a brass tube is inserted, extending on the outside to near the top of the tank; it is then bent and brought downward to the mouth of the tap. As soon as the cotton-wool has absorbed sufficient benzine, air rushes up the tube and prevents any further flow; and, consequently, should an oil vessel, containing, say, 9 drams, be put under the tap, only 21 drams more will be added before charging is automatically stopped. The top of the tank is provided with a safety-valve and inner cylinder, covered with wire-gauze (784 meshes per sq.in.) which allows any excess of air and vapor to escape. The larger apparatus, fitted with two or more taps, is placed on a cast-iron stand, and is additionally provided with a glass gage, a wing-pump, and circular stands, carrying the oil vessels, and these are, by a lever and counterbalance weight, brought up to [illegible] right for filling. The wing pump is attached by a pipe ½ in. in diameter to the storage vessel placed adjacent to the lamp room, so that the attendant never needs to handle the liquid. The capacity of the tanks varies from 9 to 10 gallons.

To insure the safe locking of the lamp the oil vessel is provided with two threads, with a maximum thickness of ⅛ in., in which three apertures are cut; into these the anchor head of the magnetic lock successively falls, when the parts of the lamp are fitted together, three distinct clicks being heard.



WOLF SAFETY LAMP

Method of Assembling

The standard brass ring contains the magnetic lock, which is dust-proof. The air-inlet ring is fitted with double wire gauze, and for fixing the same firmly against the glass cylinder it is provided with two small projections, which are forced by a circular key through small slots in the standard ring, upon which they ride and are turned back to the check [illegible] upon the ring. Perpetual washers are used for all joints, and they have been found to be more durable than asbestos.

Inside the top ring supporting the bonnet a series of strong steel springs is fixed; they hold the glass firmly in position and are of such a tension that they take up the little expansion of the glass that takes place while the lamp is in use. The bonnet is made of seamless steel, pressed cold, and is treated in a similar manner to the oil vessel. Both the inner and outer gauzes are fitted with fixed copper rings, which insures that their normal shape will be maintained while being cleaned. The inner gauze is 4 in. high, 1¾ in. in diameter at the base, and 1⅜ in. in diameter at the top. The outer gauze is 4¼ in. high, 2¼ in. in diameter at the base, and 1½ in. in diameter at the top. It will thus be seen that there is a space of ¼ in. between the tops of the inner and outer gauzes and ample clearance at the sides; and, as the five standards or poles are only brought up to and fastened to the bonnet ring, an air space is thus provided, keeping the lamp cool.

Efficiency

It is essential that a safety lamp possess the attribute of safety under the known conditions met with in mines. The Wolf lamp will withstand a velocity of 47 ft. per sec. in an explosive current; the usual velocity in a main intake is, say, 12 to 15 ft. per sec., and round the face, say, 5 to 8 ft. per sec. Of course one may get a velocity of 90 ft. per sec., when cages are running in an upcast shaft; but no safety lamp yet manufactured can withstand such a velocity, excepting an electric lamp.

The Wolf safety lamp is capable of detecting as low as ¾ per cent. of fire-damp. It is fitted with a flat wick ⅝ in. wide and gives a light equal to 1.43 c.-p., and, fitted with a round wick, it produces a light of 1.02 c.-p. The time of burning of this lamp is 16 hours when fitted with a flat wick and 20 hours when fitted with a round one.

Remembering that a lamp fitted with a flat wick ⅝ in. wide, when fully charged with 30 drams, burns 16 hours, therefore, while burning 9 hours it will consume 16.88 drams during five days; and, at 14c. per gallon, the cost will be 92c. per lamp for a week of five shifts. With a round wick this cost is reduced to 74c. per lamp for five shifts. The oil vessel will only require to be loaded with the maximum charge 2.81 times during the five shifts for a wick ⅝ in. wide and 2.25 times for a round wick. The life of the cotton-wool is considerable, it having been known to last 14 years.

The Courriéres disaster on March 10, 1906, would not have been so appalling if those who survived the explosion had been able to relight their lamps. The colliery is now equipped with 4000 Wolf safety lamps.

The Problem of Educating Employees

By W. E. Joyce*

After [illegible] years of existence the Jeddo Literary Club has disbanded and the library collected during that time, its furnishings, bric-a-brac, and club-house equipment are now being offered for sale.

For mining men everywhere there is much of interest in this announcement. The Jeddo literary organization was originally promoted by John Markle, managing partner of G. B. Markle & Co., the Jeddo coal operators, and now the largest individual shippers in the anthracite region. The passing of the literary club marks the decay of an ideal, and it is quite safe to predict that the effort will not be repeated by others in the coalfield when it comes to exercising philanthropy.

John Markle had fixed ideas about trained and educated workmen. He conceived the idea many years ago that if the mine owner could surround himself with men fairly well equipped mentally, or educated men, he must necessarily succeed in his mining by reason of better workmanship, better results in general, while the class of citizens would supply a standard for mining communities that would make of the coalfield a very desirable place in which to live. This theory is still held by some mining men who take another means for promoting.

The Lesson of Experience

John Markle has found in practice and by direct contact with mine employees, that the idea of holding an educated laborer in your employ is impossible. He has found more than this; he is convinced that interference by the mine owner with the plans of employees, such as assisting in their entertainment and culture will never be accepted in the spirit in which it is given. During the past week an order was therefore issued by the Markle company withdrawing the privilege granted twenty years ago to the Jeddo Literary Club, the use of a building with conveniences. This is the first step in severing social relations, which, it was fondly hoped, would make the Markle mining corporation an Arcadia in the industrial field, beyond the reach of the labor agitator, and which would insure tranquility and mutual happiness during the life of the mining community.

The first jolt sustained by Mr. Markle which materially shook his faith in such a scheme came in 1900, when a general strike was ordered by the United Mine Workers in the anthracite coalfield. On the date named by the union for suspension, there was an almost unanimous withdrawal of workers from the mines of the three anthracite districts. Here and there a mine continued to defy the order and efforts of the labor leaders. The one conspicuous exception to the general suspension was found at Jeddo, where the Markle mines continued at work almost to their full capacity. President Mitchell saw at once that there was trouble ahead for his scheme of winning the strike if such an important shipper continued to market coal while his army in the Wyoming and Schuylkill fields was faithful to the command. He did not then understand why there was hesitancy shown at Jeddo, and to overcome the difficulty he personally went into the Jeddo district. Then it was learned that years before the workers and the operators of the Jeddo mines had entered into a mutual agreement which bound the men to remain at work until efforts at arbitration had failed.

President Mitchell and Manager Markle debated the issues from the same platform, and for the first time the labor leader learned that he would be compelled to do some elastic stunts in reasoning because arbitration then was the great issue for the union, as it bore upon the other operators. By the force of his appeals Mr. Mitchell did justify a repudiation of his own argument, at least, to the satisfaction of his followers, and the Markle mines were forced to suspend as a result.

Abandoned Theories

Up to that time Manager Markle had implicit confidence in his scheme to surround himself with educated workmen, and in their loyalty when it came to an issue between the labor agitator and his company. He had not only been active in providing club houses for the workmen, but had gone into the public schools. The best teachers available were secured for the Jeddo schools. He was a director of the borough board, and saw to it that the teachers received every needed encouragement.

After his failure to hold his men by the exercise of a supreme effort he concluded that he had been theorizing wrongly. He was ready to recede from his position. The strike cost the Jeddo company a large sum in dollars and cents, but it is doubtful if the monetary loss proved so keenly disappointing as did the realization of failure of his scheme to cement bonds of loyalty between mine owner and men that would resist the blandishments of the demagogue or appeals of the warmest organization champion.

The conclusions adduced found no fault with the men but with the idea he had himself evolved. He was convinced that the laboring man had his own ideas about liberty, and such ideas could not be changed by the employer. A strictly business relation alone should exist, and this system henceforth will be followed at Jeddo. The years of labor, however, have not been spent in vain as far as effects upon the property are concerned, and as compared with other mines. The Jeddo operations are admittedly the best equipped and best manned of any in the anthracite region. It needs only a glance at the output and report of the State inspector to show that production to the percentage of employees places Jeddo in the front rank, while the system obtaining there, and the discipline among the men come as near the stage of perfection as it is possible to find in the mining district.

*Freeland, Penn.

Work Mining and Milling Company

In the report of the Work Mining and Milling Company for the year ended March 31, 1906, the statement is made that important discoveries were made, by lessees in the Little Clara claim, of an orebody from which 12,884 tons of ore were shipped yielding $842,748 gross and $137,864 net after deducting freight and smelter charges and royalty.

Of this amount $75,000 was paid in dividends, leaving a balance of $73,724 in the treasury.

It was decided by the board of directors to grant a new lease for 2½ years on the expiration of the present lease of the Little Clara claim. The successful bidder was A. E. Humphreys. The financial statement follows:

Receipts from ore	$856,068
Balance, April 1, 1906	14,735
Interest, etc.	838
Total receipts	$871,636
Sampling and treatment	$110,278
Freight and haulage	18,711
Payment to lessees	557,071
Management at mine	1,110
Salaries and office expenses	2,684
Miscellaneous	567
Total expenses	$720,821
Dividends paid	75,000
Total disbursements	$795,821
Balance, April 1, 1907	$75,815

Development is being done by six sets of lessees operating on other blocks of territory, but no important discoveries have so far been made.

In French patent 368,755, Aug. 9, 1906, N. Lecesne describes the industrial manufacture of zinc soaps. A suitable quantity (from 0.25 per cent.) of oleic acid or other fatty acids is mixed and thoroughly incorporated with zinc oxide and a little water, the fatty acids being used either pure or diluted with boiled oil. The resulting zinc soap can be mixed into an emulsion with raw or boiled oil, and the emulsified oil will then form a thick paste with zinc oxide or other pigment, and the constituents will not separate even on prolonging standing. It is claimed that in this way the covering power and qualities of resistance looked for in lead pigments are imparted to zinc oxide.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

The diffusion of fire damp in a mine is much more rapid than that of the carbon dioxide or after damp.

Wash-houses are required by law in Nova Scotia at every mine employing more than 12 men underground. The best practice seems to be to have concrete floors and to utilize exhaust steam to heat the wash-house.

Most of the coal mines of northern Cape Breton are submarine workings extending in some cases a mile from shore. In order to make the workings as safe as possible, the law requires that no seam shall be worked under less cover than 180 ft. of solid measures.

It has been found that the average ton of coal burned for steam-making purposes equals two tons of dry peat; 2⅜ tons of average dry wood; 2¾ tons of dry tan bark; 2⅞ tons of cotton stalks; 3½ tons of barley and wheat straw; 7 tons of wet tan bark; 0.44 ton of natural gas, or about 30,000 cu.ft., and 0.55 ton of petroleum.

In working a seam of coal by the pillar-and-stall system, the proper size of the pillars depends to a great extent, on the depth of the seam from the surface and the strength of the roof and floor. For a seam 200 ft. deep with fairly good floor and slate roof, 26-ft. pillars and 24-ft. chambers is the practice in the anthracite field.

A 15,000-lb. electric locomotive, with the current commonly employed, will run at a speed of from 6 to 10 miles per hour, and exert a draw-bar pull at full running load of 2100 lb. when the haulway is level; on a 1 per cent. grade, the draw-bar pull is 1950 lb.; on a 3 per cent. grade, 1650 lb.; on a 5 per cent. grade, the draw-bar pull is approximately 1350 lb.

The advantages which result from using a jet condenser are the low first cost, the fact that it occupies less space, and its high efficiency. The heat lost by radiation is small, but the water used must be pure so as to be available for feed-water purposes; while the water used for the surface condenser need not be so pure, as it does not go into the feed water.

A recent investigation instituted to compare a disk machine and a chain-breast mining machine showed that the latter requires about 30 per cent. less power, made only half the noise, and would not climb up or down in the coal. On the other hand, such a machine requires about 12 ft. of space between the face and the timbering, and this cannot be provided in many coal mines at present.

The Colorado Fuel and Iron Company maintains a sociological department for the purpose of bettering the social conditions of its employees. Among the betterments it has introduced are public schools, good teachers, free text-books, model dwelling houses, reading rooms, club houses, wash-houses and the excellent central hospital at Pueblo.

The Luzerne county commissioners have fixed the valuation of coal in that Pennsylvania region at $67 per ft. acre, after considering the question for a number of weeks. The city assessors for the city of Wilkes-Barre fixed the value this year at $100 per foot acre. This action is the most important of the moves incident to the readjustment decided upon. The companies have appealed on the ground that the rate is too high.

The Dominion Coal Company in Canada maintains a series of fire brigades at each of its collieries. A number of the best men are chosen for membership, and they are given comfortable quarters in one of the colliery buildings, where they may smoke and spend their evenings. Interest is further aroused by frequent contests between the different brigades in relay racing, hose reeling and coupling contests for a prize offered by the coal company.

In stripping an anthracite-coal seam, cableways are sometimes used in removing the wash and loose rock deposits over the coal. The cost of transporting the overburden varies with local conditions and also depends upon the distance to which the waste is carried before dumping. This cableway can also be used when mining coal. In practice the maximum length of a single span is 1200 ft.; loads 6 tons, traveling speed 750 to 1000 ft. per min.; speed of hoist, 200 to 300 ft. per minute.

One statistician estimates that the total coal area in the United States is approximately 400,000 square miles with an average thickness of 6½ ft. The total amount of coal under the above conditions would be 1,500,000,000,000 tons. In 1905 we used nearly 393,000,000 tons, and in 1906 about 410,000,000 tons. In all we have used, in round figures 6,000,000,000 tons, so that the total area worked out is a little less than 1,000,000 acres up to the beginning of 1907. At the rate of production during the past few years, the supply of coal in the United States would last about 4500 years, according to this estimate.

Experience has shown that the angles at which props should be set depends on the inclination of the seam. The higher the pitch of the seam the greater the angles of props. The following are the results of careful observations:

Pitch of Seam	*Under set of Props*
5 deg.	0.5 deg.
10 "	1.0 "
15 "	1.5 "
20 "	2.0 "
25 "	2.5 "
30 "	3.0 "
35 "	3.5 "
40 "	4.0 "
45 "	5.0 "
50 "	6.0 "
55 "	7.0 "
60 " and over	8.0 "

A practical mine track-layer imparts the following advice: In laying mine rails the ties should be carefully spaced, about 2 ft. center to center. The rails should be well spiked to the ties with 4 spikes per tie. The joint of two rails should be midway between the two joints on the opposite rail. In locating spikes care should be taken so that they are not all in the center of the ties, otherwise, it will cause a tendency to split the ties. The dimensions of ties should be 5 in. face, 4 in. deep and 5 ft. 6 in. long for narrow gage, rails should be 16 to 20 lb. per yard. For gangways and mechanical haulage roads, ties should have a 6 in. face and be 5 in. deep, while the rails should be 35 to 40 lb.

The first consideration in constructing siphons is that the pipes and joints should be made in such a way as to prevent inward leakage of the air, otherwise the apparatus is useless. They should be laid as regularly as practicable, either vertically or horizontally, because if not regular, the air which cannot be prevented entering along with the water will accumulate at the highest points and thus destroy the action. Provisions should be made for charging the siphon at the beginning, and sometimes, when so much air has entered as to injure the work. To do this a tap is placed at the discharging end so that it may be closed and opened by hand and a light clack is placed in the pipe at the feed end. The clack will open and keep it open when the siphon is at work and close when the top is shut at the discharging end, so as to keep the siphon charged when not working. The maximum hight the water will rise in a siphon is 27 feet, but in practice this seldom exceeds 21 feet.

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The Average Price of Copper in 1906

All of the ... lish detailed reports of their operations, now having made their statements to their stockholders covering the year 1906, in accordance with our usual custom we make comparison of the prices actually received for their output of copper during the year with the average for the year as shown by the market reports of the JOURNAL. Omitting the few companies which did not begin to produce until the latter part of the year, or greatly increased their output during the latter part of the year, when the price rose so largely; and omitting the Atlantic, which produced only a portion of the year, the following table shows the figures given by the Lake companies, which have published their reports:

RECEIPTS OF LAKE COPPER COMPANIES, 1906.

	Pounds.	Value.	Per Lb.
Adventure ...	1,[illegible]728	$[illegible]82	18.8[illegible]
Allouez ...	4,[illegible]00	[illegible]565	19.145
Baltic ...	14,387,557	2,742,403	19.05
Centennial ...	2,[illegible]015	439,516	19.51
Champion ...	16,[illegible]486	3,231,329	19.06
Isle Royale ...	2,[illegible]008	392,468	18.81
Mass ...	2,106,[illegible]	411,[illegible]	19.[illegible]
Michigan ...	2,[illegible]811	568,899	19.77
Mohawk ...	12,[illegible]515	2,[illegible]809	19.60
Osceola ...	18,388,[illegible]	3,511,958	18.89
Quincy ...	16,[illegible]585	3,157,[illegible]	19.[illegible]
Tamarack ...	[illegible]852,444	1,853,453	18.85
Trimountain ...	[illegible]567,[illegible]	1,[illegible]745	18.[illegible]
Total ...	113,411,645	$21,744,098	19.146

The average price for Lake copper in 1906, as reported by the JOURNAL, was 19.616c. per lb. The average actually received by 13 companies, producing 113,411,645 lb., or a little more than one-half of the total production of the Lake Superior region, was 19.146c. per lb. The highest price received was 19.77c., which was realized by the Michigan on a small output. The Mohawk received 19.60c. for a comparatively large output, while the Mass, Centennial, and Quincy, each received about 19.50c.

The great variation among the prices received by the several companies, and also between their own averages and ours, is extraordinary. There is always a variation among the averages of the companies, because all of the copper is not of the same grade; it is not all sold with the same skill, and mistakes are often made in forecasting the market. In 1906 some of these factors were exaggerated, and some were conflicting. In the early part of the year, when there was a decline in the market, some companies continued to sell copper, while others withdrew from the market, and did not sell any at all. In the latter portion of the year, when the market was rising, nearly all of the companies sold ahead, though for different periods. These factors are natural ones which always exist, but a comparison extending over a whole year, for a number of companies, and a reduction to a general average tend to equalize the variations. In this respect, however, 1906 was an exception, owing chiefly to the intensification of some of the conditions mentioned above.

Another Smelter-smoke Decision

Another decision bearing upon the troublesome smelter-smoke problem has been rendered, the Supreme Court of the United States having held, May 13, that the State of Georgia has the right to protect its forests, and that the Tennessee Copper Company and the Ducktown Sulphur, Copper and Iron Company can be enjoined from operating their smelting works in such a way as to cause damage to property in the State of Georgia. The works of the Tennessee Copper Company are about one-fourth of a mile distant from the State line; those of the Ducktown company are a little farther away. The text of the decision is not yet available, wherefore it is premature to discuss what effect it may have upon similar litigation elsewhere. The companies fought the case on constitutional grounds, arguing that the State of Georgia had no right to bring suit where individual citizens alone were concerned. Apparently, the Supreme Court did not take that view, holding rather that a State has the right to protect its citizens when their property is subject to damage by operations conducted in another State. Inasmuch as the decision involved such broad constitutional grounds as the relationship between sovereign States, it is likely that the decision in this case, or, at least, portions of it, will have no bearing upon similar litigation in the West. So far as we are aware, the only other smelting works in the United States which are operated under precisely parallel conditions is that of the Orford Copper Company, at Constable Hook, N. J., the smoke from which frequently blows across the Kill van Kull into the State of New York; however, in this case there is no litigation, although there is considerable complaint against the nuisance.

We understand that neither of the smelting companies in Tennessee will be immediately affected by the decision, it

per Company has been for a long while engaged upon the construction of a sulphuric acid plant, which will take care of a large portion of the sulphurous gas which heretofore it has been discharging into the atmosphere. It is hoped that this plant will be ready to go into operation during the coming summer, after which the gas discharged will be so much reduced in volume that the atmospheric dilution will prevent it from being any longer a nuisance. So far as we are aware, the Ducktown company has not yet made any plans as to this matter. Both these companies are singularly fortunate, as compared with those at Salt Lake City and elsewhere, in that they are situated in a portion of the country where there is a large market for sulphuric acid. Thus, the Tennessee Copper Company, under the able technical direction of J. Parke Channing, its president, has already entered upon this efficient means of disposing of sulphurous gas upon its own initiative, as a strictly commercial step. However, this has required careful study, and a good deal of time for the development of the plans, inasmuch as the company is boldly entering upon a new departure in the manufacture of sulphuric acid, namely, the utilization of the gas discharged by pyritic-smelting blast furnaces. The scheme is undoubtedly feasible, as the management of the company is distinctly convinced; but, nevertheless, its boldness in trying it for the first time in the world deserves proper recognition.

Paternalism in Engineering

In discussing the question of the utilization of black sand, which we raised in our [illegible] communication was published recently, and another whose letter is printed in this week's issue, inquire why the work inaugurated by the Geological Survey and carried to a certain point should not be further extended by the Survey, exception being taken to our remark that such extension would be outside of the province of the Survey. The reason is simply that the American people are not yet prepared to go so far in Government paternalism in engineering.

The prime function of a government is to govern. The civilized world in general has departed more or less from that fundamental idea, but it is still conceived to be a wise policy that a government should not undertake work that the people can and ought to do for themselves. Confining our remarks to the U. S. Geological Survey, it is well recognized that it has far exceeded its natural purpose of conducting a topographic survey of the interior of the United States and making such studies in geological science as are required to determine the value of the public lands. No one will criticize the immense value of the services that the Survey has rendered, or will desire to limit its scientific investigations to narrow lines, although it may be pointed out that it has in some instances improperly and unwisely encroached upon the field of the geological surveys of the several States, but the Survey has been severely criticized in the past for its ventures into the general field of engineering, and for many years has not overstepped the line. The coal investigation and black-sand investigation were made by the direct order of Congress, as special investigations, and of course Congress, as the representative of the people, has the right to do whatever it pleases within the limits of the Constitution. If Congress should order the Geological Survey to go further in the black-sand matter, it would do so, but otherwise it will not and cannot because the engineering part of the problem is outside of its province.

It is unnecessary to discuss at any length the objections to paternalism in industries. There is no more reason why the Government should undertake to show the people of this country how best to mine black sand than there is why it should attempt to show them the best way to manufacture shoes, weave cloth, design automobiles, or do other useful things. We have a great and growing engineering profession, whose business it is to promote industrial development. The history of the United States, as well as of the rest of the civilized world, shows that this body has been efficient. There is no reason why the Government should encroach on the field of private effort. It would be wrong to do so. Some governments have gone further than others in this sort of paternalism. Some of the immediate results are demands for bounties on production and miscellaneous scandals. The recent experience wherein statements of the U. S. Geological Survey in connection with its black-sand investigation were circularized by an impudent private company as an indorsement for the sale of stock is an example of what would happen; and is quite sufficient to keep the Geological Survey out of further contact with commercialism, at least in that particular line.

Charles Haynes Haswell

Charles Haynes Haswell, who died on Monday of this week in his ninety-eighth year, although never personally active in mining, was a friend in need to many a mining engineer. His "Mechanics' and Engineers' Pocket-book" has been the companion and guide of thousands engaged in mining operations. That pioneer of those collections of concentrated facts, which have since become indispensable in the various specialized branches of engineering, passed through 75 editions in the original language and has been translated into 69 foreign tongues.

Mr. Haswell's life bears testimony to the healthfulness of engineering pursuits. During his long and active life he saw the remarkable engineering development of the past 80 years, the most active industrial period in the world's history. He began the construction of steam engines in 1827 and joined the United States Navy as chief engineer in 1836. Although his more important labors were connected with marine engineering, his activities extended to other fields. He built many public works about the harbor of New York, and the development of the steam engine owes much to his efforts. He designed the machinery for 10 United States war vessels and in 1847-48 he drew up the plans for the entire boiler and engine equipment of the steam frigate "Powhatan," personally designing every detail and making all the working drawings with his own hands.

He wrote many treatises on engineering subjects and was the author of a number of papers of a more popular character, among others of "Reminiscences of an Octogenarian of New York, 1816 to 1860." He was in active service as a consulting engineer until his death, tall and erect, a commanding figure, and was always proud of the title "engineer."

Metallics

Saws to be used [illegible] and [illegible] sets

The miner who continually complains of the other shift frequently, and almost always, requires investigation himself.

A miner caught hiding tools should be dismissed. He not only keeps others from using the tools that he has hidden, but when he leaves, the tools are almost sure to be lost.

A stope where all the miners are friendly will accomplish more than one divided into factions, unless one can induce a healthy rivalry in regard to the amount of work done.

The shift boss should be a good enough miner himself to be able to make a pretty good guess at what is a day's work at each place. The ground broken by the miner, the rock put in the box by the mucker, shows whether a shift's work has been done or not.

The Joplin district is now supplied with natural gas, piped from Southern Kansas. For burning under boilers, the gas is supplied at 10c. per 1000 cu.ft.; for use in gas engines, the price is 25c. per 1000 cu.ft. In either way, great economy is realized as compared with coal in the old practice.

The dynamo made electrolytic copper both possible and necessary. The consumption of copper required in the generation and transmission of electric power has many times exceeded the output obtainable from the few sources of the native metal which yield a product of satisfactory conductivity without electrolytic treatment.

In reply to an inquiry: In the purchase of ore the "unit" is 1 per cent.; consequently, in the case of the ton of 2000 lb. it corresponds to 20 lb., and in the case of 2240 lb. to 22.4 lb. A lead ore containing 30 per cent. lead, to be paid for at the rate of 40c. per unit, would be worth $12. A pyrites containing 40 per cent. sulphur, to be paid for at the rate of 11c. per unit, would be worth $4.40.

The temperature coefficient of electrolytes is large and varies with the temperature. The practical effect of the change in temperature upon the resistance is rather complex. The transfer resistance exhibits a very large temperature coefficient, while the contacts and metallic conductors are not appreciably affected. The resultant coefficient figured from the switchboard is approximately 0.5 per cent. per degree Fahrenheit.

Contact resistances in electrolytic copper refining are met with at the joints in the main bars and at the connections between bars and electrodes. The joints in the main bars should be equal in conductivity to the bar itself. This standard can easily be attained if the bars are properly faced. Three or four hundred amperes per square foot of bottom [illegible] give no trouble. The contacts between the electrodes and the main bars are variable. A single contact will run from 0.000005 to 0.0005 ohm, according to the cleanness of the engaging surfaces and the pressure.

In small, irregular veins the leaser can invariably do better than the company. He has a keener scent for ore than the average foreman; he is free from administrative expenses; he takes risks that the company can not; and when the mine is in *borrasca* he will work for less than the regular wage in the hope of recouping himself when the mine comes again in *bonanza*. There is many a mine in the United States which has been unprofitable under company management and has become profitable when turned over to leasers.

European smelters, in buying zinc ore, take as the basis the price for spelter (average for good ordinary brands) at London, as reported by the *Public Ledger*, during the month of the arrival of the shipment. In the case of contracts covering the output of a year or more, it is sometimes provided that the settlement basis shall be the average price of spelter for the year. Provisional settlements are made on the monthly averages, but at the end of the year a final computation is made and the difference between it and the sum of the monthly settlements is debited or credited as required.

Most accidents from drilling into missed holes occur in development work and very seldom in stopes. From the nature of overhead stoping it is generally easy to judge where to look for a missed hole; generally the fuse, still in the hole, renders it impossible not to notice it. A rough diagram of the cross section of the winze, shaft, raise or drift can be drawn by any miner. By means of a small circle and an arrow, whose direction indicates that of the hole and whose length the relative length of the hole, the position of the holes can be easily and clearly indicated. Such a card enables any miner to see quickly whether all the holes have been fired or not.

Transfer resistance is the name which has been given to a liquid resistance, the nature of which is not fully understood. If we make a series of measurements of the voltage drop between a pair of electrodes at varying current densities, Ohm's law requires that a current-voltage plot should be a straight line. Where this line cuts the ordinate of zero current is a measure of the counter electromotive force present. If we analyze the results, however, we shall find that the indicated specific resistance of the electrolyte is higher than it should be, and that the discrepancy is greater the nearer were the electrodes spaced during the measurements. The most probable explanation seems to be that there are minute bubbles of gas in [illegible] oxygen. The transfer resistance is greatest in the high-acid electrolytes and at low temperatures. Its practical effect is to reduce the gain to be expected by spacing electrodes close together and from increasing the acidity of the electrolyte, and to increase the gain to be expected from heating the electrolyte.

In the purchase of zinc ore, the terms offered by European smelters include various provisions, which must be given consideration. The basis of settlement is always c.i.f. at some specified port, usually Antwerp. A percentage of the value of the consignment, say 75 per cent. or 80 per cent., may be drawn upon remittance of the bill of lading; the remainder upon arrival of the consignment, and determination of its assay value. In connection with the latter, the zinc must be determined by the Schaffner method (sodium sulphide titration). Differences of one unit or less between the assays of the buyer and seller are split. Differences in excess of one unit are umpired. The umpire must be an European chemist (specified in the contract). His result is accepted as final if it fall between those of the buyer and seller. If it fall outside, the original assay which is nearest to the umpire's is taken. The party whose assay is furthest from the umpire's pays the expense of the latter. These conditions as to umpire-assays are the same as obtain in the settlement for ores in the United States.

When the pay streak is narrower than the minimum width of efficient stoping, say 3 ft. 6 in., the cost of production per ton of ore increases directly as the width of the pay streak decreases. If for example we should have a pay streak of solid blende 12 in. wide and 30 in. of quartz beside it, all of which would have to be removed in stoping, a square foot of vein would yield (assuming clean separation of the minerals to be possible, which, however, would never be entirely practicable) 1 cu.ft. of blende weighing about 250 lb., and 2½ cu.ft. of quartz weighing about 412.5 lb., wherefore out of every ton of material broken there would be obtained three-eighths of a ton of blende, and if the cost of mining per ton of material were $3, the cost per ton of blende would be $8. If the blende assayed 60 per cent. zinc, the mining of a 12-in. streak would be equivalent to the mining of a 3½-ft. streak assaying 22.5 per cent. zinc, but the solid streak would have the advantage of avoiding the milling expense. The ultimate comparison, however, would depend greatly upon the cleanness with which the ore could be broken down and handled. In the case of ore which must be milled, the cost of production per ton of concentrate is obviously dependent chiefly upon the yield per ton of crude ore and the cost of mining the latter.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Utilization of Black Sand

I have read with interest the articles on black sand that have appeared from time to time in the JOURNAL. Your editorial in the issue of April 13 especially appealed to me, for I believe you have sounded the keynote of the problem, upon the solving of which alone depends the success of the now failure-ridden black sand operations.

It has been my privilege to give this subject much study and investigation during the past two years, and I have as yet failed to find a single operation that met with any degree of success, or, with the possible exception of a stock company or two using doubtful methods, that even claimed any degree of success.

That it is a topic of vital interest to the mining public I am prepared to say, for I have personally interviewed hundreds of mining men and miners on the subject, and received hundreds of letters from like sources. They all say and write practically the same thing. The placer miner: "How can we economically save the black sands that we know are carrying away a large, or the larger, proportion of our values?" The prospective beach and placer miner: "How can we economically obtain a first low-grade concentrate suitable for further treatment by known successful methods that will make our now worthless properties pay?"

Character of the Sands

That there are millions of dollars in gold and platinum metals distributed along the beaches and rivers of the Pacific slope is a well known fact to all who have given the subject the least attention. The problem of saving these values, however, has not been solved, and your statement that it is a problem of obtaining a rough black sand concentrate at low cost is, in my opinion, the whole problem.

The United States Geological Survey, in the black sand investigation conducted in Portland, has proved beyond a doubt that the ordinary concentrating table, aided by magnetic separation, could produce a very rich and marketable product from the heavy sluice and riffle sands and cocoa matting material, but it has not entered into the greater problem of obtaining these sands commercially.

You have solicited ideas and information from your readers as to what they consider the best means of approaching the problem. Personally it has not been my privilege to experiment along these lines at all, nor can I say I have consistently followed the experiments of others; hence I would refrain from speaking of the various methods that have come within my observation, many of which I know are and have been of great value and aid in regular placer and dredge operations as a small side issue.

What I would say is this: Is it not a matter of enough vital importance, not only to the placer miner, but to all users of the metals produced, that this problem be given consistent experimentation? The United States uses more platinum than all nations combined, yet this country is looking to the foreign countries for its supply when it has tons within its own borders.

A Problem for the U. S. Survey

Again, is it not a matter of enough importance for us to insist that it is the duty of the mining department of the U. S. Geological Survey to enter upon such consistent experimentation? The survey has brought these demands upon its own head; it has shown to the miner, and to the world the wonderful values scattered along the western beaches and rivers. This knowledge has created the desire to be shown how these values can be obtained. Such experimentation is of too general benefit, and has a scope too large for even the richer mining operators to undertake. A mining concern would have the benefit of the advice of an engineer or two, while the Survey has access to the combined skill and advice of the best engineers and mechanics throughout the country.

I believe the JOURNAL could do nothing of more general benefit to the mining and metal-using public than take the lead in these demands upon the Survey, and in so doing would add another laurel to the many it now holds. FRED H. HAZARD.

Portland, Ore., April 22, 1907.

Concentration of Manganese Ores

I read with considerable interest E. K. Judd's article in the JOURNAL of March 9 on the "Crimora Manganese Mine." It appears that the jig concentrates are obtained in four sizes, of which the largest is not greater than 5/8 in. It would be interesting to know the composition of these concentrates and the way in which they are used. In India all ore of such small size is at present thrown away, no doubt owing to the ease with which large quantities of lump ore can be quarried. But if the miners knew that there was a market for smalls they might endeavor to save them.

Mr. Judd also mentions the quartzite conglomerate, of which the cementing material is manganese oxide, as being stored for a possible future market. Details as to how material containing such a small percentage of manganese and such a large percentage of silica could be profitably made use of, together with the points I have raised in connection with the jig concentrates would form the subject of an article that would probably interest a large number of your readers.

L. L. FERMOR.

Geological Survey of India Calcutta, India, April 18, 1907.

Mining Reference System

Is there any practical, topical classification for mining and mining engineering references, to be used in the form of a card index? If there is, we should be glad to know of it. N. E. B.

May 8, 1907, Binghamton, N. Y.

We do not know of any such classification that has been published, but the following might be used.

I. Boring.
   a Churn drills. *b* Rotary drills. 1. Diamond drills. 2. Calyx drill.

II. Breaking Ground.
   a Hand tools. *b* Machine drills. 1. Standard air drills. 2. Air-hammer drills. 3. Electric drills. *c* Air compressors and air transmission. *d* Channelling machines. *e* Coal cutters.

III. Explosives.

IV. Support of Excavations.
   a Timber. *b* Metallic. *c* Masonry.

V. Methods of Mining.
   a Overhand stoping. *b* Underhand stoping. *c* Mill-hole. *d* Caving. *e* Room and pillar. *f* Long-wall.

VI. Surveying.
   a Surface. *b* Underground.

VII. Haulage.
   a Tramways-Underground. 1. Hand. 2. Horse and mule. 3. Electric. 4. Compressed air. 5. Rack-rail. 6. Mono-rail. 7. Shaking chutes, etc. *b* Tramways. 1. Surface. 2. Aerial.

VIII. Hoisting.
IX. Pumps.
X. Ventilation.
XI. Lightening.
XII. Placer Mining.
[illegible] Ordinary [illegible] Hydraulic [illegible]
Dredging.

Treatment of Tonopah Ores

My attention has been called to an error in an article entitled "Treatment of Tonopah Ore," in the JOURNAL of April 27 1907. The experimental work which led to the adoption of the process for the treatment of the Montana Tonopah ore was performed by me as the company's metallurgist. The general outline of the milling scheme was drawn up by me and not by Mr. Bosqui as stated and I think Mr. Bosqui will make no claim to the credit. By agreement the Montana Tonopah company pays me a bonus for the process which has been adopted.

F. M. FIELD.

Rhyolite, Nev., May 7, 1907.

Assay of Copper Ores for Precious Metals

The method given by A. R. Crook on page 853 of the JOURNAL has one objection, namely, the addition of salt solution to the nitric-acid solution which also may contain free sulphuric acid.

I note that Mr. Crook takes care to have his solutions very dilute, but even in the cold and in dilute solutions, nitric acid will act on salt, forming hydrochloric acid, and this with the excess of nitric will form aqua regia in sufficient quantity to attack some of the finely divided gold which occurs in copper ores.

I prefer to filter off the gold residue and to precipitate the silver from the filtrate, then add it when filtered to the gold residue and fuse the two together in the same manner as Mr. Crooks describes, in a crucible.

HENRY WATSON.

Chicago, May 7 1907.

Legal System of Mine Bell Signals in California

The California State Mining Bureau furnishes copies of the act establishing a uniform system of mine bell signals in that State. The law makes the use of the following signals compulsory in all mining operations:

1 bell, to hoist (See Rule 2.)
1 bell, to stop if in motion.
2 bells, to lower. (See Rule 2.)
3 bells, man to be hoisted; run slow. (See Rule 2.)
4 bells, start pump if not running, or stop pump if running.
5 bells, send down tools. (See Rule 4.)
6 bells, send down timbers. (See Rule 4.)
7 bells, accident; move bucket or cage by verbal orders only.
[illegible]
2—1—1 bells, done hoisting until called.
2—1—2 bells, done hoisting for the day.
2—2—2 bells, change buckets from ore to water or *vice versa*.
3—2—1 bells, ready to shoot in the shaft. (See Rule 3.)

Engineer's signal, that he is ready to hoist, is to raise the bucket or cage two feet and lower it again. (See Rule 3.)

SEC. 2. For the purpose of enforcing and properly understanding the above code of signals, the following rules are hereby established:

Rule 1. In giving signals, make strokes on bell at regular intervals. The bar (—) must take the same time as for one stroke of the bell, and no more. If timber, tools, the foreman, bucket or cage are wanted to stop at any level in the mine, signal by number of strokes on the bell, number of the level first before giving the signal for timber, tools, etc. Time between signals to be double bars (——). Examples:

6——5 would mean stop at sixth level with tools.

4 - —1 -1 1 1, would mean stop at fourth level, man on, hoist.

2——1—4 would mean stop at second level with foreman.

Rule 2. No person must get off or on the bucket or cage while the same is in motion. When men are to be hoisted, give the signal for men. Men *must* then get on bucket or cage, *then* give the signal to hoist. Bell cord must be in reach of man on the bucket or cage at stations.

Rule 3. After the signal "Ready to shoot in shaft," engineer must give his signal when he is ready to hoist. Miners must then give the signal of "Men to be hoisted," then "spit fuse," get into the bucket, and give the signal to hoist.

Rule 4. All timbers, tools, etc., "longer than the depth of the bucket," to be hoisted or lowered, must be securely lashed at the upper end to the cable. Miners must know they will ride up or down the shaft without catching on rocks or timbers and be thrown out.

Rule 5. The foreman will see that one printed sheet of these signals and rules for each level and one for the engine room are attached to a board not less than 12 in. wide by 36 in. long, and securely fasten the board up where signals can be easily read at the places above stated.

Rule 6. The above signals and rules must be obeyed. Any violation will be sufficient grounds for discharging the party or parties so doing. No person, company, corporation, or individuals operating any mine within the State of California shall be responsible for accidents that may happen to men disobeying the rules [illegible] shall be signed by the person or superintendent having charge of the mine, who shall designate the name of the corporation or the owner of the mine.

SEC. 3. Any person or company failing to carry out any of the provisions of this act shall be responsible for all damages arising to or incurred by any person working in said mine during the time of such failure.

Mica Deposits of North Carolina

The mica deposits of western North Carolina have been examined by several investigators. A brief paper on the subject, prepared by Douglas B. Sterrett, appears in Bulletin No. 315 of the United States Geological Survey, "Contributions to Economic Geology, 1906."

Active mica mining has been carried on in North Carolina for the last 38 years, though with varying degrees of energy and success; and the remains of ancient workings, with crude stone tools, around some of the better deposits, suggest early mining by the aborigines or prehistoric people. It is claimed that the earliest mica mining in the State was done in Jackson county in 1867, by a Mr. Person, of Philadelphia. After a number of years depression, due to low market values at a time when India mica was imported into the country in large quantities, the production is again increasing. Mr. Sterrett's paper discusses briefly the occurrence, distribution, and origin of the mica-bearing rocks and the minerals associated with the micas, and describes the principal mining properties.

The Pierce Phosphate Plant

The plant of the Pierce Phosphate Company of Polk county, Fla., will have a capacity, when completed, of 250,000 tons of phosphate rock per year, and will be the largest individual plant in the State.

The equipment of the property is being installed by the Allis-Chalmers Company, Milwaukee, Wis., and consists of one 70-ton steam shovel; one 12-in. Frayer dredge; four 6x60-ft. Allis-Chalmers driers, equipped with 18x24-in. Gates patent feeders; electric generators furnishing power for 18 motors, which drive conveyers and handling apparatus, and the usual installation of conveyer belts, screens, loaders, etc. The plant is expected to be in operation before June 1, 1907.

The production of copper by the three smelteries in the Urals, Russia, in 1906, was 258,793 poods, against 223,883 poods in 1905.

New Publications

C. H. Benjamin. Pp. 320; illustrated.

[illegible] DES OBERHARZES. By Karl [illegible] 9½ in.; paper, 3 marks, 40 pf. Halle [illegible]

DEUTSCHES PATENTRECHT FUER CHEMIKER. By Julius Ephraim. Monographien uber angewandte Elektrochemie, XXV Band. Pp. 608. 6½x9½ in.; paper, 18 marks. Halle a. S., 1907: Wilhelm Knapp.

[illegible] ELECTRIC. By H. C. Reagan. Fifth edition, revised and enlarged. Pp. [illegible] 5x8 in.; cloth, $1.50. New York, 1907: John Wiley & Sons.

ELEKTROMETALLURGIE DES EISENS. By Bernhard Neumann. Monographien über angewandte Elektrochemie, XXVI Band. Pp. 176; illustrated. 6½x9½ in.; paper, 7 marks. Halle a. S., 1907: Wilhelm Knapp.

[illegible] TY, PENNSYLVANIA. By Frederick G. Clapp. P. 144; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

ZINC AND LEAD DEPOSITS OF THE UPPER MISSISSIPPI VALLEY. By H. Foster Bain. U. S. Geological Survey, Bulletin No. 294. Pp. 155; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

[illegible] PENNSYLVANIA. By Charles Butts. U. S. Geological Survey Bulletin No. 279. Pp. 198; illustrated. 6x9 in.; paper. Washington, 1906: Government Printing Office.

SELF-PROPELLED VEHICLES. A PRACTICAL TREATISE ON THE THEORY, CONSTRUCTION, OPERATION, CARE AND MANAGEMENT OF ALL FORMS OF AUTOMOBILES. By James E. Homans. Fifth edition, revised and enlarged. Pp. 598; illustrated. 5½x8¼ in.; cloth, $2. New York, 1907: Theo. Audel & Co.

GEOLOGY OF THE MARYSVILLE MINING DIS[illegible] INTRUSION AND CONTACT METAMORPHISM. By Joseph Barrell. U. S. Geological Survey, Professional Pa[illegible] 9x12 in.; paper. Washington, D. C., 1907: Government Printing Office.

MANUAL OF EXAMINATIONS FOR ENGINEERING POSITIONS IN THE SERVICE OF THE CITY OF NEW YORK. By Myron H. Lewis and Milton Kempner. In three volumes and eight parts. Vol. I, Axeler, Transitman and Computer. Vol. II, Assistant Engineer. Vol. III, Draftsman and Inspector. Illustrated. [illegible] cloth, $5. New York, 1907: Engineering News Publishing Company.

WEST AUSTRALIAN METALLURGICAL PRACTICE. Pp. 186; illustrated. 8x10 in.; cloth, 21s., postage 2s. Kalgoorlie, W. A., 1906: Chamber of Mines of Western Australia.

A description of the ore treatment, mills and processes of 12 of the principal gold mines of Western Australia, with illustrations, tables and charts, written especially for the Chamber of Mines of Western Australia, together with introductory notes and addenda.

THE MECHANICS OF HOISTING MACHINERY, INCLUDING ACCUMULATORS, EXCAVATORS AND PILE DRIVERS. By Julius Weisbach and Gustav Herrmann. Authorized translation from the second German edition by Karl P. Dahlstrom. Pp. 332; illustrated. 5½x8½ in.; cloth, $3. New York, 1907: Macmillan Company.

Contents: Introduction. Levers and jacks. Tackle and differential blocks. Windlasses, winches and lifts. Hydraulic hoists, accumulators and pneumatic hoists. Hoisting machinery for mines. Cranes and sheers. Excavators and dredges. Pile-drivers.

MINE TIMBERING. By Wilbur E. Sanders, Bernard MacDonald, Norman W. Parlee and others. Pp. 179. Illustrated. 6x9 in.; cloth, $2. New York, 1907: Hill Publishing Company.

Contents. Preface. Mine Timbering, by Wilbur E. Sanders. Mine timbering by the square-set system at Rossland, B. C., by Bernard MacDonald. Methods of mining and timbering in large orebodies in British Columbia and Michigan, by Norman W. Parlee. Mine timbering in Section 16 of the Lake Superior Mining Company, Michigan, by C. St. G. Campbell. The framing of rectangular shaft timbers, by Wilbur E. Sanders. Square-set timbering at Bingham, Utah, by Claude T. Rice. Square-set practice at Bingham, Utah, by Louis S. Cates. Mine timbering at Lake Superior, by W. R. Crane. Timber and timbering in the Cœur d'Alene, by J. H. Batcheller. Timbering at the Chillagoe mines, Queensland, by T. J. Greenway. Timbering in Tasmania, by Mark Ireland.

This book, following the style of "Sampling and Estimation of Ore in a Mine," "Pyrite Smelting," "Notes on Metallurgical Mill Construction," and "Lead Smelting and Refining," which have met with so favorable a reception, is a collection of articles that have previously been printed in the ENGINEERING AND MINING JOURNAL, together with a few papers from the transactions of various societies, which have been added to round out the subject. The leading article of the book is the noteworthy paper of Wilbur E. Sanders, which was published originally in the *Mineral Industry*, Vol. VIII, where it attracted wide attention, being recognized as one of the most valuable contributions to this important subject. In its original publication, the illustrations accompanying this paper were unfortunately so greatly reduced that the numerals showing dimensions, explanatory legends, etc., were in many cases illegible. For the republication of the paper in the present work, all of the illustrations have been redrawn, and having been engraved with great care, the practical value of the paper has been immensely enhanced.

No less noteworthy are the papers on "Mine Timbering by the Square Set System, at Rossland, B. C.," by Bernard MacDonald; and "Methods of Mining and Timbering in Large Ore Bodies in British Columbia and Michigan," by Norman W. Parlee. Both of these papers are excellent examples of what a technical paper ought to be, presenting as they do the full practical details of their subject, together with figures of costs, etc., and illuminating the whole by intelligent and discriminating discussion.

The concluding part of the book is made up chiefly of articles that have appeared in ENGINEERING AND MINING JOURNAL during the last two or three years, and satisfactorily amplify the subject of the book. The book is presented by the editor with the same limitations that have been acknowledged with respect to the previous works of the same character. It is not offered as a complete treatise on the subject, but simply as a collection of valuable papers bearing upon it, in the selection and preparation of which much care has been exercised. The excellent character of the engravings, with which the book is profusely illustrated, deserves especial approbation. In the absence of any treatise on this important subject, which in the hand-books and text-books on mining is dealt with only in a superficial way, it has appeared worth while to make such a collection. Undoubtedly a thorough and systematic treatise on the subject of mine timbering will some day be written.

One of the most painful accidents known in Rand mining occurred recently at the Driefontein Consolidated mine, when by the burning and explosion of two cases of dynamite, 63 lives were lost, of whom nine were white men. It is not yet known exactly how the accident happened, but it appears that through the gross carelessness of someone the gelatin was set ablaze near a level in the mine, where over 60 men were waiting to come to the surface. Most of the victims were fortunately killed outright, but others were rescued, and died in the hospital later on in great agony, either from burns or from nitrous oxide poisoning.

Personal

Mining and metal[illegible] are invited to [illegible] to keep [illegible] informed of [illegible] appointments.

H. W. Hardinge, of New York, visited Cobalt, Ont., recently.

Dr. Ernst Beyschlag has been appointed director of the Geological Survey of Prussia.

W. Bornhardt has been appointed director of the Bergakademie at Berlin, Germany.

Courtenay De Kalb, mining engineer, of Los Angeles, Cal., has been examining mines in Maine.

S. F. Fowler, general manager of the Canadian Metal Company, Nelson, B. C., is visiting New York.

Frank J. Hagenbarth has returned to Salt Lake City, Utah, after having made an inspection of Mexican mining interests.

Prof. Henry Louis, of Newcastle-upon-Tyne, England, has just returned from Spain where he has been examining mines.

J. B. Tyrrell has completed the examination of the Right-of-Way mines at Cobalt, and has returned to Toronto, Ontario.

J. Parke Channing, who has been making an extended tour in the West on professional business, returned to New York last week.

R. W. Hutchinson, of Chihuahua, Mex., who represents the interests of Charles M. Schwab, in Mexico, is visiting Butte, Mont., on business.

H. H. Taft, representing Boston men who are backing the Butte & Summit Valley Company, has gone from Butte, Mont., to Denver on a visit.

Joseph C. Houston, formerly with the O'Brien company, has been engaged as superintendent of the Right-of-Way mines at Cobalt, Ontario.

O. Q. Beckworth, operating in the northern part of Gilpin county, Colo., districts has gone to St. Joseph, Mo., to look after mining interests.

F. W. Denton, general manager of the Copper Range Consolidated Company's mines in Michigan, has returned to the mines from a visit to Boston.

W. J. MacDonald, of Duluth, secretary of the Ida-Montana Copper Company, spent several days at the company's mines in Butte, Mont., recently.

Joseph L. Walters, superintendent of the Evergreen Gold and Copper Mines Company at Apex, Colo., has left for a trip to California and Nevada camps.

Paul R. Forbes, mining engineer, of New York, returned recently from Mexico, and expects shortly to go to Europe, where he will spend the summer.

John A. Church, mining engineer, of New York, who has been engaged upon mine examinations in Mexico, is expected to return to New York next week.

John C. Adams, superintendent of all mines of the Boston & Montana Company, has returned to Butte, Mont., from a business trip to Bisbee and Cananea.

J. P. Hutchins, mining engineer, of New York, has just returned from Dutch Guiana, where he has been engaged on professional work for the last six months.

Percy Rider, formerly of Ouray, Colo., but now of Arizona, has been making an examination of mining property in Clear Creek county, Colo., in the interests of Eastern investors.

Dr. Ira Remsen, president of Johns Hopkins University, Baltimore, made the class-day address to the students of the Michigan College of Mines on May 3, at Houghton, Mich.

Victor Nordberg, of the Nordberg Machinery Company, of Milwaukee, who makes Butte, Mont., his headquarters, has gone to the Cœur d'Alene mining district of Idaho on business.

Walter Harvey Weed, mining geologist, of New York, who has been absent in the West for nearly two months, on professional business, is expected to return about the end of this week.

W. A. Farish, of New York, and J. K. Turner, consulting engineer for the A. D. Myers interests, recently examined the Wonder Stray-Horse mines at Wonder, Nevada, owned by A. D. Myers.

F. F. Sharpless, mining engineer, of New York, has returned from Mexico, where he has been engaged on professional business. He expects to go to Colorado about the end of this month.

Geo. Crerar has resigned as metallurgist in charge of the San Fernando del Cobre Smelter, Mexico, to accept the management of the Takilma Smelting Company in Josephine county, Oregon.

T. R. Drummond, general manager of the Dominion Copper Company's properties in the Boundary district of British Columbia, has gone to Cobalt, Ont., as general manager of the Nipissing mines.

William P. Jahn, manager of the property of the Pilot-Butte Copper Company, in Butte, has gone to Milwaukee, Wis., to confer with members of the company on matters pertaining to the plan of develop-

W. M. Laird, of Pittsburg, Penn., president of the Pittsburg Consolidated Mining and Tunnel Company, operating at Idaho Springs, Colo., has been out looking after interests and attending a stockholders' meeting.

Benjamin Magnus has left New York for Australia, to assume the management of the Electrolytic Refining and Smelting Company of Australia, Ltd. His Australian address will be 118 Pitt street, Sydney, New South Wales.

A. W. Park has joined the staff of the John A. Traylor Machinery Company, of Denver, Colo. He was formerly with the Mine and Smelter Supply Company and recently with the Joshua Hendy Iron Works, of San Francisco.

Leo Goldsmith recently returned to New York from Virginia, where he had been examining some manganese properties, and has gone to Canada to develop a molybdenite deposit. His address for some time will be St. Patrick, Renfrew county, Ontario.

Henry Harris, who recently resigned as superintendent of the Hall Mining and Smelting Company's smelter at Nelson, B. C., has gone to Hadley, Prince of Wales Island, Alaska, where he will be superintendent of the smelting works of the Alaska Smelting and Refining Company.

Paul Johnson, who lately resigned the management of the Alaska Smelting and Refining Company's works at Hadley, southeast Alaska, left Seattle on April 30 by steamer for San Francisco, on his way to Nevada. He will be in New York about the middle of June, sailing thence for Europe.

Bruce R. Warden, one of the Canadian Pacific Railway Company's mining engineers, for some time past engaged at that company's colliery at Bankhead, Alberta, has been retained by the Nicola Coal and Coke Company to superintend the installation of machinery and plant at its Middlesboro' colliery, Coulee, Nicola district, British Columbia.

M. E. MacDonald has resigned the position of general manager of the Guanajuato Consolidated Mining and Milling Company's properties at Guanajuato, Mexico, and taken the position of consulting engineer for the company, making his headquarters for the company's business at its New York office, Mills building, No. 35 Wall street, with office for his private business at No. 40 Wall street.

The number of claims awaiting inspection is so great that the Ontario Government has been obliged to increase the staff of inspectors. In addition to A. H. A. Robinson, who officiated last year, the following have been appointed inspectors of mining claims: A. G. Burrows, late provincial assayer, C. W. Murray, G. C. Mackenzie, G. R. McLaren, R. T. Irwin, E. Wade of the School of Practical Science, Toronto, and D. W. Houston. They will enter upon their duties at once.

Obituary

George E. Davis, founder and for 20 years editor of the *Chemical Trade Journal*, died in London, England, April 20, aged 50 years. Mr. Davis was formerly one of the inspectors under the alkali works regulation acts; he was one of the original fellows of the Institute of Chemistry; a fellow of the Chemical Society;

and he took a prominent part in the industry, filling several offices. He contributed largely to chemical, technological, and microscopical literature.

John M. Bell, an old-time Montana mining engineer, died in Chalchihuites, Zacatecas, Mexico, April 23. He was connected with the mining department of the Chalchihuites Mining and Smelting Company, and while visiting some properties his horse fell with him cutting his knee; blood poison set in causing death after seven weeks' illness. Mr. Bell was born in Teesdale, England, coming to the United States when a child. He served in the Civil War, and went to Montana soon after 1864 to conduct placer mining. He was a member of the Montana House of Representatives from Deer Lodge county for two years.

Societies and Technical Schools

Manufacturers—The annual convention will be held in New York, May 20-22. Headquarters will be at the Waldorf-Astoria Hotel. Reports on a number of subjects, especially interesting to manufacturers at this time, will be made by the committees which have them in charge for the association, and an open discussion of the subjects will probably follow each report.

McGill University—Twenty students of the mining department of McGill University, Montreal, have gone to spend the summer studying practical mining in British Columbia. The trip is under the supervision of Dr. J. B. Porter, professor of mining, and J. W. Bell, assistant professor. They will be joined in British Columbia by Dr. Stansfield, professor of metallurgy, and J. A. Bancroft, assistant professor of geology, the latter having charge of the geological work to be undertaken by the students.

The mining department of this school, at Cleveland, Ohio, has been conducting an extensive series of experiments upon the concentration of the wall-rock of the Cobalt mines. About 20 tons of rock from the Buffalo mine were shipped to the school last fall. After a series of laboratory experiments were completed three-mill runs were made in the presence of representatives from the mines.

The results of these experiments, which included almost every known method of silver extraction, will shortly be published.

Industrial

The New York office of the Standard Railway Equipment Company, of St. Louis, has been removed to No. 90 West street.

The Broderick & Bascom Rope Company, of St. Louis, owing to the increased [illegible] has removed its New York office from No. 19 Murray street to larger quarters at No. 76 Warren street.

The Range Power Company, Chisholm, Minn., has placed an order with the Weber Gas Engine Company, at Kansas City, Mo., for one 350-h.p. triple-cylinder, vertical producer-gas engine, with twin suction gas producers. An electric light plant on the Mesabi range will be operated continuously by this engine.

The Southwestern Bridge Company, Joplin, Mo., has received a contract for nine steel mill buildings and two steel tanks and towers for the Kaw Gas Company, at Independence, Kan. The company has also received a contract from the Texas Company for the steel of three pump houses, two boiler houses and one warehouse at Dallas, Texas.

Max F. Abbé, inventor of the Abbé tube-mill, sailed from New York April 30, for a trip abroad. He will spend from five to six months in England, and on the Continent. Arrangements have been made with Sutcliffe, Speakman & Co., Ltd., of Leigh, Lancashire, England, to manufacture the various types of the Abbé mill, including the patented spiral feed and discharge, for use in European countries.

As the outcome of experiments carried on extensively for some time by William Bruce, of Winnipeg, Manitoba, to test the value for ornamental work of the clay found near Winnipeg, a company has been formed to carry on the manufacture of architectural terra cotta, faience decorations and ornamental tile work, the raw material being found in a clay deposit six miles from Winnipeg. The company will import skilled workmen with experience in the manufacture of high-class clay products.

Morse Bros. Machinery and Supply Company, Denver, Colo., reports the following recent sales: 100-ton concentrating plant for the Jessie Mines Company, Chaparal, Arizona, in which will be installed three No. 3 Wild mills; F. W. Hearne & Co., Central City, Colo., one No. 3 Wild mill; La Belle Gold Mining Company, Alma, Colo., 10-stamp mill with power; Balkan Mining Company, Rochford, S. D., five-stamp mill with power and tables; and Bear Top Mining Company, Murray, Idaho, one Franklin compound steam, two-stage air compressor, 690 cu.ft. capacity.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

W. G. Wilkins Company, Pittsburg, Penn. Views of Bituminous Collieries and Coke Plants. Pp. 88, all illustrations, 6x9 in., 1907.

Trill Indicator Company, Corry, Penn. The Triumph Steam Engine Indicators and Appliances. Pp. 31, illustrated, paper, 6x9 in. 1907.

American Locomotive Company, New York City. Pamphlet No. 10,015. Rotary Snow Plow. Pp. 28, illustrated, paper, 6x9 inches.

Colorado Iron Works Company, Denver, Colo. Catalog No. 7-E. Concentration Mills and Machinery. Pp. 92, indexed, illustrated, paper, 6x9 in. 1907.

Link-Belt Company, Philadelphia, Penn. Price Lists of Sprocket and Traction Wheels, substitute pages of catalog No. 37. Pp. 22, illustrated, paper, 6x9 in.; April 1907.

Keuffel & Esser Company, 127 Fulton street, New York. Folding Rules, Automatic Print Hanger and Sperry's Pocket Calculator. Folder, illustrated, paper, 5½x9 in.; 1907.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1057. Allis-Chalmers Direct Current Motors and Generators Type "K." Pp. 16, illustrated; paper 8x10½ in.; January, 1907. Bulletin No. 1423. Gates Breakers with Short Head and Concaves for Fine Crushing. Pp. 4, illustrated; paper, 8x10½ in.; February, 1907. Bulletin 1056. Induction Motors. Pp. 4, illustrated; paper, 8x10½ in.; January, 1907.

Construction News

Cornucopia, Oregon—There is talk of building a smelter at the Indiana mine. Mr. Mesner, Baker City, Oregon, is manager.

Red Cloud District, California—Cyanide plants are to be put in at Bull Creek and Red Cloud. A. J. Wagoner, Stockton, Cal., is president.

Oroville, Washington—It is proposed to build a smelter to work ore from neighboring mines. A. M. Wehe, Oroville, Okanogan county, Wash., is managing the project.

Georgetown, Colorado—Chicago capitalists are interested in the Astor group and contemplate the erection of a milling plant. E. J. Butts, Georgetown, Colo., is manager.

Weatherby, Oregon—The Butler-Platt-Thompson Mines Company is developing a group of mines and will need hoisting and other machinery. Butler & Platt, Baker City, Oregon, are managers.

Dumont, Colorado—The First Republican Mining Company has become interested in a group of claims, and the company intends to erect a mill to treat its own product. Ira La Munyon, Dumont, Colo., is manager.

Pactolus, Colorado—The Perigo & Six Day Mining, Milling and Power Company, in which Denver and Boston people are interested, proposes to erect a large electric power plant at Pactolus, to furnish power and lighting for its own and neighboring mines. J. K. Richardson, Rollinsville, Colo., is manager.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

May 8—The farmers of Yuba and Sutter counties who are about to bring an injunction suit to determine the legal status of dredge mining in the Feather and Yuba rivers seem to have been able to obtain whatever financial assistance they need, and it is expected they will shortly begin their crusade. The dredge-owners are prepared for any contest, but have little or nothing to say in the public press.

The Porter Bar Dredging Company, which has been working near Callahan, Siskiyou county, is rebuilding its dredge, and has under consideration the construction of another machine. A Marysville company has been boring prospect holes at Indian Creek and Oro Fino in the same county, where the gravel is quite deep. Machines to dredge to 100 ft. depth will be required to reach bedrock. The placer mines in Mill Gulch, Osceola, Nevada, are to be dredged by the Nevada Gold Placer Mining Company, a Colorado organization.

The Dutch Mining and Milling Company of Tuolumne county has been forced into bankruptcy on the petition of creditors, who asked Judge De Haven to declare that corporation a bankrupt and stop further proceedings by the court of Tuolumne county under a judgment obtained by S. C. Bright. The property of the company was to have been sold by the Sheriff to satisfy a judgment for $16,114 obtained by Bright on March 12. An order was issued restraining the sheriff.

The litigation over the Slap Jack mine, Groveland, Siskiyou county, which has kept that fine property idle for fully eight years has been settled amicably, and the property will be operated by the Yosemite Gold Mining Company, as was the case before the shut-down. The case was fought in all the courts, the last decision being from the United States Supreme Court; and this decision settled nothing, but left the litigants in a position to keep up the battle. But here wiser counsel prevailed and the matter was settled. The mine is well equipped with machinery, consisting of a hoist, compressor, pumps, etc., and a mill was to have been brought from a mine in Mariposa, when required.

The gravel channel of the Lucky Dog mine at Alleghany, Sierra county, was lost years ago, but has just now been again located, and is under bond to H. L. Johnson, owner of the Tightner mine. The channel was discovered many years ago by gulch miners, and was worked from several tunnels, yielding many thousands of dollars. The last leasers mined about $10,000 from a pot hole, or low pit, in the bed of the channel, and when they drove ahead found that the channel apparently ended dead against a wall of rock. Nothing was done with the mine for several years, when H. L. Johnson took hold of it. He believed that the pot hole was caused by the water of the ancient river pouring over falls, and that the high rock which cut off the channel was the rock which caused the falls. He had driven an incline tunnel through this rock and tapped the channel above the falls.

The Nevada County Mine-owner's Association has voluntarily reduced the hours of work of surface men to eight hours. Better wages elsewhere were attracting the men away, especially to the camps in the State of Nevada. Some of these camps, however, are becoming overcrowded and it is expected that men will begin to return to California before long.

Wages of men at the Keswick smelter of the Mountain Copper Company are to be increased. The company has 800 men on the roll, but needs more about the furnaces. The men working at present are satisfied with the wages and hours.

The electrical plant of the Great Western Power Company in Butte county will have a capacity of 100,000 h.p. when completed. In addition to using the power for mines it will be utilized to electrify the Western Pacific Railway across the Sierras. At Big Bend, upon the North Fork of the torrential Feather river, along which the Western Pacific runs, the river makes a great bend in a horseshoe shape and the proposition is simply to divert the river through a tunnel across this narrow neck. About 2¼ miles of this tunnel is now constructed, leaving one mile yet to be finished. They will thus obtain a fall to run their electrical machinery. The old tunnel of the Big Bend Mining Company is being utilized. This was a river-bed mining scheme on a large scale, designed to lay bare a dozen or so miles of the North Fork of the Feather. On completion of the long tunnel, when work on the bed of the river was commenced, it was found to be unprofitable. The tunnel carried all the water of the river through the hills, leaving the Big Bend around the point dry for mining. The enterprise was a failure as a mining venture, but the tunnel, dug at great expense, is now to be utilized for another purpose.

The California Metal Trades Association has failed to come to an agreement with the Iron Trades Council, representing the allied 18 iron trades, the differences not having yet been adjusted. The offer of the Metal Trades Association to submit the questions in dispute to a board of arbitration for settlement has been declined by the Iron Trades Council. As a result some 9000 iron-workers are still idle in this city. It is well known that wages in this city are very much higher than obtained in any other manufacturing center; and, consequently, the production of fabricated articles costs more. Already the effect of this is felt by manufacturers here, who are brought into hopeless competition with manufacturers operating under more reasonable conditions elsewhere. Further concessions to the workmen undoubtedly will result in the almost complete destruction of manufacturing operations here.

Salt Lake City

May 10—Construction work at the new Garfield mill of the Boston Consolidated Mining Company has received a setback on account of a strike of carpenters, who have made demands for higher wages which have been refused. This will probably delay the starting of the plant, which was scheduled to take place in July next. In the meantime the Rio Grande Western Railroad is building its tracks up to the ore-bins which were completed several weeks ago.

The operators of the Alta mining district are jubilant over the announcement that the reconstructed aërial tramway owned by the Unity Mines Company, will be ready for operation within two weeks. The line was greatly damaged by snow-slides during last winter. The present management of the Unity Company has contracted to move the output of the principal mines of the Alta district to the lower terminal, a distance of about seven miles. Heretofore these companies have had to depend on teamsters to move their ore. The Rio Grande Western will rebuild its Alta branch during the present year, the end of the line to be at the lower terminal of the aërial tramway, which will be established at Wasatch, near the mouth of Little Cottonwood cañon.

Four steam shovels are employed in the moving of overburden from the low-grade ore deposits of the Boston Consolidated Mining Company's property in Bingham. High-grade ore shipments are being made at the rate of ten carloads per day.

Tracklayers in the employ of the Western Pacific Railroad have crossed the

Utah-Nevada State line. So with the exception of the ballasting, the road is completed as far as Utah is concerned. In Nevada, the grading and laying of track is being pushed forward as rapidly as possible. It is expected that the first branch line to be built off from the Western Pacific will be started in June. It is to be built to the Gold Hill mine of the Western Utah Copper Company, in the western part of Tooele county, and will be about 30 miles in length.

Scranton

[illegible] Manager W. J. Richards, of the Philadelphia & Reading Coal Company, had a heart-to-heart talk with the officials of the coal department, to the number of more than 100 in the company's office in Pottsville, a few days ago. Owing to its being Ascension Day the mines were shut down and Mr. Richards took advantage of the idle day to marshal the officials, including division superintendents, district superintendents, outside foremen, chute-bosses and others in authority. Two sessions, morning and evening, were held, and opportunity was given every man present to speak out upon any subject pertinent to the gathering. Quite a number responded, making suggestions for the improvement of the operations of the company.

Forty-one mules were suffocated by a fire in the stable of the Woodward colliery, of the Delaware, Lackawanna & Western, last week. The company's loss aggregated $10,000. About 300 employees are thrown out of work for some time.

The first tournament of the First Aid Society at the Clear Spring colliery, West Pittston, was held last week, when some excellent work was done. The team captained by Sergeant Patrick Gibbons, carried off the honors with a percentage of 80.08. The leader was presented with a handsome Red Cross badge.

All the coal companies in Luzerne county have appealed against the new assessment of the coal lands. They claim that, as the result of an investigation, it has been found that property other than coal is assessed at about 50 per cent. of its actual value and that there can be no proper equalization when coal is assessed at a much higher figure.

The Philadelphia & Reading Coal and Iron Company is planning elaborate improvements at the Brookside Colliery, near Pottsville. Work on a new shaft was commenced in 1902, and it is now to be hastened so that the coal will be reached earlier than was originally planned. Work was commenced last week upon a new slope to connect with the Basin slope, and this will take the place of the two inside slopes. The hoisting engine for this slope will be placed on the surface; bore-holes will be drilled from the surface, and the hoisting ropes [illegible] remodeled and an expensive tunnel is to be built between Rausch Gap and Brookside. There are reports that the steam pumps inside the mines are to be replaced by electric pumps.

Toronto, Ont.

May 11—Larder lake is attracting an increasing amount of attention and the number of claims taken up is about 4000. The fact that none of these have as yet passed inspection or been subjected to the amount of development necessary to secure a title has not prevented many of them from changing hands at high figures. At present there are so many on the market that they are being bought up extensively at a low rate, some offering for as low as $40. John L. Church, of New York, is inspecting a number of claims at Larder lake, on which extensive development work is contemplated.

W. F. Brunne, of Haileybury, who with his brothers holds 14 claims some 3 miles northwest of Larder lake, states that the cyanide process will have to be adopted instead of milling for the extraction of the gold. On his properties is a dike of porphyry, 400 ft. wide in some places, a strip of which has been tested, giving assays in gold. No free gold was visible. Dr. von Hagen has bought a group of 12 claims two miles northwest of Larder lake and organized the Little Larder Lake Mining Company. J. Gordon Magee, consulting engineer of the Blue Bell syndicate, possessing extensive properties in Larder lake, has brought out samples showing free gold. He will purchase a complete camp outfit to prepare for the installation of stamp mills.

Active explorations and development are taking place in the district about Sturgeon Falls, Ont. A large reef of bluish quartz has been found a few miles west of the town some 30 ft. in width. A shaft is being put down and samples showing free gold have been taken out. Pockets of copper pyrites have also been encountered. Further west a find of copper ore has been made. A shaft has been sunk 20 ft. on a vein carrying bornite, which has been found to be 4 ft. wide at that depth. Prospectors working about 25 miles north of Sturgeon Falls report several discoveries of gold.

The provincial government of Ontario has appointed Prof. G. R. Mickle, of the Toronto School of Practical Science, mining assessor under the new mining act. He has wide powers in connection with the tax imposed on the annual profits of mines in excess of $10,000, having authority to enter any mine and examine all books and accounts. An appeal lies from his decision to the bureau of mines, and when the amount involved exceeds $1000 the case may be carried to the appeal court.

Hon. Wm. Templeman, Dominion minister of mines, has appointed Erik Nystrom, an engineer on the staff of the mines branch, to investigate the peat industry of Europe. He is instructed to proceed to Holland, Norway, Sweden, Denmark, Finland and Germany; to study the peat plants in operation and collect information in regard to machinery used, methods of working peat bogs, cost of production and manufacture of peat into briquets or other forms of fuel.

The Ontario government has set apart a portion of the Temagami forest reserve under the name of the Montreal Reserve mining division. This includes the Lady Evelyn lake area and other sections on the Montreal river. The recorder's office for the division is located at Latchford.

London

May 4—At this time of year we usually receive the reports of the various West Australian mines. The yearly reports for 1906 of the Ivanhoe, Horseshoe, Fingall, and Perseverance have been issued this week. The Ivanhoe has made sufficient profits to distribute £240,000 as dividend for the year. The ore treated was 208,304 tons and the extraction valued at £518,918. Twenty-five per cent. of the contents of the ore is extracted in the mill, 39 per cent. out of sands and slimes, and 22 out of concentrates, the total extraction being 86 per cent. The ore reserves amount to as much as 12 years' production and average $13 to $14 per ton. The Golden Horseshoe has paid exactly the same dividend as Ivanhoe; the ore treated amounted to 237,294 long tons and the total extraction by the mill, cyanide, smelting, etc., was £607,383. The ore reserves are estimated at about four years, valued at $15 per ton. The Great Fingall has paid £225,000 in dividends; treated 249,646 short tons, producing £518,657. The mine has reserves to last about 2½ years; but as mentioned by me a few months ago, the developments of new ore are far from encouraging, the average contents of all new discoveries not being more than $6 per ton. The most interesting point in the report is the confession by the managers, Bewick, Moring & Co., that they cannot give a dependable estimate of the contents of the ore reserves, owing to the irregularity of the deposit and its contents. The Great Boulder Perseverance is in somewhat of the same position as the Fingall, having reserves for two years averaging $8 to $9, and large bodies also of $6 ore. For 1906, 169,194 short tons gave £343,605, and the dividend distributed was £69,973. It will be remembered that this company nearly came to grief two years ago through the carelessness, or worse, of the old controllers. The way the mine has been rehabilitated and the costs cut down reflects great credit on the new directors and engineers.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

General Mining News

Sault Ste. Marie Canal—Although the navigation was not fairly opened until last week, owing to various obstructions, the Canadian canal at the Sault was opened April 22, and United States canal April 23. Vessel passages up to May 1 were 454, freight carried was 3,307,907 tons eastbound, and 747,923 westbound, a total of 1,078,613 net tons, or 1,434,654 tons less than in April, 1906. Mineral freight reported was 150,881 tons anthracite and 552,437 tons bituminous, a total of 703,318 tons coal; 204,660 tons iron ore; 34,092 tons pig and manufactured iron; 585 tons copper; 33,780 bbl. salt.

Alaska

KETCHIKAN DISTRICT

Alaska Industrial Company—This company recently made a shipment of 1575 tons of high-grade ore from Ketchikan to Ladysmith, B. C., where it will be treated in the Tyee smelter.

Hadley Consolidated—This company is now shipping ore from its Stevenstown mine to the Hadley smelter. A surface tramway has been built to the Mamie mine, where ore is transferred to the aërial tramway to the shipping point.

Uncle Sam—At this mine, formerly the White Eagle, a good body of ore has been opened, from which regular shipments are being made to the Hadley smelter.

United Metals Company—At this company's mine, formerly the Corbin, near Coppermount, a crosscut is being run on the 100-ft. level, in the hope of striking the main orebody.

Valparaiso—The surface tram is finished to the lake, a distance of 1½ miles from salt water. To the mine, from the end of this tram, the distance is about the same across the lake, over which the ore will be conveyed in scows to the upper end of the tram and thence by car to the beach at Dolomi. It is the intention to ship only the richer ore to the smelter, reserving the lower grade to be reduced by the stamp mill, the erection of which the management has in contemplation.

Arizona

GRAHAM COUNTY

Arizona Copper Company, Ltd.—This company reports the production of its [illegible] tons of copper.

YAVAPAI COUNTY

Cleopatra—This company has had its mill in operation only a short time, but results have been satisfactory. The mines are in the Cherry Creek district, 30 miles east of Prescott, the nearest railway station being Dewey, on the Prescott & Eastern Railway, 15 miles from the mines.

Leland—This company has commenced grading preparatory to the erection of a new mill; the machinery has been ordered.

Square Deal—This company has declared its first dividend from a month's run of the mill. Its mines are in the Cherry Creek district, 30 miles east of Prescott. The mill is only an eight-ton mill, but will be increased to 25-ton capacity. The ore is a honeycomb quartz and the values are chiefly gold, most of which is caught by amalgamation.

Arizona Smelting Company—This company at Humboldt, produced for the month of April nearly 1,000,000 lb. of copper, and had it not been delayed on account of an accident to one of the furnaces this would have been passed. The supply of ore delivered to the smelter still exceeds the capacity of the plant.

Marschall Group—This group of claims, situated on the Santa Maria river, 15 miles west of Hillside, has passed from the original owner, Wm. Marschall, to J. K. Miller. He has a company to take over the claims and development work will be prosecuted. The ledges are not large though the values run up well; the ore is free milling.

McKinley—This company is the owner of the Peacock group, situated in the Copper Basin district, about two miles south of Iron Springs. The property has been developed to a depth of 100 ft.; the vein on the surface is of 40 ft. in width and on the 60-ft. level it is known to be of the same width, the walls not having been reached. The values are gold and copper. There is an abundance of timber on the ground for all immediate purposes. The stockholders are mostly local people.

Mother Lode Copper Company—This company has been organized by local people to take over a group of claims in the Copper Basin district. The group consists of seven full claims and at present there is considerable ore exposed although the workings are not deep. The ledge is in a lime and porphyry contact, porphyry forming the hanging wall.

California

[illegible] COUNTY

Amador Mutual Consolidated—This company, at Amador City, is arranging to install a hoist suitable for a shaft 4000 ft. deep.

BUTTE COUNTY

Matheson—The Gold Dike Company has taken over this mine on Butte creek, 20 miles from Chico. The company plans to invest about $50,000 in equipment. The executive officers of the company are: W. M. Moran, president; Dan A. Matheson, treasurer; A. C. Musselman, secretary. Other directors are George K. Lane and G. M. Sparks.

CALAVERAS COUNTY

Benson—This company will begin sinking the shaft shortly, and continue it to a depth of 1000 ft. The newly-elected officers are: W. B. Robertson, of Scranton, Penn., president; Dr. Frank Burton, of Stockton, vice-president; Alfred Harvey, of Los Angeles, treasurer; Charles Sollars, of Lodi, secretary.

EL DORADO COUNTY

Crane's Gulch—At this mine, Georgetown, work has been resumed at the point where the slide covered the machinery.

Alpine—This mine is being unwatered and will be examined by the expert for George Wingfield, of Nevada.

INYO COUNTY

Bishop Creek Gold Mines Company—The road has been broken through to these mines and machinery and supplies can now be brought in from Laws

Darwin—Mines near this place, long idle, are being reopened. Nevada mining men having made large investments there. Systematic prospecting is being done in the vicinity.

LOS ANGELES COUNTY

Ocean Beach Sands—F. E. Clark, of Salt Lake, Utah, has set at work two of his gold-saving machines on the ocean beach at Shakespeare, where they are handling black sands.

MARIPOSA COUNTY

Red Cloud and Marble Springs—These mines in Bull Creek and Red Cloud districts, are being reopened after long idleness, and are being equipped with machinery. Cyanide plants are to be put in. A. J. Wagoner, of Stockton, Cal., is presi-

dent, and Ray Knight, of San Francisco, is secretary of the company.

Liberty-Pittsburg—A 6-ft. ledge of high-grade ore has been cut in this property at Masonic in a crosscut from the shaft being sunk.

True Friend—Men have commenced on a contract to sink the shaft on this mine at Masonic 200 ft. A hoist has been purchased.

Pauline—On this mine, at Masonic, work has been commenced under superintendence of John Phillips acting for the Colorado company which has bonded the claim.

Nevada County

Ethel—Work has been resumed on this property, which has been idle all winter for lack of fuel.

Central Consolidated—After several months' idleness the 20-stamp mill at this mine has been started up on good milling ore.

Cold Spring—The new 10-stamp mill of this drift mine, near Nevada City, has been completed by Superintendent H. B. Gray.

Orange County

Western Zinc Company—This company, at Silverado Cañon, near Santa Ana, has commenced a new tunnel 200 ft. lower than the old one. The company owns 27 adjacent claims.

Iron Mine—L. C. Trent has a number of men at work in this old mine, which is being pumped out preparatory to extensive development.

Gold Run Gravels—An electric plant will be put in this mine this summer, and 30 stamps added to the mill. A new compressor has been installed.

Three Star—The shaft on this mine has reached the 1200 level and the ore is of satisfactory value.

Alzord—In this old mine, 23 miles northeast of Daggett, a strike of good ore has been made in the lower level.

Milford—This mine, near Ivanpah, a producer of silver lead ore, is superintended by C. Clare, who is installing a gasolene hoist.

per mines, near Kennett, is under bond to the Guggenheims, who have had 25 miners at work opening up the property. Work has temporarily stopped owing to some questions relating to future rights of way.

Milkmaid—This mine, with the adjoining Franklin and Wheeler claims, is under bond to the Western Exploration Company, of Goldfield, Nev., with Edward Lewis as superintendent. The mine is now being reopened. It was at one time a good producer.

Sierra County

Mabel Mertz—With the establishment of the exact location of the Emigrant Channel in American Hill, made recently by this company, its location and elevation on the property of the Buckeye Gold and Gravel Mining Company, which adjoins the former on the south, is made easy of discovery. It is stated that, as soon as surveys can be made, a tunnel will be driven by that company.

Croesus Mining Company—At the Plumbago mine of this company, at Alleghany, Mason W. Mather, superintendent, another rich shoot of ore has been cut.

Quartz—George McCullough and associates have found a very extensive quartz ledge on Chipps ridge, and are now developing it.

Discovery—What is considered to be an extension of the Tightner and Rainbow ledge has been made in the South Fork mine, at Forest. The quartz was found in a tunnel being driven for a gravel channel.

Siskiyou County

Towne Mining Company—This company, which has a bond on the Blue Ledge copper mine, near Hutton, is working 180 men, paying $3.50 per day to miners and $3 to surface men. They have expended large sums in development work. F. W. Carnahan is superintendent.

Badger Gold-Copper Company—This company has been formed at Medford, Oregon, to work a group of mines in Elliott district, and has let a contract for development work.

Tuolumne County

Ellen Winton—A five-stamp mill has been bought, and will be set up at once.

Yuba County

Mount Hope—New York men have obtained control of this mine, in New York township on the Forbestown road, and will develop it under superintendency of Paris Beau.

Colorado

Clear Creek County

Dunkirk—It is reported that there is a deal on for the sale of this property at Georgetown, reported price being $100,000; Eastern people are interested.

Pay Rock—H. H. Sturm, of Denver, representing Eastern people, is examining this property at Georgetown, and there is some indication of an early sale.

Russell Page Mining and Tunnel Company—A contract has been let for the installation of an 80-h.p. boiler and three-drill air compressor for this property on Cascade creek by A. H. Page, Idaho Springs, Colo., as manager.

Lake County—Leadville

Big English Gulch—Considerable attention is being paid to this section at present and more work will be down in that neighborhood this year than ever before. The strike made in the Eagle group during the winter has been the means of causing a revival of mining in the district. It is more than probable that the owners of Bug Gold will erect a mill this summer to treat the immense body of low-grade gold ore that is in the mine. During the winter several carloads of ore were sent to Denver to ascertain the value of the crude ore and also to determine the character of mill to be installed; the results were so satisfactory that the company has decided to erect a mill. On the Rough and Ready group a tunnel has been driven several hundred feet by Lee Norris and several veins have been cut that assay fairly well. A tunnel is being driven by J. Frank on the Kankakee group and the outlook is very promising.

Crescentia—This property, Rock hill, is shipping a good grade of oxidized lead ore amounting to 30 tons daily, and also carrying on development work in the lower levels. A. F. Wuensch, the manager, has met with such success in the Crescentia, that he has decided to lease the Delaware, about 1000 ft. to the southeast of the Crescentia. Machinery has been ordered and a new shaft will be sunk. The first lift will be 550 ft., where it is expected the first ore-horizon will be encountered; the shaft will then be sent down another 200 ft. to the lime.

Dinero Tunnel—Good headway is being made on the great bore, Sugar Loaf district and it is now in a little over 350 ft. In about two weeks the Bartlett vein should be caught at a depth of about 400 feet from the surface. The Bartlett at present is shipping high-grade ore from its own tunnel level, and when the vein is cut by the Dinero tunnel it will give the owners an opportunity to double the output. R. Pitcher Woodward, financial manager and director of the Dinero Company, has been on the ground for the past few days.

Placer Mining—Work for the season has been started on all of the principal placers in the county. The tract of ground extending from the old Union smelter, California gulch, to Hayden's on the Arkansas river, a distance of eight miles, is under consideration by experienced placer miners for a dredge proposition. The ground has been repeatedly prospected and the average yield is 25c. per cu.yd.; the only successful way to work it is by dredge, and that is what the parties who are looking the ground over decide to do, if the deal is made. It is believed that lower California gulch is rich in fine gold, washed down from the work done by the pioneer miners in 1860.

Indiana

SULLIVAN COUNTY

Lyman Bituminous Coal Company—This company has been declared insolvent and placed in the hands of a receiver. The failure is attributed to poor management, unfavorable locality of the mine and the general depression of the coal trade. The mine, which is located three miles west of Jasonville, has a 6-ft. vein of coal of excellent quality. The company owns, all told, over 700 acres of excellent coal land. It was organized with a paid-up capital of $90,000. The plan is to organize a new company to take over the property.

Traction Coal Company—This company, of Indianapolis, recently incorporated with a capital of $100,000, has purchased the Sullivan County Coal Company's mines, near Dugger, and will operate the mines to their fullest capacity, shipping the product to Indianapolis over the Southern Indiana road at a rate of 50c. a ton. The new company is formed by the merging of a number of retail coal dealers or firms, with C. D. Trobridge as president. Coal men say the new merger company is to be an important factor in giving Southern Indiana mines a better outlet and will afford Indianapolis a more regular supply. This company will also be in a position to reduce the retail price of coal to the local trade, it is claimed.

Indian Territory

CHEROKEE NATION

Empire State Smelting Company—This company, at Bartlesville, has placed an order for a steel tank and tower with the Southwestern Bridge Company, of Joplin, Missouri.

Michigan

KEWEENAW COUNTY—COPPER

Keweenaw Copper Company—This company has ordered a new hoist for its Empire property.

Ojibway—Thomas Hoatson, managing director of the Keweenaw Copper Company, is to have charge of the explorations on the property of the Ojibway. Considerable drilling was done on this property last fall under the supervision of L. L. Hubbard and some very fine cores were taken out.

ONTONAGON COUNTY—COPPER

Adventure—This company produced in April 91½ tons mineral, which was the largest month for the year. All work at the property is being centered in opening No. 3 shaft, which is showing better than has been experienced in some time.

Mass—Production in April was 172 tons mineral.

Michigan—The April output of this mine was 150 tons mineral.

Missouri

ZINC-LEAD DISTRICT

A. M. Wagner, until recently the manager of the Winslow properties at Webb City, is devoting time to the preparation of a map 6x8 ft. in dimensions, of the blanket vein operations, north of Webb City.

Mercantile Metal Milling Company—This company has placed the contract for a new 250-ton mill at Webb City, including steel tank and tower, with the Southwestern Bridge Company, of Joplin, Missouri. This will be the first mill constructed entirely of steel in the zinc-lead district of Missouri.

Elliott & Zimmerman Land—W. S. Bartlett, of Joplin, formerly of Boston, owns a lease of 40 acres of this land, which joins the old Sucker Flat mines, in the south edge of Webb City, and which is also being opened up again. Mr. Bartlett is now drilling his lease, and has found the blanket vein in two different holes, the first of which showed 18 ft. of ore on the 224-ft. level, and the second found 17 ft. of ore on the 219-ft. level. Drilling is being done on the northwest 10 acres.

Ideal Mining Company—Since the purchase of the 240-acre tract of land south of Blendville, in the southwest edge of Joplin, the company has been active in having the property developed. The initial sale of ore from this tract was made last week by F. N. Vaughn & Co., who sold 8500 lb. silicate. At numerous times in the history of the Joplin mines this land has been gouged over for shallow ore deposits, but owing to the land being always in a legal tangle, mines would no sooner be opened than operations would be stopped. About a year ago the title was straightened out and the property sold to the Ideal company last fall. There are now six shafts going down by as many different lessees.

Rice Farm—The Onwata Mining Company, composed of Arkansas men, has a lease on the Rice farm southwest of the town of Jasper, in the north part of Jasper county, five miles north of any present mining operations. The land was prospected several years ago by drill and shaft, and, it is said, developed a good face of ore. Being so far from other mining operations drainage was a heavy item of expense. The present company has capital to exploit the property, and will build a large mill.

Trinity Zinc, Lead and Smelting Company—The framework for the 500-ton mill of the Deacon mine, in Richland valley, Duenweg district, is up and the work of completion is rapidly being pushed. It is to be equipped with modern machinery. This mill is being built on the south end of the 120-acre lease. J. P. Newell is the general manager. Just south of the Trinity lease, the Jasper County Royalty Company, of Joplin, have just completed the 500-ton San Gabriel mill. Both of these companies have developed a rich body of the blanket vein ore.

Montana

BUTTE DISTRICT

[illegible] Mining Company [illegible] the Anaconda mine, May 1, to permit of repairs to the hoisting engine, but has been resumed. The company is stoping on the 2200 of the main vein of the mine in Neversweat territory and is also driving west on the same level. It is crosscutting south on the 2400-ft. level of the Neversweat, but has not yet encountered ore in that direction. It is also preparing to re-timber the shaft of the Belmont from top to bottom and enlarge the opening by one compartment, making it three.

Boston & Montana—This company is sinking the shaft of the Mountain View from the 1800 to the 2200 and will connect the bottom with the 2200 of the High Ore. This mine is one of the great producers of the company, its daily output averaging 1200 tons of ore. Sinking is also in progress at the West Colusa, Badger State and Greenleaf. Seven of the new boilers at the New Leonard shaft, which have a capacity of 250 h.p. each, are in commission and the remaining one will be ready about May 12. Two large compressors are going into place at this mine.

Coalition—The shaft on the Minnie Healey will be finished to the 1400-ft. mark soon. Development is progressing on the 1300 and orebodies are blocked out in all directions from the shaft. Almost the entire claim is ore at this level and the greater part of the ore is copper glance. The lower workings are now well ventilated, as the result of connections with the openings of the Leonard. The shaft on the Rarus is still sinking and development is going ahead in intermediate levels. The mine is yielding between 500 and 600 tons of ore a day. The Corra is giving up some ore, but its grade is not up to that of the other developed mines of the company.

Alliance—This is one of the new companies that has struck commercial copper ore. On May 5 it cut the vein 35 ft. south of the 300-ft. station and has crosscut it 10 ft. without striking the hanging wall. This vein is from 20 to 25 ft. wide at the 200 and is full of high-grade ore. Drifting has been carried on east and west of the shaft at the 200, with the result that there is more than 1000 tons of ore in sight on this level. The bins are overflowing and shipments will have to be made to make room for the output.

Colusa-Leonard Extension—The company has struck a third vein of ore in a crosscut south of the 600-ft. station. Its

east and southwest, while that of the others is east and west.

all the ore it can and is letting other work wait. Crosscutting to the north from the is slow on account of the distance the waste must be hauled to the shaft, and the work which the engine must do in raising ore and lowering timbers. The output of the veins remains about the same as usual, f which is second-class ore.

Reins Copper—This company has increased its power plant and is shipping copper ore at intervals. The ore is coming from the 800 and 900-ft. levels. Drifting east on the north vein at the 1200 is

Nevada

tween the Mine Owners and Business Men's Association, and the Industrial Workers of the World, which resulted in the closing down of the majority of the mines on this field for over 40 days, has been settled by the mine owners making terms with the Western Federation of Miners, Union No. 220. The basis of the agreement is a series of resolutions passed at a recent meeting of the union, which are substantially as follows:

"In order to establish a definite understanding between the Western Federation of Miners Local No. 220 and the mine owners and operators of the Goldfield mining district, it is agreed that mining and milling operations will be resumed under the following terms:

"First. The wage scale in effect in the district March 1, 1907, shall remain in force, and eight hours shall constitute a day's work for all men under the jurisdiction of the miners' union.

"Second. The miners' union shall have jurisdiction over all men regularly employed in and around the mines, mills and smelters, including timbermen, timber framers, engineers, blacksmiths and machinists and excepting superintendents and

"Three. No strike nor boycott shall be officially declared by the miners' union unless by a two-thirds vote of the organization in favor thereof, and no lockout shall be enforced by the mine owners and operators unless by a like vote.

"Four. No town labor controversy shall interfere with the operations of the mines or the employment of miners.

"Five. These terms shall remain in force for a period of two years from date."

The opposing union which caused all the trouble, has become thoroughly disor- s a'm Lmed the district, which will hereafter be controlled by the Western Federation of Miners.

Nye County—Tonopah

Operations have been resumed on this property, which consists of a group of twelve claims adjoining the Belmont on the northeast. A 75-h.p. electric hoist has been purchased by the company, which will be erected without delay. When mining was suspended three years ago the main shaft had reached a depth of 800 ft., and the level at that depth was run on a ledge 25 ft. in width, carrying low-grade ore. Recent discoveries in the adjoining mines have shown that it is necessary to sink deeper to get rich ore, and the company decided to resume mining and continue the shaft to a greater depth. The ledge should carry ore of shipping grade before the 1500-ft. level is reached.

The north crosscut on the 500-ft. level is out about 190 ft., and the south cross cut has been run a total distance of 155 ft. from the shaft, no ore of any consequence being noticeable in the country rock, the management has decided to resume sinking to the 300-ft. level.

Boston-Tonopah—The crosscut from the 500-ft. level has been run out a distance of 350 ft. The formation is very hard, and progress is slow. Several quartz stringers have been met with, but the general impression is that the shaft must be sunk to a much greater depth before substantial returns are obtained.

Molly Group—This property, consisting of 13 claims lying east of the Jim Butler mine, has been purchased by the Western Exploration Consolidated Company, of Philadelphia. The shaft, which has reached a depth of 500 ft., will be sent down a further distance of 1000 ft. Mining will be resumed as soon as a new plant is obtainable.

Ore Shipments—The ore shipped over the Tonopah Railroad for the week ended May 2 was: Tonopah Company, 1040 tons; Belmont, 370; Montana-Tonopah, 138; Tonopah Extension, 335; total, 1883 tons. In addition the Tonopah Company shipped 2500 tons to its mill, making a total of 4383 tons reported for the week.

Pennsylvania

Anthracite Coal

Delaware, Lackawanna & Western—This company will spend about $1,000,000 in improvements upon its breakers and equipment in the coal department during the present year, the statement being made after an inspection trip by Vice-president Loomis last week. Some of the breakers are old and have passed their best days, while there is a considerable quantity of coal to be mined. The company is also making large use of electrical equipment in place of steam machinery and mules. Detailed plans have not been made of the improvements.

Lehigh Coal & Navigation—This company will convert the new No. 14 breaker at Greenwood into a washery and wash the large culm banks there, which are the richest in that part of the anthracite region. After the culm banks are worked over, the breaker will be used to treat the coal mined from the new slope now being sunk.

Coke

Connellsville Central Coke Company—This company, the output of which is controlled by J. H. Hillman & Son, of Pittsburg, has announced its plans to erect 200 of the modified Belgian type coke ovens at the Herbert works, New Salem, Penn., and the work is now under way. Contract for the brick has been closed with the Harbison-Walker Refractories Company, of Pittsburg. These new ovens will be 35 ft. long and 5 ft. wide and, although larger, are of the same general plan as the experimental ovens erected last fall at the Mt. Braddock plant of the Rainey Coal and Coke Company.

South Dakota

Lawrence County

Homestake—A circular to stockholders, signed by J. B. Haggin, president, and Fred. Clark, secretary, has been issued. It says in part: "The management regrets to announce that for the first time in over 28 years it is deemed advisable to discontinue temporarily the payment of the monthly dividend. The advisability of this action becomes apparent when it is known that there is a fire in the mine which prevents operations underground on account of the gases, and that the mills are hung up in order to allow the water ordinarily used in them to go into the mine to extinguish the fire, all other known methods of subduing it having failed, notwithstanding the heroic efforts, long continued, of all the employees on the ground. It is expected that the fire will be submerged on or about the first of June, when the water now going into the mine will be available for milling purposes again, and as many stamps (probably 500 to 600) will be started as can be furnished with ore from the surface openings. Nothing serious occurring to prevent, the mine will be unwatered to the 500 level about the middle of July, when underground operations to that depth will be resumed, and the remainder of the 1000 stamps started. Operations below the 500 will follow as each level is relieved of its water contents. When the fire was discovered the mine was in excellent physical condition. No material impairment of that condition is looked for from water contact. The unwatering will not be expensive. The treasury will take care of that. We have 20 years' ore in

night and was [illegible] is practically finished, and the property generally in good order and condition."

Utah

Salt Lake County

The ore shipments from the mines of the Tintic district were represented in the Salt Lake market by 178 carloads, the contributing mines and respective amounts being: Ajax, 6; Beck Tunnel, 12; Bullock, 2; Bullion Beck, 12; Black Jack, 1; Centennial Eureka, 56; Colorado & Centennial, 1; Eagle Eagle & Blue Bell, 8; Gemini, 5; Lower Mammoth, 9; La Clede, 2; Scranton, 6; Dragon Iron, 9; Uncle Sam Consolidated, 3; Victoria, 2; Yankee Consolidated, 6 cars.

Railway Building.—The grading of the roadbed for this railway, which will connect the new Tintic smelter with the principal mines of the Tintic mining district, has begun. The company will operate between 10 and 15 miles of track.

Scranton—A strike of considerable significance was made last week in this Tintic property, it having demonstrated the continuity of the Scranton orebody for a distance of fully 2000 ft. The mine is a regular shipper of lead and zinc ore.

Utah Mine—Regular shipments of ore are being made from this property. A car of ore sold last week gave returns of 49 per cent. lead and 108 oz. silver per ton.

Iron County

Reuben—This company is getting ready to begin a campaign of development on its property at Stateline. At the bottom of a 50-ft. shaft a body of ore is exposed which averages about $15 in gold and silver to the ton. W. J. Dooley, of Salt Lake, is president of the company.

Iowa Gold—The mill operated by this company at Gold Springs is treating successfully about 40 tons of ore per day. Charles A. Short, of Gold Springs, Utah, is manager.

Desert Wonder—This property, located near Modena, is opening up encouragingly. In the shaft considerable lead silver ore has been found. W. H. Bagnall, of Salt Lake, is manager.

Washington

Okanogan County

Nespelem—In this camp, in the southeastern part of this county, there are about 130 claims under development and some of them produce very rich ore.

Palmer Mountain—The Kimberley Development Company will install next month a hoisting engine, boiler, compressor, drills, pumps, track and cars. A shaft has been sunk 100 ft. and drifts are being driven on a vein of 7 to 10 ft. in width. The ore assays in gold, silver, lead and copper.

[illegible] recently organized to take over the Anaconda group of four claims for $40,000. It is capitalized at $1,250,000. The directors are James T. Plant, C. E. Williams, Henry Rines and G. W. Newbert, of Mora, Minn.; G. P. Ward, of Alexander, Minn.; S. Callahan, of Spokane, and P. Connelly, of Somas, Wash. J. T. Plant is president; C. E. Williams, vice-president; H. Rines, secretary and treasurer. There are two veins on the group, which will be cut by a tunnel already started, one at 400 ft. in from the portal and the other at about 600 ft.

Ruby—At this mine, on Mount Chopaca, two new levels have been opened on ore. Connections have been made between all of the levels and the mine is in fair shape to ship right along, after the railway reaches it.

Salmon River—This company owns a large group of claims 3 miles south of Conconnulli, on Peacock mountain, upon which several bodies of copper ore have been developed near the surface. The company is about to start a tunnel and drive it through 3000 ft. The tunnel work will be under the direction of William McDaniel.

Trinity—A large interest in the company was recently purchased by C. Johns, of Chicago. Arrangements will be made with the Similkameen Falls Power Company to transmit power to the mine. A wagon road, 1¼ miles, will be constructed from the mine. The company's main office is at Spokane, Wash. Edward Davis is the president.

Canada

Alberta

During the present year up to March 4, coal lands aggregating nearly 100,000 acres, chiefly in the province of Alberta, have been disposed of by the Canadian Government. The price received was $7 per acre, the land being disposed of in lots of the usual size of 320 acres, though some were of smaller dimensions.

British Columbia

Eva Gold Mines, Ltd.—A Canadian Rand compound duplex Corliss-valve 15-drill air compressor has been installed at the mill at Camborne, northern Lardeau district. This engine is direct connected to a Pelton water-wheel 13 ft. 2 in. diameter. The compressed air for operating machine drills is conveyed up the mountain about 4500 ft. to the Eva mine.

Snowshoe Mine—A Jeffrey electric locomotive has been ordered by the Consolidated Mining and Smelting Company, of Canada, for hauling purposes on the main tunnel level of its Snowshoe mine at Phœnix in the Boundary district.

West Kootenay Power and Light Company—This company, with head office at Rossland, is now using its new hydroelectric generating station at upper Bonnington falls, Kootenay river, near Nelson, where it has one 8000-h.p. unit in operation and another available whenever additional power shall be required. The voltage of the current transmitted to the Boundary district since starting the new plant has been up to 40,000 volts. The two 78-mile circuits connecting the generating station with the main sub-station at Greenwood have been constructed and equipped for 60,000 volts. These high-tension lines are carried on wooden poles, varying in hight from 35 to 80 ft. and placed on an average 150 ft. apart. The conductors used are hard-drawn copper cable. Wires are strung in a rectangle with each wire distant 6 ft. from the others. The line is transposed at every mile. Cross-arms are of wood, 5x6 in., and insulators are 60,000-volt porcelain, made by the Locke Insulator Company, of New York. There are also two 20,000-volt circuits running out of the generating station transformer house. All three Boundary copper smelters and six or more district mines are now using electricity as motive power.

Nova Scotia

Dominion Coal Company—The output for April was 316,114 tons coal, against 296,417 tons for April, 1906. The product for the first four months of the year was 1,063,548 tons in 1906 and 997,595 tons in 1907, a decrease of 65,953 tons.

Nova Scotia Steel and Coal Company—This company has made arrangements to purchase a large deposit of iron ore in Brazil. Negotiations have been carried on for some time, and last year an expert was commissioned to make an examination of the property. His report was favorable and the purchase was decided upon. Harvey Graham, one of the directors, and J. L. Jennison, of New Glasgow, solicitor for the company, left for Brazil recently to close the transaction.

Ontario—Cobalt District

Ore Shipments—Shipments of ore from Cobalt over the Timiskaming & Northern Ontario road for the week ending May 4 were: Cobalt Townsite, 40,070 lb.; Coniagas, 62,000; O'Brien, 130,390; Silver Queen, 44,000; total 276,470 pounds.

Buffalo—In this mine, Cobalt, another important find was made May 2. In trenching, a rich vein about 5 in. wide was exposed, which has been stripped for 50 ft. It branches out at one place into a network of small veins. A shaft will be sunk upon it.

Cleveland-Cobalt — The gas-producer plant from Philadelphia, ordered some time since, is being installed to furnish power for the mine at Cobalt and a pipe is being laid to carry air from the plant, which is three-quarters of a mile distant from the mine, across the Silver Queen and Timiskaming & Hudson Bay proper-

on the other four being suspended until the producer plant is in working order.

Florence—This company, which has an action pending against the Cobalt Lake Mining Company, claiming a prior right to the bed of Cobalt lake on the ground of previous discovery, has petitioned the Dominion government to disallow the act passed at the last session of the Ontario legislature validating the title of the Cobalt Lake Company. It is urged that the act is *ultra vires*, as it is confiscation of the rights of the Florence Mining Company. The case before the court has been postponed to await the result of the petition.

[illegible] It has been decided to lower the lake level 8 ft. by drainage, which will leave a considerable area of the property uncovered. A find of native silver has been made 16 ft. below the surface of the water.

Lumsden—This company has a force of 94 men at work on the Brady claim, Cobalt, adjoining the Beaver and Timiskaming mines, where 20 ft. of stripping has been done, resulting in the discovery of 14 veins, some of which have native silver contents in addition to cobalt, smaltite and nickel. Machinery has been installed on the Geeling claim, Bucke township, where 14 men are at work.

Ontario—Manitou Lake

Laurentian Gold Mine—The working force has been largely increased and the rate of pay raised 25c. a day all round. Chauncey Whetmore, late of Sonora, Mexico, is in charge of the stamp mill, operating 20 stamps. The pump and boilers installed at Crystal lake are pumping 500 gallons of water per minute to the mine.

Paymaster Gold Mine—Drifting operations commenced at the 100-ft. level have disclosed a good vein, the quartz showing visible gold. A good find of similar character has also been made at the 200-ft. level.

[illegible]

St. Anthony's Reef—At this gold mine, Sturgeon lake, the management has decided to suspend development work until proper transportation facilities are available. The mine will be re-opened on an extensive scale as soon as the Lake Superior branch of the Grand Trunk Pacific, now under construction, is open for traffic. Meanwhile the exploration of the vein will be undertaken.

Mexico

Jalisco

Copper Range—This company has ordered a 50-ton smelting plant for its properties near Autlan, in the southern part of the State of Jalisco.

Guanajuato

The many improvements and extensive development work continue unabated in the camp of Guanajuato. The 100-ton mill of the Guanajuato Amalgamated Gold Mines is running full, and from 20 to 25 tons of concentrates are shipped weekly to the smelters. The Los Angeles & Guanajuato Development Company is preparing to start operations in La Luz district. Examinations have been made of the group known as La Luz to determine upon the size and details of a mill for the treatment of the old fillings and the ore blocked out. The old San Cayetano property, consisting of 750 acres and held since 1814 by the United Mexican Mines Association, Ltd., of London, which is now winding up its affairs, seems to have been at last placed by W. Murdock Wiley, who for some time has held an option on the property, and who has had it about placed several times. The San Cayetano Tunnel Mines Company, as the new company will probably be named, will be closely allied to the Mineral Development Company, of 99 John street, New York, with Mr. Wiley as temporary president. It is understood that the transfer was made for $135,000 gold. The Peregrina Company has completed its new 120-stamp and cyanide mill, which is a model of its kind. It consists of Gates crushers, with belt conveyers to the stamp bins; stamps of 1000 lb. each in batteries of five, dropping 6 to 8 in. and about 90 times a minute. The material passes through a 30-mesh sieve over plates to cone classifiers and Wilfleys, the oversize going to tube mills. The sands are drained before leaching and then handled wholly by the Blaisdell automatic system.

For the San Matias, of the Guanajuato Transportation and Milling Company, a Butters slime plant is being installed at a cost of $10,000 gold. Work has started on the construction of the initial 20 stamps of the 80 for the Republic Mining Company for treating the ores from its Union, Cordobanes and other properties. The Guanajuato Reduction and Mines Company is completing its second 80-stamp unit and preparing for the installation of a third 80, making a total of 240 stamps, capable of treating about 750 tons under one roof. Even at this rate it is estimated that it will take close to 10 years to work over the company's old dumps.

The old Cinco Señores, of San Luis de la Paz, Guanajuato, which 10 or 12 years ago was in bonanza and whose shares were selling for $3000 and over, but which in the last few years has fallen greatly in production, partly because it did not keep up with development work, has been reorganized with $300,000 Mexican capital, divided into 6000 shares, of which 1729 will be free and the remaining 4271 assessable. The shares are to be sold at $5 cash and 90 per cent. in nine assessments as called, the proceeds to be used in working the lower levels, which are now largely under water. Manuel Aramburu, of 18 Cadena street, Mexico City, is the president of the new organization.

Australia

New South Wales

The gold yield in March was 36,973 oz. fine. For the three months ended March 31, it was 95,493 oz. fine in 1906, and 87,024 oz. in 1907; a decrease of 8469 oz. this year.

Western Australia

The output of gold in March is reported at 129,725 oz. fine, being 14,467 oz. less than in February. For the three months ended March 31 the production was 442,364 oz. in 1906, and 426,156 oz. in 1907; a decrease of 16,208 oz. this year.

The January gold yield, 162,238 oz. fine, was a great improvement on previous few months' yield and shows an increase of 7873 oz. over that of January last year. The many new fields which are opening up well will, it is hoped, more than make up for a falling off in the Great Fingall mine, and the general lowering of the grade of ore now treated at Kalgoorlie.

Dividends paid by the various West Australian companies during 1906 totaled £1,092,002.

The old Southern Cross fields are in great favor and gold mining is looking very promising. The Marvel Loch mine has been floated into a strong company in Melbourne. A large capital is provided for and active development work is in progress. A great deal of prospecting is going on for miles around.

On the northern fields Black Range continues to do well. The last fortnightly return by the Black Range Company's mine was 567 oz. from 385 tons treated by battery and 331 oz. from 467 tons of tailings cyanided. The 200-ft. level is opening up well. The Kohinoor lease, which was also secured by the Black Range Company, has since the purchase yielded 909 oz. gold from 115 tons treated; the sands will bring up the average value to over 10 oz. per ton.

The Pilbarra fields are quiet, owing to delay in starting the proposed railway. A promising silver-lead mine is being worked near Roebourne and the tinfields of Wodgina are steadily increasing their output.

New Zealand

Exports of gold and silver in January are reported by the Mines Department as follows, in ounces:

	1906.	1907.	Changes.
Gold	61,704	27,510	D. 34,194
Silver	85,552	189,552	I. 104,000

The gold bullion reported this year was equal to 25,221 oz. fine gold, or $521,303 in value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, May 15—The coal trade in the West presents no new features. The cold weather seems to have come to an end at last, so that the abnormal late demand for domestic coal has probably come to an end. The market for steam coal continues active, factories being generally well occupied. Apparently, also, there is a disposition to put in stocks, so as to avoid a repetition of the troubles of last winter. The Lake trade is in full swing, and vessels are getting away from Lake Erie ports as fast as possible. The railroad service, for the time being, is good, and few complaints are heard.

In the East the trade is moving along steadily. Steam-coal requirements are large and are taking most of the available coal, both anthracite and bituminous. The coastwise trade is hanging back a little, on account of scarcity of vessels at the shipping ports.

Railroad service is generally good; but there is much complaint about long and vexatious delays in unloading coal cargoes at New England ports.

There are rumors that the control of the New York, Ontario & Western, and its anthracite properties, now held by the New York, New Haven & Hartford Company, is to be passed over to the New York Central. Possibly there is some foundation for these, but nothing definite can be said as yet.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to May 4 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	1,402,770	1,807,924	I. 405,154
Bituminous	11,315,574	12,707,790	I. 1,392,216
Coke	4,380,705	4,797,723	I. 417,018
Total	17,119,049	19,397,837	I. 2,278,788

The total increase this year was 13.3 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to May 11 were 378,028 tons.

Coal tonnage originating on the lines of the Southern Railway for the two months ended Feb. 28 was: Tennessee district, 245,777; Alabama district, 398,223; total, 644,000 short tons.

Shipments of anthracite coal in April were 5,916,583 long tons, a high figure for that month. This compares with 488,203 tons in April, 1906, when most of the mines were shut down pending a settlement with the miners. For the four months ended April 30 the shipments, by companies, were, in long tons:

	1906. Tons	1906. Per Ct.	1907. Tons	1907. Per Ct.
Reading	[illegible]	20.1	4,291,165	20.6
Lehigh Valley	2,799,560	17.1	3,597,766	17.2
N. J. Central	2,064,234	12.6	2,685,379	12.8
Lackawanna	[illegible]	16.-	3,3[illegible]44	16.1
Del. & Hudson	1,671,880	10.2	2,071,803	9.9
Pennsylvania	1,4[illegible]47	8.8	1,892,538	9.2
Erie	1,610,264	9.8	2,214,838	10.6
N. Y., Ont. & W	[illegible]	4.3	[illegible]244	4.2
Total	16,404,254	100.0	20,976,057	100.0

The total increase this year was 4,571,803 tons, or 27.9 per cent. Shipments by months this year have been: January, 5,249,946; February, 4,563,720; March, 5,245,808; April, 5,916,583 tons.

Receipts of coal at Boston for the four months ending April 30 are reported by the Chamber of Commerce as follows:

	1906.	1907.	Changes.
Anthracite	175,[illegible]	662,147	I. 186,791
Bituminous	1,025,[illegible]	913,[illegible]	D. 112,210
Total domestic	1,500,735	1,575,316	I. 74,581
Foreign coal	283,237	185,055	D. 98,182
Total	1,783,972	1,760,371	D. 23,601

The foreign coal is chiefly from Nova Scotia, with a small quantity from Great Britain.

Anthracite Sizes

A statement compiled by W. W. Ruley, of Philadelphia, gives the sizes of anthracite shipped to market in 1906 as follows:

	Tons.	Per Ct.
Lump	1,420,511	2.55
Broken	3,723,515	6.68
Egg	6,988,774	12.55
Stove	10,061,784	18.06
Chestnut	10,699,744	19.21
Total large	32,894,124	59.05
Pea	7,490,203	13.29
Buckwheat	8,320,522	14.94
Rice and barley	7,083,746	12.72
Total small	22,804,471	40.95
Total	55,698,595	100.00

The proportion of small sizes was highest in the Schuylkill district, where it was 44.78 per cent. The Lehigh region reports 43.29 cent., while the Wyoming region shipped 38.6 per cent. of small sizes.

New York

Anthracite

May 15—The warm spring weather which has set in at last—unexpectedly, as it generally does—rather emphasizes the dullness in the anthracite trade, so far as larger sizes go. The small steam sizes are still in strong demand, but supply is a little better. Coastwise trade has been restricted by scarcity of vessels. Car supp[illegible] about transportation.

Prices are unchanged, as follows: Broken, $4.35; egg, stove and chestnut, $4.60. Small sizes are quoted nominally: Pea, $3; buckwheat, $2.50; rice, $1.85; barley, $1.50. All f.o.b. New York harbor.

Bituminous

The Atlantic seaboard soft-coal trade is quiet at this time, although lack of vessels is having some effect, shippers being unable to move orders in hand; in the meantime other orders are accumulating. Many coasting vessels are taking outside freights, for which rates are very high and attractive. The general market for soft coal is slightly improved outside of this situation, in that accumulations of coal at tidewater ports are being materially reduced. There is, however, no change in prices, quotations being $2.30@2.35 f.o.b. New York harbor shipping ports. Good steam coal can still be purchased from $2.60@2.70, same delivery.

Trade in the far East is calling for fair shipments upon the season contracts in hand, which will permit a prompt moving of the coal when available vessels arrive at shipping ports. Discharging at the unloading ports is slightly better than it was, and most vessels are being finished without much demurrage.

Trade along the Sound is showing an inclination to take a little more coal than it did and the worst effects of the lower prices of anthracite which began April 1 are about over.

Trade in New York harbor is quiet, but the situation is clearer on account of the absorption of the stocks of coal which were at tidewater. Contractors are taking their usual amount for this period of the season and things are apparently shaping themselves to move more regularly.

All-rail trade is quiet on new business and contractors are pretty well filled up as coal is being delivered to them and accumulations are piled up at tide. Good coals can be bought around $1, f.o.b. mines. Car supply is up to all demands and transportation from mines to tide is very nearly up the schedule.

Coastwise vessels are very scarce and in great demand. We quote rates from Philadelphia to Boston, Salem and Portland $1@1.05; to Providence, New Bedford and the Sound, 90c.; to Lynn and Bangor, $1.25; to Portsmouth, Gardiner and Saco, $1.15; to Bath, $1.10, with towages where usual.

Birmingham

prices obtain for coal. The railroads are giving a better service and the operators are complaining but little in this regard. The real warm weather has not yet been felt in this section of the country, and the slack conditions usually observed when warm weather does come on are delayed.

new slope in the vicinity of Connellsville, in Tuskaloosa county. Several coal companies were organized during the past three weeks and new openings are going be made by all. Activity in the iron market will hold up the coal market.

Coke is not so strong in demand and quotations are not as firm as they have been. The production is none too large, however, and the producers look for a recovery in the near future.

Chicago

May 13—Sales of all grades of domestic coals have been good in the last week. The cold weather has been chiefly responsible for this. Eastern and western coals alike have profited.

Sales of steam coals have been good and contracts are increasing in number and quantity of coal. There is still a tendency on the part of users of large amounts to hold off, in the belief that the open market will be more favorable to their interests.

Western bituminous sells for $1.70@2.50 for run-of-mine; $1.90@2.65 for lump and egg, and $1@1.75 for screenings.

Eastern bituminous is firm. Smokeless is held at $3.35 for run-of-mine and $3.65 for egg and lump. Pittsburg No. 8 is held at about $2.90, and receipts are not yet adequate. Youghiogheny is scant at $3.20 for ¾-in. Hocking is firm at $3.15

Cleveland

May 14—Local buyers are bidding for grain tonnage up the lakes, but there is little activity in iron-ore shipments. The tonnage moved to Cleveland during the [illegible] off, but receipts during the week picked up considerably. The Chamber of Commerce today completed its table of coal receipts and shipments, by rail and lake. The receipts of anthracite were 22,541 tons, all by rail; bituminous, 456,420 tons, all by rail. Bituminous forwarded by lake, 282,474 tons.

Coal dealers report a firmer market on the opening of navigation. Supplies on hand have been materially lessened, but prices continue about the same.

Pittsburg

May 14—There is a good supply of railroad cars this week and the mines are practically in full operation. The demand is fair, but prices are somewhat easier, quotations being on the basis of $1.20 for mine-run coal at mine. The rivers are still navigable and several tows of coal boats and barges were sent to lower ports during the past few days, the total tonnage sent out being in the neighborhood of 1,000,000 bu. There is plenty of empty craft in the pools and harbors and the mines will be kept running steadily for some time, and a large tonnage likely will be accumulated for the June rise.

[illegible] Coke prices continue low, sales having been made at $2.25 for furnace coke for prompt shipment. Higher prices, however, are expected to prevail before the end of the week. For last-half delivery $2.65@2.75 is quoted. Foundry coke for spot shipment is down to $3 per ton, the lowest rate reached for a long time. For second half, sales of foundry coke are being made at $3.50@3.75. The *Courier*, in its summary for the week, gives the production in both regions at 415,482 tons. The shipments aggregated 15,115 cars, distributed as follows: To Pittsburg, 5067 cars; to points west of Connellsville, 9126 cars; to points east of Connellsville, 922 cars.

Foreign Coal Trade

May 15—Imports of coal into Germany for the three months ending March 31 were, in metric tons:

	1906.	1907.	Changes.
Coal	1,824,026	2,375,856	I. 551,830
Brown coal	1,960,500	2,013,953	I. 53,453
Total	3,784,526	4,389,809	I. 605,283

Imports of coke in 1907 were 105,258 tons; of briquets, 40,382 tons.

Exports of coal from Germany for the three months ending March 31 were, in metric tons:

	1906.	1907.	Changes.
Coal	5,216,596	4,721,804	D. 490,792
Brown coal	5,057	3,982	D. 1,075
Total	5,220,653	4,728,786	D. 491,867

Exports of coke in 1907 were 865,066 tons; of briquets, 289,267 tons. Included in the coke exports were 1033 tons to the United States.

Coal production in Germany for the three months ended March 31 was, in metric tons:

	1906.	1907.	Changes.
Coal	35,240,540	35,410,498	I. 169,958
Brown coal	14,542,212	14,904,190	I. 361,978
Total mined	49,782,758	50,314,688	I. 531,930
Coke made	4,818,332	5,237,792	I. 419,460
Briquets made	3,705,463	3,777,140	I. 71,677

A large part of the briquets is made from brown coal, or lignite.

Iron Trade Review

[illegible] *May* 15—The week has shown increasing activity in the iron trade, and active buying in various lines is reported. Although there is still some uncertainty about the crop outcome, the foundries seem to have dropped all uncertainty and are contracting freely for third and fourth quarter delivery; while there have been sales running into the first quarter of 1908. Basic pig is in demand, as well as foundry.

In finished material there has been more inquiry for structural steel. Bridge and building projects still seem to be coming forward. The rail capacity for 1907 is pretty well taken up, and a considerable tonnage is already on the books for 1908 delivery.

The first shipments of Lake iron ore have arrived at Lake Erie ports, and the receipts there will be large and continuous from now on.

There has been a good deal of talk in the press about accidents due to breakage of rails; and charges have been freely made that a good many rails of recent make are not up to the proper standard. Some careful investigation will be needed to determine whether this is the case or not. This talk has started also some discussion as to the superiority of open-hearth steel rails over those of bessemer steel. On this point some things have been said which show little knowledge of the subject.

Pig-iron Production—The statement of the furnaces in blast on May 1 shows coke and anthracite furnaces active, with a total weekly capacity of 523,900 tons, or 26,400 tons more than on April 1. The estimate of the *Iron Age* for coke and anthracite production, with an allowance for the charcoal furnaces, gives a total production for April of 2,251,500 tons of pig iron, and for the four months ended April 30 of 8,830,600 tons.

Lake Iron-ore Rates — The Cleveland *Marine Review* has compiled the average rate at which all ore, both wild and contract, was moved from the head of the lakes to the lower lakes during the season of 1906. The rate is an absolute one, as the figures are obtained directly from the shippers. The average rates for 10 years have been, in cents per ton:

1897	63.800	1902	77.490
1898	59.000	1903	84.010
1899	79.400	1904	72.540
1900	120.700	1905	75.060
1901	79.990	1906	75.079

In 1906 the great bulk of ore was moved at the flat rate of 75c., but certain shippers have continuing contracts somewhat lower than this figure, and a small amount was moved at a rate considerably higher than 75c. The average rate works out as given in the table.

Baltimore

May 14—Imports of steel-making alloys for the week were: Spiegeleisen, 1225 tons; ferromanganese, 2800 tons; ferrosilicon, 318 tons; silicon-spiegel, 300 tons. Receipts of manganese ore were 443 tons. Arrivals of iron ore were 6050 tons from Nicolaieff, Russia; 4300 tons from Spain; 11,175 tons from Cuba; 21,525 tons in all.

Birmingham

May 13—Alabama pig iron appears to have taken a strong position. No. 2 foundry, for delivery during the last quarter of the year, commands $20@21 per ton and is selling right along. In fact, there is talk of some of the manufacturers in this section withdrawing from the market altogether. Third-quarter iron is hard to get and is being sold almost as spot iron. Some spot iron has been selling lately, one brokerage firm announcing during the past week that orders to the amount of 1600 tons had been accepted; more than $23.50 per ton, No. 2 foundry, has been received. Some of the larger companies in this district have been in the spot market also. Several sales of iron for delivery during the first quarter of 1908 have been made and the statement is given out that the quotation for that product is but a little under $19 per ton. The first sales of 1908 iron, according to good information, were made on a basis of $18 and less per ton.

Foundries and machine shops are doing well. There is no hesitation in the demand for cast-iron pipe. Soil-pipe makers report much activity, though they are feeling the labor troubles in San Francisco and other western places. Alabama manufacturers have sold no less than 15,000 tons of soil-pipe to San Francisco, Los Angeles and Seattle this year. The freight rate on pipe from this district to San Francisco is $13 per ton.

Chicago

May 13—The last week has held the iron market firmly in line with previous weeks, and has seen a turning to foreign irons as a means of relief from the present scarcity of small supplies. The demand for iron generally has been strong, but the shortage in supplies has kept actual sales small in tonnage, though many in number.

No. 2 Northern for quick delivery brings $27 and No. 2 Southern, $26@27. For second-half delivery No. 2 Northern is quoted at $24.50@25, and No. 2 Southern at $20@20.50, Birmingham, or $24.35@24.85 Chicago.

The demand for finished material continues. Coke is steady, with Connellsville foundry at $6 and Southern coke 25 to 50c. lower.

Cleveland

Sales of pig iron continue strong on the advance to these quotations for last-half delivery; Bessemer, $23.90; No. 1 foundry, $24; No. 2, $23.50; No. 3, $23; No. 2 Southern, $23.85; gray forge, $22.50.

Spot furnace coke is quoted at $2.50 and foundry at $3.30@3.35, while foundry for future delivery is selling at $3.25. The market reports a fair demand, but prices appear to have reached the top for the time being.

Philadelphia

May 14—This territory is more disturbed by what is transpiring outside of its limits than within. The most interest felt is among a very few who handle basic pig. The large transactions which took place recently have been followed up by smaller sales which go to show that all the basic pig which can be had can find ready market. The heavy undercurrent has advanced prices nominally all around, but the volume of business definitely closed within six days does not size up much. Brokers speak of possibilities of business on a large scale, especially in pipe iron, No. 2 foundry and basic. Conditions are more or less unsettled, and there are rumors of business of large proportions, but careful inquiry reveals a moderate volume only. Quotations are nominally higher than a week ago, but sales have been made at about last week's level.

Steel Billets—Deliveries are now being hurried along on orders placed some time ago, but new orders for the week have been light.

Pittsburg

May 14—Indisputable evidence of the remarkable strength of the iron and steel markets was shown in the bi-monthly examination of sales of bar iron, tin-plate and sheets under the wage scale of the Amalgamated Association of Iron, Steel and Tin Workers. The adjustment clearly shows that all sales made in March and April were at the established prices and that but few low-price contracts remain unfilled. Compared with the previous examination held early in March there was an advance in all branches. In sheets the advance was the first to be recorded under the sliding scale. The base is 2.30c., being the average of Nos. 26, 27 and 28 gages. The established price for No. 26 is 2.45c., for No. 27, 2.50c. and for No. 28, 2.60c. The average of all sales shows a price of 2.46c., which was a surprise when it is known that large sales were made of No. 26 gage and that on all large orders a concession of 0.05c. was allowed. As a result the wages of the sheet workers were advanced 2.6 per cent., this being the increase for every 0.10c. above the base.

Tin-plate took another jump and the average for the past two months was $3.72 a box. The base of the tin-plate scale is $3.40 a box and the wages are advanced 2 per cent. with every increase of 10c. a box above the base. The January settlement showed $3.50, the March settlement $3.60 and the present settlement $3.70, making the advance in tin-plate workers' wages this year 6 per cent. The American Sheet and Tin Plate Company voluntarily concedes this advance to the men employed in its non-union mills.

Late this afternoon the National Tube Company issued its new price list. This [illegible] vance over the old list of two points, or $4 a ton, except for 7- to 12-in. pipe, which remains the same at 70 per cent. for black [illegible] treme discount to jobbers in carload lots is 74 and 5 per cent. off the list, and to consumers one point less discount. All pipe mills are crowded with orders and cannot promise deliveries inside of from four to six months.

Pig Iron—Second-half pig iron sold above the $23 rate during the week, when contracts were closed for 7500 tons of basic and 600 tons bessemer for fourth-quarter delivery at about $24, Pittsburg, or 15c. above the highest previous sale. Two lots of basic iron sold later in the week at $22.25, Valley furnaces, for delivery in the last quarter. Furnaces are evidently discouraging sales at fancy prices that are calculated to disturb the market, and endeavoring to keep prompt and future prices down. One significant transaction was the sale of 3750 tons of malleable bessemer iron for equal deliveries over the first quarter of 1908 at $22, Valley furnaces. During the past 10 days there have been a number of important inquiries from steel interests for pig iron for second half. One large producer rejected inquiries aggregating over 40,000 tons. It is announced that there is no bessemer or basic iron and but little foundry and forge iron for delivery this year. It is believed, however, that some producers are reserving some which will be sold later on. Some small lots of bessemer and No. 2 foundry sold this week at $25 and higher for prompt shipment. A sale of 5000 tons of gray forge for second-half delivery at $22.85, Pittsburg, is reported. For third-quarter delivery bessemer, basic, malleable bessemer and No. 2 foundry are quoted at the uniform price of $23, Valley furnaces.

Steel—There is scarcely any tonnage in billets or sheet-bars available and prices are nominal, $31.50 being named for bessemer and $33 for open-hearth billets. Sheet-bars for prompt shipment readily command $31. Merchant-steel bars are firm at 1.60c. and plates at 1.70c.

Sheets—Mills are still several months behind in deliveries and new business is being booked almost daily, but no date for shipment is promised. Black sheets remain at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Ferro-Manganese—Another drop in ferro for prompt shipment occurred this week when a sale was made at $69 a ton. The tonnage was small and it is believed [illegible]

Dusseldorf, Germany

May 1—The German Iron and Steel Union reports the output of the German blast furnaces in March at 1,099,257 tons of pig iron, which was 40,730 tons more

than in March, 1906. For the three months ended March 31 the total make of

	Tons.	Per ct.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Total	[illegible]	100.0

There were this year increases of 22,335 [illegible] in steel pig, which includes spiegeleisen, ferromanganese and all similar alloys; 9132 in bessemer; 70,615 in Thomas, or basic pig. There was a decrease of 8314 tons in forge, making the total gain 124,178 tons, [illegible]

Metal Market

NEW YORK, May 15.

Gold and Silver Exports and Imports

Through United States Ports in March and year

Metal.	Exports.	Imports.	Excess.
Gold.			
Mar. 1907..	$2,126,173	$ 5,007,319	Imp. $2,881,146
" 1906.	5,918,927	5,630,695	Exp. 287,932
Year 1907..	5,763,304	11,607,691	Imp. 5,904,387
" 1906.	20,146,922	10,316,087	Exp. 9,830,835
Silver.			
Mar. 1907..	5,058,461	3,936,139	Exp. 1,122,322
" 1906.	5,213,811	3,509,838	" 1,703,973
Year 1907.	14,969,396	11,315,168	" 3,354,228
" 1906.	19,165,608	12,676,998	" 6,488,610

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending May 11 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
[illegible]	$84,910	$ 44,[illegible]	$ [illegible]	$ 44,[illegible]
[illegible]	1,877,446	5,397,370	13,707,558	703,143
[illegible]	4,010,360	26,184,906	24,175,124	746,364
[illegible]	32,906,025	4,979,478	11,[illegible]	1,2[illegible]

Exports of gold for the week were to the West Indies; of silver to London and Paris. Imports for the week, both gold and silver, were from the West Indies and Mexico.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to May 2:

	1906.	1907.	Changes.
India...	£ 6,394,103	£4,465,334	D. £ 1,928,769
Straits	1,750	321,500	I. 319,750
[illegible]	[illegible]	[illegible]	[illegible]

Imports for the week were £10,000 from the West Indies; £277,000 in bars and £104,000 in Mexican dollars from New York; £156,000 in bars and £58,000 in Mexican dollars from China; a total of £605,000. Exports were £56,000 in coin to the Straits and £55,550 to India; £111,550 in all.

Indian exchange has been easier, the Council bills offered in London having been taken at an average of 16.06d. per rupee. There has been rather more active buying of silver in London on Indian account.

The joint statement of all the banks in the New York Clearing House for the week ending May 11 shows loans $1,126,223,600, a decrease of $14,096,700; deposits, $1,104,419,100, a decrease of $16,183,800, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	$186,143,100	$212,484,800
Legal tenders.	80,000,600	72,106,200
Total cash	$266,343,700	$284,591,000
Surplus	$12,891,600	$ 8,486,225

The surplus over legal requirements shows an increase of $1,661,600, as compared with the previous week this year.

Specie holdings of the leading banks of the world, May 11, are reported as below, in dollars:

	Gold.	Silver.	Total.
Assd New York	.....	.....	$212,484,800
England..... ...	$177,925,460	.....	177,925,460
France	520,860,285	$195,702,455	716,562,740
Germany	167,925,000	55,975,000	223,900,000
Spain...	77,100,000	126,305,000	203,705,000
Netherlands ..	26,687,000	27,700,000	54,787,000
Belgium.....	16,473,335	8,236,665	24,710,000
Italy	162,015,000	24,962,000	186,977,000
Russia	586,935,000	30,625,000	617,560,000
Aust.-Hungary.	226,985,000	63,365,000	290,350,000
Sweden.....	20,880,000	.....	20,880,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables to the *Commercial and Financial Chronicle* of New York.

Prices of Foreign Coins

	Bid.	Asked
Mexican dollars.....	$0.50½	$0.52½
Peruvian soles and Chilean	0.45½	0.48½
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.85	3.89
Spanish 25 pesetas...	4.78½	4.80

STERLING EXCHANGE.

	Silver.				Silver.		
May	Sterling Exchange.	New York, Cents.	London, Pence.	May.	Sterling Exchange.	New York, Cents.	London, Pence.
9	4.8600	64	30	13	4.8620	65	30 1/16
10	4.8615	64	30	14	4.8620	65½	30 3/16
11	4.8620	65	30	15	4.8625	65	30 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

	Copper.			Tin.	Lead.	Spelter.	
May.	Lake, cts. per lb.	Electrolytic, cts. per lb.	London, £ per ton.	cts. per lb.	cts. per lb.	New York, cts. per lb.	St. Louis, cts. per lb.
9	25 @25¾	24 @24	101 ..	43	6.00	6.40 @6.50	6.25 @6.35
10	25 @25½	24½ @24	101⅜	44	6.00	6.40 @6.45	6.25 @6.30
11	25 @25½	24½ @24½	....	44	6.00	6.35 @6.45	6.20 @6.30
13	25 @25½	24 @24	102	44	6.00	6.35 @6.45	6.20 @6.30
14	25 @25½	24 @24	102½	44	6.00	6.35 @6.45	6.20 @6.30
15	25 @25½	24 @24½	102	44	6.00	[illegible] @6.45	6.20 @6.30

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former g.m.b's. The New York quotations for electroytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

The silver market has advanced this week on improved demand from India. In London it closes firm, with 30 5/16d. bid.

Copper—The market seems to be drifting back into the same condition which existed a few weeks ago, as a result of the disparity between the prices of furnace material as offered in Europe and the prices for electrolytic in this market. The stimulating influence of a brisk European business has disappeared and quotations for all grades have receded gradually. Business in the domestic market is at a standstill, and the close is nominal at 25@25½ for Lake copper; 24@24¼ for electrolytic in ingots, cakes and wirebars; 22½@22¾ for casting copper.

The standard market in London has been fluctuating within narrow limits, business being of rather reduced proportions. The close is easy at £102 2s. 6d. for spot, £101 5s. for three months'.

Refined and manufactured sorts we quote: English tough, £108@109; best selected, £112@113; strong sheets, £120@121.

Exports of copper from New York for the week were 230 long tons. Our special correspondent reports exports for the week from Baltimore at 1244 long tons copper.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The visible supply in this market is very small. Spot deliveries are hard to obtain, and are ruling at a premium. Futures are entirely neglected. We quote the market 44@45c.

The foreign market, after being well sustained in the early part of the week, has broken quite sharply on liberal sales for both accounts, and closes unsettled at £189 for spot, £185 for three months.

Exports of tin from the Straits, as reported by cable for April, were 4893 long tons in 1906 and 3729 in 1907; a decrease of 1164 tons. For the four months ended April 30 the total was 19,150 tons in 1906, and 17,298 tons in 1907; a decrease of 1852 tons, or 9.7 per cent.

Lead—The market remains unchanged at 6c. New York.

The market in Europe has been without any special features throughout the week,

and closes at £19 15s. for Spanish lead, £19 17s. 6d. for English.

Sodium—A fair business is being done day to day at declining prices. Sellers are particularly anxious to place future deliveries, for which there is no ready market. The close is easy at 6.35@6.45 New York, 6.20@6.30c. St. Louis.

The market in London is unchanged at £25 17s. 6d. for good ordinaries, £26 2s. 6d. for specials.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—On free offerings of metal, with a demand that is only fair, the market has declined. At the close, quotations are 22½@23c. for Cookson's, 19c. for Hallett's, and 16½@17½c. for ordinaries.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is $31 per ounce for ordinary metal and $33.50 for hard. Scrap is quoted at $20@22 per ounce.

Quicksilver—Current prices at New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Missouri Ore Market

Joplin, Mo., May 11—A number of producers have undertaken to head off the tendency among miners to ask for higher wages by laying off the night shifts. This move works three ways. It stops the cry of a shortage of miners, stops the possibility of demands from labor and aids in restricting the output at a time when it exceeds the demands. It is estimated that the output has been reduced 300 tons per month by this move, although only a few mill-owners have adopted it. An effort is being made to have the movement spread as far as possible.

The highest price paid for zinc was $50 per ton, on a basis of $45@47 per ton of 60 per cent. zinc; average price, $45.86. The highest price for lead was $82 per ton, with medium grades selling at $77 to $80; the average price is $78.68.

Following are the shipments of zinc and lead from the various camps of the district for the week ending May 11:

	Zinc Ore, lb.	Lead Ore, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	$[illegible]
Joplin	[illegible]	[illegible]	[illegible]
Galena Empire	[illegible]	132,400	[illegible]
Alba-Neck City	[illegible]	[illegible]	[illegible]
Duenweg	[illegible]	179,480	[illegible]
Spurgeon	[illegible]	[illegible]	16,262
Prosperity	[illegible]	[illegible]	[illegible]
Oronogo	611,930	[illegible]	[illegible]
Badger	[illegible]	[illegible]	[illegible]
Granby	470,000	40,000	[illegible]
Aurora	[illegible]	13,490	[illegible]
Baxter Springs	[illegible]	[illegible]	[illegible]
St. Louis	[illegible]	[illegible]	[illegible]
Sarcoxie	[illegible]	[illegible]	[illegible]
Sherwood	74,130	[illegible]	[illegible]
Cave Springs	[illegible]	[illegible]	1,496
Zincite	[illegible]	[illegible]	[illegible]
Carthage	[illegible]	[illegible]	1,005
Iberia	[illegible]	[illegible]	[illegible]
Carl Junction	[illegible]	[illegible]	910
Totals	[illegible]	[illegible]	$[illegible]
10 weeks	[illegible]	[illegible]	[illegible]
Zinc value, the week, $[illegible]		10 weeks	$[illegible]
Lead value, the week, [illegible]		10 weeks	[illegible]

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.34	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	[illegible]
May	40.51	....	May	78.40	..
June	43.83	..	June	80.96	..
July	46.25	..	July	74.31	..
August	43.56	..	August	75.36	..
September	42.58	..	September	79.64	..
October	41.57	..	October	79.84	..
November	44.11	..	November	81.98	..
December	43.68	..	December	81.89	..
Year	43.24	..	Year	77.40	..

Wisconsin Ore Market

Platteville, Wis., May 11—The record of the past week has been above the average as far as production is concerned. Two strikes in different parts of the district have given promise of an increased production as soon as machinery can be placed on the ground. Weather conditions had somewhat to do with the loading, as did the continued scarcity of cars. The price of 60 per cent. ore was off from last week, ranging from $47 to $48. Two separate lots are reported as having been sold at $50. Lead sold strong at unchanged prices.

The shipment for the district, by camps, for the week ending May 11 is as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	[illegible]	[illegible]	[illegible]
Buncombe-Hazel Green	618,300	.....	.....
Benton	[illegible]	[illegible]	[illegible]
Cuba City	308,410	.....	.....
Galena	[illegible]	[illegible]	[illegible]
Linden	[illegible]	[illegible]	[illegible]
Livingston	[illegible]	[illegible]	[illegible]
Mineral Point	[illegible]	[illegible]	[illegible]
Highland	[illegible]	[illegible]	[illegible]
Rewey	[illegible]	[illegible]	[illegible]
Total for week	[illegible]	[illegible]	[illegible]
Year to May 11	33,622,879	1,451,320	189,160

Producers are not working their mines to the limit, as had been supposed; most of them are running at about their normal capacity.

Chemicals

New York, May 15—The chemical market generally continues active, and in good condition. There is, however, little that is specially new to report.

[illegible] strong and steady, with no material change. Sellers continue to quote $7.50 per 100 lb. for carload and larger lots; $7.75 per 100 lb. for smaller parcels.

Nitrate of Soda—There is no change in the market. The demand continues good and prices remain the same. We continue to quote for spot $2.70 per 100 lb. with 96 per cent. for all positions of 1907 at $2.50. The price for 95 per cent. is $2.45 for both 1907 and 1908. Stocks are reported extremely low, and spot nitrate is hard to get.

Mining Stocks

New York, May 15—The general stock markets have been irregular, moving up and down from day to day with no definite tendency apparent. Money has been a little harder; and another cause affecting the markets is found in reports current of damage to crops from late cold weather. Strong speculation in grain has taken something away from stocks. Some large issues of new securities have not been well received by the public, and trading has been largely professional, as for some weeks past.

On the curb market in New York trading in mining stocks has not been active. The market was dull through the week, with buying orders scarce and a downward tendency in prices. Greene-Cananea was among the more active stocks, closing at $15.50, while Butte Coalition was steady around $8. Foster Cobalt closed at $1.25, while Nipissing sold from $13 down to $12.25, recovering a fraction.

Boston

May 14—Trading in the mining-share market is at a low ebb and fluctuations have been unimportant the past week. For a spell they drifted downward, but have recovered and closing prices tonight are at, or near, the prices of a week ago.

Amalgamated Copper ran off $1.62½ to $93, since touching $95. Copper Range fell $2 to $80.75, recovering to $83. North Butte fell a little more than this, touching $89.50, with subsequent recovery to $92.75. Old Dominion settled $1 to $54.25, and rights for the new stock have been quoted from 15 to 12c. Quincy went off $2.25 to $130, touching $132 today. The stock of this company is more widely scattered than ever, there being over 1700 stockholders now.

Calumet & Hecla is up $10 to $875. It is now said that there is no possibility of a compromise between Calumet and the Osceola interests and the former will press the matter to a final conclusion. Mohawk slid back $3 to $85 on a narrow market. Osceola is off $3 to $141, while Tamarack is up $5 to $125 on light trad-

at $63.75, while United States Smelting is [illegible]

On the curb Globe Consolidated spurted $4 to $10 on excellent buying, reacting to $12.37½ in the meantime.

Colorado Springs

[illegible] of business on the local mining exchange the past week. Prices of shares have not fluctuated much, except Portland, which sold down as low as $1.11 and as high as $1.18. The most active traders of the week have been Gold Dollar and Isabella, but on the whole the market has been dull and featureless.

STOCK QUOTATIONS

NEW YORK	May 11
Name of Comp.	Clg.
Alaska Mine	
Am. Nev. M. & P. Co.	
Amalgamated	94
Anaconda	62⅞
Balaklala	9⅜
British Col. Cop.	8
Buffalo Cobalt	
Bunker & Lorraine	
Butte Coalition*	27
Butte Cop. & Zinc	
Cobalt Contact	
Cobalt Silver	27
Cons. Ely Mining	9⅛
Davis Daly	15¼
Development Co.	7
El Rayo	
Foster Cobalt	1
Furnace Creek	1⅛
Giroux Mine	8¾
Gold Hill	1⅞
Grandy, New	
Greene Gold	
Greene C. & S.	1⅞
Greene'r & D. Val.	
Guanajuato	
Gregory Exp.	
Hancock	
McKinley Dar.	1⅜
Miami Cop.	4⅛
Mines Co. of Am.	1½
Mitchell Mining	4
Mt. Lyell (N. New)	
Nev. Utah M. & S.	6
Newhouse M. & S.	
Nipissing Mines	12⅜
Old Hundred	3½
Silver Queen	1½
Stewart	2½
Tennessee Copper	
Tonopah Ext.	4¼
Utah Apex	
West End Cons.	

BOSTON	May 14
Name of Comp.	Clg.
Adventure	30
Allouez	50
Am. Zinc	40
Arcadian	6¾
Atlantic	13¾
Bingham	18⅝
Boston Con.	40
Calumet & Ariz.*	175
Calumet & Hecla*	870
Centennial	31
Con. Mercur	40
Copper Range	82⅞
Daly-West	16⅝
Franklin	17
Greene-Can. ctfs.	15⅜
Isle Royal	19
La Salle	17
Mass	7
Michigan	14⅜
Mohawk	86⅝
Mont. C. & C.(new)	3½
Nevada	
North Butte	91⅞
Old Colony	54⅜
Old Dominion	
Osceola	141
Parrot	
Phoenix	
Quincy*	130
Rhode Island	5⅞
Santa Fe	3¼
Shannon	18
Tamarack*	123
Trinity	22⅝
United Cop., com.	62
U. S. Oil	1⅜
U. S. Smg. & Ref.	53½
U.S.Sm.& Re.,pd.*	45
Utah Copper	64
Victoria	9
Washington	
Winona	9
Wolverine	
Wyandotte	

N. Y. INDUSTRIAL	
Am. Agric. Chem.	
Am. Smelt. & Ref.	129
Am. Sm. & Ref., pf.	
Beth. Steel	
Colo. Fuel & Iron	31
Federal M. & S., pf.	
Int. Salt	
National Lead	61⅛
National Lead, pf.	93
Pittsburg Coal	9¼
Republic I. & S.	27
Republic I. & S., pf.	84
Sloss-Sheffield	59
Smelting	
Tenn. C. & I.	34
U. S. Red. & Ref.	29
U. S. Rubber	
U. S. Steel	100
Va.-Car. Chem.	37
Va. I. Coal & Coke	

SAN FRANCISCO	May 11
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.50
Best & Belcher	1.10
Caledonia	.30
Challenge	.09
Con. Cal. & Va.	.92
Crown Point	.24
Exchequer	.46
Gould & Curry	.16
Hale & Norcross	.52
Mexican	.72
Ophir	2.40
Overman	.12
Potosi	.07
Savage	.63
Sierra Nevada	.36
Union	.39
Utah	.03
Yellow Jacket	.90
TONOPAH STOCKS	
Golden Anchor	.23
McNamara	.39
Montana-Ptts.ex.	.15
North Star	.33
Rescue	.17
GOLDFI'D STOCKS	
Black Ants	.08
Blue Bull	.35
Columbia Mt.	.70
Comb. Frac.	.97
Conqueror	.16
Daisy	1.50
Florence	5.50
Frances-Mohawk	1.40
Goldfield Con.	7.47
Grandma	.19
Great Bend	.89
Red Hills	.06
St. Ives	1.07
BULLFROG STOCKS	
Amethyst	.41
Bonnie Claire	.42
Mayflower Con.	.42
Montgomery Mt.	.15
Original	.10
MANHAT'N STOCKS	
Gold Wedge	.10
Manhattan Mg.	.12
Pine Nut	.15
Ruby Wonder	.30
Stray Dog	.19
Yellow Horse	.05

NEVADA (Weir Bros. & Co., New York)	May
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	15.67½
Tonopah Exten.	2.67½
Montana Tonopah	3.35
Belmont	4.12½
Tonopah Midway	1.50
West End Con.	1.10
Jim Butler	.99
GOLDFI'D STOCKS	
Sandstorm	.38
Kendall	.35
Red Top	4.00
Jumbo	4.00
Goldfield Mining	1.40
Dia'dfield B. B. C.	.28
Atlanta	.62½
Mohawk	15.00
Silver Pick	.82
Laguna	1.40
BULLFROG STOCKS	
Mont. Shoshone C.	9.37½
Tramps Con.	.62
Gold Bar	.70
Bullfrog Mining	.18
Bullfrog Nat. B.	.25
Homestake Cop.	.93
MANHAT'N STOCKS	
Manhattan Con.	.65
Manhat'n Dexter	.14
Jumping Jack	.13
Stray Dog	.17
Indian Camp	.13

COLO. SPRINGS	May 11
Name of Comp.	Clg.
Acacia	10¾
Black Bell	4
C. C. Con.	
Dante	5
Doctor Jack Pot	7½
Elkton	56¾
El Paso	46½
Findlay	
Gold Dollar	7¾
Gold Sovereign	
Isabella	25¾
Index	
Jennie Sample	
Jerry Johnson	
Mary McKinney	59
Pharmacist	6¾
Portland	1.17¾
Un. Gold Mines	8¾
Vindicator	
Work	18¾

BOSTON CURB	
Adventure	
Ariz. Com	
Black Mt.	6
Cananea Cent.	
East Butte	11
Hancock Con.	9
Keweenaw	1½
Majestic	3½
Raven	1¼
Superior	
Superior & Pitts	18¾
Trethewey	17¾

LONDON	May 11
Name of Comp.	Clg.
Anglo-French	12
Camp Bird	£1 8s 0d
Colorado Mex.	
Copper Hill	
Esperanza	6
Tomboy	1 18 9
El Oro	1 6 3
Mexico	3 17 6
Oroya	1 1 3
Real del Monte	1 2 6
Stratton's Ind.	3 6
Stratton's Ind.	3

Quoted through Hay Stone & Co., N. Y.

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	May 27	$2.00	$3,081,758
Am. Smelters Sec., pf., B	June 1	1.25	375,000
Bunker Hill & Sullivan	May 4	0.60	180,000
Doe Run Lead	May 15	0.50	29,531
Lehigh Coal & Nav.	May 27	1.00	235,110
Mexico Con. Mg. & Sm.	May 25	0.50	120,000
N. Y. & Hon. Rosario	May 25	0.10	15,000
Quincy, Mich.	June 10	4.50	495,000
Tenn. Coal, Iron & R.R.	May 1	1.00	225,536
Tenn. C. I. & R.R., pfd.	May 1	2.00	4,960
Tonopah Co., Nev.	Apr. 22	0.35	350,000
United Copper	Apr. 25	1.75½	787,500
United Copper, pfd.	May 15	3.00	150,000
U.S. Cast Iron Pipe & Fdy.	June 1	1.00	150,000
U. S. C. I. Pipe & Fdy., pfd.	June 1	1.75	262,500
U. S. Steel Corp.	July 1	0.50	2,541,513
U. S. Steel Corp., pf.	May 31	1.75	6,041,998
U. S. Cast Iron Pipe & Fdy.	June 1	1.00	125,000
U. S. C. I. Pipe & Fdy., pfd.	June 1	1.75	218,375
U. S. Reduction & Ref., pfd	July 1	1.50	59,187
United Verde	May 1	0.75	1,500,000
Vindicator Con., Colo.	Apr. 25	0.03	45,000
Yellow Aster, Cal.	May 4	0.10	10,000

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.	Apr. 30	May 21	$0.10
Benson, Cal.	June 9	June 29	0.10
Cheltac, Nev.	Apr. 22	May 16	0.10
Con. Imperial, Nev.	May 7	May 29	0.01
Dale, Utah	May 14	May 24	0.25
Little Chief, Utah	May 14	May 30	0.02
Lucky, Utah	May 15	June 5	0.02
Lost Packer, Idaho	May 6	May 27	1.00
Lucky Dutch'n, Nev.	May 4	May 25	0.01
N. Y. Bonanza, Utah	May 11	May 31	0.03
Overman, Nev.	May 17	June 7	0.10
Potosi, Nev.	May 14	June 4	0.10
Rescue, Nev.	May 8	May 29	0.10
Utah & N. Y., Utah	Apr. 27	May 18	0.01
Western, Utah	May 11	June 3	0.05
Yellow Jacket, Nev.	Apr. 13	May 22	0.10

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.862
March	64.597	67.519	29.854	31.325
April	64.765	65.462	29.984	30.263
May	66.976		30.968	
June	65.394		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.927		31.483	
October	69.523		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.863	18.116	25.236	78.147	107.366
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	24.224	18.688	25.260	84.793	98.625
May	18.475		18.724		84.867	
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.886		23.850		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.606	
March	36.662	41.313	September	40.516	
April	38.900	40.938	October	42.852	
May	43.313		November	42.906	
June	39.260		December	42.750	
			Av. year.	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.081	19.681
March	5.350	6.000	15.922	19.703
April	5.404	6.000	15.959	19.975
May	5.685		16.725	
June	5.750		16.813	
July	5.750		16.525	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.066	6.687	24.569	26.094
April	6.078	6.685	5.931	6.535	25.781	25.900
May	5.997		5.846		27.000	
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.076	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

VOL. LXXXIII. NEW YORK, MAY 25, 1907. NO. 21.

The Electrical Equipment of the Yak Tunnel

The Power Plant Supplies Current for the Operation of the Tunnel, for Mining in Adjoining Properties and for Lighting and Power

BY ROBERT E. RENZ*

The Yak tunnel of the Yak Mining, Milling and Tunnel Company is located in the Leadville mining district and is 1½ miles southeast of the city of Leadville, Colorado. The object of the tunnel is to tap and drain various mines and mineral bodies tributary to the tunnel course. The company mines its own properties and also hauls ores and waste for other mines which the tunnel taps. All power operations are performed by means of electric current, with the exception of a few compressors used in sinking shafts, etc.

Fig. 1 is a photograph of the power house. At the left can be seen an additional boiler house which is being added. In the distance is the Leadville mill of the American Zinc Extraction Company. This mill is driven entirely by electric motors,

FIG. 1. SURFACE PLANT—POWER HOUSE.

When the tunnel was first begun, mules were used to haul the waste, but as the course grew longer it was found that mule haulage was too slow and expensive, and the haulage was changed to electric, which has proved highly satisfactory. The main tunnel is more than 2½ miles long and at present mule haulage would be impracticable and entirely too expensive.

The original power plant consisted merely of one 75-kw. 250-volt generator for supplying current for trolley system and one hoist, and one steam air compressor. As the work progressed this equipment was found inadequate and plans for enlargement were considered, and after taking into consideration the territory to be supplied with power, it was decided that 6600 volts alternating-current system would be most satisfactory.

Fig. 2 gives a view of the interior of the power house looking from the east end. In the foreground is a compound Norwalk steam compressor of 800 cu.ft. of free air per minute capacity, compressing to 100 lb pressure. Next is a 75-kw. 250-volt direct-current Goodman generator which formerly supplied current to the trolley system. This generator is seldom used at present, except in case it is found necessary to shut down the motor-generator set located about one mile into the tunnel.

over 400 h.p. in motors being installed and separation of ores being made with International magnetic separators. The power is furnished by the Yak power house at 6600 volts and transformed at the sub-station to 440 volts.

The general scheme is to transmit the power at 6600 volts to various places where it is needed and then to transform it to 440 volts for use in motors. As the territory covered is large, a considerable saving is made in investment in copper by using a high voltage. A secondary voltage of more than 440 volts is not practicable on account of the power being used underground.

Past the Goodman generator can be seen a Leyner electric compressor. The capacity of this compressor is 800 cu.ft. of free air per minute and is driven by a 150-h.p. 440-volt three-phase motor. Fig. 3 gives a view of the compressor.

At the west end of the power house is located a 6600-volt 60-cycle 425-kw. revolving-field Bullock generator, direct connected to a 600-h.p. cross-compound condensing Allis-Chalmers Corliss engine.

While a 25-cycle current would have been more satisfactory for power work than one of 60 cycles on account of slower speeds, and hence more satisfactory for hoist and pump work, the 60-cycle cur-

*Electrical engineer for the Yak Mining, Milling and Tunnel Company, Leadville, Colo.

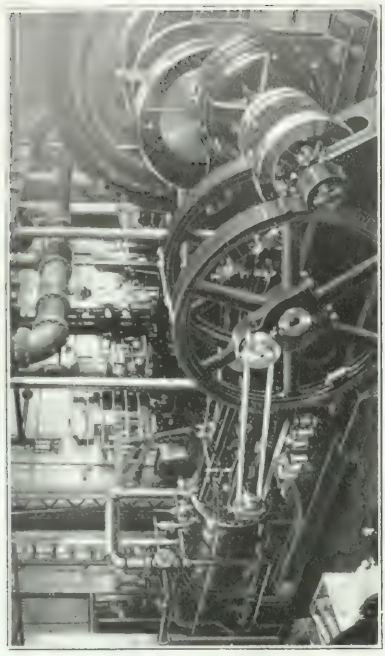


FIG. 3 COMPRESSOR

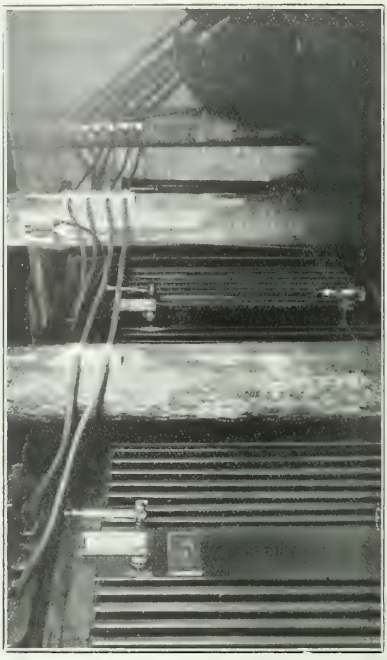


FIG. 8 TRANSFORMER STATION AT TUNNEL LEVEL

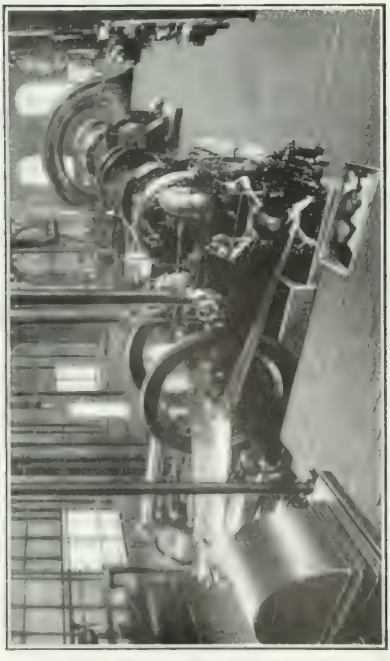


FIG. 2 INTERIOR OF POWER HOUSE

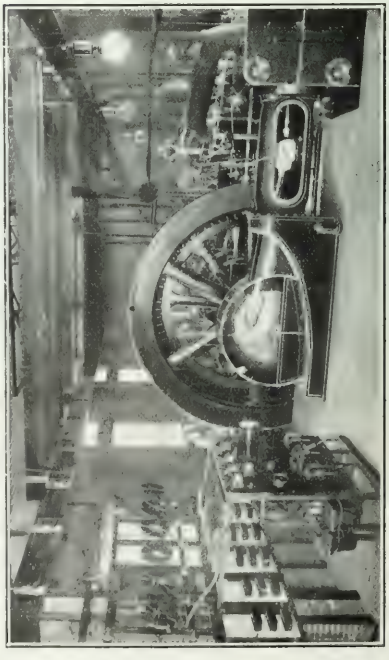


FIG. 4 425-KW. UNIT AND SWITCHBOARD

rent was decided upon because [illegible] ing load to be connected on in the future. As the 25-cycle was out of the question for lighting, the 60-cycle was decided upon as a compromise for both lighting and power load. Fig. 4 shows the 425 kw. unit and switchboard.

The condenser used with the alternating-current unit is a Wheeler closed condenser with a capacity of 10,000 lb. of steam per hour. Drainage water from the tunnel is used for cooling.

A section of the engine room showing the alternating-current unit and condenser is shown in Fig. 5.

Fig. 6 is a plan of the engine room. In the boiler house are two 400-h.p. Cahall water-tube boilers, suitable for 165 lb. steam pressure. In addition there are three 150-h.p. Frost fire-tube boilers, a part of the original installment. The coal is shoveled directly from cars into the bins. All the firing is done by hand, one man taking care of all the boilers. Feed water is obtained from a reservoir several miles distant in the mountains. This water is pure snow water and there is no trouble with boiler scale.

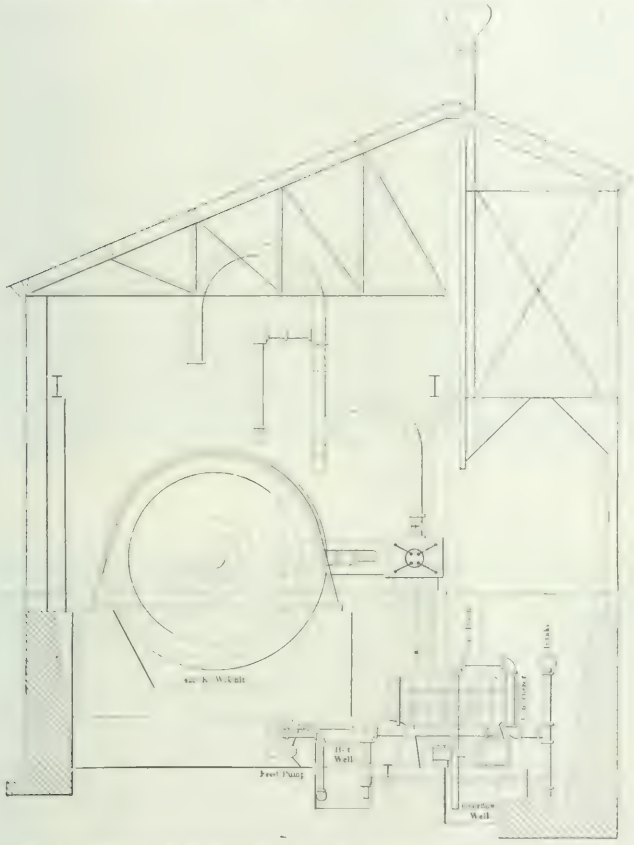


FIG. 5 SECTIONAL ELEVATION, YAK MINING MILLING AND TUNNEL COMPANY, POWER HOUSE

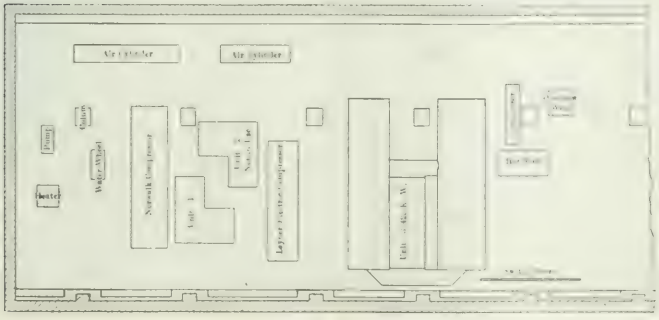


FIG. 6. PLAN OF ENGINE ROOM

Connections

A diagram of the connections for the entire transmission system is given in Fig. 7. The lines extend from the power house to the Horseshoe station, which supplies power to the tunnel proper. From the Horseshoe station lines extend to Vinnie sub-station, where the voltage is lowered to 440 volts. The station supplies a hoist at the Elk shaft and a hoist at the M. N. shaft. These shafts are at the surface, but are in the vicinity of the tunnel. The tunnel at this point is about 1300 ft. below the surface.

Between the Horseshoe sub-station and Vinnie station power is tapped off for the Hopemore shaft. The 50-h.p. hoist located here is supplied with transformers to lower the tension to 440 volts. From the Vinnie sub-station the line extends to the Fortune sub-station, where power is used for a hoist and compressor.

The Horseshoe sub-station consists of a lightning-arrester station on the surface and a transformer station at the tunnel level. The 6600 volts is transmitted from the arrester station to the transformer station by means of paper insulated lead-covered cable.

Fig. 8 is a view of the transformer station at the tunnel level in a chamber cut out of solid rock and timbered. This sort of station makes a satisfactory place for transformers, for it is cool. The capacity of transformers is 125 kw. each.

This station supplies power to a hoist at the Louisville shaft, a hoist at the Willard winze, a pump at the Cord winze, and a motor-generator set at the Cord station; besides several small diamond drills, pump and blower motors.

The motor-generator station is shown in Fig. 9 and consists of a 100-h.p. three-phase 440-volt induction motor, belted to a 75-kw. 250-volt generator. This generator supplies power for the trolley system and a 75-h.p. direct-current hoist at the Cord winze. This hoist is of the counter-balanced type and is shown in Fig. 10. The depth below the surface at this point is approximately 650 ft. The motor on this hoist is to be changed shortly to a variable-speed alternating-current motor. The reason for changing is to obtain better efficiency by using alternating-current power directly and to reduce the load on the motor-generator set.

Hoists, Pumps and Compressors

A single-drum hoist located at Louisville shaft is driven by a 50-h.p. variable-

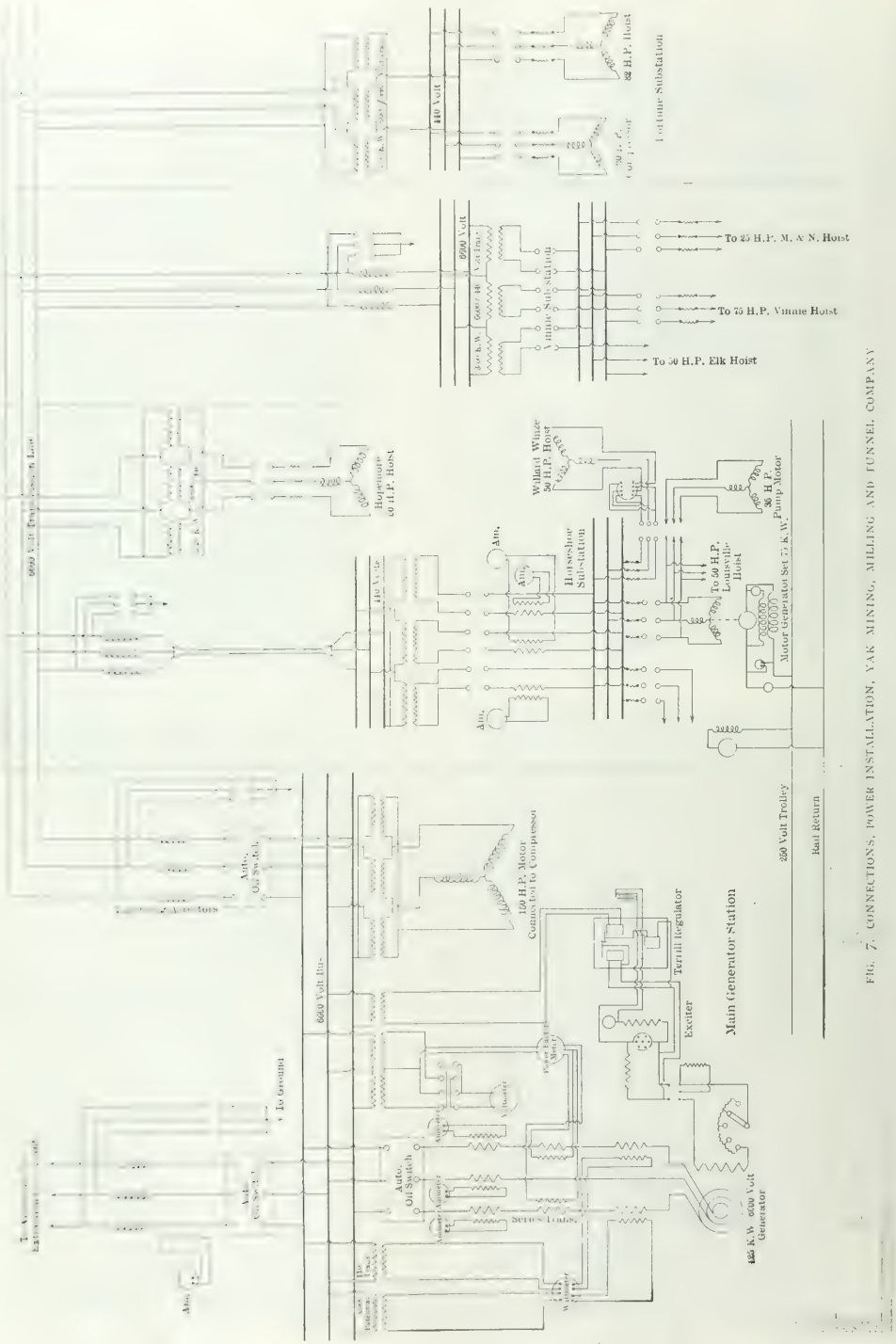


FIG. 7. CONNECTIONS, POWER INSTALLATION, YAK MINING, MILLING AND TUNNEL COMPANY

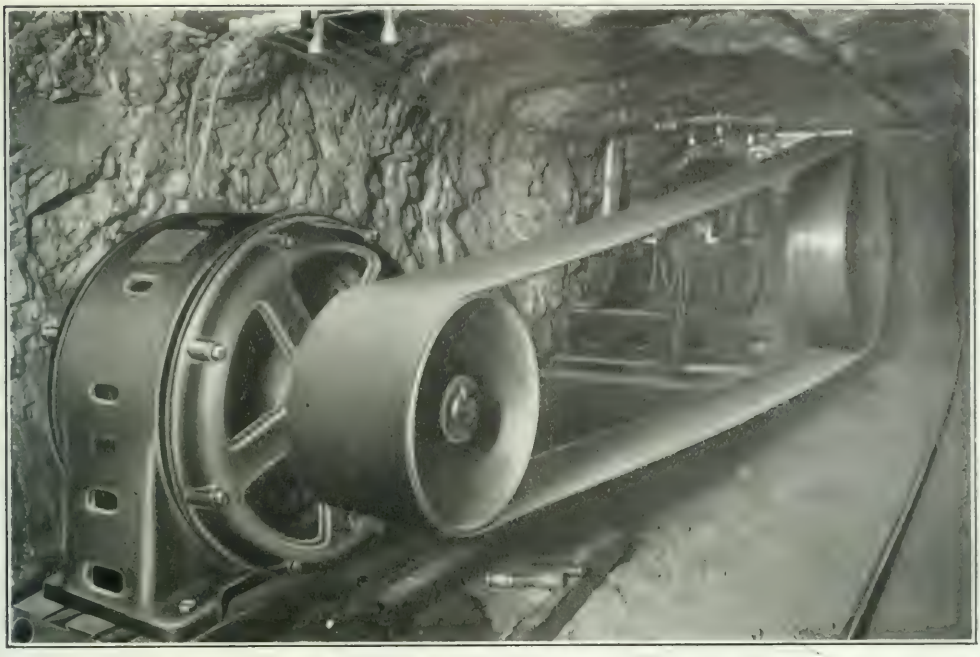


FIG. 9. MOTOR GENERATOR STATION.

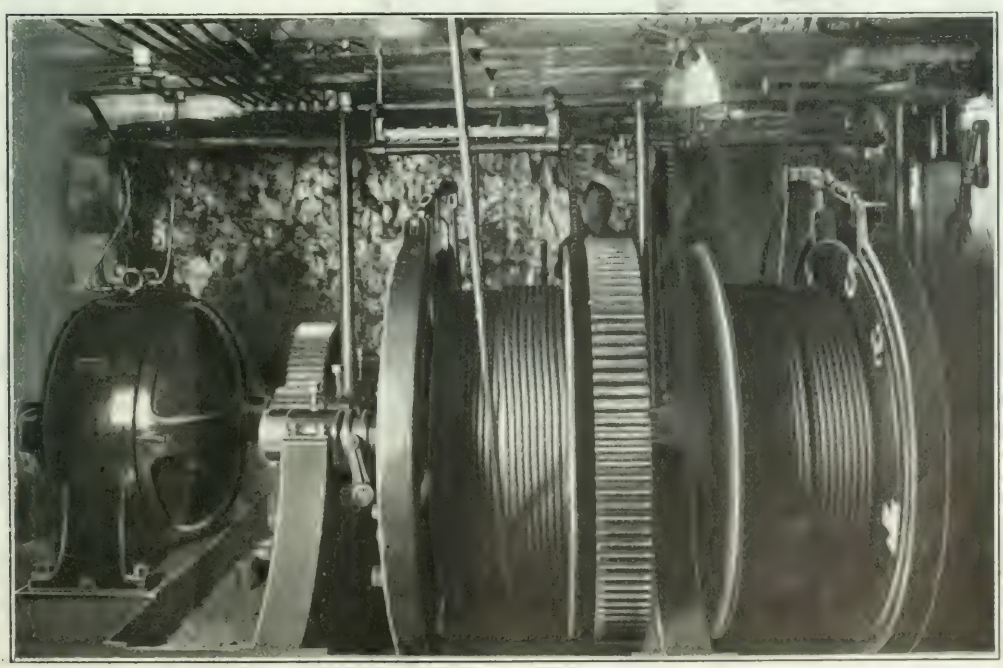


FIG. 10. COUNTERBALANCED HOIST AT CORD. W. & N.Z.

lar hoist is operated at Willard winze.

One object of the tunnel being for drainage, it is obvious that little pumping [illegible] 600 ft. below the tunnel level. Even at this depth it is necessary to pump only 150 gal. of water per minute. This is pumped with an Aldrich triplex electric pump, operating under a head of 600 ft., and so far it has given entire satisfaction.

Electric power is applied to two diamond drills, one direct current and one alternating current. Of the two, the alternating-current drill is the more satisfactory because the motor has no commutator and the control apparatus is more substantial and satisfactory. One advantage of the electric diamond drill is its flexibility and ease of connecting up.

The hoist on the surface at Hopemore shaft is driven by a 50-h.p. variable-speed alternating-current 440-volt motor. At the Vinnie sub-station are three 60-kw. transformers. They are oil cooled and supply 440 volts to a 45-h.p. alternating-current motor connected to the Elk hoist and a 25-h.p. alternating-current motor connected to the M. & N. hoist, also to a 30-h.p. [illegible] compressor located at the tunnel level.

transformers supplying 440 volts to a 82-h.p. variable-speed induction motor geared to a single-drum hoist, also power to a 20-h.p. electric-driven compressor.

Wherever it is possible, as on pumps, compressors, etc., induction motors of the squirrel-cage type are used. These motors are essentially constant-speed motors and are more durable and simple than variable-speed motors. Of course hoists require variable-speed wound-rotor motors. Taken as a whole, induction motors at the Yak have given practically perfect performance, have caused very little trouble and need little attention.

Fig. 11 is a sketch showing the relative position of the pole lines, the tunnel and the various stations. The pole line is constructed of 35-ft. poles, the wire being No. 4 hard-drawn copper supported on 15,000-volt porcelain insulators spaced in a 36-in. triangle. Lightning arresters are tapped in at various sub-stations and in general have given very good protection, considering that the lightning is rather serious in this district, due to the large orebodies near the lines. The arresters used are of the well known Westinghouse and General Electric multi-gap types.

The trolley system extends through practically the whole tunnel. At present all the haulage is done by three Goodman locomotives, weighing 5 tons each, and operating at a voltage of 250 on a 19-in. gage track. Considering the rough roadbed in parts of the tunnel and the heavy

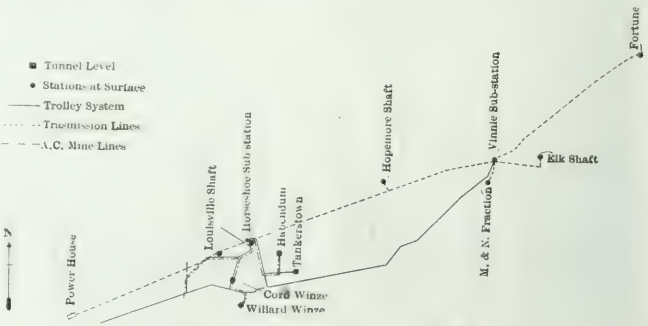
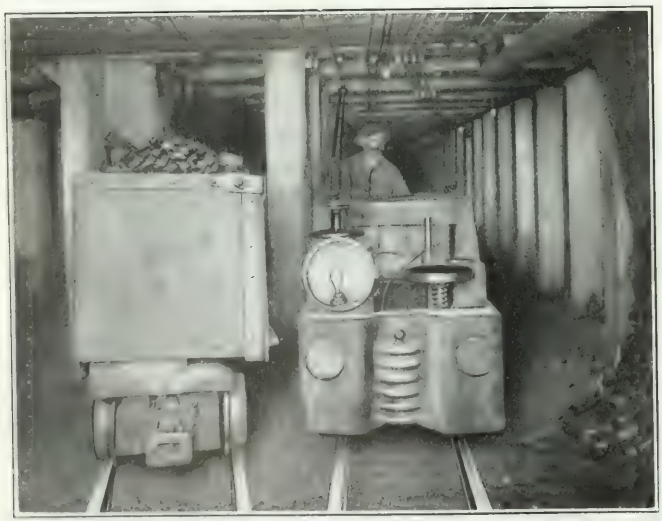


FIG. 11. DISTRIBUTION OF TROLLEY AND TRANSMISSION LINES



[illegible] ON THE LEFT SHOWS [illegible] OF LOADING.

work these locomotives are called upon to do, they have given excellent service. One locomotive can haul 30 cars of 2½ tons capacity, or a load of 75 tons net. The low voltage of 250 was selected in the interest of safety. A higher voltage is too dangerous, the tunnel being rather low in certain places.

The trolley wire is No. 2/0 figure-8 wire, supported by mine hangers. These hangers grip the wire; no soldering being required, and are easy to put up.

Fig. 12 shows a locomotive and cars at the Cord loading station. This illustration shows the method of loading from chutes into haulage cars. At the outside ore trestle the cars are dumped directly into railroad cars, thus making the loading and unloading of tunnel cars a simple matter. An automatic block-signal system has been installed in connection with the trolley system. This will save considerable time and reduce the danger of accidents.

Bell telephones are placed at different points throughout the mine and also on various levels at the Cord winze, and are connected with a private exchange at the tunnel mouth.

[illegible] in regard to compressed air is to distribute small electric compressors of, say, from one to three drills capacity at the base of operation. This will avoid the necessity of long pipe lines, with their losses, and will give a more flexible and efficient system.

[illegible] AND TRANSFORMERS.

At the Fortune station are three 50-kw.

The spindle of a roller used on a plane or a slope wears out before any other part, and for this reason must be well oiled. If the spindle gets dry it begins to wear, and when such action is once started the roller will do service only a short time, even if oil is then well supplied.

The Tin-stream Works of Red River, Cornwall

The Same Tailings Are Treated by Twelve to Twenty Operators, Simple and Inexpensive Concentrators Extracting a Profit Each Time

BY EDWARD WALKER

Concerning the recovery of tin oxide from slimes at the mines and also in the Red river in Cornwall, I learn by conversation with various engineers that the apparatus in use will survive for a long time to come, and that details of Cornish stream-tin works are quite unknown outside Cornwall. Moreover, fuller study of tin-stream works has revealed to me the explanation of the phenomena, the reason why so much slime is lost at the mines, and why a constant succession of tin-stream works makes profits by treating the slimes over and over again.

At the dressing works at the various mines the slimes from the stamps and from the calcining furnaces are of such low grade, carrying only a few pounds of tin oxide to the ton, that they are not supposed to be worth treating on buddles, tables or other ordinary slime concentrators. They are therefore passed over "rag frames" in order to obtain concentrates that can be treated on buddles or tables.

THE STREAM WORKS AND DRESSING PLANT OF EAST POOL MINE

The Rag Frame

I have never seen a working drawing of a rag frame published in any technical publication, so I take this opportunity of giving one. The frames are usually arranged in groups, as shown in the photograph. The plan and elevation show a pair arranged opposite one another. Each frame consists of a sloping board *A* about 6 ft. long by 6 ft. wide. Along the tops of the boards run launders *B* and *C* carrying slimes and water, respectively. The launders run out through pipes over the buttors and down the frames. During their passage down the frames the heavier particles adhere to the surface, as is the case with buddles, and the lighter portions run over the tailboard *D* into the discharge launder *E*.

During this time water from the launder *C* has been running through the pipes *G* into the V-shaped vessels *F*. These vessels are pivoted at each side of the frames and in normal position are shown by the full lines. They are connected by a series of levers *H* and wire cords *I* with the tailboards *D*. These levers are held up by the pivoted rods *J* running in sockets *K* fixed to the boards. When the vessels *F* become filled with water they overbalance and discharge their contents on the top of the frames, assuming then the position shown in the dotted lines.

The motion of the vessel and levers tips up the tailboards. The discharged water runs quickly over the frames and washes down such heavy particles as have accumulated into the launders *L*. After the water has been discharged from *F* the vessels and the levers gradually resume their normal position once more. In some cases the resumption of position is assisted by the water from *G* running into the scoops *M* attached to the levers *H*. These scoops are not always used, and in the installation shown in the photograph they are not to be found.

Efficiency of the Frame

This description shows the action of the frames. Their efficiency is not very great, for the concentrates obtained in the launders *L* are still of very low grade and have to be sent over a further series of similar frames. The advantage of the frames is their extreme cheapness, durability and automatic action, and for this reason they will continue to be widely used for bringing up poor slimes to a state fit for treatment on the more expensive slime tables.

At Dolcoath and the other mines these frames are used for this purpose, but the fact that they extract a very small proportion of the contents of the slimes is proved by the doings of the tin streamers below.

The tailings from the mines are discharged into the rivers, which consist really for a large part of the mine waters. The Red river, carrying the waters and tailings from Dolcoath and neighboring mines, contains large quantities of tin oxide that has not been caught at the dressing works. The waters are worked over and over again by a succession of tin-stream works between Dolcoath and the sea, and they all make a very decent living.

In preparing the waters of the river for treatment on the frames the waters are first led to a sluice, where the sands accumulate while the slimes run over into other settling pits. When sufficient sands accumulate the sluice is opened and the sands are washed down into pits, whereby the lighter parts are removed and only the heavier parts remain. These are fed

iron and driven by water wheels, and thus reduced to slimes. For my own part I should call this a tube mill, but the recent inventors and introducers of tube mills object to their attention being called to a machine which has been in operation in Cornwall for more years than they can remember, so I had better say nothing about it.

The slimes from this mill and from the settling pits are then passed over rag frames three or four times and afterward buddled. The buddles employed are usually of the concave type, the slimes being fed inward from the circumference. They are very wide and their slope is very gentle, so that the fine particles of tin oxide shall have a greater chance of adhering.

The Tin-stream Works

At the mines the refinements of sliming are not carried to the extent that is observable at the tin-stream works. The [illegible] tables and Acme tables used [illegible]

[illegible]

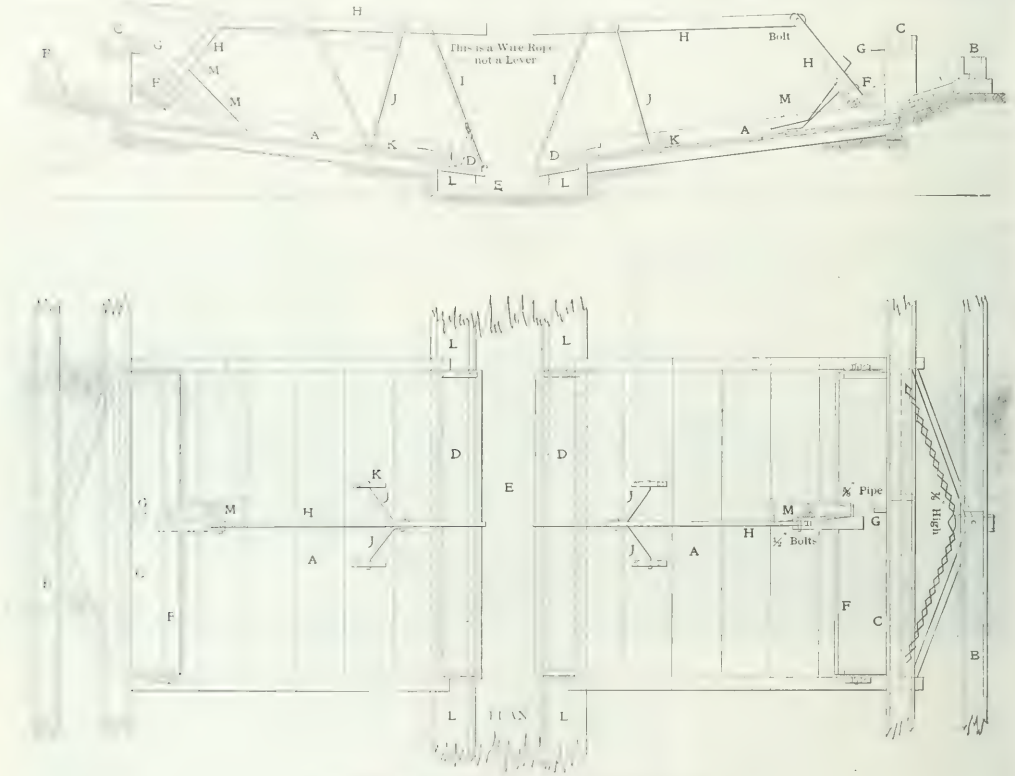
[illegible] to their short length of surface and the comparatively steep slope. It is often wondered why the mines do not adopt additional plant for treating their slimes instead of discharging them into the river, but my own observation shows that the mines usually are cramped for room for surface works and could hardly follow such a policy if they desired to do so.

The tin streamers are very reticent in regard to their results and are not willing to give any figures of production or of efficiency of their plant. They confess, however, that the contents of the river are not so great now as they were 10 years ago. This is a considerable admission for a tin streamer to make and shows that the dressing at the mines is conducted in a more efficient manner than formerly.

One point remains to be discussed. Why is it that a succession of from a dozen to 20 tin-stream works between Dolcoath and the sea can handle the same tailings and all make a profit? I have heard many theories put forward, varying from the natural concentration in river beds to the growth of tin crystals out of nothing.

To me the explanation seems quite simple. Each dressing works at the mines or at the tin-stream works passes the original slimes only once over the rag frame. The succeeding series of rag frames treat the concentrates from the preceding ones. With such a slippery article as tin oxide it is obvious that the settlement of the particles on a surface is a matter of chance, and the passage of the slimes down a mere 6-ft. length is not sufficient to catch 5 per cent. of the contents. From this point of view it is easy to see why constant retreatment of the slimes pays the various tin streamers, and why the last streamers do very nearly as well as the first.

Whether the mines or the first streamers could improve their extraction by passing the original slimes over a succession of rag frames, resolves itself into a question as to the space at their disposal. If they cannot expand laterally, they could build rag frames with more than one deck and extend their operations vertically. I give this explanation and suggestion for what it is worth.



CORNISH RAG FRAME, PLAN AND SECTIONAL ELEVATION

The production of gold in the common wealth of Australia in the first quarter of 1907 was 807,354 oz., a decrease of 66,029 oz., as compared with the corresponding period of 1906.

United States Smelting, Refining and Mining Company

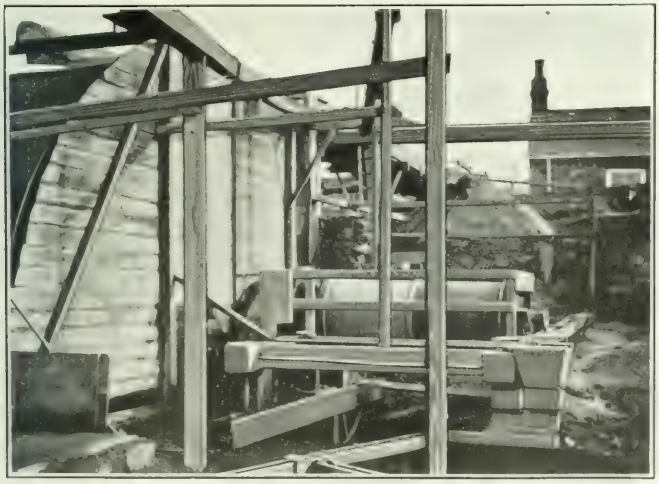
The balance sheet published in the report of the United States Smelting, Refining and Mining Company for the year ending Dec. 31, 1906 shows net earnings of $3,503,322.47, of which $430,820.20 was paid in dividends on minority stock of subsidiary companies, and $1,508,581.37 in dividends on the preferred stock of the United States Smelting, Refining and Mining Company, leaving $1,990,572.90 undistributed surplus.

The total assets at the end of the year were $46,078,504.84 against a capital liability of $42,561,537.50. The subsidiary companies of the corporation are: The United States Mining Company which owns either the whole or a majority of the stocks of the United States Smelting Company, Centennial Eureka Mining Company, Mammoth Copper Mining Company, United States Stores Company, United States Metals Refining Company. The United States Mining Company also owns one-half the stock of the International Metals Selling Company and a majority of the stock and bonds of the Niagara Mining and Smelting Company. The corporation also owns all the preferred stock and a majority of the common stock of the American Exploration Company and substantial holdings in the Richmond-Eureka Mining Company; also nine-tenths of the stock of the Real del Monte Mining Company. It also purchased during the year 50,000 shares and $50,000, 7 per cent. gold bonds of the Peruvian Mining, Smelting and Refining Company. For construction and other additions to property in 1906 the sum of $1,664,636.87 was charged to capital account. This item includes $708,192.60 for real estate and refineries at Chrome and Grasselli, and $679,603.61 for smelting buildings and plant at Bingham Junction, Mammoth and Chrome.

During the year the directors authorized, in California, an enlargement of the [illegible] the farmers have objected; and the acquisition of several mining claims adjoining the various properties; they caused the construction of a lead refinery at Grasselli, near Chicago; authorized the purchase of additional land adjoining the copper refinery, at Chrome, N. J., a 50 per cent. enlargement of that plant and the construction of a complete smelting and converting plant at Chrome.

The company decided not to extend its operations into South America, to the extent of becoming responsible for the operations of properties there, but joined to a limited amount in subscribing to the stock of the Peruvian Mining, Smelting and Refining Company which was formed to acquire the Churrucca mines in Peru. This subscription, together with its share of profits in the Exploration Company, gives the ownership of one-fourth the outstanding stock of the Peruvian Company.

RAG FRAMES AT STREAM TIN WORKS, PEE RIVER, CORNWALL.



PIPE MILL FOR GRINDING [illegible] PEE RIVER, CORNWALL.

converting plant; the acquisition of additional mining claims adjoining the Mammoth mine; the construction of a railroad to connect the mine and the smeltery; the lease of the Quartz Hill mines and the construction of a railroad to connect these mines with the Southern Pacific Railroad. They authorized, in Utah, many additions to the smeltery, especially with the hope

It is reported that the Chilean Government will soon begin the preliminary work on a railway running north and south, which will be of great importance in the development of mines, especially in the north of the Republic.

It is reported that extensive operations have been begun in the development of newly discovered manganese deposits near the line of the Kars railway in Russia.

The copper-smelting works at Guayacan, Chile, manufacture sulphuric acid as a by-product, but at present its output is greater than the country can take care of. Consequently, to utilize the surplus, a plant for the leaching of copper ore with sulphuric acid is being erected in connection with the smeltery.

Mining in Rhodesia, South Africa

In the annual report of the British South Africa Company for the year ending March 31, 1906, Sir William Milton, administrator of Southern Rhodesia, states that great activity has been displayed in every mining district, resulting in an increase in the number of gold-producing properties and opening up fresh ground. During the previous year the number of small workers who produced gold reached 72, but in the year under review the total increased to 164. In some cases local syndicates have been formed to finance such workers, and the British South Africa Company has helped a number of this class of producer to erect mills by advancing money on easy terms of repayment.

Diamonds were discovered during the year about 12 miles west of Gwelo township, which led to a good deal of excitement, as it is contended that they occur in alluvial, and that a profitable industry will arise for alluvial diggers. Prospecting work was carried out on areas granted for the purpose and 1161 carats were declared up to March 31, 1906. The deposit from which they were won also contains other precious stones of value. Washing machinery is now being erected to deal with large quantities of the soil.

Production of Gold

The highest point reached in the gold production of the previous year was 35,000 oz., as declared in March, 1905; but this total was soon left behind, and 40,000 oz. were declared, to be followed again by 45,000 oz., in March, 1906. The silver, lead and coal productions were not only maintained but showed an increase, and diamonds, as above mentioned, have been declared for the first time.

The reef claims current at the end of the year were 61,548 as compared with 54,730 current on March 31, 1905. The gold produced shows an increase of 125,503 oz., as compared with the previous year's output. The total production from April 1, 1905, to March 31, 1906, reached 435,019 oz., as against 309,516 oz. for the year ended March 31, 1905. The value of the production amounted to £1,556,741, as against £1,113,068, so that an increase occurred on the previous year's figures of £443,673, which may be considered very satisfactory.

Of the above gold totals the discharged companies and tributors of discharged claims produced 330,250 oz., valued at £1,200,237, and the small workers accounted for the balance, viz., 104,769 oz., valued [illegible].

The Mineral Production, 1906.

	Value.
[illegible] oz.	£1,556,741
[illegible] oz.	2,958
[illegible] tons	6,858
[illegible] tons, of which 82,014 tons were used	62,289
[illegible] 1161 carats	1,028
Total	£1,639,874

The previous year's value amounted to £1,116,878.

The total crushing power in the country on March 31, 1906, was equivalent to 1150 stamps and 4 tube mills, an increase in comparison with last year of 250 stamps and 3 tube mills.

The number of tons of quartz crushed for gold was 1,100,609 tons, as against 787,936 tons of the previous year. The total gold won, including the output from tailings, slimes, etc., amounted to 435,019 oz., which is 7.905 dwt. gold bullion or 28.288 shillings per ton of quartz milled.

There was no output from the copper claims, but work was continued on areas in the Victoria and Umtali districts. The copper claims current on March 31, 1906, numbered 3133, as against 3943 of the previous year.

Shipments of chrome-iron ore from claims situated on the Selukwe Commonage were made during the year, and it is hoped, if cheap railway rates can be secured, to continue such consignements. The number of claims pegged on the deposit reached 800.

Since March, 1906

The progress of the industry since the year ended March 31, 1906, with which the report of Sir Wiliam Milton is solely concerned, has been remarkable. In the gold industry in particular a series of new records has been established, the highest production in any one month having now reached a total of 50,127 oz., as against 37,116 oz. in 1905, and 28,100 oz. in 1904.

The Mineral Output of Southern Rhodesia

	Gold. Oz.	Silver Oz.	Lead Tons.	Coal Tons.
1890-1898	22,914	....		....
1899	56,742	112	...	....
1900	85,567	351		
1901	172,035	3,132		
1902	194,170	3,445	...	...
1903	231,872	20,715	128	46,870
1904	267,737	70,146	455	39,678
1905	407,048	89,278	570	97,191
1906	551,895	110,575	652	103,803

During last year 1849 carats of diamonds, 3400 tons of chrome-iron ore and 17 tons of wolframite ore were also produced.

With regard to chrome-iron ore, the deposits in the Selukwe district are reported to be of practically unlimited extent, and of uniform and high quality. The market for this ore is at present of comparatively small dimensions, but endeavors are being made to foster a larger trade, which may hereafter have an important bearing on railway receipts.

The output of minerals from Northern Rhodesia has also commenced. Mr. Ackermann visited the Rhodesia Broken Hill mine, the Bwana M'Kubwa mine of the Rhodesia Copper Company, Ltd., and the Kansanshi mine of the Tanganyika Concessions, Ltd. It was impossible until the railway had reached the Rhodesia Broken Hill mine to ship the large tonnage of mixed lead and zinc ore required to carry out on an adequate scale the metallurgical tests, the results of which are needed to determine the nature of the plant required for the separation and treatment of the various classes of ore. When these tests have been completed, work can be prosecuted vigorously. Meantime upward of 10,000 tons of calcined zinc ore have been despached during the past six months from the Rhodesia Broken Hill mine to Beira. Shipments of this ore will continue to be made, but the tonnage handled cannot reach its full dimensions until the plant required to deal with the mediumgrade ores and to produce metallic lead has been erected. A small tonnage of rich copper ore is also on its way to Beira from the mines of the Kafue district.

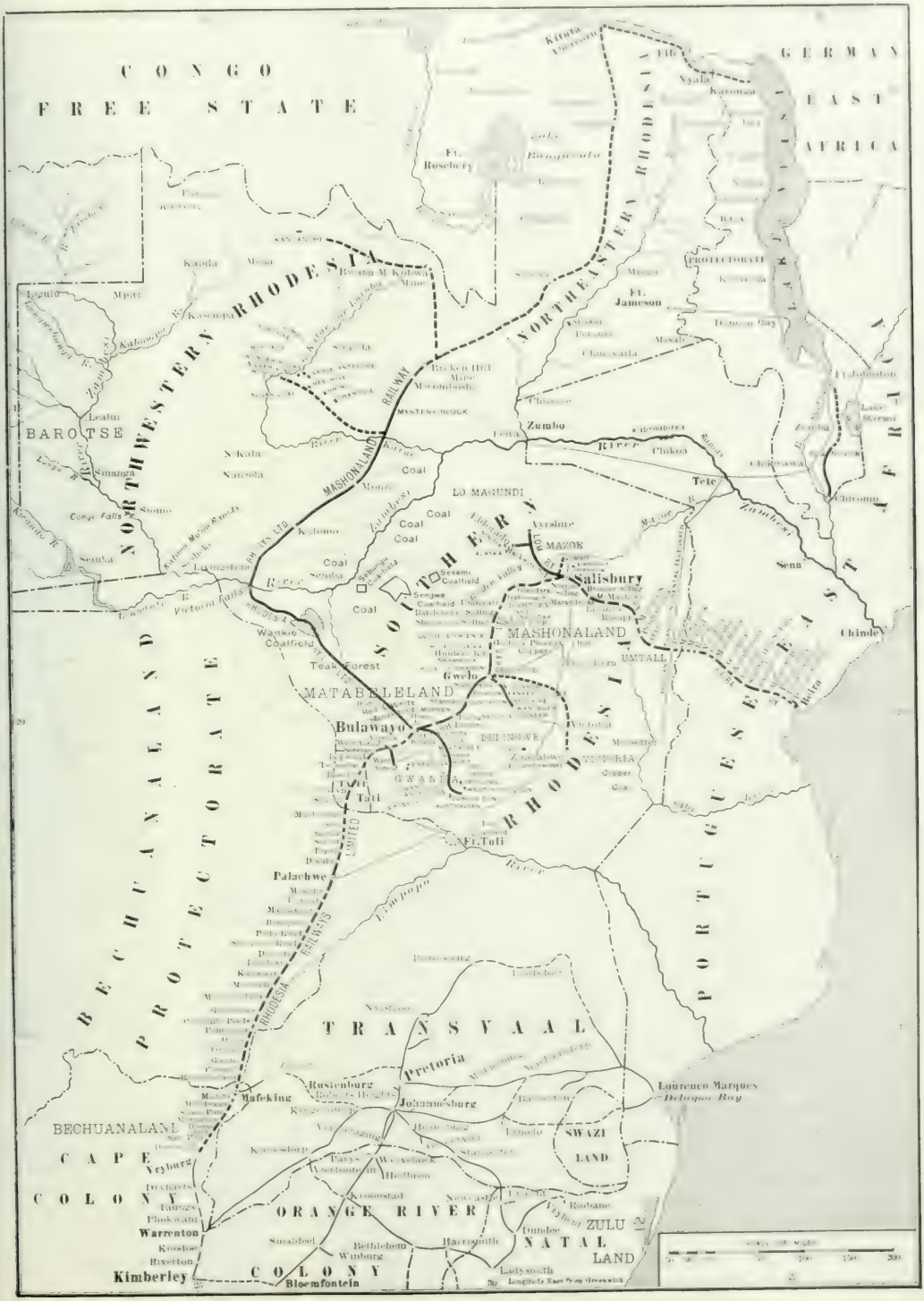
The total production of diamonds up to the end of December last was 1849 carats, the stones being of fine quality and commanding high prices. Outside the areas controlled by the Willoughby group a number of prospectors have been at work, but so far as is known at present no important finds have been made. Certain alterations have recently been made in the terms given to diggers in the districts which are now engaging attention, and special inducements have also been ordered to discoverers of any new fields situated at least 100 miles from any previously known deposit.

The French Mint

The French mint, in 1906, coined 46,486,029 pieces, of which 34,288,854 were for France, 12,194,060 for Indo-China, and 2115 for Tunis. The total weight of metal of all kinds used was 485,600 kg. The French pieces coined included 18,310,600 of gold—30,247 of 100 fr., 14,613,010 of 20 fr. and 3,665,353 of 10 fr. The silver pieces were 4,587,244 in number; 1,908,100 of 1 fr. and 2,679,144 of 50 centimes. The bronze coins were 11,394,000 in number, 3,000,000 being 10c. and 8,394,000 of 5c. The five-centime piece, or "sou," is the smallest coin made in value. For Indo-China there were coined 10,194,060 silver piasters, and 2,000,000 small copper coins. The coinage for Tunis was only 106 gold pieces and 2006 silver pieces.

The production of gold in the commonwealth of Australia in the first quarter of 1907 was 807,354 oz., a decrease of 66,029 oz., as compared with the corresponding period of 1906.

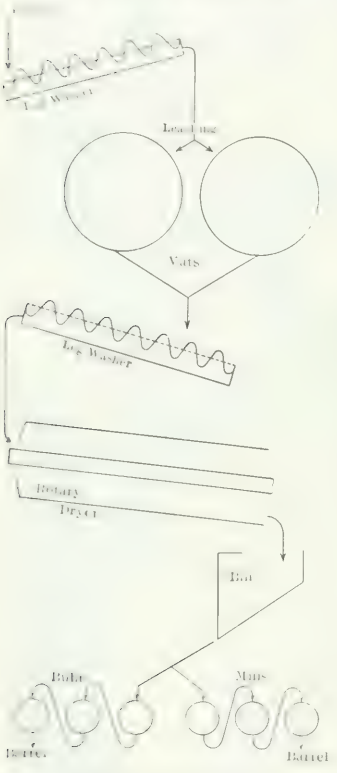
Phosphate rock is acidulated by the Wallaroo Phosphate Company, at Wallaroo, South Australia, the output of which is about 10,000 tons of acid phosphate per annum. This is consumed principally in Yorke's peninsula. The demand is greater than the local works can supply, wherefore about 30,000 tons of acid phosphate per annum has to be imported.


CONGO FREE STATE
GERMAN EAST AFRICA
NORTHWESTERN RHODESIA
NORTHEASTERN RHODESIA
BAROTSE
LO MAGUNDI
MASHONALAND
MATABELELAND
Salisbury
Bulawayo
Gwelo
Tati
Ft. Tuli
Palachwe
Zumbo
Tete
Chinde
Senna
Beira
Umtali
Ft. Jameson
Ft. Rosebery
Victoria Falls
Wankie Coalfield
Teak Forest
Hunters Road
Selukwe
Gatooma
Umvuma
Enkeldoorn
Mazoe
Mashonaland Railway
Rhodesia Railways
Limpopo River
Zambesi River
Chikoa River
Pungwe River
Buchanan Mining Co. Ltd.
Rhodesia Copper Co. Ltd.
Rhodesia Exploration Co. Ltd.
Rhodesia Goldfields Ltd.
Rhodesia Railway Trust Ltd.
Rhodesia Reduction Co. Ltd.
Rhodesia Tanganyika Ltd.
Rhodesia Tobacco Co. Ltd.
Rhodesia Trading Co. Ltd.
Rhodesia Wankie Coal Co. Ltd.
Rhodesian Mining & Land Co. Ltd.
Rhodesian Railways Ltd.
Rhodesian Rubber Co. Ltd.
Rhodesian Selection Trust Ltd.
Rhodesian Tobacco Co. Ltd.
Rhodesian Trading Co. Ltd.
Rhodesian Wankie Coal Co. Ltd.
Rhodesian Wankie Coal Co. Ltd.
Rhodesian Wankie Coal

A Barytes Grinding Plant

[illegible]

There are two plants in the vicinity of New York for pulverizing barytes, both of them treating only imported crude mineral: That of Hammill & Gillespie, at Stamford, Conn., grinds other materials as well, but that of the Ainslie Mining and Railway Company, Ltd., in Long Island City, treats barytes alone. The latter plant is modeled closely after the [illegible] of Missouri and the



BARYTES MILLING PROCESS

South, but has enough features of unusual interest to deserve a short description. To the manager, H. R. Harrison, I am indebted for the privilege of visiting the works.

The crude material is mined by the company on the east shore of Lake Ainslie, on Cape Breton Island, Nova Scotia. The mineral deposit and the operating methods have been recently described.

Briefly, the mineral is carried from the working place by a system of trams and chutes to a wharf on the edge of the lake; thence it is discharged into a steam lighter which carries it across the lake, delivering it into railroad cars. These travel over the tracks of the Inverness Railway and Coal Company, to Port Hastings, whence the ore is shipped by steamer to Montreal and New York, and by rail to Dartmouth, N. S., in each of which cities the company maintains a grinding plant.

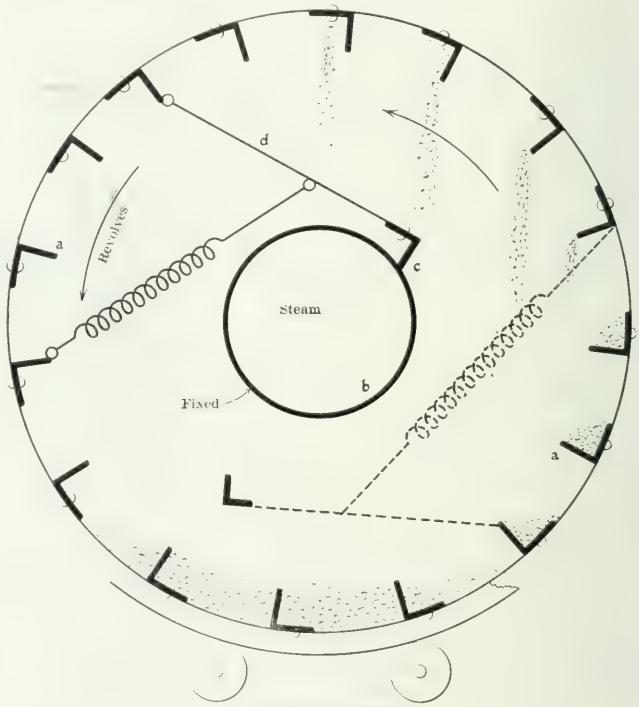
[illegible] Engineering, No. 26 Cortlandt street, New York.

Arrangement of the Plant

The plant in Long Island City (Greater New York) is situated on the east side of Newtown creek; the sea-going carrier is able to proceed directly to the works, and to unload at the door. The cargo is unloaded into horse dump-carts, which pass over weighing scales, for the purpose of levying the import duty, before dumping [illegible] under a shed. As the crude material is needed for supplying the mill, it is brought in by wheelbarrow and put on the floor beside the crusher. A ship-load is generally sufficient to keep the mill going until the next arrival, although during the winter shipments are suspended for several months.

The general plan of the process is indicated in the accompanying diagram, from which the elevators are omitted. The elevators are all of the common belt-and-bucket type, and as the building was not designed for the operations now conducted in it, a great number of these is required. The mineral is shoveled into the hopper of a small gyratory crusher, the discharge from which is elevated to a log-washer. This completely separates the clay and dirt adhering to the barytes.

The discharge from the log-washer, the maximum size of which is about ½ in., falls through a chute into one of two bleaching tanks, for the removal of all soluble impurities. The bleaching tanks are ordinary wood-stave, circular vats, 3¼ ft. high and 12 ft. in diameter, lined with sheet lead. At opposite points of the circumference two 2-in. lead pipes enter each vat, and are coiled into parallel spirals on the bottom; this coiled part of the piping is punctured with small holes. The pipes are arranged to admit either steam or water; in other plants com-



SECTION OF DRYER

pressed air also is occasionally admitted as the stirring agent, to avoid undue dilution of the acid bath.

Washing and Drying

When a vat is conveniently full, an ordinary charge weighing 10 tons or more, sulphuric acid is poured in and sufficient water is added to submerge the charge. Steam is then admitted through the lead pipes, and the agitation is continued for 12 hours, or more. The acid bath is run to waste, and, in summer, is then replaced by cold water, to cool the charge; in winter this detail is not observed. In either case, the bleached material is shoveled out

of the vats upon a platform, and from this into a log-washer similar to that used in the first treatment. This washing removes the soluble sulphates formed in the vats, as well as traces of acid. The strength of the acid bath, and the duration of the bleaching process are both subject to considerable variation, according to the nature and amount of the impurities in the ore.

From the discharge end of the second log-washer, the cleaned barytes is elevated to a rotary dryer, heated by steam. This dryer is a simple, cylindrical shell 20 ft. long and 4 ft. in diameter; it rolls on two tires, one near each end, each resting on a pair of supporting wheels, and is driven by a cog and pinion near one end. It is inclined ¾ in. to the foot. To the interior surface of the shell are riveted parallel angle irons *a*, 6 in. apart, of each of which one leg extends 3 in. inward from the circumference. These are designed to lift the ore on the upgoing side, and to let it fall, from near the top, upon a central, stationary tube *b*, 1 ft. in diameter, containing steam. Another section of angle iron *c*, the length of the dryer, is hinged to the outer shell at three points by swinging arms *d*. As the shell revolves, this swinging arrangement scrapes off the material collected on the top of the steam tube; the spring supports serve only to cushion the oscillations of the scraper. The dotted lines indicate the position taken by the scraper during the lower part of its rotation. The dryer revolves 12 times per minute. From the dryer the barytes falls into a hopper which stores the supply for the grinders.

The product is pulverized in buhr mills, arranged in two independent series of three each, the ore passing from one to the next until it has passed through the three mills. The stones have a diameter of 4 ft. The flow from the last mill is caught in ordinary flour barrels, holding 550 to 600 lb. each, in which it is shipped.

The Revised Nevada Mining Law

The State mining regulations have been revised by the Nevada legislature and the new law will be come effective on July 1 next. The changes made are chiefly in minor details, the most important modification being a clause reducing the period allowed for recording the location and boundary notices from 90 to 20 days.

The amended act is as follows:

Sec. 1. Any person, a citizen of the United States, or who has declared his intention to become such, who discovers a vein or lode may locate a claim upon such vein or lode by defining the boundaries of the claim in the manner hereinafter described and posting notice of such location at the time and point of discovery, which notice must be posted upon one of the several monuments prescribed in Sec tion 2 of this act, and which notice must contain: First, the name of the lode or claim; second, the name of the locator or locators; third, the date of location; fourth, the number of linear feet claimed in length along the course of the vein each way from the point of discovery, with the width on each side of the center of the claim and the general course of the vein or lode as near as may be.

Sec. 2. The locator of a lode mining claim must sink a shaft upon the claim located 4x6 ft. to the depth of at least 10 ft. from the lowest part of the vein of such shaft at the surface, or deeper if necessary, to show by such work a lode deposit of mineral in place; a cut or crosscut or tunnel which cuts the lode at a depth of 10 ft., or an open cut along the said ledge or lode equivalent in size to a shaft 4x6x10 ft. deep, is equivalent to a discovery shaft. The locator must define the boundaries of his claim by removing the top of a tree, having a diameter of not less than 4 in., not less than 3 ft. above the ground, and blazing and marking the same; or by a rock in place, capping such rock with smaller stones, such rock and stones to have a hight of not less than 3 ft.; or by setting a post or stone, one at each corner and one at the center of each sideline. When a post is used, it must be at least 4 in. in diameter by 4½ ft. in length, and set 1 ft. in the ground. When it is practically impossible on account of bedrock or precipitous ground to sink such posts, they may be placed in a mound of earth or stones, or where the proper placing of such posts or other monuments is impracticable or dangerous to life or limb, it shall be lawful to place such posts or monuments at the nearest point properly marked to designate the right place. When a stone is used, not a rock in place, it must be not less than 6 in. in diameter and 18 in. in length and set two-thirds of its length in the top of a mound of earth or stones, 4 ft. in diameter and 2½ ft. in hight. All trees, posts or rocks used as monuments, when not 4 ft. in diameter at the base, shall be surrounded by a mound of earth or stones 4 ft. in diameter by 2 ft. in hight, which trees, post, stones or rock monuments must be so marked as to designate the corner of the claim located; provided, however, that the locator of a mining claim shall within 20 days from the date of posting the notice of location define the boundaries of said claim by placing at each corner and the center of each sideline one of the hereinbefore described monuments, and shall within 90 days from the date of posting of said location notice perform the location work hereinbefore described.

Sec. 3. Any locator or locators of a mining claim, after having established the boundaries of said claim, and after complying with the provisions of this act, with reference to the establishment of such boundaries, may file with the district recorder of the district in which such claim is situated a notice of location setting forth the name given to the lode or vein, the number of linear feet claimed in length along the course of the vein, the date of location, the date on which the boundaries of the claim were completed, and the name of the locator or locators. Should any claim be located in any section or territory where no district has yet been formed, or where there is no district recorder, the locator or locators of such claim or claims may file with the county recorder notice of locations as set forth above, and said notice of locations will be *prima facie* evidence in all courts of justice of the first location of said lode or vein. Within 90 days of the date of posting the location notice upon the claim the locator shall record his claim with the mining district recorder and the county recorder of the mining district or county in which such claim is situated by a location certificate which must contain:

First. The name of the lode or vein

Second. The name of the locator or locators.

Third. The date of the location and such description of the location of said claim, with reference to some natural object or permanent monument, as will identify the claim.

Fourth. The number of linear feet claimed in length along the course of the vein each way from the point of discovery, with a width on each side of the center of the vein, and the general course of the lode or vein as near as may be.

Fifth. The dimensions and location of the discovery shaft, or its equivalent, sunk upon the claim.

Sixth. The location and description of each corner, with the markings thereon.

Any record of the location of a lode mining claim which shall not contain all the requirements named in this section shall be void. All records of lode or placer mining claims, millsites, or tunnel rights heretofore made by any recorder of any mining district or any county recorder are hereby declared to be valid and to have the same force and effect as records made in pursuance of the provisions of this act. And any such record, or a copy thereof, duly verified by the mining recorder or duly certified by a county recorder, shall be *prima facie* evidence of the facts therein stated.

According to the *Bd. of Trade Journ.*, Feb. 7, 1907, a company has been formed to work the iron sand found in extensive deposits on the Japanese coast. The iron sand contains no sulphur nor phosphorus. The deposit to be worked lies between Muroran and Hakodate; in some places it is 45 miles in length, 1800 ft. wide, and 4 to 10 ft. deep.

An enormous deposit of pure salt is reported to have been found on the west side of the Utah desert, not far from the Nevada State line.

Portland Cement Resources of West Virginia

West Virginia, with its valuable deposits of coal and natural-gas fuel, its 3000 miles of railroad and over 500 miles of navigable waterways, nearness to large markets, and almost inexhaustible deposits of materials for the manufacture of portland cement, deserves careful attention on the part of capitalists in search of profitable investments. At present there is a single mill, that of the Buckhorn Portland Cement Company, located on the Cheat river, near Rowlesburg, which is in successful operation with a daily output of 1200 barrels. The State Geological Survey has recently issued a report on clays, limestone, and cement in West Virginia. In my work in the preparation of this report, as well as in reports on these resources for private companies during the past two years, I have been surprised at the natural advantages for the growth of the cement industry in this State, and the fact that many of these valuable properties remain undeveloped.

Advantages of Martinsburg

In the eastern part of the State is the city of Martinsburg, reached by two railroads, the Baltimore & Ohio, and the Cumberland Valley. It is only 75 miles from Washington, 100 miles from Baltimore, 196 miles from Philadelphia and 228 miles from Pittsburg. These cities can be reached with a very low freight rate. In this region the Shenandoah limestone of Cambro-Silurian age covers a wide area and consists of belts of rock of marked uniformity of composition in the same belt, but varying from one belt to another. Near Martinsburg there are several belts of high-grade rock, light in color and smooth in fracture, which average in composition 96 to 99 per cent. carbonate of lime, and less than one per cent. of silica. These belts can be traced in a few cases eight to ten miles in length and in width, 25 to 600 ft.

On account of the high degree of purity the rock is in demand for furnace flux and has been extensively quarried for this purpose. From 50,000 to 70,000 tons have been shipped in one month from the Martinsburg quarries mostly to Pittsburg. The impression has been that this grade of rock is reaching exhaustion in this area, but a recent examination has shown that there are very large deposits not yet opened.

Dolomites and magnesian limestones of almost theoretical purity occur in elongated lenses in this field, and have been worked on a small scale to furnish rock for open-hearth steel furnaces. While the [illegible] stone could be used in the manufacture of portland cement, there are a number of belts of a lower grade of stone adapted to this work. They average in carbonate of lime about 90 to 92 per cent. with a higher percentage of alumina and silica than in the pure rock. All of these belts trend north 25 deg. east, with very little soil cover, the rock over much of the area coming to the surface. Diamond drill holes to a depth of 200 ft. were stopped in limestone of the same grade as that at the surface.

In direct contact with the limestone are belts of shale in which the percentage of silica and alumina is 72 to 80 per cent. and the ratio of these elements within the proper proportion for economical manufacture. Cement made from a proper mixture of this limestone and shale shows a high degree of strength. Neat briquets after 28 days broke at 850 lb. and at over 500 lb. with three parts sand.

Favorable Conditions

The direct association of these materials will result in economy in quarrying and handling the materials. In many places it would be possible to build a mill which would stand half on shale and half on limestone. The quantity of materials available with low quarry cost would be almost unlimited even with a very large mill. The total quantity would last a number of plants for centuries. Water supply is constant and abundant in the Opequon creek which flows part of its course along the contact of a wide belt of limestone and shale. The Potomac river has high limestone bluffs in part of this area and is only eight to ten miles distant from Martinsburg. On this river is a large electric power plant using the water power of the river. This plant now supplies light and power to Martinsburg, and a second plant is in process of construction, thus introducing cheap light and power for mills.

The topography is rolling and suitable for building sites of any size. Coal for fuel can be secured from the Cumberland region, 75 miles distant, and there is active coal development in the mountains near Cherry Run, 15 miles distant. These coals are all probably too low in volatile matter for use in the rotary kilns. The best grade of cement coal used throughout the United States east of the Mississippi river is the Pittsburg coal from the Fairmont, West Virginia, mines. This coal can be shipped to Martinsburg for $2.60 a ton.

In addition to the cement manufacture, a comparatively small additional expense would add the equipment for crushing rock for ballast and for crushing the high-grade rock for use as flux in the steel works at Baltimore and Pittsburg. The screenings would be available for concrete work. The high-grade rock as well as the beds of dolomite near at hand could be burned into lime which would reach a wide market. With these natural advantages, the Martinsburg area is destined to be one of the very important cement centers of the country, and at the present time much attention is being paid to it and several tracts are under option. The prices for the land are at present reasonable, and the people are interested in securing new enterprises.

Shepherdstown and the Shenandoah

Northeast of Martinsburg, at Shepherdstown this same belt of limestone forms a vertical bluff along the Potomac river, for over a mile. The strata as at the other localities, are steeply inclined. Much of this rock is highly magnesian, but pure strata are to be found, and shales and clay at no great distance away.

The dam in the Potomac, which is at present out of repair, furnished water power for the old natural cement mill at this place, and was estimated to give 1000 h.p. The water was backed for five miles giving connection with the Chesapeake and Ohio canal, and through this waterway the cement was shipped to Washington, at a cost of 8c. a barrel. The area is also reached by the Norfolk & Western Railroad.

The rock along the river forms a vertical bluff with a hight of 125 ft., with practically no cover, so that it could be worked with a high face in an open quarry. The Fairmont coal for the kilns could be shipped part of the way by water and thus reduce its cost. Good building sites are available within a mile of the town.

Further south, in Jefferson county, near Charlestown and Millville, this limestone is found suitable for Portland cement, and the shales near at hand. Near the latter place is an extensive deposit of marl of good thickness. A large electrical power plant is being constructed on the Shenandoah river, within a mile of the marl deposit. The area is reached by the Baltimore & Ohio road. Other locations with similar deposits of limestone and shale are to be found in these counties.

Near Keyser, in Mineral county, the lower Helderberg limestone contains 93 to 98 per cent. carbonate of lime with shales near. This location is near the Baltimore & Ohio and the Western Maryland railroads, and not far distant from large coalfields.

Near Hendricks, in Tucker county, is a tract of land of nearly 500 acres, which is almost ideal in its arrangement of materials for cement work. At the base of the mountain is the railroad and river with water supply. On the hill above is the deposit of Greenbrier limestone at least 400 ft. thick, and over the limestone is the deposit of red shales at least 200 ft. thick. In places these have slipped and formed 6 or 8 ft. of cover over the limestone. The silica-alumina ratio in this shale is 3.6. These materials have been

[illegible] State geologist, Morgantown, W. Va.

tested in some of the large testing laboratories, and have yielded a high-grade portland cement.

THE GREENBRIER LIMESTONE

This locality is near some of the large coal mining centers, and coal could be obtained from these mines at a very low cost. It is not necessary to go away from the limestone tract for fuel, a condition which adds still more to the value of the location. Above the limestone 655 ft., or 1050 ft. above the railroad track, is a vein of coal 4½ ft. thick. The entry has been driven a couple of hundred feet to the northeast, and shows a bright glistening coal with 25 per cent. of volatile matter and 68 per cent. of fixed carbon. The coal is probably the Nuttall (Sewell) seam, although the identification is not certain, but it belongs in the Pottsville series.

A timber chute lined with steel plates and 1200 ft. long, leads from the mines to the inclined track, 1500 ft. long, to the mill site. Natural gas has been piped to the town a mile distant. The limestone quarry was opened a few years ago for lime, which is burned in two nine-foot steel-clad kilns, and there is a good market for the lime in the tanneries and pulp mills of this section.

In the southern part of the State, along the Chesapeake & Ohio Railroad, the Greenbrier limestone reaches a thickness of 1000 ft. While this rock varies in composition over the area, there are large deposits that are high grade limerock and near clays and shales that might be utilized for cement manufacture. The area is not far removed from the New River coalfields, and has abundant water supply, in places available for water power. The product would reach the eastern markets over a trunk line railroad.

Near Morgantown, in the northern part of the State, this same limestone is found with the shales over it. The limestone is, at least, 100 ft. thick, and is near the railroad. At Morgantown the product could be shipped to Pittsburg and the cities along the Ohio river by boat or barge, affording cheap transportation. Deckers creek, flowing along the outcrop of the rock, would furnish an abundant water supply. The area is three to four miles from two large coal mining centers, and seven miles from the natural gas pipe lines with gas at 5c. per 1000 cu.ft. Pittsburg coal would cost at the plant one dollar a ton. The materials have been carefully tested in two laboratories and have proved suitable for the manufacture of a high quality of cement. Across the river from Morgantown is a good deposit of limestone and shale with the Pittsburg coal on the same tract, and the area is crossed by two natural-gas pipe lines. This area is near the Baltimore & Ohio Railroad, and on the river.

As a result of the work of the State Survey attention has been called to these opportunities for portland-cement development, and much interest is now being taken in this field. Three companies are now carefully investigating some of the areas described, and the summer of 1907 will probably see work started on new plants. When the development is fully started the growth of the cement industry in this State will be rapid. These tracts, with their natural advantages, justify the prediction that West Virginia will before long become a prominent cement-producing State.

Treatment for Electrical Shocks

BY RICHARD LEE.

The common use of electricity in coal mines, and the conduction of current along gangways and entries through exposed wires, has resulted in numerous accidents due to miners coming in contact with two conductors at different potentials. The electric shock that results depends mainly on the strength of current passing through the body, the time for which it is maintained, and the physical condition and peculiarities of the victim. There is a difference of opinion as to whether alternating-current or continuous-current shocks under certain conditions are the more dangerous. It is well to remember, however, that a high-potential alternating circuit should not be regarded as safe to handle, even when the current has been shifted off, until it has been connected to earth and so practically discharged.

A live wire may often be handled without inconvenience when standing on an india-rubber mat or on a dry-wood floor, but it is a safe rule to avoid contact with any part of an electrical apparatus without thoroughly understanding what one is doing. The symptoms of an electric shock are as follows: (1) Stoppage or weakening of the action of the nerves; (2) contraction and stiffening of the muscles; (3) stoppage or weakening of the action of the heart. The contraction of the muscles is what prevents the victim from letting go after grasping a live wire.

A person who has received a severe shock may become unconscious and seemingly cease to breathe. None of these symptoms necessarily indicates death, and under no circumstances should remedial measures be abandoned until a physician has pronounced life extinct. It is most likely that many victims have been given up for dead after an electric shock, when the continuous application of further remedies might have restored them. A number of cases are on record where subjects who have received severe shocks have been unconscious for more than 30 min. without the slightest discernible heart action, and still have recovered because of the artificial respiration applied. In treating a case [illegible] blood to the brain, which action may prove a remedy for syncope, a condition often resulting from such a shock. If the heart has stopped beating, it is sometimes possible to start that organ again by applying a series of smart taps over the chest. The treatment should also be accompanied by drawing the arms in and out so as to aid or rather force artificial respiration. A number of authorities also advocate hypodermic injections of ether and alcohol beneath the skin, so as to distend the arteries and help the heart action. In trying to disengage a man who is in contact with live metals, it is well to remember that dry clothing is a good insulator, and the best plan is to sieze the victim's arm on the clothing and try to pull him away. Under no circumstances should the rescuer touch the bare skin or take hold under the armpits where the clothing is apt to be damp.

The Lake Fork District, Colorado

On the western side of the Continental Divide, near the head of Lake Fork of Gunnison river in southwestern Colorado, about 14 miles by road northeast of Silverton and nearly the same distance southwest of Lake City, is a mining region that may be considered a geologic extension of the famous Silverton district. The Silverton district has been worked for many years. In the summer of 1906 a party under Mr. Cross, engaged in reconnaissance work in the San Cristobal quadrangle, made a somewhat hurried survey of the Lake Fork region. The discussion is published by the Geological Survey in its annual economic bulletin, No. 315.

The region was prospected many years ago and has been the scene of more or less activity ever since, but developments have been greatly retarded by lack of transportation facilities. To reach the nearest railroad, at Animas Forks, 5 miles west of Whitecross, one must cross a divide requiring a 1500-ft. climb, and the railroad at Lake City is nearly 15 miles distant. Nevertheless considerable ore has been shipped from the various mines of the region, and active development is progressing as rapidly as the conditions warrant. Many prospects have workings of several hundred feet.

At the time of the visit the Ohio mine, on the east side of Lake Fork between Copper and Silver creeks, was being more actively developed than any other in the vicinity. About 70 tons of ore had been shipped, and nearly as much more lay in the bins ready to be moved. The ore in the bins was estimated to carry 12 to 15 per cent. copper, $10 to $12 in gold, 50 to 60 ounces in silver, and 10 per cent. zinc.

Charles Haynes Haswell

[illegible] the most distinguished marine engineer[illegible] in New York City, May 12, in his ninety-eighth year, his death being due to a shock attending a dislocation of the shoulder, [illegible] he had been in good health and was regularly at his work in charge of important construction operations for New York City.

[illegible] was born of English parents in this city, May 22, 1809. At the age of 19 he secured employment in the engine works of the pioneer establishment of James P. Allaire. While with this firm he was selected by the United States Navy Commissioners to take charge of the building of a steam war vessel for the Government and in 1836 joined the United States Navy as chief engineer, receiving his commission as engineer-in-chief in 1845. Some years prior to this date he conceived the idea of building a steam launch and in 1837 constructed the "Sweetheart," which was the first private steam yacht launched. He held the rank of engineer-in-chief of the navy until 1851, and during that period designed the machinery for ten war vessels and introduced numerous mechanical improvements for increasing the early steam navy's efficiency.

His aggressiveness as a practical engineer and his ideas due to his mechanical training involved him in frequent controversies with the naval authorities. When the old "Missouri" some fifty years ago was about to start for the Mediter[illegible] a proposal was submitted to the Secretary of the Navy that the funnels then in use be replaced by two horizontal pipes leading into the wheel house, the idea of the inventor of the scheme being that the smoke from the fires would be concealed from the enemy by being drawn from the furnaces by the suction of the paddle wheels. The proposal was indorsed by the secretary; and Mr. Haswell, who fought the project as an impracticable idea, was suspended from the service. The arrangement was given a trial, which was witnessed by many prominent government officials, and upon its proving a complete failure, Mr. Haswell was notified that if he would apologize for his action he would be reinstated. This he refused to do, and as a result was detached from the service.

CHARLES HAYNES HASWELL

He was, however, shortly after reinstated and later was chosen to design and superintend the building of the machinery for several revenue cutters. In 1843 he was ordered to Washington to discharge the duties devolving upon the engineer-in-chief, and in 1845 he was promoted to that position, which he held until 1851, when President Fillmore appointed a civilian to supersede him, later, however, restoring to him his rank as senior chief engineer.

In 1847-48 he designed the entire boiler and engine equipment of the steam frigate "Powhatan." Owing to a lack of professional aid, and the urgent requirements of the service and the contractors, he was compelled personally to design every detail and made the working drawings himself.

After retiring from the navy in 1851 Mr. Haswell built several merchant steamships and then engaged in engineering practice in New York. For over 40 years he was surveyor of steamships for the marine underwriters of New York. He designed and located the buildings on Hoffman island in the lower bay and built the crib bulkhead at Hart's island. He constructed what at the time were the most extensive and difficult building foundations in the city. For several years past he had supervised extensive work of construction and improvement at Riker's island. From 1855 to 1858 he was a member of the board of councilmen of New York City, and during the latter year was its president. Later he entered the employ of the city, and during his many years of service acted as chief engineer of the dock department, superintending engineer to the department of charities and correction and the board of health, and consulting engineer to the board of public improvements. He was appointed by the latter body in 1898 to design and supervise the extension of Riker's island, and in 1902 was appointed consulting engineer to the board of estimate and apportionment, which position he held at the time of his death.

Mr. Haswell first brought out his pocket-book, which is now in its seventy-second edition, in 1843, the volume at that time containing 284 pages. He was also the author of "Reminiscences of an Octogenarian," a book of memoirs covering the old New York from 1816 to 1860. He was a member of the Engineers' Club of New York and Philadelphia, and belonged to many engineering and scientific organizations, among these being the American Society of Mechanical Engineers, the American Society of Civil Engineers, American Society of Naval Engineers, the Institution of Civil Engineers and the Institution of Naval Architects of Great Britain.

Centennial Copper Mining Company

The treasurer's statement in the annual report of the Centennial Copper Mining Company for the year ending Dec. 31, 1906, gives a balance of $340,310.30 for the end of that period as compared with $331,779.16 of the year before. Energies were directed chiefly toward the development of the property. The sale of 2,253,015 lb. of copper brought $439,155.50 or an average of 19.5078c. per pound.

Operations of the year included 2437½ ft. of sinking, raising and drifting, and 12,741 fathoms of stoping. Of the 192,866 tons of rock broken 166,000 tons were treated yielding 13.58 lb. of refined copper per ton. The cost of sinking was $19.28 per foot, raising $10. and drifting $6.223 per foot. The cost of stoping was $7.997 per fathom.

The total assets at the end of the year were $2,091,233.11.

Chrome Plant of U. S. Metals Refining Company

A New Copper-smelting Plant Now in Course of Construction and Description of an Important Electrolytic Refinery

BY LAWRENCE ADDICKS

The property at Chrome, N. J., formerly known as the Delaware Refinery, is now owned by the United States Metals Refining Company, which is a subsidiary company controlled by the United States Smelting, Refining and Mining Company. It forms the copper-refining link in the metallurgical chain operated by the parent company. Since the change of control two years ago the refinery has been brought up to 200 tons a day capacity, and a complete copper-smelting plant with blast furnaces and converters has been added, arranged for rapid expansion into a still larger unit, if found desirable. The entire plant as it stands today represents the most modern practice.

Shipments can be received by rail, by lighter or directly by steamer, a large steamship dock having been erected in connection with the smelter. Cupriferous material of every nature from lean ore to bullion is received. A three-track trestle with an ore-bin capacity of about 8000 tons affords ample storage for properly distributing the different ores to as nearly

GENERAL VIEW OF SMELTING PLANT, U. S. METALS REFINING COMPANY, CHROME, N. J.

ing the intention to bed the ores as is commonly done in lead practice.

Ore Sampling

At the head of the trestle is a well equipped sampling mill, designed to make the least fines consistent with accurate sampling. Ore is dumped from the car on a 5-in. grizzly and any lumps retained are broken by hand with a sledge. The grizzly delivers directly to a Brunton oscillating sampler, which cuts out one-fifth which passes successively through three other samplers and appropriate crushing machinery, so that 1/625 of the original carload is delivered in ¼-in. size upon the floor of the final sampling room, and 624/625 is returned as reject to the car from which it was taken and sent on to the bins. The first Brunton sampler which takes 5-in. lumps is the largest of the type that has been built. The capacity of the mill is conservatively rated at 100,000 lb. an hour.

From the ore beds the ore is transferred to an electric-driven charging-car carrying one trailer which runs on tracks at a lower level. The car and trailer extend just the width of the charging doors of the blast furnaces. The pair pass on over

[illegible] installed in duplicate, and are raised with the motorman to the furnace charging door and dumped directly into the furnace, which is charged alternately from either side.

[illegible]

The blast furnaces are of the usual water-jacketed type, the jacket sections being vertical. It is intended to install two large furnaces, but the plant is being started with a small 38x60-in. Traylor furnace, formerly in use at the refinery and one large furnace. The building and equipment is all on the larger scale. Air is furnished at 32 oz. to the furnaces and jacket water is taken from the 5000-gal. circulating system in the refinery. The jackets were made by the Marine Boiler Works Company.

The blast furnaces produce matte assaying 50 per cent. copper, and a highly silicious slag. The latter is withdrawn in sectional cast-steel cars handled by electric locomotives. The matte is collected in 14-ft. settlers in the customary way and tapped out into ladles handled by a 40-ton crane and poured directly into the converters, of which there are at present two stands and six shells.

Note—From advance sheets of *The Mineral Industry*, Vol. XV.

*Superintendent, Chrome Plant, United States Metals Refining Company, Chrome, N. J.

84x120-in., Allis-Chalmers, motor governed and supplied with air at 12 lb. The blister copper is cast into bars and sent to the refinery, where it is treated just as outside bullion, a complete interaccounting of metals being made between the two plants.

Gases from the various units enter a long flue 12x13 ft. equipped with self-discharging hoppers throughout, and finally pass into a 200x12-ft. Kellogg brick stack. No dust chamber has been erected, as the size of the flue is ample at present. The stack will easily handle four furnaces, and should these be erected later there is ample ground space for a dust chamber. The stack is furnished with a self-sealing discharge for flue dust and is built without a lining.

Power Plant

Power for the smelter is supplied from a separate plant on account of lack of space for additional engines in the refinery power house. Steam and electric power, however, are taken from the refinery power house. Air for the blast furnaces is taken from a No. 9 Root blower, driven by a 11x24x36-in. Hamilton-Corliss tandem engine. The converters are supplied by a 13x28 in. and 30x30x42-in. Nordberg blowing engine. This power house also contains a 13x27-in. and 23x15x30-in. Ingersoll-Rand cross-compound two-stage Corliss air compressor, furnishing air at 80-lb. pressure for general use, reserve units for this service being installed in the other power house.

Sampling Pig Copper

Following now the course of the converter bars into the refinery, they are taken on narrow-gage cars by an electric locomotive to the pig-copper scales. Cars of five tons capacity are used. This gives a gage which will take a curve of 25-ft. radius and also gives a car which can be pushed by hand, when desired, as all the cars are equipped with roller bearings. The scales are in duplicate, all material being weighed first on one, then on the other, one scale being used by the representative of the seller in the case of custom material.

From the scales the pig is taken directly to the sampling room, which is equipped with three high-speed drills and apparatus for rapidly handling the material, the capacity of each drill being 100 pigs an hour. As an average pig weighs 300 lb. this gives a total capacity of 45 tons an hour.

Anode Furnaces

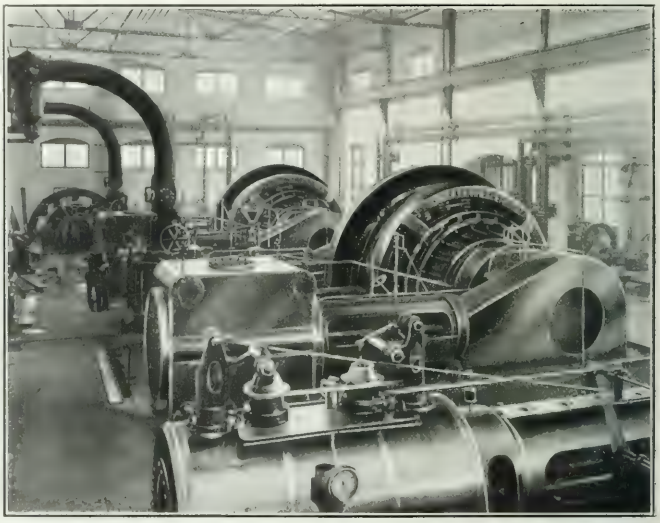
From the sampling room the tracks lead directly to the anode furnaces, which are three in number. Two of them have a capacity of 100 tons in 24 hours, and the third 150 tons. Just short of 200 tons has been drawn from the large furnace in a single charge. This very large increase in size over the customary unit has been entirely successful. The furnace was built to be equipped with waste heat boiler and charging crane, but the arrangement is being tried out first on the wirebar furnace, which is an exact duplicate, and will be described in that connection. The two smaller furnaces are equipped with B. & W. type boilers. The anode copper is ladled into molds carried by a Walker casting wheel, each anode being 3 ft. square and weighing 600 lb. As far as I know this is the largest anode that has ever been used. The old plant had a capacity of about 115 tons a day, and when this was to be brought up to 200 tons, it was decided to build no new tanks but to increase the depth of the tanks 12 in. changing from electrodes 2x3 ft. to 3x3 ft. and increasing the current density about 20 per cent.

The anodes are cooled in a bosh of the same dimensions as a tank in the tank house and are kept in this space relation upon a special car and upon storage racks under the yard crane if not required at once in the tanks, so that all handling of anodes is mechanical and rapid.

Tank House

The tank house contains 816 tanks in 24 groups of 34 tanks each, arranged in accordance with the Walker patent. The building is in three bays with two cranes in each bay. Twenty-six pairs of electrodes are used to a tank. At present anodes are left in 28 days and the cathodes fourteen. Experiments now being carried out indicate that the most economical relations will probably be 30 days for anodes and two days for cathodes, as the present cathodes are exceedingly heavy, weighing about 300 lb. apiece. The current density is about 21 amperes per square foot, which is higher than any other plant with the exception of the Boston & Montana. The normal current is 9500 to 10,000 amperes. The tank room is divided into three circuits of 272 tanks each. A current density of 500 amperes per square inch has been adopted for all bus bars on electrolytic work.

The slimes are sluiced through launders to a screen and sump from which they are pumped with a steam siphon to the top of the silver building. The circulation of electrolyte is accomplished by means of hard-lead centrifugal pumps in a pump house outside of the main building. The tanks are two in cascade and a circulation of about 4 gal. per minute per tank is maintained.



REFINERY POWER PLANT, U. S. METALS REFINING COMPANY

Wire-bar Furnaces

The cathodes when unloaded are placed by a mechanical device in horizontal piles of 5000 lb. each and sent to the wire-bar furnaces, where they are picked directly from the car by the charging crane and put into the furnaces. Charging cranes have been used for many years in connection with open-hearth steel furnaces, but this is the first successful application to a copper-refining furnace. The design has been modified from the steel type, the load being pushed off the peel instead of being dumped from a shovel, and the furnace can be packed as tightly with cathodes as by hand. In view of the success of this experiment, it is intended to extend the use of the crane to all the

furnaces. Patents on the arrangement have been applied for.

In order to accommodate the charging crane, it was necessary to build a furnace with one side practically all doors. Three doors 3 ft. 6 in. by 6 ft. 11 in., have been provided with only sufficient space between to afford room for a powerful buckstay. The hearth of the furnace is 14 ft. 5 in. x 34 ft. 3 in., and the walls are lined with magnesite brick to a point about two courses above the metal line, where a single course of chrome brick is laid and the wall continued with silica brick, the object of the chrome brick being to interpose a neutral layer between the basic and the acid brick. The bottom of the furnace consists of 9 in. of sand upon 9 in. of brick resting upon iron plates which are supported by brick piers.

The gases pass up a 6-ft. brick-lined iron stack placed directly over the poling door without the usual connecting flue. The result is a marked improvement in the draft. The stack is carried by a tower of structural steel which straddles the end of the furnace. The staying is all direct, a yoke being passed around the stack to avoid the customary oblique stays. The fire box is stayed as a separate unit. The conker plate is water-cooled but all other parts are air-cooled.

The stack is capped by a damper, and in this way closed off when the waste heat boiler equipment is in use. Then the gases are drawn from a point between the throat of the furnace and the bottom of the iron stack through a very short flue to a 515-h.p. Worthington boiler. Draft is produced by a motor-driven fan. Evaporation tests have not yet been made on this unit but it is hoped to reach 6 lb. of water from and at 212 deg. F. per lb. of coal burned by the furnace.

The crane was built by the Morgan Engineering Works, and is equipped with four motions, motor driven. It travels on overhead runways, passing the various furnaces. By recharging at night, which can be very rapidly done with the crane, 400,000 lb. can be brought round in one charge. In addition to the large furnace there are two 75-ton units which will probably be replaced by larger ones at an early date.

Power Plant

The furnace-coal and ash-handling system is not yet completed at this writing. It is intended to handle all the coal through the roof trusses in electric larries; the ashes are to drop directly into cars which run outside the building through a tunnel to a shaft where they will be picked up by a yard crane and transferred to the narrow-gage railroad system.

Anthracite buckwheat is burned under the boilers, run-of-mine bituminous in the refining furnaces, and fuel oil in the silver refinery. Coal is stored in heaps by a locomotive crane, a method which has been found simple and economical. The loop tracks at the west side of the property give a storage of about 15,000 tons.

The buckwheat coal is unloaded at the power house from hopper-bottom cars into an elevating and conveying system which delivers it to overhead bunkers in the boiler room carrying a day's supply from which it is spouted directly to the boiler-room floor. The boilers are hand-fired, with forced draft supplied by fans. They are of the B. & W. horizontal type, furnished with McClave grates and carrying 150 lb. per sq.in. pressure. The flue gases are carried off by the natural draft of a 175-ft. brick stack 12 ft. in diameter. One economizer is installed and space is left for two more units.

Feed water is taken from the mains of the Middlesex Water Company and softened in a We-Fu-Go plant, which delivers it to a suction well. Three outside-packed plunger pumps force it through primary and secondary closed heaters furnished by the Goubert Manufacturing Company, and then by way of the Green economizer to the boilers. Complete duplicate feed mains are installed and in addition there is a test service, feeding certain boilers next the superheaters. Large measuring tanks are provided and all piping and valves are arranged for frequent steam-consumption tests on the various engines.

The steam is superheated in a separately fired Schmidt superheater to 475-500 deg. F., which has been found economical after experiments ranging from the saturated temperature of 366 deg. F. to 750 deg. F. A duplicate system of headers is installed, arranged so that any engine or engines can run on either superheated or saturated steam and virtually forming a ring main. Cochrane separators are used to take care of priming, and all high-pressure grips are handled by a Holly return system. Locke engine stops are used on all the larger units.

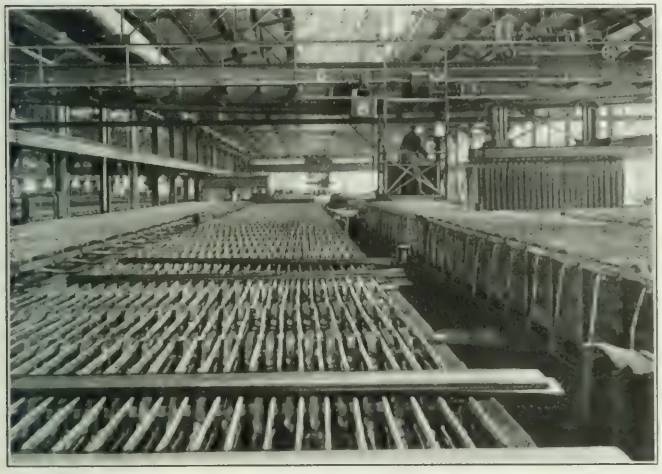
There are four electrolytic generating units, two 1500-h.p. Nordberg engines driving 1050-kw. Crocker-Wheeler generators, one 1125-h.p. Rice & Sergeant engine driving a 750-kw. Crocker-Wheeler generator and a 775-h.p. Hamilton-Corliss engine driving a 520-kw. Crocker-Wheeler unit. These are all horizontal, 100 r.p.m., full Corliss gear and valves, except the Rice & Sergeant, which has poppet valves on the high-pressure cylinder, and the Hamilton-Corliss, which runs at 105 r.p.m. Normally three out of the four engines are in service and the 520-kw. unit is arranged to run in the place of any of the others.

The switches are of the multi-blade knife type, furnished by the Walker Electric Company, three 5000-ampere units being placed in parallel to give the full 15,000-ampere overload capacity of the largest generators. Instead of circuit breakers, Eppensteiner engine-stop relays are used. This is a relay attached to the ammeter shunt which operates the engine stops and shuts the engine down in case of a current overload. It was developed at this plant and has recently been put upon the market under the above stated name by the Western Electrical Instrument Company. The bus-bars consist of two bars in parallel with a total cross-section of 20 square inches.

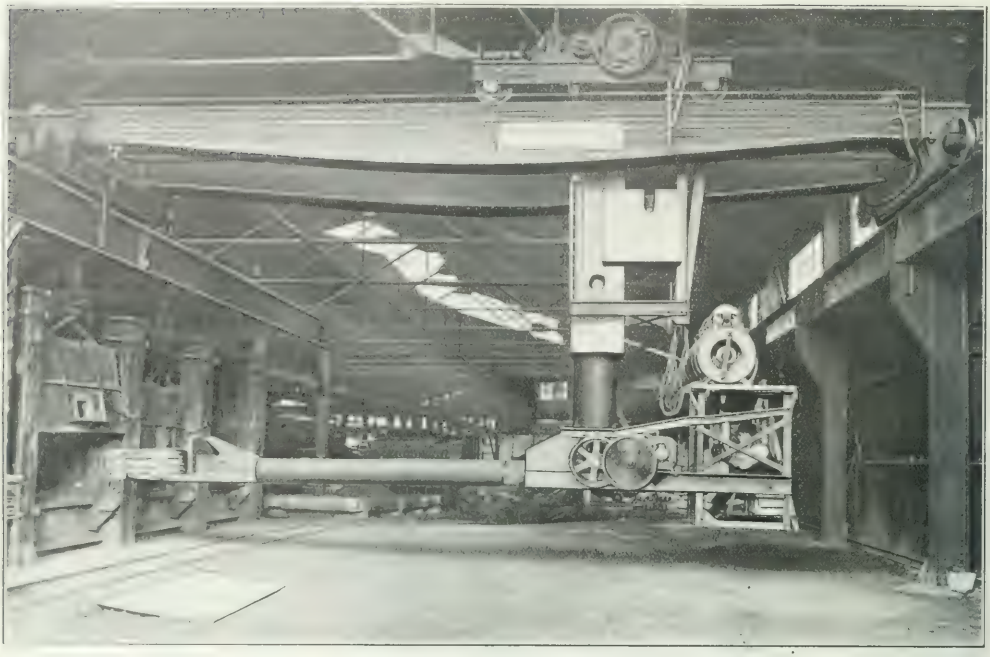
Light and power are furnished by three 300-h.p. Nordberg-Corliss engines driving 200-kw. Westinghouse generators and a 100-kw. high-speed unit, all operating in parallel at 240 volts direct current.

Hydraulic System

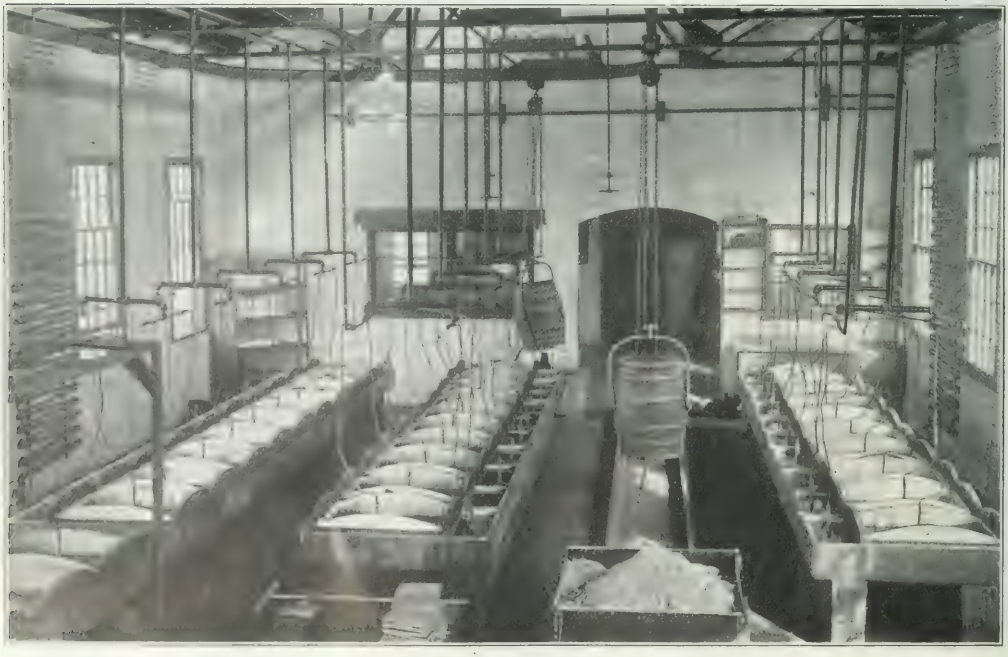
The hydraulic system is quite elaborate. The condensing system consists of two 5000-gal. centrifugals, motor driven,



TANK HOUSE, U. S. METALS REFINING CO.



CHARGING CRANE FOR CATHODE MELTING FURNACES



[illegible] POLISH PARTING PLANT

supplying three Worthington and two Yberger barometric heads with salt water. Two engine-driven fire-pumps are arranged to handle the bosh system, circulating fresh water from reservoirs through the boshes and jackets and then through cooling sprays back to the reservoirs. A 50-lb. cold water, 100-lb. hot water and 180-lb. hydraulic service are also maintained. The pressors furnish air at 80 lb. per sq. in. and air lifts and air-driven tools are quite generally used around the plant.

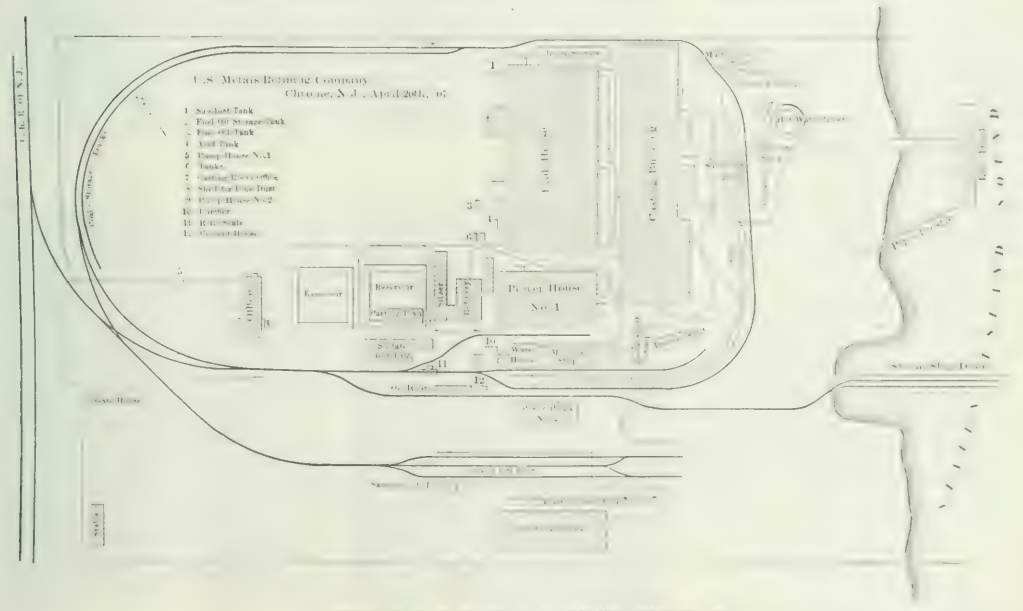
As an illustration of the varied service the modern works power plant is required to perform, it is interesting to note in tabular form the various pressures of air, steam and water actually carried. (See

the slag returns to the anode furnaces minimum. The filter press is made of lead-lined cast-iron egg is used.

In the furnace room are two 6 ft. 6 in. by 8 ft. reverberatories, with a capacity

CHROME PLANT, U. S. METALS REFINING COMPANY

Upper drawing, Section from North to South. Lower drawing, Section from East to West.


U.S. Metals Refining Company
Chrome, N.J., April 20th, 06
1 Sulphuric Tank
2 Fuel Oil Storage Tank
3 Fuel Oil Tank
4 Acid Tank
5 Pump House No. 1
6 Tanks
7 Casting Room Office
8 Shelter Fire Door
9 Power House No. 2
10 Ladder
11 Rail Scale
12 Cement House
Reservoir
Power House No. 1
Lock House
Crane
Coal Storage
Oil House
Water Main
Gate House
Gate House
Gate House

sq.ft. of anode surface per cell is used. The electrolyte is the usual silver-copper nitrate with small quantities of free nitric acid present. Power is taken from one of the tank-house circuits. The silver crystals are scooped up from the horizontal carbon cathodes, washed and melted in an oil-fired crucible furnace. The gold mud which is collected in canvas bags is boiled first with nitric and then with sulphuric acid and similarly melted. The various waste liquors are sent to the slimes boiling tanks. The parting plant was designed for an ultimate capacity of 1,000,000 oz. a month, so that outside doré can be parted.

REFINING.

The sulphate building demands a word in passing. Here about 200,000 lb. a month of blue vitriol is produced from tank-house electrolyte and nickel sulphate is recovered from the mother liquors. The process is the customary oxidation with shot copper, concentration and fractional crystallization.

VII.—STEAM AND WATER PRESSURES.

Source.	Medium.	Pressure.
Dry vacuum	Air	28 in. vacuum
Induced draft	Gases	1 in. vacuum.
Natural draft	Air	1 in.
Blast furnaces	Air	2 lb.
Converters	Air	12 lb.
Condensing	Steam	28 in. vacuum
Back pressure	Steam	5 lb.
Live steam	Steam	150 lb.
Superheated	Steam	150 lb.
Condenser	Water	10 lb.
Fresh	Water	20 lb.
General service	Water	50 lb.
H. P.	Water	100 lb.
Fire	Water	150 lb.
Feed	Water	170 lb.
Hydraulic	Water	180 lb.

River-bed Mining in California

River-bed mining still continues at a number of points on the American river and its forks. On the Middle Fork the Mammoth bar was worked successfully for many years by Col. W. S. Davis, of Auburn, Placer county. The deepest pit sunk at that point was 63 ft. He subsequently worked Texas bar, and last season commenced on Quail bar, which is being again worked by Colonel Davis this year. The gravel is raised by elevators and dumped into the boxes. A car running at the rate of 500 ft. a minute, suspended from a cable between two towers, carries the boulders away from the pit. The car and elevator are run by electricity, which is generated by water taken from the California ditch, in El Dorado county, and conveyed to the dynamo through a pipe line having a hight or pressure of 1000 ft. The method of mining these bars adopted by Colonel Davis has been very successful and the results profitable.

Colliery Investigations by the Geological Survey

The United States Geological Survey, within a few weeks, will establish in the Pittsburg district, an experiment station for the purpose of testing explosives used in coal mining, the ultimate object being, if possible, a reduction in the number of mine disasters resulting from gas and coal-dust explosions. Miners' safety lamps will also be tested at this station, and the investigations will be conducted both in the laboratory and in the mines.

The station will consist of an explosive gallery, rescue room, observation house, lamp-testing rooms, and explosives laboratory. This gallery is to be made of boiler-plate and will be in the form of a cylinder, 100 ft. long and 6 ft. in diameter. A series of safety valves on hinges will be arranged along the top to allow the escape of gas following an explosion. Port holes along the sides, covered with half-inch plate glass, will allow those in the observation house to see whether an explosion has taken place in the gallery during the tests. The cylinder will be filled with fire-damp and air, or coal dust and air, and the explosives will be hurled into the gallery by means of a steel mortar fired by electricity from an observation house 60 ft. away. The fire-damp and air will be thoroughly mixed by an electrical fan.

Explosives Tests

All explosives, if used in large quantities, will ignite fire-damp or coal dust. Tests will be made with various explosives and the maximum quantity of each explosive that can safely be used in mines will be published under the head of "Permissible Explosives." Explosives known as safety explosives in which the temperature at the point of detonation is low and the flame of short duration, will have a higher limit charge than the less safe explosives. The rescue room will resemble the interior of a mine and during tests will be filled with smoke. The efficiency of all apparatus for sustaining life will be determined by a series of tests. Miners will be shown how to rescue their fellow miners.

The observation house will run parallel with the explosive gallery 60 ft. away and will give opportunity for a number of persons to witness the tests in safety.

All safety lamps that are now used in this country will be tested, not only for their candle power but also for their relative safety in the presence of fire-damp. The lamps, which will be tested in a separate room, will be subject to different velocities of explosive mixtures of gas and at various angles.

All explosives will be first tested by the pendulum test and the Trauzl test, to arrive at the quantity to be used in making experiments in order to get the same disruptive force. The Pendulum test, or the English test, consists of a large pendulum weighing several tons which swings backward when the force of an explosive is exerted upon its face and the distance of the swing is indicated by a delicate sliding rule. The explosive is fired from a mortar and the force of the explosion is played against the face of the pendulum. The Trauzl test consists of a cylindrical lead-block 20 cm. high and 20 cm. in diameter. The weighed explosive with the electrical detonator is placed in this central cavity and tamped with a known quantity of sand and moist clay. After the charge has been exploded the pear-shaped expansion of the bore is measured by filling it with distilled water at 16 deg. Centigrade.

Results of Explosions

A pressure gage will be used for measuring the actual pressure in pounds per square inch developed by the detonation of various explosives. The analysis of the products of combustion will also be made. The heat of decomposition of all explosives in terms of calories will be ascertained by detonating large quantities in a bomb. The explosives will be fired from the mortar at night and the length of the flame will be determined by photography. The time of the flame will also be determined by an electrical apparatus. The rate of detonation will be ascertained by an electrical rotary recording drum.

Actual experiments will be made in mines to lessen the waste of fuel in mining operations. Several of the best explosives which have been determined by the results at the testing station will be purchased in the open market. They will be used in different mines and the amounts of lump and slack coal produced will be carefully screened and weighed. A classification of these explosives will be made in reference to the cost of explosive per ton of coal produced. Different methods of using explosives in mines will be investigated with special reference to increasing safety and efficiency.

The experiments will be under the direction of Dr. Joseph A. Holmes, chief of the Technologic branch of the Geological Survey. Dr. Charles E. Munroe has technical supervision of the tests which will be conducted at the station. Clarence Hall, explosives expert for the Geological Survey, assisted by W. O. Snelling, will have immediate charge of the experiments. Mr. Hall has recently returned from Europe where he made a study of the foreign government testing stations.

The Russian minister of commerce has appointed a commission to devise methods for the development of the Russian half of Sakhalin, especially the mining industry.

The Cassiar Coalfields in British Columbia

By J. J. Bell*

One of the most promising of the hitherto unworked coalfields of British Columbia is to be found in the Telkwa valley, Cassiar district. When prospecting for gold and copper, in 1901, William Limin discovered valuable beds of coal.

OUTCROP OF SEAM NO. 5, 14 FT. THICK

NO. 1 SEAM, THE THICKEST COAL BED IN THE CASSIAR DISTRICT

SEAM NO. 2, WHICH AT SOME POINTS IS 15 FT. THICK

In 1902 a party, equipped with a diamond drill and other tools, made a thorough examination, which revealed the extent and richness of the deposit. The same year Professor Coleman, of the School of Practical Science, Toronto, was sent out, and his report fully confirmed the results arrived at by the first explorers. He states that the coal is of good bituminous quality, burning well and satisfactorily standing exposure. The seams are apparently of the same age and general character as the best coals mined on the Pacific slope and vary in thickness from 3 to 15 feet.

Extent of the Deposit

In 1904 A. Webster, formerly of the Geological Survey, visited the locality. He considers the deposits to be of the very first quality, both as a coking and a steam coal.

A section of the strata in descending order is as follows: Ash, rock, drift, etc., 100 feet; coal seam No. 1, 20; clay shale, 25; coal seam No. 2, 15; clay shale, 4; coal seam No. 3, 2½; clay shale, 40; coal seam No. 4, 4; clay shale, 35; coal seam No. 5, 14 feet. This gives a total thickness of coal of over 50 ft. Allowing one million tons for each foot to the square mile the amount of coal would be 25,100,000,000 tons. The present holders expect to mine 3,000,000 tons a year, at which rate the deposit would not be exhausted for nearly 1000 years.

Tests with the diamond drill show that the seams dip toward the north and east, and that there is considerable faulting. A hole near the northern boundary penetrated 130 ft. into the sandstone without reaching the coal; at this point drilling operations had to be suspended on account of the breaking of the drill. The deposit is underlaid by conglomerate. An interesting feature is the ash beds. In some places fire has eaten its way into the seams, probably from Indian camp fires, and having burned the coal, the overlying rock has fallen down, smothering the fire and leaving the ash beds.

The only coal so far mined was for the use of the prospectors. They burned it for three months in a stove without having a clinker. Tests show that it is low in ash and sulphur. It is [illegible] and can be mined with little waste.

Location and Transportation

The seams crop out on Goat and Mud creeks, which are tributaries of the Telkwa. The latter flows into the Buckley, which in turn empties into the Skeena, near Hazleton, up to which point steamers ascend. From this point supplies can be taken in by pack train. The Telkwa and Buckley valleys are fertile and a number of claims have been taken up; however, settlement will be slow until railway communication is established. Wheat, oats, potatoes, etc., can be raised with little difficulty, so that supplies for the miners can be readily obtained. The elevation is about 2000 ft. above the sea.

The Cassiar Coal Development Company, composed principally of Toronto and Hamilton men, has a government lease for 52 square miles, and is negotiating with English capitalists to take a large interest. The Grank Trunk Pacific Railway is expected to pass through or near the property, while a charter controlled by the same company exists for a road to Kitamaat arm, which lies 80 miles distant, and has a land-locked harbor connecting with the Pacific ocean.

Boiler cinder is a valuable substitute for crushed stone or gravel in making a cinder concrete. It should be screened to remove the fine ash particles, and when made into a mixture of one part cement, two parts sand and four parts cinder, it forms a good concrete which is light in weight and which takes up considerable shock without being too rigid. Cinder concrete is suitable for machine-shop and engine-room floors which are subject to considerable vibration from machin-

*29 Prince Arthur avenue, Toronto, Canada.

Four Tests of a Capell Mine Ventilating Fan

Measuring the Quantity of Air in a Fan-drift Seems to Give Incorrect Results Because of the Proximity of the Fan

BY JOHN B. THOMSON

whether the combined mechanical efficiency of the fan and of the engine attained 60 per cent. The results of the [illegible] a good opportunity [illegible] seemed to be a mystery or inaccuracy, which will subsequently be referred to.

The Capell fan is 8½ ft. in diameter and 3½ ft. broad, getting air at one side and exhausting out of the mine. The diameter of the ear is 5 ft. 9 in., equal to an area of 26 sq.ft. The fan is driven by a steam engine with a single cylinder, 9 in. in diameter and 16 in. stroke, having a piston-rod at one end, 1⅝ in. in diameter. The fan is belt driven, the ratio of the pulleys being 2½ to 1. One of the pulleys, however, was altered between the first and second tests, making the ratio 5 to 3. The rectangular upcast shaft, 7 ft. long and 5 ft. wide, is used exclusively as an airshaft. The ear of the fan is 18 ft. from the edge of the upcast pit, and the fan drift is built of brick, with a cement-concrete roof and floor.

All the tests were made when the pit was entirely clear of workmen.

The first test was made on Sept. 23, 1905. When the engine was running at 90 revolutions and the fan at 225 r.p.m., four indicator diagrams were taken from each end of the cylinder, showing a mean pressure of 54.895 lb. per sq.in., and 24.98 h.p.

The air was measured in the fan-drift, about midway between the upcast shaft and the fan. The drift was divided into nine spaces (Fig. 1), and shelves were placed in the centers of the spaces to support the three anemometers, which were used, after being calibrated at Kew. The anemometers were allowed to run for 5 min. in each space, so as to get a fair average. The results of these tests are recorded in Table I. It will be noticed that the quantities of air in Nos. 1 to 6 spaces were positive, and that they were negative in Nos. 7, 8 and 9 spaces. The average speed of the engine, when the air was being tested, was 92 revolutions and of the fan 230 r.p.m., so that the power in the air at 90 r.p.m. should be (22.42 × 90 ÷ 92 or) 21.93 h.p. The mechanical efficiency was (21.93 × 100 ÷ 24.98 or) 87.8 per cent. When these figures were worked out the result seemed to be absurd, and it was decided to make another test.

[illegible] Trans. Inst. Engineers & Shipbuilders in Scotland, Vol. XLIX, Part 2.

Test No. 2

The second test was made on Oct. 14, 1905, and, as already mentioned, the ratio of the pulleys had been altered since the first test. In this case, the speed of the steam engine was 120 revolutions, and of the fan 200 r.p.m. The average of ten indicator diagrams showed a mean pressure of 35.06 lb. per sq.in., and 21.27 h.p.

The air was measured in the fan drift as in the first test. The top shelf having been broken, a new one, a little thicker, was substituted and made a slight difference in the area of the spaces. Table II shows the results of this air test, and it will be again noticed that the readings are positive in the first six spaces and negative in the last three spaces. The horsepower in the air being 18.38, and that of the engine 21.27, the mechanical efficiency was 86.4 per cent.

The results of the two tests, being so near one another, pointed to some other reason for the high efficiencies shown than inaccurate testing; and, seeing that there was such an eddy in the fan drift, it was decided to make another test and measure the air at the bottom of the upcast shaft. A rather unusual circumstance at the colliery allowed this to be done with very little trouble. The upcast shaft is sunk to the Ell coal seam a depth of 324 ft. This seam is not being worked at present, and a short drift, 120 ft. long, leads from the bottom of the upcast shaft to the top of a blind pit, sunk to the lower seams now being worked and ventilated, so that all the air that goes to the fan passes through this drift on its way to the upcast shaft.

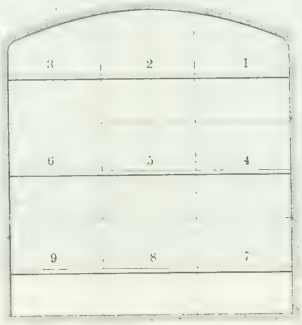


FIG. 1. FAN DRIFT

TABLE I. RESULTS OF EXPERIMENTS UPON A CAPELL FAN.

No. of Space.	Area of Space.	Velocity of Air Per Minute.	Quantity of Air Per Minute.		Watergage.	Horsepower in the Air.	
	Square Feet.	Feet.	Cubic Feet.	Cubic Feet.	Inches.	Horsepower.	Horsepower.
1	4,030	3,618	14,580		2.42	5.56	
2	4,600	4,361	20,060		2.43	7.68	
3	4,030	2,641	10,643		2.43	4.07	
4	3,725	2,325	8,288		2.18	2.84	
5	3,725	1,910	7,114		2.18	2.44	
6	3,725	2,268	8,448		2.22	2.96	
				69,134			25.55
7	3,725	732	2,726		2.15	0.92	
8	3,725	1,043	3,885		2.11	1.29	
9	3,725	740	2,756		2.11	0.92	
				9,367			3.13
Totals.	35,010			59,766	2.25		22.42

TABLE II. RESULTS OF EXPERIMENTS UPON A CAPELL FAN.

No. of Space.	Area of Space.	Velocity of Air Per Minute.	Quantity of Air Per Minute.		Watergage.	Horsepower in the Air.	
	Square Feet.	Feet.	Cubic Feet.	Cubic Feet.	Inches.	Horsepower.	Horsepower.
1	[illegible]	3,981	15,645		1.93	4.76	
2	[illegible]	3,565	16,042		2.11	5.33	
3	[illegible]	3,226	12,674		2.09	4.17	
4	[illegible]	2,541	9,428		1.90	2.82	
5	[illegible]	1,541	5,740		1.86	1.68	
6	3,725	1,[illegible]	[illegible]		1.86	1.80	
				65,686			20.56
7	[illegible]	[illegible]	1,885		1.80	0.54	
8	[illegible]	1,[illegible]	3,758		1.84	1.07	
9	[illegible]	[illegible]	2,030		1.78	0.57	
				7,673			2.18
Total.	34,710			58,013	1.90		18.38

TEST No. 3

The third test was made on November 14, 1905. The steam engine was running at a speed of 120 revolutions and the fan at 200 r.p.m. The mean indicated pressure taken from 12 diagrams was 3389 lb. per sq.in., and the engine produced 2056 h.p. The quantity of air passing through the drift in the Ell coal seam was 43,035 cu.ft. per min., and the observations recorded in Table III were taken in order to

TABLE III. OBSERVATIONS IN THE ELL COAL SEAM

Barometer, at surface	29.08 in.
Barometer, at Ell coal seam, downcast side	29.44 in.
Thermometer, at surface, in atmosphere	62 Fahr.
Thermometer, in fan-drift	62 Fahr.
Water-gage, in fan-drift	2.06 in.
Water-gage, in Ell coal seam	1.16 in.

calculate what the volume should be in the fan drift. The difference of (2.03 — 1.16 in. or) 0.87 in. in the readings of the water gages is equal to 0.06 in. of mercury; and consequently, the actual barometric pressure in the Ell coal seam would be equal to (29.44 + 0.06 or) 29.50 in. of mercury. The volume of air, calculated at the pressure in the fan drift, would consequently be (43,035 × 29.50 ÷ 29.08 or) 43,656 cu.ft. per min. The water gage due to the differences of temperature, calculated on the depth of the Main coal seam, 393 ft., was 0.11 in., and the actual water gage due to the fan was (2.03 — 0.11 or) 1.92 in. The horse-power of the ventilation is (43,656 × 1.92 × 5.2 ÷ 33,000 or) 13.20. The mechanical efficiency was (13.20 × 100 ÷ 20.56 or) 64.2 per cent.

This result seems to be a nearer approach to the real efficiency than that obtained in the two former tests, and the question arises as to why the anemometers should register a greater velocity in the fan-drift than is due to the quantity of air actually passing

TEST No. 4

To satisfy myself that it was not due to a misconception in regard to the negative and positive readings in the fan-drift, I had a false floor of wood and brattice-cloth put in the fan-drift, so as to reduce its area and to avoid any negative readings. On November 14, 1905, 3 days after the third test, the air was measured in the fan-drift and in the drift in the Ell coal seam, at precisely the same time, and the following results were obtained: Quantity of air in fan drift, 56,033 cu.ft. per min.; quantity of air in drift in Ell coal seam, 40,964 cu.ft. per min.; a difference of 15,069 cu.ft. per minute.

Calculating proportionately, the quantity of air that would have been measured in the fan drift had it been made during the third test, would have been (40,964 : 43,035 : : 56,033 : 58,865) cu.ft. per min.: the horse-power of the ventilation would have been (58,865 × 1.92 × 5.2 ÷ 33,000 or) 17.8; and the mechanical efficiency would have been (17.8 × 100 ÷ 20.56 or) 86.5 per cent.

From the results of these tests, it seems [illegible] mechanical efficiency, to measure the quantity of air in the fan drift, as the velocity of the air, taken so near the fan, is influenced by it in the same way as air rushing through a regulator, when a factor has to be introduced to allow for vena contracta.

A New Safety Mine Cage

A patent has been granted to George Killian, of Scranton, Pennsylvania, for a safety mine carriage and a detachable cone for mine cages, and all kinds of elevators. The object of the device is to promote a simple safety appliance whereby the mine cage cannot be carried over the head wheel, in the event of the engineer losing control of the engine or being unable to shut off steam as is sometimes the case. The hoisting rope on the lower end is connected in the usual manner to the cone. A pair of jaws swinging freely and fastened pivotally to the cone, are grooved on their inner or adjacent faces for the reception of the hook or link of the cage. These jaws are held together and connected to the hook by means of a ring which is riveted in the depending parts of the jaws by soft metal pins. A stationary ring is supported by suitable framework at a point below the head wheel through which ring the hoisting rope passes. This ring is large enough to permit the cone to pass through it, but engages the stationary ring in case the cage or elevator is raised to an abnormal hight.

Should the cage be drawn up far enough to cause the ring or cone to strike against the stationary ring, the impact will sever the soft metal pins, thereby stripping off the ring and releasing the jaws. Upon the jaws being released they will swing outward and free the cage loop, thereby releasing the cage and preventing its being carried up over the head wheel, or causing any damage to the shaft or anyone who might be on the cage. The mine cage is made entirely of steel and is equipped with double independent springs which release automatically when the ring is stripped from the cone. Instantly eight bull-nosed safety dogs imbed themselves in the guides making it impossible for the cage to drop more than one inch, and the heavier the weight on the cage, the quicker the jaws will act. Another feature is the simplicity in attaching the hoisting rope to the cone. The jaws can be swung out of the way, making it a very simple matter to secure the rope to the cone as the jaws are hung from the lower sides of the cone, and on opposite sides of a vertical hole in the latter, for the reception of the rope. The invention has been given a thorough test [illegible]

The Girard Estate Collieries

S. Thompson, chief engineer of the coal properties of the Girard Estate, always give some interesting data relating to the anthracite trades. The Girard collieries in 1906 furnished 3 per cent. of the total anthracite shipments; but the collieries are operated by different companies, and represent a variety of practice. The Girard Estate includes 13 collieries, leased to six different companies, and two washeries, each leased to a separate company.

The production for two years has been

	Tons.	Per Ct.	Tons.	Per Ct.
Fresh mine coal	[illegible]	[illegible]	[illegible]	[illegible]
Washery coal	[illegible]	[illegible]	[illegible]	[illegible]
Total shipments	[illegible]	[illegible]	[illegible]	[illegible]
Used at mines	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]

The total decrease of 115,740 tons, or 5.8 per cent., in 1906 was due to the stoppage of mining in April, when the discussions between operators and miners were in progress. To this also must be attributed the increased proportion of coal consumed in operating, on which the time idle has a considerable influence. The pumping and other similar work must be continued, whether coal is produced, or not.

The average royalty received by the Girard Estate in 1906 was 34.21c. on fresh-mined coal, 19.49c. on washery coal: an average of 29.30c. per ton on all coal mined, against 29.98c. in the preceding year. The average royalty on all coal shipped was 33.07c. per ton in 1905, decreasing to 32.47c., in 1906, owing to the larger proportion of small coal.

An interesting statement, given below, shows the production of the different sizes of coal in 1906; the first column giving the sizes made of fresh-mined coal, the second that of all coal shipped, including washery coal, or coal recovered from old culm banks:

	Fresh mined Coal. Tons.	Per Ct.	All coal. Tons.	Per Ct.
Lump	[illegible]	[illegible]	[illegible]	[illegible]
Steamboat	[illegible]	[illegible]	[illegible]	[illegible]
Broken	[illegible]	[illegible]	[illegible]	[illegible]
Egg	[illegible]	[illegible]	[illegible]	[illegible]
Stove	[illegible]	[illegible]	[illegible]	[illegible]
Chestnut	[illegible]	[illegible]	[illegible]	[illegible]
Total large	956,670	63.44	977,067	57.13
Pea	[illegible]	[illegible]	[illegible]	[illegible]
Buckwheat	235,409	15.61	305,681	17.87
Rice	[illegible]	[illegible]	[illegible]	[illegible]
Barley	[illegible]	[illegible]	[illegible]	[illegible]
Total small	551,397	36.56	733,204	42.87

The proportion of small in the washery coal is naturally very much greater than in freshly prepared coal. Thus, at the Raven Run washery, the largest on the estate, the proportion of small or steam sizes was 85.5 per cent. last year; the remaining 14.5 per cent. being all chestnut, the smallest of the large sizes. The coal used in operating collieries is not sized, but it is all small sizes or culm, practically. Adding this, there would be, for the total mined, 51.6 per cent. large, and [illegible]

The Washington Coal Situation

By R. P. Tarr*

Washington, the State destined soon to rank according to population well up in the list of States, contains the measures which must furnish fuel for not only its own demands, but also for those of western Montana, Idaho and Oregon. Within this State are the undeveloped beds, and the only coal areas of importance in northwestern United States. During the past winter the State was in the throes of a fuel famine, and this has caused a unique situation. There are undeveloped and almost unknown deposits in Whatcom, Skagit, Snohomish, Chehalis, Pacific, Lewis, Cowlitz, Clarke and Skamania counties, and other parts of Kittitas than those to which operations are now confined.

Early Operations

It was when the earlier efforts were being made to open the coal deposits of Washington that the most serious mistakes occurred, producing adverse conditions now. Besides the knowledge of the existence of coal in certain parts of the State, little was known concerning any area until after the investigations and reports of Bailey Willis, Geologist U. S. Geological Survey (Vol. 15, tenth census). This admirable report, practically confined to the Palmer-Wilkeson fields, directed attention to this region. Into these sections the pioneer of the early 80's made his entrance, wholly unprepared and entirely ignorant of mining methods, eager only to file his claim.

Soon many mines were opened, to be operated only temporarily. Of these there are nearly a score, abandoned monuments of the errors of those who were unacquainted either with coal-mining problems, the demands of the time, or with financial requirements of big projects. These failures produced a reaction which placed a discount on the merits of the coalfields in general, and put a quietus to future development by driving away both capital and interest.

When the railroad and steamship companies attacked the problem of mining systematically these difficulties disappeared. The railroads which now contemplate entering the Sound country will probably also achieve success. But there is another problem confronting the State. Along with the railroad development comes increase in population and additional industries. The commercial side of coal development must therefore be considered immediately. The railroads cannot take care of this; outside capital must.

At the present time 30 mines are in operation, about half of which may take ranking importance. The remainder have small outputs and are undergoing every sort of struggle to stagger on. Several of them are reopenings of abandoned properties and owing to former mistakes in mining methods cannot be operated with advantage.

Present Output

During 1906 the total coal output in the State was 3,290,534 tons. This was an increase of 443,633 tons above that of 1905. Of these thirty mines, five are operated by the Northern Pacific Railway Company and produce 44 per cent. of the entire output, eight are operated by the Pacific Coast Steamship Company and produce 37 per cent. of all coal mined. The remaining seventeen mines produce but 19 per cent. of the entire tonnage.

The following analyses show the values of the best types of coal mined for various uses:

	Roslyn No. 7 Coal	Roslyn No. 1 Coal	Wilkeson Bituminous	Fairfax Coke
Moisture	1 91	1 44	1 38	1 30
Volatile matter	34 30	40 90	21 69	19 22
Fixed carbon	51 11	49 24	66 96	64 22
Ash	12 68	8 42	9 97	15 26

The coal is mined from three principal fields:

Palmer (King County) producing 52 per cent.
Roslyn (Kittitas County) ..... 41 per cent.
Wilkeson (Pierce County) ..... 7 per cent.

Of the entire output, 65 per cent. is consumed by railroad and steamship companies. The remaining 34 per cent. is used commercially in Washington and tributary territory having a population of 1,250,000 inhabitants.

Character of the Deposits

The Cascade uplift was very intense, but not to the degree that much metamorphism of the coal measures has taken place. During the uplift four active volcanoes were formed, namely Baker, Rainier, Adams and St. Helens. Dikes from these have considerably broken the measures and aided in the production of faults. Near some of these a slight metamorphism produced coked portions. This is graphitic coke and not anthracite as some assert. The seams are in many localities in a tilted condition and are worked at dips varying from 15 to 90 deg. In those portions where the dip is less steep the amount of moisture runs from 10 to 15 per cent. Most of the coals belong under the characterization of lignites. While far superior to the brown lignites of Dakota and Montana, these moist Washington coals do not stand transportation well and cannot be stored at all.

All Washington coals contain more ash and have a duller luster and lighter texture than eastern coals. Having been deposited during Cretaceous-Tertiary times when the amount of carbon dioxide was greatly diminished, there is thus good reason for these different and inferior characteristics. While many seams are of extreme thickness, there are few more than 6 ft that are not streaked and exceedingly dirty.

The containing walls of the coal seams are generally of shale and poor, but in a country plentiful in timber, this is not so serious a matter as elsewhere. Cleaning by the dry process will do much to benefit the quality of the coal. The coal is here and must be mined. The glacial deposits and forest coverings have done much to render prospecting difficult. We have, as yet, only a scant knowledge of the coal resources of the State.

Iron and Steel Bounties in Canada

The new bounty bill has passed the Canadian Parliament and become law. The bounties provided for iron and steel production are as follows:

a. In respect of pig iron manufactured from ore, on the proportion from Canadian ore produced during the calendar years—1907, $2.10 per ton; 1908, $2.10 per ton; 1909, $1.70 per ton, and 1910, 90c. per ton.

b. In respect of pig iron manufactured from ore, on the proportion from foreign ore produced the calendar years—1907, $1.10 per ton; 1908, $1.10 per ton; 1909, 70c. per ton, and 1910, 40c. per ton.

c. On puddled iron bars manufactured from pig iron made in Canada during the calendar years—1907, $1.65 per ton; 1908, $1.65 per ton; 1909, $1.05 per ton, and 1910, 60c. per ton.

d. In respect of rolled, round wire rods not over ⅜ in. in diameter, manufactured in Canada from steel produced in Canada from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, when sold to wire manufacturers for use or when used in making wire in their own factories in Canada, on such wire rods made after December 31, 1906, $6 per ton.

e. In respect of steel ingots manufactured from ingredients of which not less than 50 per cent. of the weight thereof consists of pig iron made in Canada, on such ingots made during the calendar years—1907, $1.65 per ton; 1908, $1.65 per ton; 1909, $1.05 per ton, and 1910, 60c. per ton.

f. On pig iron manufactured from Canadian ore by the process of electric smelting during the calendar years—1909, $2.10 per ton; 1910, $2.10 per ton; 1911, $1.70 per ton, and 1912, 90c. per ton.

g. On steel ingots manufactured by electric process directly from Canadian ore, and on steel ingots manufactured by electric process from pig iron smelted in Canada by electricity from Canadian ore during the calendar years—1909, $1.65 per ton; 1910, $1.65 per ton; 1911, $1.05 per ton, and 1912, 60c. per ton.

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*Illustrated.

The Sulphur Industry

The United States [illegible] large importer of brimstone; in 1903 the imports amounted to 100,931 long tons. In 1904 the American production of brimstone was in excess of 190,000 tons, and in 1906 it was considerably upward of 200,000 tons, while the imports had dwindled to about 73,000 tons. We have many times remarked how this great industrial change was brought about by the success of the Frasch process in exploiting the sulphur deposit of Louisiana, not only excluding the Sicilian sulphur to a large extent from the United States, but also threatening the European market, and causing directly the winding up of the old sulphur trust (the Anglo-Sicilian Sulphur Company) and the practical assumption of the management of the sulphur industry of Sicily by the Italian Government, the latter operating through an organization known as the Consorzio. At the time of the organization of the latter, we spoke of the strange and hazardous character of the undertaking. Our anticipations have been fully borne out. The Sicilian sulphur producers have been dissatisfied (leading to strikes and riots last year) and the definite policy of the Consorzio has not yet been settled.

In commenting upon the above situation, Messrs. Emil Fog & Sons, of Messina, in a recent commercial report, said: "The election of the definite board (of the Consorzio) has not yet taken place; and until it has, it will be impossible to report on the future tendency of the brimstone market. Everything depends on the men that will be elected, their capacities and intentions. The provisional board so far has pursued absolutely passive tactics; the definite board may show more enterprise and adopt more energetic measures, especially with respect to America." They go on to say that the constant rumors of American exports to the Continent are creating ill feeling among the Sicilian producers, who recently held a meeting at which it was proposed that retaliative measures be taken, meaning, of course, the dumping on the American market, at cost price, of the stocks inherited from the Anglo-Sicilian company.

With singular fatuity, the Sicilians appear to be unable to appreciate the strength of the position of the Union Sulphur Company, in spite of the elaborate reports made upon its prospects by engineers sent to Louisiana by the Italian Government. Even now they consider the brilliant reports of the Louisiana production to be exaggerated, especially with respect to the future prospects, and insist that the Union Sulphur Company should purchase a certain quantity of brimstone annually from Sicily!

An actual competition between the Union Sulphur Company and the Sicilian producers would inevitably lead to disaster, especially to the latter. There is a large and turbulent population in Sicily which is dependent upon the exploitation of its mines. The earnings are small and the social condition is unsatisfactory. The strikes and riots which occurred last year are illustrative of what would be likely to happen under the stress of severe competition. It is that which the Italian Government has aimed to prevent. On the other hand, the Union Sulphur Company has evidently preferred to uphold prices, rather than to engage in an industrial war. Negotiations for an agreement have been under consideration for nearly two years, but no conclusion has been reached, although there has evidently been a provisional understanding, as to which profound secrecy has been preserved. Naturally the latter has been a subject of discussion and discontent among the Sicilian producers, none of whom knows apparently just where he stands. There is a general demand that the full details of the situation should be made public. We believe the reason why they have not been made public is simply that no final agreement has yet been made, but it is probable that it soon will be. It certainly is desirable to come quickly to an understanding as to this matter, which at present is creating so much uncertainty and distress in Sicily.

The Geological Survey

The new director of the Geological Survey is losing no time in the inauguration of plans looking toward the improvement of his organization. The most important has been a conference with the State geologists, which was held at Washington, May 20, to discuss coöperative work in various States by the Federal and State surveys. The directors of many of the State surveys were present at this conference. It is evident without argument that a great advance in the perform-

secured, and the general efficiency of not only the State surveys, but also of the Federal survey, can be improved by the development of a good plan of coöperation. It is gratifying that the director of the U. S. Geological Survey has so early taken up this important question.

He has also inagurated other changes, which are interesting, although of less importance. The work and status of the topographical engineers connected with the survey have been more clearly defined. Various changes have been made in the internal organization of the geological branch. Among others, Mr. Lindgren has been promoted to the headship of a division, a promotion which it is gratifying to note, in view of the sterling character of his work and his high attainments as a scientist in the field of economic geology. Dr. Hayes has lost his previous strange title of "Geologist in Charge of Geology" (what else than geology should a geologist be in charge of?) and now has the rational title of "Chief Geologist," continuing the direction of the geologists in the field, in which work he has achieved signal success, filling a difficult position with an ability which has commanded the sincere respect of his associates.

"High Grading"

One of the old problems of mining, which has never been satisfactorily settled, is the prevention of thefts of high-grade ore. The question has become a particularly important one in recent years, because of the discovery of many mining districts where the ore is of singularly high grade. At Kalgoorlie, Western Australia, the situation became so bad that recently the government had to appoint a commission to investigate the evil. However, this commission does not appear to have come to any satisfactory conclusion. In a recent interview Mr. Hoover, of Bewick, Moreing & Co., who is now visiting in Australia, remarked that, after the appalling state of affairs disclosed by the report of the commission, it was a great pity that no more effective remedies were proposed. In Mr. Hoover's opinion the suppression of gold stealing from the mines rests with the police, and it would be advisable to introduce the system which exists in London, where anyone who can show that the purpose is in the interests of public order and for the public good can hire a policeman from the regular force, the policeman remaining entirely under the control and direction of the regular police officials, and the police administration being reimbursed the cost. That is undoubtedly a practicable recommendation and one which, if put into effect, would greatly tend to reduce the evil of "high grading."

We have in the United States the same trouble which exists in Western Australia. Everyone remembers the serious extent to which the stealing of ore was carried on at Cripple Creek, Colo., and how the practice was partially broken up by destroying the "assay offices" where the stolen ore was bought. At Goldfield, Nev., conditions are worse than they ever were at Cripple Creek. "High grading" is regarded by many miners as a legitimate perquisite, analogous to secret commissions. Mine operators so unlucky as not to possess a "rich streak" have found it difficult to keep miners, who constantly try new employers until they find work near the rich ore. This scandal was so open that premiums were offered for work in the Hayes-Monnette lease on the Mohawk mine, where the ore was so rich that a miner could easily carry away one thousand dollars' worth in his coat pocket. An amusing incident occurred in the case of one of these gentry, who was too greedy and loaded himself so heavily that he could not get out of the bucket upon reaching the surface. Not less scandalous has been the way in which this stolen ore has been collected by the wagons of reputable concerns and shipped openly to the smelters.

Last January a strike of the miners at Goldfield was feared, because the mine owners proposed to establish "change houses," in which the men were to be required to change their digging clothes for ordinary clothes, under supervision. Of course it has been well recognized that American miners would not permit that rule, which is enforced in the diamond field of South Africa, and the operators of Goldfield were over venturesome in sugggesting it. In a way they paid a penalty for their temerity, because the miners, having taken the proposal as a reflection on their honesty and threatened a strike, the dispute was finally settled by the miners allowing change houses in a modified form, while as a compensation they exacted an increase of wages to the minimum of $5 per eight-hour shift.

Obviously the prevention of stealing from mines is distinctly a police duty. Under the conditions which exist in such parts of the world as Western Australia, Nevada and other remote districts, where society and government are not highly organized, it is too much to expect of the State and county governments that they shall control every mine. However, Mr. Hoover suggests an expedient whereby anyone to whom it would be worth while could secure the desired protection. A similar practice, although not particularly for the prevention of ore stealing, actually exists at many of the remote mining camps of Mexico and has been found to work well.

Wash-houses at Collieries

It is unfortunate that so many colliery operators have assumed an antagonistic attitude toward the legislation proposed in several States, compelling the establishment of a wash-house at each colliery. There is no good reason for such an attitude except the objection to the cost entailed, which after all is insignificant and consequently is not a good reason. On the other hand, there are positive benefits to be derived. The improved hygienic conditions inaugurated in such a way would lead to better health, greater strength, and more cheerfulness on the part of the miners, who would do better work, and the operator would be the gainer. A further tendency toward such increased efficiency would result from the greater self respect that the men would have if they were able to go home clean from their work, instead of in the disreputable condition at present. If the operators think that unclean, dirty men, who are so because they lack the facilities to preserve their self-respect, make the best miners, then their objections to the proposed legislation are well founded. However, we do not think so. The States where such proposed laws have been introduced should enact them.

In 1906 anthracite mining was a slightly more hazardous occupation than mining bituminous coal in Pennsylvania. According to the State department of mines, of 166,175 anthracite miners 557 were killed in accidents, and of the 172,928 bituminous coal miners 477 were fatally injured.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Silver-Cobalt Deposits

A pessimistic and somewhat superstitious friend asked me the other day: "Are there any silver-cobalt mines that have proved lasting?" This is a question naturally suggested by the records of old mines in which these elements were associated. The German miners gave the name Cobalt (Kobold) to the substance which seemed to drive away the riches of a mine. Kobold was a gnome or evil spirit of the mine. Cobalt seems to have earned its evil name and deserved it in some of the mines of the Harz mountains. Chile is another country where rich showings of silver and cobalt failed to make good. In Percy's "Metallurgy of Silver," there is an analysis of a Chilean ore containing: Silver, 12.56 per cent.; metallic arsenic, 66.17; arsenious oxide, 17.22; and cobalt, 3.24 per cent. The silver was in the metallic state. In other places in Chile the cobalt is in much higher proportion, but the mines are not worked.

In the beginning of the nineteenth century, rich silver-cobalt ores were discovered in the county of Stirling, Scotland, and $250,000 were taken out of the mine. After that there was nothing. This mineral seems to have been similar to the Canadian cobalt ores consisting of native silver, sulphides and cobalt in calcite. Nobody hears of silver-mining in Scotland now.

But if cobalt augurs badly for the staying powers of a mine, nickel may be said to do the same, if we take Silver Islet for an example. This mine was situated on an island near the Canadian shore of Lake Superior. The mineral contained: Silver, 78.34 per cent.; arsenic, 5.98; nickel, 12.93; and cobalt, 2.75 per cent. Some records of this mine may be found in the Transactions of the American Institute of Mining Engineers, 1877. My information is obtained from Percy, who quotes Mr. Courtis's paper read before the Institute in February, 1877, as follows:

"Mr. Macfarlane, unable to get the Canadians to raise the necessary money to carry on the work, in spite of the fact that many thousands of dollars worth of ore had been taken out, succeeded in interesting parties from the States. These parties bought all the lands of the Montreal Mining Company, and a capital of $73,020 paid a dividend of $160,000 the first year, besides paying about $200,000 toward settlement with the Montreal Mining Company, and expending also a large amount of money to establish the plant.

"In the report for this year we find the total amount of dividends has been $622,-066.66, and the total production $2,237,-479.84. The great outlay was needed at the mine to establish a town on a barren rocky shore; to maintain a foothold on a little rock not 80 ft. square against the mighty storms of Lake Superior; to furnish steam tugs, engines, pumps, and build a mill capable of concentrating over 75 tons of rock per day.

"Silver Islet stands today perfectly equipped for mining concentrating, and smelting 50 to 100 tons of ore a day. It has immense tracts of land in a mineral district, which has hardly been explored as yet. It has $700,000 worth of property on hand, and only $400,000 indebtedness, and its own vein has been exposed only about 800 ft. deep and 600 ft. horizontally yet today its stock is almost valueless. The failure of Silver Islet to produce even expenses for the last two years has dampened the ardor of other mining companies so that with the exception of very feeble efforts at other points, except Duncan, the results of whose development all interested are watching, there is no extensive mining being done.

"The average assay of all ore smelted from Silver Islet during the first three years was above 900 oz. per ton."

Then there is a note from Dr. Sterry Hunt dated Montreal, Nov. 18, 1879, announcing that "drifts a few fathoms from the old shaft have disclosed a parallel lod which has enabled them to pay off in the last six months a debt of $400,000, and the weekly yield is now from $50,000 to $70,000. On Nov. 1 the estimated value of the ore in sight was $1,000,000.

"The country rock of Silver Islet is diorite in clay-slate. The native silver is disseminated through the ore in dendritic masses. Associated minerals are native silver filiform and massive cerargyrite, argentite, pyrargyrite, niccolite containing cobalt, annabergite galena, zinc blende, copper pyrites, iron pyrites, marcasite, gypsum, calcite, dolomite, rhodocroisite, quartz and graphite."

The ore was smelted with galena from Colorado and Utah, limestone and iron cinders from rolling mills, in small rectangular one-tuyered blast furnaces smelting about 6 tons a day. The base bullion contained 2000 oz. silver to the ton, which was cupelled directly Regulus and Speiss were obtained, which was roasted and used over again until concentrated enough to be worked for nickel. The slags contained from 1 to 5 oz. silver and less than 1 per cent. lead.

An analysis of the slag is also given, as follows: Lime, 10.77 per cent.; magnesia, 1.97; alumina, 12.25; ferrous oxide, 41.11; and silica, 33.77 per cent..

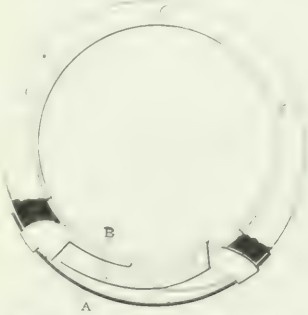
Whether cobalt in Canada will last for many years or not remains to be seen. It would be interesting if those readers who have had experience with cobalt silver mines would give some account of them. The literature of the subject is scanty.

H. W.

Chicago, Ill., May 15, 1907.

Tampering with Safety Lamps

I recently visited a mine, where much gas was present, in which the Wolf safety lamp is in use. Some "smart" miner, disobeying orders and risking the lives of everyone underground, had tampered with the safety lamp, nearly everyone in use at the mine showing evidence of having been opened.



The magnetic lock on the Wolf lamp is an ingenious device. However, it has been found that without injuring the mechanism of this excellent lamp, it is possible to open it by drilling a hole at the point marked *A* in the accompanying engraving. By inserting a needle, the lever *B* can be moved, and the bottom of the lamp can be unscrewed without the use of a magnet. To conceal this deviltry the little hole at *A* was filled with grease, so as to be almost invisible.

This is a danger which ought to be called to the attention of mine managers, and the manufacturers of the Wolf lamp. Of course, it can be easily eliminated by a little modification in the design of the locking mechanism of the lamp.

RICHARD LEE.

New York, April 30, 1907.

Anaconda Copper Mining Company

This company owns mines and works in the Butte district in Montana, besides coal mines and other subsidiary property. It is controlled by the Amalgamated Copper Company. The report covers the [illegible] stock is $30,000,000. The surplus, or undivided profit, [illegible] at the close of the year.

The mines of the company produced [illegible] of ore during 1906. The reduction works treated for all companies [illegible] by them ores and other cupreous material. From the ore treated for the Anaconda company there was produced 94,963,835 lb. of copper, 2,979,908 oz. of silver and 15,985 oz. gold.

The earnings and expenses for two years past were as follows:

	1905.	1906.	Changes.
Gross earnings	$23,734,203	$26,968,871	I. $3,234,668
Expenses	18,146,481	18,384,702	I. 238,221
Net earnings	$ 5,587,722	$ 8,584,169	I. $2,996,447
Other income	181,106	258,500	I. 127,394
Total net	$ 5,718,828	$ 8,842,669	I. $3,124,841

From the net income in 1906 dividends amounting to $6,900,000, or 23 per cent., were paid, leaving a surplus of $1,942,969. Adding the balance from 1905, made a total surplus of $9,183,241. The net income last year was equal to 29.5 per cent. on the stock.

President John D. Ryan states that all departments of the company were in continuous operation during the year. The company treated at the reduction works an increased amount of ore for other companies, thus reducing the cost of treating the product of its own mines. On account of the higher prices for copper received there has been a greater proportion of lower-grade ores mined, although the re[illegible] of the higher grade ores have been [illegible]. Through the economies introduced in the operation of mines and works and the higher price for copper, it [illegible] during the year to mine at a profit on as much as 1 per cent. lower [illegible] than the lowest grade [illegible] during the last few [illegible].

It has been determined that the work[illegible] of the tailings in the dump of the old works by leaching and precipitation can be [illegible] during the months [illegible] and other [illegible] will make the leaching and precipitation of these tailings profitable during all of the year. With any reasonable price for copper, the yield from working the tailings should be large for many years to come.

The [illegible] departments made profits [illegible] for the year. The saw mills [illegible] to furnish a considerable [illegible] and lumber for commercial uses outside of the company's needs. The Butte, Anaconda & Pacific Railroad yielded net profits of $342,193. After paying a dividend of 6 per cent. on the capital stock a surplus was left of $282,193. Additional equipment has been ordered to be delivered before next winter.

A detailed analysis of earnings and expenses for 1906 is as follows:

Sales copper, silver and gold	$20,955,332
Royalties, dividends and rentals	146,731
Miscellaneous	172,989
Net profits, subsidiary dep'tm'ts	387,615
Total receipts	**$21,662,867**
Decrease in copper, silver and gold on hand	$455,102
Mining expenses	5,870,439
Ore, matte and copper bought	315,091
Transportation of ore to mill	234,150
Reduction expenses at Anaconda	4,424,278
Transporting, refining and selling metal	1,721,966
Administration expenses	57,672
Total expenses	**$13,078,698**
Net balance	**$8,584,169**

The total quantity of cupreous material treated in the reduction works, was 3,006,910 dry tons. The material treated for the Anaconda was 1,404,828 tons ore; 18,490 tons of slimes; 3324 tons flue-dust; 160,516 tons slag; 654 tons miscellaneous cleanings from old works, a total of 1,683,818 tons. The yield, as stated above, was 94,963,835 lb. copper, 2,979,908 oz. of silver, and 15,885 oz. gold; giving averages per ton of ore only of 03.5 lb. copper, 1.99 oz. silver, and 0.011 oz. gold per ton. An increased product of arsenic has been recovered from flue dust, and a good price is being received for it on contract for the entire output of the plant.

The electrical equipment of the concentrator has been completed, and the power costs at that plant will show a large reduction during the coming year.

An experimental plant to leach the tailings in the dumps at the old works was in operation during part of the year with gratifying results. It has been determined that the working of these tailings by leaching and precipitation can be done at a good profit. With any reasonable price for copper, the yield from working the tailings should be larger for many years to come.

The yield of copper from the precipitating plants treating the water taken from the mines through the High Ore pumping plant, was larger than in any previous year and netted the company a very good profit after deducting all costs of draining.

The coal mine at Belt produced 201,851 tons of coal, of which 152,304 tons were shipped to the other departments of the company, 116,469 tons were sold and 23,076 tons were used by the coal department.

The brick department at Anaconda has much improved its product and business, the silica and fire brick manufactured by the company now finding ready market at all smelting centers in the Intermountain and Pacific coast territory.

Electric Smelting of Iron Ore

The results of the experiments in electric smelting, undertaken to demonstrate the commercial feasibility of the process as applied to Canadian iron ores, were given in a preliminary report by Dr. Eugene Haanel, published last year, and have received extensive publicity. The final report just issued* is of a more elaborate character and comprises a detailed statement of the work done and its results, with analyses of the raw material used and the pig iron and slag produced and many other data of practical value to metallurgists. It contains numerous illustrations of the plant and machinery, showing the changes it was found necessary to make in construction, and plans are also given of two recently patented electric furnaces. The appendix comprises much recent information on the subject, including a description of Swedish improvements in the process, and the results of German and French experiments.

The report states that the first electric smelting plant in Canada for the production of pig iron and later of high-grade steel and steel castings is at present under construction at Welland, Ont., by R. Turnbull, Canadian representative of the Heroult process and furnaces, and R. H. Wolff, American representative of the same, and their associates. The first installation consists of one 3000-h.p. furnace of the latest Heroult type, which is expected to produce 35 tons of pig iron per day, when not utilizing the gases produced by the reduction and 40 tons when the gases are used. Power will be furnished by the Ontario Power Company, of Niagara Falls, at 12,000 volts and transformed to the required voltage by transformers furnished by the Packard Company of St. Catharines, Ont. These will be of the oil- and water-cooled type, of 750 kw. each, and arranged with taps on the secondary side to allow a range from 30 to 40 volts on the secondary. The furnace is so arranged that a three-phase current can be employed. The furnace will be used to demonstrate that pig iron can be commercially produced at a site where the price of power is high and the nearest ore supply 150 miles distant. Some of the ore used will be brought from Port Arthur, containing as high as [illegible] per cent. sulphur, and other Canadian ores will be employed. The first furnace will be followed by a second one, probably of larger capacity, and a Heroult steel furnace will also be installed for the manufacture of high-grade steel castings, at present not made in Canada.

*"Report on the Experiments made at Sault Ste. Marie, Ont., under Government auspices in the Smelting of Canadian Iron Ores by the Electro thermic Process." By Eugene Haanel, Ph. D. Ottawa: Government Printing Office.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by The Engineering and Mining Journal upon the receipt of 25 cents. In ordering specifications correspondents are requested to give the number, name of inventor and date of issue.

CEMENT

CEMENT KILN. Thomas M. Morgan, Longue Pointe, Quebec, Canada. (U. S. No. 851,765; April 30, 1907.)

COAL AND COKE

BRIQUETTING. A. W. H. Vivian, London, England. Briquetting small coal by means of a mixture of water, magnesite cement and oil that has been treated with chloride of sulphur. (Brit. pat. 7357 of 1906; April 27, 1907.)

CHARCOAL AND COKE MAKING. W. S. Simpson, London, England. A retort for making charcoal and coke from peat, brown coal, etc. (Brit. No. 7732 of 1906; April 13, 1907.)

COAL CRUSHER. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Co., St. Louis, Mo., a corporation of Missouri. (U. S. No. 850,988; April 23, 1907.)

COAL CUTTERS. H. Hird, Dewsbury, England. Improvements in the coal cutters, consisting of rotating drills mounted on a traveling carriage. (Brit. No. 11,525 of 1906; April 20, 1907.)

COAL-CUTTING MACHINES. H. Hurst, Dewsbury, England. Method of securing cutters to the cutter wheels of coal-cutting machines. (Brit. No. 11,524 of 1906; April 27, 1907.)

COAL-MINING DEVICE. H. Haughton, Ormskirk, Lancashire. A split steel rod for use in breaking down coal without the use of explosives. (Brit. No. 25,371 of 1906; April 20, 1907.)

COKE MANUFACTURE. G. de Velna, Paris, France. Method of utilizing small coal for the manufacture of coke suitable for use in metallurgical operations. (Brit. No. 19,780 of 1906; April 13, 1907.)

COKE OVEN. Andrew Kerschgens, Charleroi, Penn., administrator of Jospeh Kerschgens, deceased. (U. S. No. 850,939; April 23, 1907.)

DISTILLATION OF COAL—Method of Distilling Coal. Olivier A. Gobbe, Jumet, Belgium. (U. S. No. 852,268; April 30, 1907.)

PEAT-WORKING MACHINE. Geo. Matthews, Riga, Mich. (U. S. No. 852,609; May 7, 1907.)

COPPER

CONVERTING COPPER MATTE—Art of Converting Metals. Richard L. Lloyd, Cananea, Mexico. (U. S. No. 851,816; April 30, 1907.)

ELECTROLYTIC COPPER. M. Perreur-Lloyd and A. M. Gardner, Paris, France. In electrolytic methods for producing copper from solutions of copper and iron sulphates, methods of dealing with the sulphuric acid so as to use it over and over again. (Brit. No. 25,489 of 1906; April 27, 1907.)

MATTE SMELTING. J. Savelsberg, Papenburg, Germany. A method of treatment of copper and other mattes for the purpose of removing the iron by mixing the ground matte with silica and iron and distributing it over a layer of incandescent fuel, through which an air blast is forced from below. The iron slags off and the remaining sulphides and sulphates of copper, etc., become sintered. (Brit. No. 10,329 of 1906; April 20, 1907.)

ORE TREATMENT—Method of Treating Ores. James W. Bolleau, Denver, Colo., assignor of one-half to James B. Knoblock, Denver, Colo. (U. S. No. 853,575; May 14, 1907.)

GOLD AND SILVER

HYDRAULIC MINING—Regulating Means for Hydraulic Nozzles. George J. Henry, Jr., San Francisco, Cal. (U. S. No. 853,786; May 14, 1907.)

STAMP MILLING PRACTICE. C. E. Holland, New York, N. Y. Electrolytic apparatus for settling float gold coming from stamp batteries, or floating ore coming from concentrating plant. (Brit. No. 6937 of 1906; April 27, 1907.)

IRON AND STEEL

BLAST FURNACE TOP. John W. Gocher, Johnstown, Penn. (U. S. No. 851,128; April 23, 1907.)

BLAST FURNACES. Skimmer for Blast Furnaces. Charles D. Irvin, Pittsburg, Penn. (U. S. No. 851,596; April 23, 1907.)

FERRO-MOLYBDENUM. H. W. C. Annable and the Ferro-Alloys Syndicate, London. Obtaining ferro-molybdenum from molybdenite by heating the latter with alkali in the presence of oxygen, and preparing from the product a solution containing molybdate of the alkali; precipitating this by means of a salt of iron, so obtaining molybdate of iron, which can be reduced to ferro-molybdenum. (Brit. No. 5031 of 1906; March 30, 1907.)

FERRO-MOLYBDENUM—Manufacture of Ferro-Molybdenum. Henry W. C. Annable, London, England, assignor to the Ferro-Alloys Syndicate, Ltd., London, England. (U. S. No. 852,929; May 7, 1907.)

MOLD for Casting Chilled Rolls. Ralph H. West, Cleveland, O. (U. S. No. 853,490; May 14, 1907.)

MOLD—Metal Mold for Casting Iron and Steel. Alonzo W. McArthur, Swampscott, and Jesse M. Darke, Lynn, Mass., assignors to General Electric Co., a corporation of New York. (U. S. No. 852,671; May 7, 1907.)

OPEN-HEARTH FURNACES. J. A. Drain, Pittsburg, Penn. In open-hearth furnaces, arrangements for discharging the contents into more than one ladle. (Brit. No. 19,633 of 1906; April 13, 1907.)

TEMPERING BATH. J. Churchward, New York, N. Y. Improved tempering bath for steel castings, composed of two superimposed baths, one of carbolic and linseed oil and the other of a mixture of mercury and fat. (Brit. No. 19,170 of 1906; April 27, 1907.)

LEAD

LEAD OXIDE—Process of Making Lead Oxide. Clarence A. Hall, Philadelphia, Penn. (U. S. No. 852,325; April 30, 1907.)

PETROLEUM

PUMPING—Deep Oil Well Pumping. Ross J. Hoffman, Bradford, Penn. (U. S. No. 852,061; April 30, 1907.)

QUICKSILVER

MERCURY OR QUICKSILVER STILL. Raymond A. Lackmann, Portland, Ore. (U. S. No. 853,701; May 14, 1907.)

ZINC

ALLOY. J. H. W. Rolason, Birmingham, England. The use of zinc as an alloy for standard silver, such silver containing 925 parts of fine silver and 75 parts of zinc, the metal thus formed being more ductile and more easily annealed. (Brit. No. 7195 of 1906; April 27, 1907.)

LOW GRADE CALAMINE. F. S. Moyano, Agullas, Spain. A process for utilizing low-grade calamine by first calcining and then treating with a solution of calcium chloride, the zinc chloride thus produced being precipitated as oxide by the admixture of carbonate of magnesium. (Brit. No. 24,526 of 1906; April 27, 1907.)

METALLURGICAL CONDENSER. Woolsey M. Johnson, Iola, Kan. (U. S. No. 851,529; April 23, 1907.)

ORE REDUCTION—Process of Reducing Zinc Ores. Carl G. P. de Laval, Stockholm, Sweden, assignor to Société Anonyme Métallurgique Procédés de Laval, Frankfort-on-the-Main, Germany, a corporation of Belgium. (U. S. No. 852,440; May 7, 1907.)

RETORTS—Process of Filling Zinc Retorts. John D. James, Pulaski, Va. (U. S. No. 851,668; April 30, 1907.)

ZINC OXIDE. H. A. Leaver and C. Buch, London. Improved process for recovering zinc oxide and ammonia from flux skimmings of zinc by means of lime. (Brit. No. 5665 of 1906; March 30, 1907.)

ZINC SULPHATE—Process of Reducing Zinc Sulphate Directly from the Ore. George O. Angell, Philadelphia, Penn. (U. S. No. 851,639; April 30, 1907.)

ORE DRESSING

BALL MILL. Hermann Lehnert, Eisenach, Germany. (U. S. No. 851,013; April 23, 1907.)

CONCENTRATING TABLES. G. Green, Lanark, England. Method of mounting concentrating tables having a vanning motion, the tables being mounted by means of brackets on pivots which oscillate round a center above, the motion thus obtained moving the table through an arc and imitating the motion of the vanning shovel. (Brit. No. 14,721 of 1906; April 20, 1907.)

CONCENTRATOR. Henry L. Lightner, San Francisco, Cal., assignor of one-third to William Priest and one-third to Henry Feige, San Francisco, Cal. (U. S. No. 851,426; April 23, 1907.)

CONCENTRATOR. John F. Isbell, Denver, Colo. (U. S. No. 853,459; May 14, 1907.)

CONCENTRATOR — Centrifugal Concentrator. Charles T. Heisel, Cleveland, Ohio. (U. S. No. 852,558; May 7, 1907.)

CONCENTRATOR — Electromagnetic Machine or Concentrator. John H. Ryan, Portland, Ore., assignor of one-third to O. B. Stubbs and one-third to Charles N. Ryan, Portland, Ore. (U. S. No. 853,475; May 14, 1907.)

CRUSHER. Milton F. Williams, St. Louis, Mo., assignor to Williams Patent Crusher and Pulverizer Co., St. Louis, Mo., a corporation of Missouri. (U. S. No. 851,390; April 23, 1907.)

CRUSHER—Dry-pan Crusher. Jacob W. Boltz, Topeka, Kan. (U. S. No. 852,160; April 30, 1907.)

CRUSHING MACHINE. Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass., assignors to Sturtevant Mill Co., Portland, Me., a corporation of Maine. (U. S. No. 853,656; May 14, 1907.)

CRUSHING ROLLS. Frank P. Snow, Los Angeles, Cal. (U. S. No. 853,481; May 14, 1907.)

ORE FEEDER. Henry Eggers, Denver, Colo. (U. S. No. 853,346; May 14, 1907.)

ORE MILL. Julius Johnson, Mesa, Ariz. (U. S. No. 851,757; April 30, 1907.)

ORE PULVERIZER. George J. Beistner, Chicago, Ill., assignor of one-half to Walter H. Stone, Chicago, Ill. (U. S. No. 852,096; April 30, 1907.)

ORE PULVERIZER and Concentrator. Obadiah K. McCutcheon, Pittsburg, Penn. (U. S. No. 850,952; April 23, 1907.)

ORE PULVERIZING OR GRINDING MILL. James W. Fuller, Jr., Catasauqua, Penn. (U. S. No. 852,173; April 30, 1907.)

ORE SEPARATING AND CONCENTRATING MACHINE. William P. Clifford, Iconium, and William W. Rankin, Ottumwa, Iowa. (U. S. No. 853,917; May 14, 1907.)

ORE SEPARATOR. Lon D. Hall and Samuel P. Hall, Prescott, Ariz. (U. S. No. 853,782; May 14, 1907.)

ORE SEPARATOR—Centrifugal Machine. Birger Ljungström, Stockholm, Sweden, assignor to Aktiebolaget Separator, Stockholm, Sweden. (U. S. No. 852,666; May 7, 1907.)

ORE SEPARATOR—Electromagnetic Separator. William Blackmore, London, England. (U. S. No. 851,979; April 30, 1907.)

ORE SEPARATOR—Magnetic Ore Separator. Henry H. Wait, Chicago, Ill., assignor to International Separator Co., Chicago, Ill., a corporation of New Jersey. (U. S. No. 851,046; April 23, 1907.)

PEBBLE MILLS.—Lining for Pebble Mills. Max F. Abbé, New York, N. Y. (U. S. No. 851,637; April 30, 1907.)

SEPARATION OF MINERALS — Apparatus for Separating Minerals. James F. Latimer, Toronto, Ontario, Canada. (U. S. No. 851,599; April 2, 1907.)

SEPARATION OF MINERALS — Process for Separating Minerals. James F. Latimer, Toronto, Ontario, Canada. (U. S. No. 851,600; April 23, 1907.)

SEPARATOR—Mineral Separator. Chas. U. Shepard, Summerville, S. C. (U. S. No. 853,603; May 14, 1907.)

METALLURGY—GENERAL

BRIQUETTING. — Method of Forming

851,167; April 23, 1907.)

SINTERING.—Apparatus for Sintering Fine Ore. John G. Bergquist, Chicago, Ill., assignor to American Sintering Co., Chicago, Ill., a

MINING MACHINERY AND APPARATUS

AERIAL TRAMWAY BUCKETS—Automatic dumping mechanism for aerial-tramway buckets. Hiram G. Perris, Leaven

1907.)

BLASTING—Miner's Blast-charger. William G. Peay and George W. Ham, Willard, Ky. (U. S. No. 852,900; May 7, 1907.)

CAR-DUMPING APPARATUS. Truman H. Aldrich, Jr., Birmingham, Ala. (U. S. No. 852,643; May 7, 1907.)

COMPRESSED AIR—Apparatus for Extracting Moisture from Compressed Air. James R. Duncan, New York, N. Y. (U. S. No. 853,345; May 14, 1907.)

CONVEYING MACHINERY. Machinery for Conveying Earth, etc. Samuel Lloyd, Birmingham, and Alfred R. Grossmith, Corby, near Kettering, England. (U. S. No. 852,885; May 7, 1907.)

DEEP BORING APPARATUS. H. M. Smit, Utrecht, Holland. An apparatus for determining the dip of strata, for use in connection with deep boring apparatus. (Brit. No. 10,764 of 1906; April 20, 1907.)

DREDGER and Excavator. Marx P. Schetzel, Oakland, Cal. (U. S. No. 851,628; April 2, 1907.)

DREDGING and Excavating Machine. John Kennedy, Montreal, Quebec, Canada. (U. S. No. 851,093; April 23, 1907.)

DUST-PREVENTION APPARATUS. H. D. Griffiths and G. H. Colwill, Swansea, Wales. An exhaust apparatus for preventing dust in mines, by means of which the dust from the drills is drawn through a tank of water. (Brit. No. 7355 of 1906; April 27, 1907.)

EXCAVATING BUCKETS. Scraper for Orange-Peel Buckets. Louis A. Désy, Montreal, Quebec, Canada, assignor to Joseph William Harris, Montreal, Canada. (U. S. No. 851,733; April 30, 1907.)

EXCAVATING SCOOP. Russell Wiles, Chicago, Ill., assignor to John W. Page, Chicago, Ill. (U. S. No. 852,863; May 7, 1907.)

Locomotive Mine Car Reel Apparatus for Mining Locomotives. Harry W. Shaver, Pocahontas, Va., assignor to General Electric

New York. (U. S. No. 853,522; May 14, 1907.)

MINE CAGES. S. Henrard, Liege, Belgium. Improved method of suspending mine cages in case of accident to the winding rope. (Brit. No. 1964 of 1907; April 27, 1907.)

MINE CAR. Franklin C. Hockensmith, Pittsburg, Penn., assignor to Hockensmith Wheel and Mine Car Co., Penns Station, Penn., a corporation of Pennsylvania. (U. S. No. 852,879; May 7, 1907.)

MINE GASES—Apparatus for Detecting the Presence and Volume of Fire-damp and Other Light Gas in Mines, etc. James McCutcheon, Edinburgh, Scotland. (U. S. No.

1907.)

MINER'S LAMP. Ralph L. Graves, Sump-

(U. S. No. 852,078; May 1, 1907.)

PICK FOR MINING OR CUTTING MACHINES. Thomas N. Wallace, Centerville, Iowa, assignor of fifteen one-hundredths to John R. Needham, Centerville, Iowa. (U. S. No. 854,970; April 30, 1907.)

ROCK DRILL. Edward Leichter, Nevada City, Cal., assignor of one-half to James C. Campbell, Nevada City, Cal. (U. S. No. 853,555; May 14 1907.)

ROCK DRILL. Her Rock Drill Co., Denver, Colo. An improved pneumatic hammer rock drill. (Brit. No. 18,882 of 1906; April 13, 1907.)

ROCK DRILL. Electric Rock Drill. John Riddell and George B. Painter, Schenectady,

ROCK DRILLING MACHINES. C. R. Newton, Johannesburg, S. A. An improved tool holder for holding drills in percussive rock drilling machines. (Brit. No. 20,721 of 1906; April 20, 1907.)

METALLURGICAL MACHINERY AND APPARATUS

BRIQUET PRESS. Ely C. Hutchinson, San Francisco, Cal., assignor to Charles R. Allen, San Francisco, Cal. (U. S. No. 851,007; April 23, 1907.)

BRIQUET PRESS. Oscar Busse, Meiderich, Duisburg, Germany. (U. S. No. 850,905; April 23, 1907.)

BRIQUETTING. Apparatus for Preparing Pulverulent Materials for Molding or Briquetting. George J. Mashek, Newark, N. J. (U. S. Nos. 852,024 and 852,025; April 30, 1907.)

BRIQUETTING APPARATUS. Société de Sacre Madame de Dampreny, Charleroi, Belgium. In briquetting apparatus in which plastic material is extruded, improved means for cutting up the extruded mass into bricks. (Brit. No. 14,254 of 1906; April 13, 1907.)

BRIQUETTING MACHINE. Robt. Schorr, San Francisco, Cal. (U. S. No. 852,457; May 7, 1907.)

INGOT-CHARGING CRANE. Clarence L. Taylor, Alliance, Ohio, assignor to Morgan Engineering Co., Alliance, O. (U. S. No. 853,482; May 14, 1907.)

ORE TREATMENT—Apparatus for the Treatment of Sulphides and Other Ores. Geo. E. Kingsley, Toronto, Ontario, Canada. (U. S. No. 852,510; May 7, 1907.)

REFINING METALS—Apparatus for Converting Metals. Richard L. Lloyd, Cananea, Mexico. (U. S. No. 851,817; April 30, 1907.)

STAMP-MILL MACHINERY. James C. Anderson, Highland Park, Ill. (U. S. No. 852,756; May 7, 1907.)

FURNACES

ANNEALING FURNACE. T. V. Hughes, Birmingham, England. In annealing furnaces for toughening metals, in which a gaseous non-oxidizing atmosphere is used, methods of arrangement to prevent air entering with the articles to be treated. (Brit. No. 729 of 1906; April 13, 1907.)

BLAST-FURNACE CHARGING APPARATUS. Guy R. Johnson, Clarksville, Tenn. (U. S. No. 853,016; May 7, 1907.)

CHARGING DEVICE—Device for Charging Furnaces, Gas Generators, etc. Hugo Rehmann, Millheim-on-the-Ruhr, Germany. (U. S. No. 853,420; May 14, 1907.)

CHARGING TRUCK for Annealing Furnaces. John G. Blum, Toledo, Ohio. (U. S. No. 852,012; April 30, 1907.)

CRUCIBLE FURNACE. Julius Borbeck, Altena, Germany. (U. S. No. 852,867; May 7, 1907.)

ELECTRIC FURNACE. Henry N. Potter, New Rochelle, N. Y., assignor to Geo. Westinghouse, Pittsburg, Penn. (U. S. No. 851,961; April 30, 1907.)

ELECTRIC FURNACE PRACTICE. H. Rochling and W. Rodenhauser, Volklingen, Germany. In electric furnaces a method of observing the covering of slag in as hot and liquid a state as possible. (Brit. No. 17,615 of 1906; April 20, 1907.)

ELECTRIC MELTING FURNACE. P. R. Kuhnrich, Sheffield, England. An electric melting furnace for metals, mounted on trunnions so as to be rotatable around a horizontal axis, and provided with discharge openings of such construction that a casting ladle is dispensed with. (Brit. No. 6283 of 1906; April 20, 1907.)

ELECTRIC RESISTANCE FURNACES. F. A. Kjellin, Stockholm, Sweden. Construction of electric resistance furnaces which will allow of the treatment of large charges. (Brit. No. 21,416 of 1906; April 27, 1907.)

FURNACE CHARGING. Charging Bar for Open-hearth Charging Machines. Clarence L. Taylor, Alliance, Ohio, assignor to Morgan Engineering Co., Alliance, Ohio. (U. S. No. 853,483; May 14, 1907.)

MUFFLE FURNACE—Recuperative Muffle Furnace. Lazruby C. Hamilak, St. Louis, Mo., assignor to Gas Bench Construction Co., St. Louis, Mo., a corporation of Missouri. (U. S. No. 852,506; May 7, 1907.)

OPEN-HEARTH FURNACE PRACTICE. E. Bosshardt and H. Garda, Cologne, Germany. In open-hearth furnaces for smelting, melting and producing alloys, improved methods of preheating the air employed. (Brit. No. 15,075 of 1906; April 27, 1907.)

ROASTING FURNACE. W. B. Dennis, Black Butte, Oregon. A roasting furnace, consisting of a series of chambers arranged vertically over each other, through which the ore descends gradually. (Brit. No. 12,523 of 1906; April 20, 1907.)

SMELTING FURNACE. Walter G. Perkins, San Francisco, Cal. (U. S. No. 852,613; May 7, 1907.)

STACK-FURNACE CONSTRUCTION. Joseph L. Hunter, Roanoke, Va. (U. S. No. 853,698; May 14, 1907.)

TURBO BLOWER. Hans Holzwarth, Hamilton, O., assignor to Hooven, Owen, Rentschler Co., Hamilton, Ohio. (U. S. No. 853,363; May 14, 1907.)

TUYERE VALVE—Hot-blast Valve. Jacob B. McKennan, Pueblo, Colo. (U. S. No. 853,722; May 14, 1907.)

INDUSTRIAL CHEMISTRY

ACID COOLING and Generating Chamber. Iens P. Libme, Cleveland, O., assignor to the Grasselli Chemical Co., Cleveland, O., a corporation of Ohio. (U. S. No. 852,390; April 30, 1907.)

ALUMINUM PROCESS. A. Klemm, Mannheim, Germany. Producing alumina and alkali thiosulphate by mixing alkali sulphate, carbon and bauxite, calcining, lixiviating and treating with sulphurous acid or sulphuretted hydrogen. (Brit. No. 5478 of 1906; Apr. 6, 1907.)

ARSENIC REMOVAL. Peter Spence & Sons, Manchester, England. In clarifying solutions which have been obtained by acting on aluminum compounds by means of sulphuric acid containing arsenic, precipitating the arsenic as sulphide by adding calcium sulphide, the precipitated sulphide on falling acting to clear the solution generally. (Brit. No. 6529 of 1906; April 13, 1907.)

ARTIFICIAL FUEL—Composition of Matter to be Used as Fuel and Process of Making Same. Edgar L. Culver, South Omaha, Nebr. (U. S. No. 851,407; April 23, 1907.)

ATMOSPHERIC NITROGEN—Process of Oxidizing Atmospheric Nitrogen. Albert Neuburger, Berlin, Germany. (U. S. No. 850,392; Apr. 13, 1907.)

CALCIUM PHOSPHATE—Method of Producing Dicalcium Phosphate. Eugen Bergmann, Ohlau, Germany. (U. S. Nos. 852,371 and 852,372; April 30, 1907.)

EXPLOSIVE. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,268; Apr. 13, 1907.)

EXPLOSIVE. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,502; Apr. 13, 1907.)

EXPLOSIVE—Ammonium-nitrate Explosive. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,325; Apr. 13, 1907.)

EXPLOSIVE—Ammonium-nitrate Metallic Explosive and Process of Making Same. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,267; Apr. 13, 1907.)

EXPLOSIVE and Process of Making Same. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Co., Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,326; Apr. 13, 1907.)

EXPLOSIVES—Manufacture of Explosives. Hugh C. L. Bloxam, Cape Town, Cape Colony, assignor to South African Maganite Explosives Syndicate, Ltd., Cape Town, Cape Colony. (U. S. No. 853,056; May 7, 1907.)

EXPLOSIVES—Waterproof Composition for Explosives. Fin Sparre, Wilmington, Del., assignor to The E. I. du Pont de Nemours Powder Company, Wilmington, Del., a Corporation of New Jersey. (U. S. No. 850,266; Apr. 13, 197.)

POTASH EXTRACTION—Method of Extracting Potash from Feldspathic or Other Potash-bearing Rock. Allerton S. Cushman, Connecticut. (U. S. No. 851,922; April 30, 1907.)

SULPHURIC ACID. J. Raschen, A. E. Waring and the United Alkali Company, Liverpool. An improvement to the inventors' process for removing arsenic from sulphuric acid by means of hydrochloric acid gas. (Brit. No. 5151 of 1906; Mar. 30, 1907.)

SULPHURIC ACID—Tower for Sulphuric-acid Plants. Richard Cellarius, Sergievskoi Posad, Russia. (U. S. No. 848,631; April 2, 1907.)

ZINC SULPHIDE—Apparatus for Producing Alkali Hydrates and Zinc Sulphide. Charles Ranson, Brussels, Belgium, assignor to Henry William De Stuckle, Dieuze, Germany. (U. S. No. 850,965; April 23, 1907.)

ANALYTICAL CHEMISTRY

ASSAYING. Assayer's Pouring-mold. John J. Bailey, Victor, Colo. (U. S. No. 850,811; Apr. 13, 1907.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Hon. Frank Cochrane, minister of mines for Ontario, has returned from a trip to England.

C. I. Burt, an operator of the Georgetown, Colo., district, is making a business visit to eastern points.

W. A. Clark has returned to Butte, Mont., to look after his extensive mining and smelting interests there.

G. G. S. Lindsey, general manager of the Crow's Nest Pass Coal Company, Fernie, B. C., has been in Toronto.

Arthur Pierce, mining engineer, of London, England, spent several days in Butte, Mont., recently, on mining business.

Dr. Regis Chauvenet, of Denver, has been examining mines in Gilpin county, Colo., in the interests of Eastern capitalists.

George E. McClelland, manager of the Freeland mines at Idaho Springs, Colo., has returned from a business visit to the East.

Col. George G. Vivian, of Denver, has been making examination of mining properties in Gilpin and Clear Creek counties, Colorado.

Clifford Wilfley has been appointed engineer for the Virginia & Mexico Mine and Smelter Corporation, at Hostotipaquillo, Mexico.

Herman Wendler, of Ures, Sonora, Mexico, sailed from New York, May 21, on a business trip to Europe. He will return in the fall.

E. G. Biddison has been appointed superintendent of the mines of the Ohio Coal Company, in Coshocton and Guernsey counties, Ohio.

Christ Miller, formerly foreman for the Lehigh Valley Coal Company at Oneida, Penn., has succeeded the late William Jones as foreman of the Tomhicken mine.

Burt Adams Tower, mining engineer, of Butte, Mont., is visiting Idaho in the interest of the Mines Exploration and Development Company, a Butte corporation.

E. C. Frisbee, H. R. Mandell and William E. Bright, of Massachusetts, attended the meeting of stockholders of the Raven Mining Company, in Butte, Mont., May 15.

John E. Pettit has been appointed State mine inspector of Utah, in place of Gomer Thomas, who has resigned in order to take charge of a large coal mining operation.

Alexander Agassiz, president, and Rudolph Agassiz, second vice-president of the Calumet & Hecla Company, are in the Lake Superior country on the usual semi-annual visit to the properties.

W. A. Carlyle has resigned the position of general manager of the Rio Tinto copper mines in Spain, which he has held during the past seven years. He has begun consulting practice in London.

Thomas H. Williams, general superintendent of the Kingston Coal Company, was severely burned recently by an explosion of gas in that company's No. 4 colliery near Kingston, Pennsylvania.

F. P. Vandenbergh, who resigned a year ago as chief chemist to the Belen mines at Cumpas, Sonora, Mexico, has recovered his health and is now developing personal interests at Santa Rosa, New Mexico.

H. E. T. Haultain, who for the past year and a half has been manager of the production end of the Canada Corundum Company, has been appointed general manager, with headquarters at Craigmont, Ontario.

C. S. Durell, late at Searchlight, Nev., has taken over the management of the Death Valley Gold Mining Company at Cima, California. He will also act as consulting engineer for the Arcalvada Mining Company, in the same district.

Eli T. Connor, formerly superintendent of the Wyoming division collieries of the Lehigh Valley Coal Company, has been selected by the Guggenheim interests to take charge of the operations of the New River Collieries Company in West Virginia.

Norman R. Fisher, of New York, having taken over the general management of a number of properties in Cobalt, Ont., and the surrounding districts, has opened offices in Haileybury, Ont., which he is for the present making the headquarters of his consulting practice.

Prof. Frederick H. Sexton, who resigned the chair of mining in Dalhousie University, Nova Scotia, to accept the metallurgical professorship in the University of Missouri, has been appointed director of technical education for Nova Scotia and principal of the school of technology to be established in Halifax.

Eugene Coste, of Toronto, Ont., has just returned from South America. He has obtained an option on a large area of land in Columbia. Natural gas is burning on the surface of the property, which is located near the towns of Barranquilla and Porte Colombia. Development work will shortly be undertaken.

William H. Smith, Jr., for the past 14 years general superintendent of the Jeddo mines of G. B. Markle & Co. at Jeddo, Penn., has resigned his position, and is succeeded by John T. Keith. Arthur P. Goedecke has been appointed assistant superintendent. Joseph R. Cragne, mining engineer, has been promoted to be assistant to the general superintendent.

Simonds & Burns, of New York, have established headquarters at Haileybury, Ontario, for work in the Cobalt and ad-

the firm, assisted by C. E. Beckwith, will remain there practically all the time. They are at present representing the interests of New York capitalists in the development of quite a large property and are making a specialty of prospecting work in the district.

J. C. Evans, of Youngstown, Ohio, has just returned from Zaragoza, South America, where he has been operating Cyclone drills, prospecting a placer property for the South American Development Company. The results were highly satisfactory. It is rumored that a dredge will be put on the ground immediately. Mr. Evans expects to return to South America the latter part of the year to take charge of drills for developing a new territory.

In the Star-White suit in the Supreme Court of British Columbia, recently, a number of mining engineers appeared as witnesses. The list included Frank L. Sizer, of Helena, Mon.; S. S. Fowler, of Nelson, B. C., and J. M. Harris, for the plaintiff; Max Boehmer, of Denver, Colo., W. J. Elmendorf, of Spokane, Wash., and Byron N. White for the defendant; W. E. Zwicky, of Kaslo, B. C., who was appointed by the court to make surveys of the property in dispute.

Obituary

Frank H. [illegible] died [illegible], N. Y., May 13, aged 58 years. He was connected with the iron trade for a number of years, and was the leader in the organization of the Buffalo & Susquehanna Iron Company, and the successful development of its business.

Col. S. B. Dick, who died in Meadville, Penn., May 10, aged 71 years, was for many years prominent in the iron industry of the western part of Pennsylvania. He was stockholder, director and president in several iron companies. He was also largely interested in railroad and mining enterprises in Colorado.

Societies and Technical Schools

Massachusetts Institute of Technology—The presidency has been offered to Benjamin Ide Wheeler, now president of the University of California, and widely known as an organizer and educator.

American Society of Mechanical Engineers—The semi-annual meeting of this society, to be held in Indianapolis, Ind., May 28 to 31, promises to be of especial interest. A wide range of subjects will be taken up and discussed, among which will be reports of committees on standard proportions for machine screws; standard tonnage basis for refrigeration; papers on pumping engines, the heating of storehouses, and kilns for portland cement.

and discussions of superheated steam, including papers on its specific heat, its flow, furnace and superheat relations, the determination of entropy lines for superheated steam, the performance of Cole superheaters, superheated steam in an injector; the use of superheated steam on locomotives in America, analysis of locomotive tests, and material for the control of superheated steam. An automobile symposium has been planned for the evening session, May 30, at which papers, illustrated by lantern slides, will be read and discussed. Several excursions have been arranged to different plants and points of interest in and around Indianapolis. One of the professional sessions devoted to superheated steam, will be held at Purdue University.

Mining Society of Nova Scotia—The fifteenth annual meeting was held in Halifax, March 27 and 28. The reports showed the affairs of the society to be in good condition. A. A. Hayward, the retiring president, delivered the annual address, and the following papers were read:

"Mine Pumping with Direct Connected Turbine Pumps," by P. H. Moore.

"Sinking and Timbering of the Allen Shaft," by H. E. Call.

"History of the Mining Society of Nova Scotia," by G. W. Stuart.

"Notes on the Property of the Seal Harbor Mining Company," by T. G. MacKenzie.

"Classification of Coal," by A. L. MacCallum.

"Coal Shipping Piers," by Hiram Donkin.

"Geological Conditions of the Iron Ores of Nova Scotia," by Professor Woodman.

"Londonderry Furnace Practice," by H. S. Badger.

"Sibley Mine, North Brookfield," by E. Percy Brown.

The new officers elected are: President, C. J. Coll, Stellarton; first vice-president, Dr. J. E. Woodman, Halifax; second vice-president, T. J. Brown, Sydney Mines; secretary-treasurer, H. M. Wylde, Halifax. Council: J. A. Johnson, H. S. Poole, F. H. Sexton, G. W. Stuart, R. H. Brown, B. F. Pearson.

Industrial

The Abner Doble Company, San Francisco, has appointed Mitsui & Company to act as sole agents in Japan and its territories, Korea, China and Manchuria, for the sale of Doble tangential water wheels and hydraulic apparatus. Mitsui & Company is the largest engineering house in the Far East, with its 35 branch offices.

The Duff Manufacturing Company, Pittsburg, Penn., the sole manufacturers of Barrett ratchet jacks, is placing on the market a new ball-bearing lifting jack which embodies many new ideas and improvements, and which will be manufactured in connection with the Duff roller bearing screw jacks.

The New York Engineering Company is now in its new offices in the United States Express Building, No. 2 Rector street, New York. The company devotes its attention exclusively to the designing and building of gold dredges, under the management of Vice President A. C. Ludlum, and has obtained many contracts.

It is announced that the Mississippi Glass Company has purchased the Sergeant Glass Company's plant, at Kane, Penn., and will operate it in manufacturing rolled, figured, polished plate and wire glass. With this new plant and its facilities added to its Latrobe, Port Allegany, Morgantown, and St. Louis factories, the Mississippi company becomes the world's largest producer of flat glass, having a capacity of 30,000,000 sq.ft. per annum.

The American Electric Furnace Company, No. 45 Wall street, New York, gives notice that it has taken over all the business pertaining to electric furnaces heretofore carried on by the American Gröndal Kjellin Company, of New York, and the Induction Furnace Company, of Newark, and has acquired all patents relating to electric furnaces taken out by F. A. Kjellin and E. A. Colby, which were owned by these companies. The company is prepared to furnish furnaces for the treatment of various metals and alloys and full information in regard to their application.

The Tennessee Coal, Iron and Railroad Company, in order to handle its increased business at the Ensley works, has just placed an order with the Crocker-Wheeler Company, Ampere, N. J., for the complete electric-motor equipment of its new steel-rail mill at Birmingham, Ala. The order includes 15 Crocker-Wheeler Form W rolling-mill motors, designed for the arduous service of rolling mills. The order aggregates about 575 h.p. Among other purchasers and users of the Form W-rolling-mill motor are the Alliance Machine Company, Bethlehem Steel, Carnegie Steel, Illinois Steel, Lorain Steel, Mineral Point Zinc, Morgan Engineering, National Tube, Pennsylvania Steel, Shelby Steel Tube, and the Youngstown Sheet and Tube companies.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Du Bois Iron Works, Du Bois, Penn. Gas and Gasolene Engines. Pp. 35, illustrated; paper, 6x9 inches.

C. O. Bartlett & Snow Company, Cleveland, Ohio. Catalog No. 16. Mechanical Dryers. Pp. 60, illustrated; paper, 6x9 in.; 1907.

D. T. Williams Valve Company, Cincinnati, O. Williams Oil and Grease Cups. Pp. 20, illustrated, paper, 3½x6 in.; May, 1907.

Buffalo Forge Company, Buffalo, N. Y. Buffalo Steel Plate Planing Mill Exhausters and Dust Separators. Pp. 4, illustrated; paper, 3½x6½ inches.

C. W. Hunt Company, West New Brighton, New York. Catalog No. 072. "Hunt" Coal Handling Machinery. Pp. 63, illustrated; paper, 7x9 inches.

Monongahela Manufacturing Company, Monongahela, Penn. General Miscellaneous Coal Handling Machinery. Pp. 120, illustrated; paper, 9x12 inches.

Jeffrey Manufacturing Company, Columbus, Ohio. No. 57 B. Jeffrey Conveying Machinery for Saw Mills, etc. Pp. 72, illustrated, paper, 6x9 in.; March, 1907.

B. F. Sturtevant Company, Hyde Park, Mass. Bulletin 143. Generating Sets with Horizontal Engines, Class HCr. Pp. 7, illustrated, paper, 6½x9 in.; March, 1907.

The Railway Materials Company, Chicago, Ill. Bulletin No. 5. The Park Automobile Loader and Conveyor. Pp. 14, illustrated, paper, 6x9 in.; October, 1906.

Vulcanite Portland Cement Company, Flatiron Building, New York City. Pamphlet No. 7. Cement Sidewalk Paving Suggestions as to Method of Construction. Pp. 24, illustrated, paper, 6x9 in., 1907.

Allentown Rolling Mills, Allentown, Penn. Pump Data No. 11. The Aldrich Electric Boiler Feed Pump. Pump Data No. 12. The Aldrich Electric Sinking and Recovery Pump. Pp. 8, illustrated, paper, 6x9 in.

Chrome Steel Works, Chrome, N. J. Chrome Steel Wearing Parts for Cement Grinding Mills. Pp. 13. A Tempered Steel Jaw Plate for Blake Type Crushers. Pp. 8, both illustrated, paper, 5x7 in.; 1907.

Construction News

Silver Creek, South Dakota—It is proposed to enlarge the stamp mill at the Gordia mine. L. M. Kearney, Rochford, South Dakota, is owner.

Nelson, Kentucky—The Nelson Creek Coal Company is preparing to open mines and install machinery. John W. Bastin, Nelson, Ky., is general manager.

Horse Branch, Kentucky—The Lillian Coal Company is preparing to open a coal mine and will need machinery. Frederic Ackart, Central City, Ky., is secretary.

Christiansburg, Virginia—The Rorer Anthracite Coal Company is preparing to open coal mines and build a breaker, and will need machinery. M. H. Corgan, Nanticoke, Penn., is president and general manager.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

May 15. The office of State [illegible] commissioner of California was abolished at the last session of the legislature, so that W. W. Waggoner is now out of office. Last week the State Department of Engineering came into existence under the new law and will perform the functions before belonging to the Department of Highways, Public Works Commission, Débris Commission and Lake Tahoe Débris Commission. Nathaniel Ellery is the new State engineer. The State débris commissioner was a useless official at best, as all the work in that connection was done by the California Débris Commission, a Federal board composed of officers of the Engineer Corps, United States Army, and still in existence. Whatever business in the subject of mining débris is necessary to be done, can be carried out by the California Débris Commission, empowered by act of Congress, and the new State engineer can consult with them when State interests are in any way affected.

The opening of spring has renewed the interest of the new mining camps in the mountain county of Modoc where mineral discoveries were made at several points last year. Miners, prospectors, and promoters are now going to the Hoag, Bidwell, New Pine Creek and Windy Hollow mines. Indications are that all of that country will be prospected much more closely than it ever has been before. Many of these people represent capital, not merely of the promoter kind, but that which is able to make sound investments. Numbers of these come from Goldfield and other newer Nevada mining camps, and are pleased with the prospects and what developments have already uncovered. The main drawback at present is the quantity of snow still lingering on the mountains. This is not melting very fast at present, because of the cool weather.

In another county not generally considered as a mining [illegible] siderable interest is being shown in copper deposits. The Tom-Head mountain copper belt is 30 miles due west from Red Bluff, or 42 miles by the wagon road which passes by the Blossom, Burrill, Pettyjohn and Stevenson ranches. The road is practically level for a distance of 32 miles to Stevenson's. From this point the elevation increases rapidly for the next 10 miles, until the camp of the California & Massachusetts Copper Mines Company is reached at an altitude of 4300 ft., and 42 miles from Red Bluff. The great mines in [illegible] have been largely developed in the past six years in spite of many obstacles which are not encountered in the Tom-Head district, where topographical conditions, etc., favor cheap mining. It is true that at present no railroad has penetrated this region, but the old Humboldt trail passes directly over the property now being operated by the California, and this great natural highway to the port of Eureka will unquestionably some day be paralleled by a railroad to the coast. The supervisors of the county are building roads and bridges, and on their completion mining will be greatly facilitated, and it will be practicable to haul freight both ways at all times during the year, as the road is of such a character that for seven months in each year an automobile can be driven from Red Bluff to within 60 ft. of the company's principal works.

For a year or more mining affairs at Nevada City have been rather dull, which was due mainly to the Champion-Home litigation. Now several of the mines are again active and miners are employed in the following number: Champion, 100; Murchie, 40; other Willow Valley mines, 40; Union, 12; Blue Tent, 12; Mountaineer, 20; Oustomah, 14; Union Hill, 12; Charronat, 10; Indian Flat, 10; miscellaneous, 140; total, 511. This is an enumeration of miners only, although men otherwise employed about the mines will swell these figures. The pay roll is increasing, too, and can be added to by those employed in the many mines that draw supplies and put money in circulation for living expenses directly to the business of Nevada City. There are other mines being constantly opened, and considerable capital is being interested in developing claims in the Willow Valley district.

The Mount Shasta Mines Corporation was sold this month for over $50,000. The property was bought for the benefit of the bond-holders. The sale was made under a trust deed. The company was in a tight hole three or four years ago, being heavily in debt to local creditors and others. The company paid its debts by a bond issue—100 bonds of $500 each, secured by a trust deed. The bonds were not to be paid until 1911, but the company defaulted on interest and the property was sold under the trust deed. The transaction involves the transfer of the Mount Shasta, Lucky Boy, and Monitor Mining claims, together with all improvements, including mill, hoisting works, bunkhouses and office building.

The Keystone mine at Amador City, owned by J. M. McDonald, is reported sold to Nevada men. This mine has been worked for more years than any other in the State and it is estimated has yielded over $9,000,000 since it was opened in the fifties.

The plant of the Hercules Powder Company at Pinole has been tied up through the refusal of the union men to work at the side of 11 non-union machinists who struck for an eight-hour day. Nearly 1000 men are affected by the strike.

Salt Lake City

May 17—The deal, which had been pending for some time, for the sale of the properties of the Bingham Amalgamated Copper Company, in Bingham, has been declared off and the company will continue to operate its property as heretofore.

Negotiations have begun looking toward the sale of the Conger mine in Bingham. It is planned to effect a coalition with several adjoining properties.

Notice has been received from the headquarters of the Boston Consolidated Mining Company, to holders of the debenture bonds of the company that they will be retired Nov. 1 next at £105 for each £100 bond. About one-half of the issue has already been converted into stock.

The Utah Copper Prince Mining Compeny has filed articles of incorporation to develop a mining property in Utah county. William Snell is president and L. A. Watson, of Salt Lake, secretary.

A contract has been let to the General Electric Company, to equip the Copperton mill of the Utah Copper Company, with additional electrical machinery. The plant will be operated in the future by electric power generated from the Garfield plant now nearing completion.

It is believed that something definite regarding the proposed coalition of the Silver King, Keith-Kearns and other Park City mines will be released within the next 30 days. The matter of titles is being looked into, and as soon as the examination is concluded, the proposed Silver King Amalgamated Mines Company, will be organized. F. Augustus Heinze is interested in this enterprise.

Dividends for May payment have been declared by several mining companies operating in Juab county, as follows: Beck Tunnel Consolidated, $40,000; Grand Central, $10,000; Utah (Fish Springs)

$3000; Lower Mammoth, $9500; Colorado, $40,000. The two last named mines are represented in the dividend column for [illegible]

The Scranton Extension Mining Company has been organized to develop property near the Scranton mine in the North Tintic district. George Beck, of Lehi, is president.

The directors of both the Uncle Sam Consolidated and May Day Mining companies have decided upon a plan of consolidation, which now awaits ratification by share holders. It is proposed to form a new company, to take over the assets of the older organizations, without reference to the Humbug ground and the four-fifths interest in the Richmond & Anaconda mine, owned by the Uncle Sam Consolidated Company. Shareholders of the Uncle Sam and May Day will share equally in the stock of the new organization.

The Newhouse Mines and Smelters corporation produced over 1,000,000 lb. of copper during April. A total of 26,000 tons of ore were mined and the recovery of gold and silver amounted to about $2.50 a ton.

The Murray smelter of the American Smelting and Refining Company, was forced into idleness last week on account of a strike of laborers—mostly foreigners. The company has granted a slightly increase in wages and some of the furnaces have been started again.

At the annual meeting of shareholders of the Nevada Douglas Copper Company, operating at Yerington, Nev., the following officers were elected: President, J. D. Wood; vice-president, F. J. Hagenbarth; secretary and manager, Walter C. Orem; treasurer, W. V. Rice, of Salt Lake; who, with Henry P. Henderson, of Salt Lake; A. J. Orem, C. H. Hastings, F. A. Schirmer, of Boston and A. L. Pearse, of London, Eng., are directors. The financial statement showed a cash balance on hand May 11 of about $44,000. The installation of an air compressor and other large equipment is in progress. Facilities for ore treatment will probably be provided during the year.

Denver

May 17—Amid the cheers of thousands, the blowing of whistles, and the ringing of bells, Lieutenant Governor Harper, of Colorado, pressing an electric button, on May 11, started the work on the new drainage tunnel, in the Cripple Creek district. A number of special trains brought a large number of visitors, to whom a hearty greeting was extended by Mayor Van Tilborg, of Cripple Creek. The mayors of the leading towns of the district made short addresses, which were responded to by prominent citizens of Denver, Colorado Springs, and other points, after which President Alderson, of the School of Mines, made the address of the day on the "Opening of the Cripple Creek Drainage Tunnel—Its Significance in Scientific Mining."

A mining deal of considerable importance, involving two large properties located in the Black Hills, has just been closed in this city, when the Hidden Fortune and the Columbus Consolidated properties were consolidated under one management, the headquarters of which will be in New York.

It is reported on good authority that the Carpenter smelter, at Golden, has been sold by Berry Brothers, of Detroit, to a syndicate, which intends to start operations before long.

The Federal grand jury, impanelled in the United States Court will investigate land frauds, including coal and timber lands, which have been committed in this State, and interesting developments may be expected. Action is taken on the reports of the special corps of investigators, which has been at work for some time past. Judge Lewis, in his instructions to the jury, laid special stress on the matter of showing favors to anyone, on account of good reputation or influence in the community.

Naturally the great trial at Boise, Idaho, of the leaders of the Western Federation of Miners is being watched here with great interest, all three being residents of this city.

During the month of April the output of the tungsten district in Boulder county, was 120 tons of concentrates, valued at about $75,000. During this year tungsten concentrates to a value of about $235,000, have been shipped.

Scranton

May 21—The Delaware & Hudson Company is building a large pumping station on its property in Plymouth Junction, to be located at No. 1 shaft. A tunnel is being built to the Susquehanna river, from which the water will be pumped to the new washeries to be built at No. 3, No. 5 and Boston collieries. The station will be one of the largest in the anthracite region.

Extensive improvements are being made by the Delaware & Hudson in the neighborhood of Wilkes-Barre for the purpose of tapping the collieries of the Kingston Coal Company. At present all the coal of the Kingston company is shipped to market over the Lackawanna Railroad and these collieries are among the most productive in the region. Last year the company shipped 1,195,581 tons over the Lackawanna road. A new market for the coal will be found by the Delaware & Hudson.

Fred E. Zerby, of Wilkes-Barre, has been appointed general manager of the Kingston Coal Company to succeed the late Robert S. Mercur. For the past five years Mr. Zerby has been superintendent of the Wyoming division of the Lehigh Valley Coal Company.

Toronto, Ont.

May 20—The buildings of the reduction plant of the North Ontario Reduction and Refining Company, at Sturgeon Falls, Ont., the construction of which was commenced in October last, are now completed, in readiness for the installation of the machinery. The main structure is 126 x80 ft., the central portion of the building being 60 ft. in hight. It is erected upon a foundation of solid masonry. The plant is not a smelter, as the term is usually understood, but will be operated by the "hydro-electric" process for treating ores. It was erected by W. B. Holman, of Grand Rapids, Mich., and O. L. Young, manager of the Idaho Reduction Works, who are both directors of the company. In addition to the main building there is a sampling plant or laboratory, a two-story building, 35x75 ft.

The machinery is all under contract. The boilers and engines, built at the Scannell Boiler Works, Lowell, Mass., have been shipped. The crushing plant and electrical machinery are furnished by Allis-Chalmers-Bullock, Montreal, and it is hoped to have the plant installed and ready for operation by July. It will have a capacity of 300 tons per day. The capacity of the sampling plant is three tons per hour, and as soon as it is finished it is intended to treat Cobalt ores in small quantities until the large plant is ready. A rough estimate of the total cost is $75,000.

It is claimed that by this process all the metallic contents of the Cobalt ores, in addition to silver, can be saved. The transportation facilities are good, as the site faces on the river, and a railway siding connects it with the Canadian Pacific main line. The town of Sturgeon Falls has given the company a bonus of $8000 and exemption from local taxation for 10 years.

London

A short time ago, in writing of the organization of a new company to manufacture aluminum, I referred to the prosperous state of the British Aluminum Company. The results of the working of this company during 1906 are now to hand and show a profit of no less than £155,023. This result, for a company which struggled for many years through financial and technical difficulties of an almost overwhelming character, is particularly gratifying. In the early part of this year the capital of the company was increased from £700,000 to £1,300,000, in order to cope with the demand for the metal. The company originally started at the Fall of Foyers on the Caledonian canal in Scotland, but the water capacity there has proved to be ridiculously small, besides which the dues on vessels passing up the canal added seriously to expenses. The intention is to abandon Foyers eventually and to concentrate operations at Ballachulish.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

TALLADEGA COUNTY

Talladega Graphite Company—This company has been organized to develop some promising graphite deposits. It will have its main office at Talladega and its plant at Ashland, Ala. The plant has already been installed, and its product will be refined graphite for commercial purposes. Officers of the company are: President, A. A. Allen; vice-president, J. E. Michael; secretary and treasurer, C. H. Michael.

Alaska

KETCHIKAN DISTRICT

Copper mining on a larger scale than heretofore will be the record for this season in southeastern Alaska. The outlook is especially bright for that district which draws its mining supplies from Ketchikan, the Ketchikan mining district. Practically all the mines or prospects that have ever shipped ore are working a large and an increasing force of miners. Prince of Wales Island continues to be the center of production, almost all the present producing mines being located upon that island. Prospectors report much snow upon the mountain slopes, making moving very difficult. Heavy rains would melt the snow, aiding the prospector greatly.

The matte smelter at Hadley, Prince of Wales Island, is again working to its full capacity. The furnaces were blown in about May 1. It is to be hoped that a sufficient supply of coke can be obtained to permit the continuous operation of this plant. Labor troubles at the coal mines of British Columbia have, this past year, produced a shortage of fuel for this district. At present a full fuel supply cannot be obtained, and a little uneasiness is felt for the coming season. Several thousand tons of ore are now contracted for by the smelter, and the expectation is that the shipments to British Columbia and Tacoma smelters will also be large.

Colorado

GILPIN COUNTY

Barnes—This group of three claims on Quartz hill, owned by Byron S. Lake, of Denver, has been sold to New York people, who will organize a company. The purchase price was $25,000. The main shaft is down 750 ft. and the production to date is $75,000. H. A. Hicks, Central City, Colo., is agent.

Eldorado — Pennsylvania people have purchased the lease and option of E. S. Moulton on this property in Spring gulch and have organized the Gilpin & Eldorado Mining and Milling Company. H. Earhardt, Central City, Colo., will be manager. The company proposes installation of a heavier plant of machinery and will erect its own stamp mill in the future.

Kansas Bee Gold Mining and Milling Company—Eastern and Colorado people are interested in this incorporation and will arrange for heavy operations at an early date, with B. L. Martin, Central City, Colo., as manager.

Old Kentucky—Thomas F. Daly, of Denver, has acquired by sheriff's deed this group in Hawkeye district, together with machinery, buildings, and improvements formerly owned by the Old Kentucky Gold Mining Company. Arrangements will be completed for the resumption of operations at an early date.

Plateau Mining, Milling and Development Company—This company has absorbed all of the interests of the Bullion company in the Pine Creek district, Omaha, Neb., people are interested and they will arrange for operations on the consolidated group. E. J. Adams, Apex, Colo., is manager.

LAKE COUNTY—LEADVILLE

With the resumption of work on a number of old properties, and the starting of new shafts the Arkansas Valley smelter finds itself overstocked with sulphide ores, and has placed a restriction on this class of ore. All of the large producers are cut down about half, and but little of this class of ore is being taken from the smaller men. There is a movement on foot by Denver, Pueblo and Eastern capital to start up the old Elgin smelter, to relieve the congestion of the ore market. This plant was especially equipped a few years ago for the treatment of sulphide ores. In the present condition of the market the American Smelting and Refining Company, no doubt, would willingly take the matte which would assist materially in smelting the refractory ores daily received at the Arkansas Valley plant.

The two new mills that have been in course of construction during the spring will start work before the end of May. The Leadville District Milling Company will treat the dumps of the Ibex Company; a conservative estimate places the dumps at 1,000,000 tons. The other mill on Carbonate hill, to treat the ores found in the dumps of the Morning and Evening Stars, [illegible] It is expected that the lead concentrates received from the two mills will greatly assist the local smelters in getting rid of some of the extra tonnage piled on the dump, and enable it to run at full capacity. The closing down of the smelter at Murray, Utah, should help the local plant as the lead ore will probably be diverted here.

Bessie Wilgus—This shaft, Rock hill, has now reached a depth of 700 ft., and drifting has been started north and south. The ground at this depth will be thoroughly prospected to locate the main ore-shoot that trends from the Reindeer through this territory.

Rock Hill—With the [illegible] loads the properties on this hill are able to resume shipping. The Reindeer is outputting in the neighborhood of 75 tons daily; from the Rock and Dome 30 tons are going out; from the Casey lease 100 tons of good iron are being shipped daily, and the President is shipping 30 tons of low-grade sulphides. Sinking the new shaft on the Delaware has been started. Still farther west the new shaft on the Alhambra placer, has reached a depth of 500 ft., and is in the porphyry; it will be sunk 150 ft. deeper when drifting in different directions will be started. At the Nil Desperandum a body of low-grade sulphide has been caught in the lower south drift.

R. A. M.—The lessees working this property, Iron hill, are at present driving a drift to connect with the Pyrenees shaft from the 1000-ft. level, and when the connections are made all of the pumping will be done from the latter shaft. An attempt was made to reach the orebody below the lower level from the Pyrenees shaft, but it was found to be so hot that it was impossible for men to work. When the connection is made it will supply plenty of good air.

Yak Tunnel—In addition to the regular monthly output of ore the company is doing a large amount of development work on different claims. The Louisville, which is being worked from the tunnel level, is shipping 30 tons daily of a good grade of sulphide. An upraise is being carried in the M. N. ground, Breece hill, to connect with the shaft from the surface. When this work is completed the opening of the large body of zinc ore in the property will be commenced.

Elgin Smelter—The increase in the output of low-grade sulphide ores, and

the lack of smelting facilities has brought to the attention of several capitalists the advisability of starting this plant. Although it has been idle for several years the machinery is in good order, and all of the furnaces are adapted for the treatment of sulphide ores. Arrangements for the purchase of the plant are now going on and should be settled definitely within a short time.

Leo Shaft—A drift is being run from the bottom of the shaft, head of California gulch, following a small streak of zinc ore, and the impression prevails that it is a stringer from the main North Moyer ore-shoot.

Sunday—This property, Ball mountain, has resumed shipping and the grade of ore is higher than the average hitherto sent from the property. The main shaft is still being sunk and will reach the objective point about the middle of the month, when it will be 450 ft. deep. Drifting from the bottom to the vein will then be started.

SAN JUAN COUNTY

Work in the San Juan is opening up well as the heavy snows of the past winter are going off.

Peerless San Juan—This company has found some good ore in its mine near Silverton. Orders have been placed with the John A. Traylor Machinery Company, of Denver, for a 420-cu.ft. cross-compound belt-driven air compressor, with 75-h.p. A. C. motor; also for Hardsocg wonder air-hammer drills and piston drills.

Michigan

HOUGHTON COUNTY COPPER

Osceola—The Calumet & Hecla Company has filed its answer in the United States circuit court for the western district of Michigan in the equity suit brought by A. S. Bigelow to restrain the defendant corporation from acquiring control of Osceola. The Calumet & Hecla charges that the plaintiff has perpetrated a fraud upon the court by acquiring "an ostensible legal title" to 23 shares of Calumet & Hecla stock for the sole purpose of instituting proceedings against the defendant, his object being not to protect the interests of the stockholders, but to maintain control of the Osceola corporation. Calumet & Hecla admits it has brought 40,080 of a total of 90,000 shares of Centennial, 42,828 shares of a total issue of 100,000 shares of Allouez, and 22,671 shares of Osceola out of 96,150 shares issued, and that it has proxies representing over 25,000 shares more. The defendant denies that it has or could have any purpose to secure a monopoly of the production of Lake copper. It admits that it has expended for the purchase of Allouez, Centennial and Osceola not less than $6,000,000 but denies that these companies are competing companies. The defendant denies that it has any intention to acquire any interest in Tamarack or Isle Royale, or that it ever intended to alter the legal status of the Ahmeek, Laurium or Seneca companies as independent corporations in any degree whatever, and charges that Mr. Bigelow and his associates own a controlling interest in each of the latter companies. Calumet denies that it ever intended to acquire or combine with the Quincy Company, and says that Mr. Bigelow's alleged apprehensions and charges in that behalf are without any foundation in fact whatsoever.

The defendant says its acts and purposes will tend to increase competition of Lake copper with the production of the world. It further avers that "the relations now and heretofore existing between the companies controlled by the Bigelow syndicate, and also the relations between the Osceola and the other 'Bigelow mines' have resulted in loss and damage to the stockholders of the Osceola;" that stockholders have become dissatisfied with the management, and desire a change.

KEWEENAW COUNTY COPPER

Cliff—The Keweenaw Central Railroad is building a spur into this property, and as soon as completed rock shipments will be made from openings and stock-pile. The new shaft-house on this property is nearly completed.

Keweenaw—This company is considering putting in an electric plant at the Mandan property to furnish light and power.

Mohawk—The management at the mine is considering the advisability of adapting electrical power for mining purposes. T. A. Chatman, of Chicago, is consulting engineer and is at the mine going over the ground. The third head at the stamp mill has been compounded and will go into commission in a few days; as soon as this head is in operation the fourth will be altered. With these improvements made the production from then on should show marked increase over the first quarter of the year.

Missouri

ZINC-LEAD DISTRICT

Alpha—The lead strike of this company in No. 2 shaft on the 135-ft. level, is more than bearing out the drill indications, and is especially rich. This is the same company that located a channel deposit last year and has been making large turn-ins for several months. Developments have proved it a double channel, with a 10-ft. rib intervening. These two channels have been driven, side by side, for several months, with here and there a door cut through the bar. Drilling and cross-cut drifting have proved the existence of open ground and no ore each way from these parallel channels. Other channels have been located in the same vicinity by the Argosy Mining Company, Stevens & Co., and Adams & Co.

Lewis Land—This land at Alba is coming into prominence along with other property in the Alba-Neck City district. On the 220-ft. level a 16-ft. vein of ore has been penetrated by drilling. The second hole has been started in an effort to locate the extension of the orebody. Drilling will be continued until the full extent of the vein is determined. A shaft will be started immediately on the first drill-hole. This land is two miles east of Alba.

Lyon-Dougherty Land—In the fifth drill hole put down on their 10-acre lease of this land southeast of Prosperity, Lon Hatcher and associates have penetrated a 25-foot vein of sheet ore on the 190-foot level. This promises to be a big producing property when fully developed.

Rohrer Land—The drill on the Henry Rohrer land, near Sarcoxie, which a few days ago encountered silicate and lead ore on the 50-ft. level has since encountered zinc at the 98-ft. level in another hole. This is the third hole put down on this land and a shaft has been started on the second. The Optimo and the O. K. mines in the same locality are doing well at present.

LAWRENCE COUNTY

It is claimed at Aurora that geologists have pronounced a section south of Aurora, in Lawrence county, an undeveloped ore area, and the owners of a 160-acre tract have contracted for an extensive amount of drilling.

Montana

BUTTE DISTRICT

Anaconda—The shaft on the High Ore mine of the company is 2780 ft. deep, and will be continued to 2800 ft. The veins will be crosscut at the 2600 and bottom. The Neversweat has been closed down a few days on account of a break in the hoisting engine, but will be in operation soon. The work of re-timbering the shaft of the Belmont is under way and will consume some time, as the opening will be enlarged to three compartments.

Boston & Montana—All mines of the company are in operation, and are yielding an average of 3300 tons of ore a day. The shaft of the West Colusa has reached 1700 ft. An immense tonnage has been blocked out in this mine, the Leonard and the Mountain View. The shaft on the Badger State has passed the 200-ft. mark, and is to be sunk to the 1800-ft. level.

Butte & London—The shaft reached 1000 ft. May 20. The new 1000-gal. pump has arrived, and is going into the 800-ft. station.

Coalition—The Rarus shaft is 2100 ft. deep, and is to be sunk to the level of the West Colusa, in order that the water may drain into the latter, and thence to the Leonard. The air-shaft, now two compartments, and 1400 ft. deep, is being en-

largest [illegible] in progress from below. The lower workings are well aired, but the air is warm. In driving for waste for filling purposes several new bodies of ore have been struck recently in the lower workings, but their extent is not yet known. The shaft on the Minnie Healey is finished to the 1400, but not entirely timbered.

Davis-Daly Estates—Crosscutting north of the 400- and 600-ft. stations in the Mt. Moriah continues without the interception of veins so far. The shaft is sunk in a mineralized vein. Drifting east and west at the 500 of the Smokehouse has not shown bodies of commercial ore. The vein struck in the crosscut south of the 1800-ft. station of the Original, has not been crosscut, and its width or character is not known. The flow of water from it is still heavy, though greatly diminished. The shaft on the Colorado will reach 1000 ft in a short time, and after a station is cut and pump installed a crosscut will be driven north from the station to tap the Baltic vein, supposed to be a continuation of the Moonlight and Blue Jay.

North Butte—The face of the crosscut heading, north from the 1600-ft. level of the Jessie has entered Berlin ground, and will have to be driven between 300 and 400 ft. before it strikes the Berlin vein. Legal complications over the sale of the Berlin group to the company have caused delay in the beginning of work in the shaft on that property. The company is cutting skip pockets at the 1800 level of its main shaft and mining about 1200 tons of ore a day. It expects to resume sinking when this work is finished.

Fergus County

North Moccasin—The controlling interest in this property, near Lewiston, has been sold to the Barnes-King Development Company. The stock was held by John A. Drake.

Nevada

Esmeralda County—Goldfield

Combination Fraction—The Morton-Beesley lease on this mine has a 7-ft. body of ore averaging between $500 and $600 per ton. The lessees have but 40 days to continue their operations before the property reverts to the company. Consequently every effort will be made to run the ore out as rapidly as possible. The average daily output now is valued at $50,000 but within the next 10 days this will probably be doubled.

Little Florence—A shipment of 75 tons of high-grade ore has been made to the Salt Lake smelters. Some of this ore averaged over $1000 per ton. The vein still holds its strength and has every appearance of being permanent.

Great Bend—A new electric power plant has been installed, and within a few days sinking operations will be resumed. The shaft will be run straight down to the [illegible] level.

[illegible] ending May 6, the ore shipments of this company amounted to 1000 tons, which is the best for the year so far, and shows that the railway is giving better service.

Lyon County

The new mining town of Alberta is situated on the eastern slope of the Mason Valley range, in which the Yerington copper mines are located, and on the west bank of Walker river. The preliminary survey of the proposed branch of the Oregon Short Line crosses the southern corner of the townsite. The eastern portion of the town lies 20 ft. above the river and gradually rises about 25 ft. at its western limit, thus assuring drainage. Alberta overlooks the entire Mason valley, which is the largest fertile valley in the State. The Bluestone mine is in the range just above the town, and the reduction works of this mine, now being built to reduce 1000 tons of ore daily, are between the mine and Alberta.

Nye County—Bullfrog

Eagle—Work on this property has hitherto been confined to surface trenching chiefly. At present the sinking of a shaft and the running of a long crosscut tunnel are being undertaken, the surface indications having warranted the management in launching out into substantial development work.

North Star—The main tunnel has been run in 400 ft., and there are good indications that it is rapidly approaching the main ledge.

Oasis—The shaft has been sunk to a depth of 70 ft. on the ledge, which on this surface outcrops for a distance of 3000 ft. The ledge is over 40 ft. wide on the surface. Sinking will be continued to the 200-ft. level before driving is started.

Pioneer—Active prospecting work is being done on the surface of this property, which is well located in the Mayflower section of the field. A vein-bearing formation 48 ft. in width has been uncovered assaying up to $10 per ton. It is proposed to commence sinking a deep shaft on this formation within the next fortnight.

Shoshone—The main shaft has reached a depth of 440 ft., and is in the lode which at the bottom shows free gold, and assays well. This is the deepest orebody yet opened on the field. The management is shipping a carload of rich ore daily to the Salt Lake smelters from the Shoshone, and, beginning the present week, similar shipments will be made from the company's Polaris mine. In this mine a large body of shipping ore has been cut in the 300-ft. level.

[illegible]

Gold Crater—Preparations are being made to start the sinking of a new vertical working shaft to a depth of 350 ft. A new hoist has been installed, and it is expected that men will be put to work soon sinking. The preliminary prospecting operations proved the mine to be valuable.

Otero—The shaft is being sunk to the 100-ft. level as rapidly as possible. It is in good ore at present, and the management is sanguine.

Thanksgiving—Drifting has been started from the 236-ft. level along the vein, and a crosscut is being run to the hanging wall. For a distance of 9 ft. across the vein assays return values up to $300 per ton. The vein is almost vertical, and is mineral-bearing from the surface to the bottom level.

Nye County—Tonopah

Ore Shipments—Shipments of ore over the Tonopah Railroad for the week ending May 9 were: Tonopah Company, 1568 tons; Belmont, 435; Montana-Tonopah, 125; Tonopah Extension, 220; Midway, 80; total 2428 tons. In addition the Tonopah Company shipped 3305 tons to its mills.

Midway—Development work continues to be carried out systematically. The workings are looking well. Large and valuable orebodies have been opened up, and shipments of high-grade ore are being made whenever the management can secure railroad accommodation.

Rescue—Rumors have been prevalent in Tonopah lately of a rich strike in this mine. The manager, however, denies that a valuable strike has been made, but he hopes to make an important announcement shortly. The north and south crosscuts on the 650-ft. level are each out 140 ft. They are in a formation carrying numerous quartz stringers showing assay values, which indicate close proximity to an orebody. It is possible, however, that it will be necessary to sink the shaft a farther distance before a permanent orebody is discovered.

Tonopah Extension—The shaft has now reached a depth of 980 ft., and when the 1050-ft. level is reached preparations will be made to crosscut to cut the vein at that depth. Stoping is being done in all the Western levels from 270 to 600 ft The vein varies from 30 to 40 ft. in width, with an average value of $100 per ton. There is sufficient amount of ore already developed in the mine to keep a 100-stamp mill running steadily for a number of years, and consequently, the company has decided to erect such a mill in the Tonopah district. The company's engineering staff is now engaged in drawing plans and estimates for the mill, and it is probable that steps will be taken to commence its erection within the next three months.

North Carolina

The stockholders' committee recently issued the following notice to stockholders: "The Union Copper Mines Company, with capital of $2,500,000, full-paid and non-assessable, divided into 500,000 shares of par [illegible] incorporated under the laws of Maine, and has purchased the property of the Union Copper Mining Company, which was sold by order of the court in the receivership proceedings. The committee has been successful in completing the arrangement which it undertook to secure between stockholders and creditors of the Union Copper Mining Company and shares of the old company may be deposited at any time before June 1, 1907, with T. C. Buck & Co., 42 Broadway, New York, and for two shares of the old company so deposited one share of the new company will be given.

Oregon

Baker County

Dredging—Eugene Pearson, of Portland, and associates, have incorporated the Burnt River Consolidated Mining and Dredging Company capitalized at $1,500,000, and have purchased 1200 acres of placer grounds 28 miles south of Baker City, over Dooley mountain, on Burnt river, the land including 500 acres fit for dredging, from the Merchant's Mining Company, W. J. Patterson, of Baker City.

The ground is covered with several reservoirs and ditches and has plenty of water. The gravel is 22 ft. to bed rock. Two giants are working now and there is water sufficient for six; it is expected to put in several more immediately. A large dredge will be put on the land in another year.

Poorman—Engineer John Arthur, of this copper group, Goose Creek, reports his men are now crosscutting the vein and are in 30 ft. on ore. The ores are iron and copper sulphide. The group is 28 miles east of Baker City.

Indiana—This mine, J. W. Messner, manager, is now down 400 ft. Manager Messner will sink to the 600-ft. level and continue development work before beginning the shipment of ore or the erection of his own smelter. The Indiana is 28 miles northeast of Baker City.

Pennsylvania

Anthracite Coal

A new coal company has been organized in Philadelphia to work some coal lands in Luzerne county. The officials are Charles C. Burchill, of Mahanoy City, president; Louis McCaffrey, of Philadelphia, vice-president; William Nicewenter, of Shenandoah, treasurer, and Henry Keiper, of Shenandoah, secretary.

Delaware & Hudson—This company is installing two new Hamilton-Corliss engines at the fan-house of No. 2 colliery, near Plymouth.

Coke

Dunlap Connellsville Coke Company—This new company has acquired a tract of 155 acres of coking coal in Redstone township, Fayette county. William A. Bishop, Connellsville, Penn., is president.

Unity Connellsville Coke Company—This company has bought land in Unity township, Westmoreland county, and is preparing to open mines and to build 150 coke ovens.

South Dakota

Custer County

Hartwell—The tunnel is now in 67 ft. from the first set of timbers, and the mine is showing up better. Rails for the tunnel track, a car, and other machinery, have been purchased, and the force of men will be increased in June.

Saginaw—A new 100-ton mill is being installed at this mine, seven miles northwest of Custer. The mill will be arranged so as to treat all the different kinds of ore on the ground. Machinery for crushing, concentrating, amalgamating and cyaniding will be installed. A new hoist is also going in, and a safety cage.

Lawrence County

Columbus—The deal whereby the Hidden Fortune holdings were to be incorporated with those of the Columbus has been consummated. The property of the former company was bid in at public auction by E. Nesmith, of the Colorado Iron Works, on a judgment of $239,000. This judgment was immediately made over to the Columbus. This company has increased its capitalization to $7,000,000, and has issued bonds to the amount of $400,000. It is the intention of the company to commence work on both properties at an early date, to put the Hidden Fortune mill into running order, and to build an aërial tramway to bring the ores from the mine to the mill. The company now has nearly 1000 acres, and a supply of ore running from $3 to $5 a ton, together with some of high grade.

Globe—Continuous operations on this property have resulted in opening up a vein 30 ft. wide and averaging $12 a ton. This is in addition to the bodies of low-grade ore. Work at the mill goes on rapidly. Practically all the machinery has arrived, and it is expected to have the works in operation by July.

Gilt Edge Maid—At a special meeting of the stockholders held in Deadwood the directors were authorized to issue bonds to the amount of $200,000. With this amount the company's debts will be paid, and funds supplied to carry on development work.

Homestake—Flooding of the mine is progressing rapidly, and will be accomplished by the end of this month. A new high-pressure compressed-air motor has arrived, and as soon as work recommences, will supersede the small steam engine which has been used for transporting ore between Lead and Terraville. The new motor weighs 8½ tons, and is similar to the one which has been in use on the Lead side for a number of years.

Utah

Iron County

Jennie Extension—In a shaft on this property, near Gold Springs, 4 ft. of ore averaging $13 a ton has been encountered. C. A. Short, of Gold Springs, is manager.

Jennie Gold—The new mill at this property continues in successful operation. A large compressor plant is to be installed soon.

Juab County

Beck Tunnel Consolidated—This company has decided to sink a new double compartment shaft. It will be located near the center of the property, and will be the main working shaft. Superintendent John Roundy expects to encounter the orebody at 300 ft. depth.

Salt Lake County

Bingham Copper—This company has broken ground preparatory to the installation of a compressor plant. The management has planned a broad campaign of development. E. W. Clark, Ophir, Utah, is president.

Columbus Consolidated—At Alta, this company is sinking four shafts. Ore will soon be moved over the aërial tramway operated out of the district.

New England Gold and Copper—Manager H. M. Adkinson states that the output of concentrate from the mill hereafter, or until the plant is again enlarged, will be on the basis of one carload every two days. In the mine, which is situated in Bingham, conditions are satisfactory.

South Columbus—Four drifts are being run in ore in this Alta property, which will soon become a regular shipper.

Utah Apex—The April earnings of this company amounted to about $24,000 net. About 100 tons of high-grade and 300 tons of mill ore are being mined daily. The Markham Gulch mill, owned jointly by the Utah Apex and Utah Development companies, will be in commission within a week.

Tom Moore—A contract has been let to drive the main tunnel in this Bingham property 100 ft. farther.

Washington County

Utah & Eastern—The smelter of this company at Shem City is in operation again, the April output being about 93,000 lb. The plant was running only a portion of the month, however. The company op-

erates a [illegible] ...ter and nearest railroad point, a distance of about 30 miles.

Canada

Alberta

The Canadian Rand Company, Ltd., is supplying three complete haulage plants to as many collieries in western Alberta—one each to the McNeill Company's anthracite mine at Canmore; the Lille colliery of the West Canadian Collieries, Ltd., of Blairmore; and the Hillcrest Company's mine, near Frank. Each system includes a four-stage air compressor, locomotive, and pipe-line storage. Each train will have a capacity of 40 cars of coal up a 1½ per cent. grade. A similar plant has been installed at the International Coal and Coke Company's colliery, at Coleman, Alberta, and as well at one of the Crow's Nest Pass Coal Company's mines, at Michel, British Columbia.

British Columbia

Centre Star—The Consolidated Mining and Smelting Company, of Canada, is installing at its Centre Star mine, Rossland, an 1150-h.p. Nordberg hoisting engine having cylinders 28x60 in., drums 10 ft. diameter by 5 ft. face, and capacity 1350 tons in 10 hours from a depth of 3000 ft., using 4½-ton skips, in balance. Ordinary speed when hoisting is 2500 ft. per min. Brakes, reversing gear and clutches are operated by auxiliary engines. Corliss valve is controlled by a governor. Hoisting cable is of 1¼-in. steel. The engine is set on massive cement-concrete foundations and housed in a frame building 52x56 ft., erected for the purpose.

Ontario—Cobalt District

Ore Shipments—Shipments from Cobalt continued comparatively light, the total for the week ending May 11 being: Coniagas, 124,000 lb.; Right of Way, 1400; Trethewey, 43,360; O'Brien, 65,210; total, 233,970 pounds.

Green Meehan—At this mine, Cobalt, operations have been considerably delayed by the non-delivery of a compressor which was due Feb. 15. A force of 70 men and three steam drills are at work. The large open cut, which has yielded a quantity of high-grade ore, is down about 40 ft. The main shaft is down over 50 ft., and is yielding a good quality of ore. No. 2 shaft is on a 5-in. vein, carrying high values at 25 ft., and No. 4 shaft has reached at 20 ft. ore carrying a good showing of native silver. A large quantity of low-grade ore is on hand, for the treatment of which a concentrator is to be installed this summer.

Silver Bar—The vein on this property, Cobalt, on which a shaft was sunk for 150 ft., and drifting started, disappeared some time since. Interest has now been revived by the discovery of another small vein of native silver, which has been uncovered for 150 ft. or more.

Timiskaming—In this mine, Cobalt, 27 tons of ore taken from the 75-ft. level of the rich vein, and running from 9000 to 18,000 oz. per ton in silver content, were shipped to the smelter May 15. Another important find of silver calcite ore has been made in drifting at the 50-ft. level.

Big Bear—Twenty-two men are at work on this mine at Cobalt under Superintendent F. L. Cole, who has had experience in Brazil and South Africa. Five veins have been uncovered. Vein No. 5 at a depth of 6 ft. carries niccolite and a good showing of native silver. Two other veins show calcite and smaltite on the surface. A shaft is down 25 ft. on a 7-inch vein of crystallized calcite.

Cobalt Lakes—E. L. Fraleck, superintendent of this company at Cobalt, reports that No. 5 vein at 41 ft. is showing solid smaltite with a quantity of leaf silver. The shaft is down 20 ft. on No. 6 vein and native silver is showing. The compressor will be installed early in May.

Foster—In this mine, at Cobalt, a drift from No. 5 shaft at the 70-ft. level has encountered at a distance of 94 ft. one of the surface veins. It is 8 in. wide of smaltite and carrying native silver.

Timiskaming & Hudson Bay—In this mine, at Cobalt, a fissure from 4 to 5 ft. wide has been uncovered, containing from 4 to 12 in. of solid ore and extending 400 ft. to the boundary of the Nipissing property north of Cobalt town.

Nipissing—The work at Cobalt is now under the direction of T. R. Drummond, the new superintendent. The force of 250 men at present employed will be increased to 600 on the completion of camp buildings for their accommodation. No shipments of ore have been made for some weeks and there are about 10 carloads on hand, including three carloads taken in the course of development work from vein 49, drifting on which has been started at 110 ft. The shaft on vein 26 has reached a depth of 60 ft., but the vein has been struck at 110 ft. by cross-cutting from another shaft and found to be 9 in. wide at that depth, and to maintain its value. Vein 27, which hitherto has yielded the greater part of the output in bulk, from open-cutting, is being worked by drifting at the 60-ft. level and a cross-cut is also being run at the same depth for exploration. The building for the new sampling works is completed; rolls, crushers, etc., supplied by Allis-Chalmers-Bullock, are being installed. It will be the first sampling plant of the camp.

Temagami Silver Mining Company—This company is conducting active development in the Temagami forest reserve. The property comprises three islands on the Cross lake arm of Lake Temagami and the adjacent bed of the lake. On Island A, seven acres in extent, the work [illegible] strong silver-lead 2 ft. wide on the sur[illegible] bottom of which the vein had widened t[illegible] 3 ft. A second vein, 40 ft. distant, has been unearthed, yielding high-grade ore. A copper vein with a surface width of 3 ft. has also been discovered. A small plant has been put in. Superintendent R. E. Patterson, formerly with the Clergue Copper Company, Lake Superior, is in charge.

Ontario—Retired Leases

The Ontario government has cancelled leases covering about 1000 acres of mining lands in Raglan township, Renfrew county, held by the Corundum Refiners, Ltd., of Toronto. These leases were granted on condition that the company would establish a corundum industry and expend $150,000, which it has failed to do.

Africa

Transvaal

The gold production reported for April and the four months ended April 30 is as follows, in ounces fine gold:

	1906	1907	Changes
April	4[illegible]	[illegible]	[illegible]
Four months	1 [illegible]	2 [illegible]	[illegible]

The increase for the four months this year was 22.5 per cent.

The Chamber of Mines reports in regard to native labor that 8318 natives were distributed to the mines during April, while 7335 left through time expiry and other causes, giving a net gain during the month of 983 natives. The number employed at the end of April, excluding those engaged at the Robinson group of mines, was 91,824.

Australia

Western Australia

Gold production in April is reported at 130,086 oz.; being 360 oz. more than in March, but 22,130 oz. less than in April, 1906. For the four months ended April 30 the total gold production reported was 604,583 oz. in 1906, and 556,243 oz. in 1907; a decrease of 48,340 oz. this year.

New Zealand

The Mines Department reports the exports of gold for February and the two months ended Feb. 28, as follows, in bullion ounces:

	1907	1906	Changes
February	32 [illegible]	4[illegible]	[illegible]
Two months	[illegible]	[illegible]	[illegible]

The bullion reported for the two months in 1907 was equal to 63,523 oz. fine gold, or $1,313,022. Exports of silver for the same periods were, in ounces:

	1907	1906	Changes
February	[illegible]	[illegible]	[illegible]
Two months	[illegible]	[illegible]	[illegible]

January exports this year were large, but there was a heavy decrease in February.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

[illegible] the East shows little change, either in anthracite or in bituminous. Contracts for bituminous supplies for the season are generally closed, and have been about up to the average. There are, as usual, some large consumers who think that they can do better by trusting to the open market; but the great majority prefer to cover their requirements by contract. Steam coal is in good demand, and steam sizes of anthracite are in better supply than they have been.

In the West, warmer weather seems to have come at last, with a corresponding decrease in demand. As in the East, there is a steady demand for steam coal, which helps to equalize matters. Car service is generally fair, and many mines [illegible] cut down their time, in order to [illegible] and congestion in the larger markets.

The reports of coal tonnage furnished by leading carriers show decreases, for the most part, for the four months ended April 30. The Pennsylvania Railroad lines are almost the only exception. How much of this decrease was due to railroad congestion and how much to a decrease in [illegible] is not easy to determine. The railroad troubles, however, undoubtedly had considerable effect.

[illegible] TRAFFIC NOTES.

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to May 11 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	1,427,778	1,081,516	I. 356,738
Bituminous	13,845,000	13,615,572	I. 1,230,182
Coke	4,632,409	4,052,586	I. 149,167
Total	17,906,187	20,517,074	I. 2,610,887

The total increase thus far this year has been 14.6 per cent.

Washery coal—that is, coal saved from old culm banks—in the anthracite region in 1906 amounted to 3,846,501 long tons, or 6.9 per cent. of the total anthracite shipments. This is the largest quantity ever reported in one year, and was an increase of 1,202,456 tons over the previous year. In addition to the shipments, 259,807 tons were used at mines or sold locally, making a total of 4,106,308 tons saved [illegible].

Shipments of bituminous coal and coke over various railroads in western Pennsylvania and West Virginia are reported as below for the three months ended March 31:

	—Coal— 1906.	1907.	—Coke— 1906.	1907.
Balt. & Ohio	6,880,768	6,064,110	1,533,840	1,441,196
Buff., Roch. & Pitts.	1,792,346	1,627,728	170,508	156,929
Bch. C. Div., N. Y. Cent.	2,470,605	1,832,250	25,956	20,829
Norfolk & W.	2,307,794	2,786,785	667,456	657,534
Pitts. & L. Erie	3,021,412	2,358,007	1,213,955	1,353,336
Total	16,881,925	14,668,880	3,611,715	3,619,824

In addition to the coal and coke given above the Baltimore and Ohio carried 249,381 tons of anthracite in 1906, and 273,605 in 1907; an increase of 24,224 tons this year. The tonnages given in the table show an increase of 8109 tons, or 0.2 per cent., in coke, but a decrease of 2,213,045 tons, or 13.1 per cent. in coal.

The railroads in the Ohio Coal Traffic Association report the coal originating on their lines for the three months ending March 31, as follows, in short tons:

	1906.	1907.	Changes.
Hocking Valley	1,120,334	801,037	D. 319,297
Toledo & Ohio Cent.	534,826	412,019	D. 122,807
Baltimore & Ohio	539,502	505,760	D. 33,742
Wheeling & L. Erie	913,507	821,284	D. 92,223
Cleve., Lorain & Wh.	680,046	595,005	D. 85,041
Zanesville & Western	366,802	358,072	D. 8,730
Toledo Div., Pen. Co.	740,046	647,563	D. 92,483
L. Erie, Alliance & Wh.	295,719	292,636	D. 3,083
Marietta, Col. & Clev.	.....	3,982	I. 3,982
Total	5,191,382	4,437,358	D. 754,024

The decrease in the total tonnage this year was 14.5 per cent.

Receipts and shipments of coal at Chicago for the three months ended March 31, are reported as follows by the Chicago Bureau of Coal Statistics:

	Received.	Shipm'ts.	Balance.
Anthracite	392,249	300,639	91,610
Bituminous	4,479,961	1,240,989	3,238,972
Coke	99,233	79,194	20,039
Total	4,971,443	1,620,822	3,350,621
Total, 1906	4,039,676	1,269,810	2,769,866

The balance represents, approximately, the city consumption of fuel. Receipts of bituminous coal this year were: Pennsylvania, 288,008; Ohio, 250,996; West Virginia, 177,054; Indiana, 868,099; Illinois, 2,895,714 tons.

Coal receipts at St. Louis for the three months ended March 31, were 2,461,640 tons in 1906, and 1,994,458 tons in 1907; a decrease of 467,182 tons this year.

Coastwise coal shipments from the leading Atlantic ports for the three months ending March 31, are reported as follows:

	Anthracite.	Bituminous.	Total.
New York	3,762,245	3,203,340	6,965,585
Philadelphia	509,490	1,101,143	1,610,633
Baltimore	10,827	864,575	875,402
Newport News	.....	572,188	572,188
Norfolk	.....	336,884	336,884
Total	4,315,562	6,048,130	10,363,692
Total, 1906	4,394,669	5,726,443	10,121,112

The total shipments show an increase this year of 242,580 tons, or 2.4 per cent.

New York

ANTHRACITE

May 22 No special features are noted in the anthracite-coal trade during the past week. The demand continues fairly strong, especially marked for small sizes. Car supply is fair and movements are somewhat better than in the past. Coastwise trade is good, all the barges offered being loaded at once.

Prices are unchanged as follows: Broken, $4.35; egg, stove, and chestnut, $4.60. Small sizes are quoted nominally: Pea, $3; buckwheat, $2.50; rice, $1.85; barley, $1.50. All f.o.b. New York harbor.

BITUMINOUS

The Atlantic Seaboard soft-coal trade is affected largely by short vessel supply which is bringing about an accumulation of orders in shippers' hands and is detaining coal from reaching consumers as quickly as expected. The high outside freight rates have attracted many vessels, leaving but a small supply for the usual trade.

Trade in the far East shows a strong demand, it being impossible to fill orders on account of short vessel supply; so that stocks are accumulating in the hands of shippers. Some small shortages in the East have been bridged over by purchases of outside coal.

The trade along the Sound has been ordering a little more coal, and in the last few weeks the Sound barge business has been in better condition and the trade is being moved more promptly.

New York harbor trade is slightly improved and better prices prevail, in a small way; from $2.70@2.75 is being received for better grades of steam coal. All rail trade is inclined to be slow, as everyone is pretty well supplied. Car supply is up to all demands.

Rates on coastwise shipments are unchanged from last week and are quoted as follows: Philadelphia to Boston, Salem and Portland, $1@1.05; to Providence, New Bedford and the Sound, 90c.; to Lynn and Bangor, $1.25; to Portsmouth, Gardiner and Saco, $1.15; to Bath, $1.10; with towages where usual.

Birmingham

May 20 Coal mine operators in Alabama assert that there has been no falling off in the demand for coal, and so far there is no reason for any curtailment of the production. Good prices prevail and the large consumers in the district are

not giving any indication that there is soon to be any [illegible] or hesitation in accepting coal as fast as it can be delivered. Some of the operators in this section are still making efforts to get men, in fact, in some quarters it is reported there is room for a number of good miners.

Nothing is heard as to union and non-union coal miners. The union miners in this district are to hold their annual meeting in June, but no apprehension is felt by the commercial companies who give employment to this class of labor that there is to be any trouble. With the exception of the two weeks' pay day there is but little difference from conditions in this district two years ago and the present state of affairs.

A little better condition prevails as to coke. The demand is better, prices are firm again. Several hundred coke ovens are either under construction or in contemplation for construction during the summer.

Chicago

May 20—The feature of the coal market continues to be large sales of domestic coals, both anthracite and bituminous. The continued cold weather accounts for this in large measure. In bituminous steam coals the tendency is toward strengthening run-of-mine and fine coals, prepared sizes gradually weakening. Contracts are strengthening, despite the general tendency of users of large amounts of coal to hold off because of favorable conditions in the open markets for the last two years.

Western bituminous—Illinois and Indiana—sells for $1.90@2.65; $1.70@2.50 for run-of-mine, and $1.25@1.75 for screenings. The tendency in Western coals is toward the fine sizes, on account of the anti-smoke prosecutions in Chicago and the growth of mechanical devices for burning fine coal.

Eastern coals are quiet; the demand is not large and supplies are not too great in the case of any well known coal. Smokeless is firm, with supplies somewhat scant, at $3.35 for run-of-mine and $3.65 for lump and egg. Hocking is quiet and firm at $3.15 for lump, and Youghiogheny is somewhat scarce at $3.15 for ¾-inch.

The strict enforcement of demurrage and re-consignment rules has resulted in a general strengthening of the market, by prohibiting the usual accumulation of coal on tracks in Chicago.

Cleveland

May 21—The coal market carries little change from last week. Pittsburg slack is easier at $1.60@1.75 for No. 7. Run-of-mine sells at $1.85 and ¾-in. lump at $1.60. The Lake trade is quiet. Coal shippers are getting wild tonnage at regular, or contract rates.

Indianapolis

The [illegible] coal trade [illegible] the middle of October last year and continued [illegible] last shown signs of [illegible]. The unprecedentedly cold April made as good a market as some of the winter months, according to statements made by dealers.

The Big Four Railroad is now handling large quantities of coal to this and eastern Indiana markets. This is a result of amicable arrangements recently made by this road with the Evansville & Terre Haute and the Southern Indiana, whereby the latter companies are delivering more than 200 loaded cars to the Big Four daily and at a division of rates satisfactory to all the companies.

C. D. Trobridge, president of the recently incorporated Traction Coal Company, of Indianapolis, denies that the company is to be a merger company to include all the prominent local dealers in the city. The object is only to organize and incorporate a company sufficiently strong financially to buy the Sullivan County Coal Company mines and have four or five yards to distribute the coal to consumers.

Pittsburg

May 21—The market continues strong, but production is falling off on account of a shortage of railroad cars, and a serious scarcity is expected later on. Not more than 85 per cent. of the railroad mines were in operation at the opening of the week and a number will be closed tomorrow, as there are not enough cars. All the river mines are running and the supply of empty coal boats and barges is sufficient to keep them going for some time. The rivers are navigable today and preparations are being made to send out a large tonnage of coal tonight and tomorrow.

Connellsville Coke—Spot coke continues weak, and sales of furnace coke have been made during the past few days at $2.15 and foundry as low as $3. Some transactions, however, were at higher prices. For second half delivery furnace coke is quoted at $2.75@2.85 and foundry at $3.25@3.50. The Courier in its summary for the week gives the production in both regions at 416,071 tons. The shipments aggregated 14,858 cars, distributed as follows: To Pittsburg, 6761 cars; points west of Connellsville, 8877 cars; to points east of Connellsville, 761 cars.

Foreign Coal Trade

The coal bunkered, or supplied to steamships engaged in foreign trade, at United States ports for the three months ended March 31 was 1,411,580 tons. Adding this to the exports, previously reported, makes a total of 3,665,696 tons coal [illegible] for [illegible] the [illegible] the United States.

The total exports of fuel from Great Britain, [illegible] shipped for [illegible] month ending April 30, are reported as follows, in long tons:

	1906.	1907.	Changes.
Coal	16,934,250	18,859,218	I. 1,924,968
Coke	[illegible]	[illegible]	[illegible]
Briquets	407,951	447,823	D. 19,228
Total exports	17,026,125	19,506,586	I. 1,970,461
Shipped coal	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The total increase was 8.4 per cent. The shipments of coal to the United States for the four months were as follows:

	1906.	1907.	Changes.
Atlantic ports	20,174	7,821	D. 12,353
Pacific ports	[illegible]	[illegible]	[illegible]
Total	28,710	16,795	D. 11,915

Among the larger exports this year were 3,652,917 tons to France; 2,647,613 tons to Italy; 2,496,657 tons to Germany.

Imports and exports of fuel in Austria-Hungary for the two months ended Feb. 28 were, in metric tons:

	Imports	Exports
Coal	1,629,352	124,318
Brown coal	2,527	1,279,598
Coke	86,172	51,152
Briquets	8,761	12,573
Total	1,726,912	1,467,551

There was also imported 625 tons of peat and 326 tons charcoal, exported 3543 tons peat and 4884 tons charcoal.

Shipments of Nova Scotia coal for the four months ended April 30 were as follows, by companies:

	1906.	1907.	Changes.
Dominion	738,570	720,361	D. 18,209
N. S. Steel	122,761	120,276	D. 2,485
Cumberland	156,305	145,858	D. 10,447
Acadia	76,997	88,208	I. 12,211
Intercolonial	87,430	84,710	D. 2,720
Inverness	92,881	71,090	D. 21,790
Total	1,274,944	1,230,503	D. 44,441

The total shipments show a decrease of 3.3 per cent. this year.

Iron Trade Review

New York, May 23—The rush to buy pig iron is not so much in evidence this week, probably because many have satisfied their requirements. Present demand is chiefly of smaller lots for early delivery, and these are held in fair volume. [illegible] conditions are found to continue somewhat, though not quite to the same extent. Rails and structural material show a good deal of activity, and there is also considerable activity in bars and plates.

[illegible] Company, which has acquired possession of a number of the charcoal blast furnaces in the Lake Superior country, all of them in Michigan. The furnaces included in the merger are the Newberry, Marquette, Manistique, Gladstone, Elk Rapids, Boyne City, Antrim and Hinkle.

Baltimore

[illegible] Receipts of iron ore were 5300 tons from Cuba; 6400 tons from Nicolaieff, Russia; 3050 tons from Beni-saf, Algeria; 15,350 tons in all. Other receipts included 6870 tons of iron pyrites from Spain; 4500 tons copper ore from Santiago, Cuba; 294 tons chrome ore from Liverpool.

Birmingham

[illegible] While intimation is given that some of the manufacturers are about to withdraw from the market, it cannot be denied that the iron market is in a strong condition. No. 2 foundry iron for delivery during the fourth quarter is selling easily at $20 per ton. Third-quarter iron is becoming almost as scarce as spot iron. Iron for delivery within the month brings something like $24 per ton, No. 2 foundry. The production is a little improved, the Tennessee Coal, Iron and Railroad Company having three furnaces in blast now at Bessemer. Sales for delivery during the coming year are still being made and at prices that are satisfactory.

Steel, cast-iron pipe, machine and foundry work are in strong demand. John A. Topping, president of the Republic company and chairman of the executive committee of the Tennessee company, is in the Birmingham district looking over conditions.

Chicago

[illegible] The pig-iron market locally is still strong. The demand for all grades of iron, for both quick and future delivery, is strong and promises to continue. The tone of the market is decidedly bullish. Prices continue firm. For deliveries in the second half, Southern No. 2 brings $20.50@21.50, with quick deliveries within the next month and a half at about $23, Birmingham. These quotations make the price of Southern in Chicago $24.85@25.85 for the second half and about $27.35, Chicago, for quick delivery.

Northern furnaces are reported to be largely sold out for the rest of the year. Shipments of Southern are delayed greatly owing to lack of iron. The probabilities for the year seem to justify faith in the continuance of high prices and comparatively scant supplies. Northern No. 2 is quoted at $25@25.50 for the last half, and $27@27.50 for quick delivery.

Coke is fairly strong, with supplies well regulated to demand. Connellsville 72-hour is selling at $6 and Southern coke of the best grade at about 25c. lower.

Cleveland

[illegible] from the pig-iron market to finished lines, and heavy sales are reported in structural material. A strong demand for crude steel has advanced prices. Merchant pipe is up $4 a. ton. Pig iron is [illegible] with no quotations on No. 2 foundry below $24 for last-half delivery. Demand from real estate quarters has put up the price of structural steel, and it is reported that steel bars are to be advanced. Trade on the lakes is quiet, no [illegible] cargoes of any size having yet reached Cleveland from upper lake ports.

Local iron dealers report the following prices for last-half delivery: Bessemer, $[illegible]; No. 1 foundry $24.50; No. 2 foundry, $24; No. 3 foundry, $23.50; No. 2 southern, $24.35; gray forge $22.50. It is expected that prices will show further strength.

Philadelphia

May 22.—The demand for basic pig in eastern territory overshadows everything else in the crude-iron market. The worst feature is that it partakes of speculation though not to such a degree as some published statements assert. The extraordinary demand for material into which basic pig enters warrants the action that has been taken, resulting in an advance in price of several dollars per ton within a few months. Foundry, forge and malleable are all higher by a dollar or two under an active spring demand. The requirements represent actual business recently taken by mills, foundries and engineering plants. Our furnace people speak in glowing terms of the pig-iron situation and predict that the present conditions will continue. Brokers report some moderate business in English and Scotch pig. Southern furnaces have been called upon within a week to take care of some urgent buyers who paid premiums for early delivery. In some quarters a subsidence of the present buying activity is predicted and the prediction appears reasonable—but reasonable predictions are dangerous. For No. 2 Foundry, prices range all the way from $24 to $26.50, according to delivery; gray forge, from $23.75 to $25.50. Basic, $23.50 to $25.50, low phosphorus is $27.50.

Billets—Billets have sold at $32.50 with $33 as a fair asking price. Large orders will be placed before Saturday. Forging steel has been booming in a quiet way in moderate lots at $37.50.

Bars—Premium prices are the rule for early deliveries. Consumers are on the war-path and a good many stores were pretty well cleaned out last week.

Sheets—The bulk of business of the past week is in small lots which went at prices a little above the card.

Pipes and Tubes—A large business has been done within a week at the recent discounts. The demand is still heavy.

Plates—The many small buyers of iron and steel plate throughout this territory are badly handicapped by the fact that the plate mills are swamped with big orders and will be worse swamped before long.

Pittsburg

There is but little change in the market for finished steel products. New business is still being placed in all lines, and the mills are unable to catch up on deliveries. It seems certain now that the year will close with many unfilled orders on the books of the large interests. No promises are made for delivery. Premiums for reasonably prompt deliveries in most of the important lines are offered and range from $1 to $4 a ton over the established prices. In merchant steel bars there is a particularly heavy demand. The agricultural implement makers have entered the market, having given up hopes of obtaining the usual concession of $2 a ton. Orders are being placed ranging from 500 to 5000 tons for the year beginning July 1, and all are at the ruling rate of 1.60c. Pittsburg.

Crude steel continues scarce, and prices are higher. While the rate for sheet-bars for third quarter has been fixed at $30, it is practically impossible to place a large order even at that price. Yesterday the leading producer announced the price of sheet-bars for June delivery at $31, but a Youngstown concern has refused an order for 2000 tons at that figure. The high price of sheet-bars and tin-bars is seriously affecting independent sheet and tin-plate interests who have not covered for their requirements. But for the fact that the mills are sold for more than six months ahead, prices for sheets and tin-plate would be advanced. A further complication in the situation may arise when the demands of the Amalgamated Association of Iron, Steel and Tin Workers are presented for the new scale to become effective when the present agreement expires on June 30. The annual convention in session in Toledo has decided to ask for an advance of 6 per cent. for the roller and doubler in the tin-plate mills, and about 2 per cent. for other tonnage men. No important change that will be objected to by manufacturers is proposed in the sheet scale. It is understood that the convention decided to put the sheet-mill hands on a tonnage basis. The leading interest, which usually arranges the wage scale for all union sheet and tin-plate mills, is preparing for a conference with the committee of the Amalgamated Association, and efforts are being made to hold it early next week.

The most important wage change contemplated by the workers' organization is in the iron scale, and the demands are likely to meet with serious opposition from the manufacturers. It is proposed to continue the base of the scale at $5 a ton when bar iron is selling at 1c. a pound. The pay of the puddlers is to advance 12½c. with every increase in the selling price of 0.05c. above the base. The examination of the sales sheets of bar iron for March and April disclosed an average of 1.6c. a pound which, under the existing scale, gives the puddlers a rate

at $6 a ton, or 20 cents above the old rate. Under the proposed scale this average would give the puddlers a rate of $6.50 a ton.

Pig Iron—Sales for the week for this year's delivery were confined to three lots of bessemer and malleable bessemer aggregating 2000 tons for May and June at $23.50, Valley furnaces. No. 2 foundry iron in small lots for early delivery brought $25 and as high as $26, Valley. A number of inquiries are in for second half, but it is not likely that any large tonnage can be placed at any price. A feature of the pig-iron market was the placing of an order for 25,000 tons of malleable bessemer for delivery in the first quarter of 1908 at $22, Valley furnaces. As there is practically no bessemer iron for this year it is believed the market for 1908 will open in a short time. Gray forge is stronger this week, and the minimum quotation for second and third quarter is $22.90. Pittsburg.

Steel—The supply of crude steel is not sufficient to meet the demand. A number of mills have withdrawn from the market, having completely sold up for the year. Bessemer billets are quoted nominally at $31.50, and open-hearth at $33, Pittsburg. Plates remain at 1.70c., and merchant steel bars at 1.60c.

Sheets—New business in sheets is being booked daily, and the mills do not appear to be catching up on deliveries. Prices are unchanged, black sheets being quoted at 2.60c., and galvanized at 3.75c. for No. 28 gage.

Metal Market

NEW YORK, May 22

Gold and Silver Exports and Imports

At all United States Ports in April and year

Metal.	Exports.	Imports.	Excess.
Gold:			
Apr. 1907..	$2,201,659	$ 4,928,190	Imp. $2,726,831
" 1906 .	2,485,552	14,941,583	Imp. 12,456,031
Year 1907..	7,491,963	16,575,105	Imp. 8,650,142
" 1906..	22,632,174	25,257,670	Imp. 2,625,496
Silver:			
Apr. 1907..	4,862,708	3,921,484	Exp. 941,514
" 1906..	4,213,687	2,834,859	" 1,378,828
Year 1907..	19,802,394	15,307,010	" 4,295,384
" 1906..	23,379,295	15,510,857	" 7,868,438

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending May 18 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 1,000	$ 112,195	$ 596,012	$ 9,410
1907.....	1,878,446	5,509,574	14,303,870	712,553
1906	4,968,621	41,378,528	24,085,712	776,429
1905.	32,914,546	5,038,542	12,068,639	1,459,809

Exports of gold for the week were to the United States; of silver, to London. Imports, both gold and silver, were from the West Indies and South America.

The foreign commerce of the United States for the four months ended April 30 is valued as follows by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.
Exports, merch'dise.	$562,949,438	$660,004,924
Imports.	441,950,062	511,982,230
Excess, exports	$120,581,376	$148,022,694
Add excess of exports, silver..		4,223,384
Total		$160,197,449
Deduct excess of imports, gold		8,670,142
Net export balance		$151,527,307

The gold and silver movement in detail will be found in the table at the head of this column.

The joint statement of all the banks in the New York Clearing House for the week ending May 18 shows loans $1,124,808,700, a decrease of $1,414,900; deposits, $1,106,100,900, an increase of $1,681,800, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	$185,441,600	$215,060,200
Legal tenders.	81,095,900	72,947,700
Total cash	$266,837,500	$287,997,900
Surplus.....	$10,129,275	$ 11,472,675

The surplus over legal requirements shows an increase of $2,986,450, as compared with the previous week this year.

Specie holdings of the leading banks of the world, May 18, are reported as below, in dollars:

	Gold.	Silver	Total.
Ass'd New York	.....	.....	$215,060,200
England.....	$174,744,455	....	174,744,455
France.....	522,575,160	$196,050,015	718,625,175
Germany.....	175,390,000	58,465,000	233,855,000
Spain.....	77,635,000	126,015,000	203,650,000
Netherlands....	26,334,500	27,524,000	53,858,500
Belgium.....	16,313,345	8,156,655	24,470,000
Italy.....	162,015,000	24,962,000	186,977,000
Russia.....	579,915,000	28,800,000	608,715,000
Aust.-Hungary.	226,985,000	63,365,000	290,350,000
Sweden.....	20,800,000	.....	20,800,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables to the *Commercial and Financial Chronicle* of New York.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to May 9:

	1906.	1907.	Changes.
India.....	£ 6,606,603	£4,610,344	D. £ 1,996,259
China.....	.....	.....	.....
Straits..	1,750	321,500	I. 319,750
Total	£ 6,908,353	£4,931,844	D. £ 1,676,519

Receipts for the week were £11,000 from Australia, and £152,000 from New York; a total of £163,000. Exports were £145,000, all to India.

SILVER AND STERLING EXCHANGE

May.	Silver. Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	May.	Silver. Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
16	4.8640	65⅝	30⅛	20	4.8685	65⅞	
17	4.8690	65⅝	30⅛	21	4.8680	66	30⅛
18	4.8690	65⅞	30⅛	22	4.8675	66	30⅛

New York quotations are for fine silver per ounce Troy. London prices are for sterling silver, 0.925 fine.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.47½	$0.53½
Peruvian soles and Chilean	0 46	0 47
Victoria sovereigns	4 85	4 87
Twenty francs	3 86	3 89
Spanish 25 pesetas ..	4 78½	4 80

Other Metals

May.	Copper. Lake. Cts. per lb.	Copper. Electrolytic. Cts. per lb.	Copper. London. £ per ton	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York. Cts. per lb.	Spelter. St. Louis. Cts. per lb.
16	24¼ @25¼	24 @24¼	103	44¼	6 00	6 35 @6 40	6 20 @6 25
17	24¼ @25¼	24 @24¼	102⅝	44	6 00	6 35 @6 40	6 20 @6 25
18	24¼ @25¼	24 @24¼	....	44	6 00	6 35 @6 40	6 20 @6 25
20	24¼ @25¼	23¾ @24		43¾	6 00	6 35 @6 40	6 20 @6 25
21	24¼ @25⅜	24 @24	101⅛	43¾	6 00	6 35 @6 40	6 20 @6 25
22	24¼ @25¼	23¾ @24	101¼	43¾	6 00	6 35 @6 40	6 20 @6 25

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former 2000 lb. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for nearby shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper—There has been no change in the situation. Consumers, both in this country, as well as abroad, are persistently holding aloof and sellers have so far been unable to stimulate any interest, in spite of the lower prices which are being asked. A feature of the week has been some offerings of copper by consumers for resale. The market closes nominal at 24¼@25; for Lake copper, 23¾@24; for electrolytic in cakes, wirebars or ingots; and 22½ to 22¾ for casting copper.

The scarcity of near-by options has sustained the spot quotation for standard, but there has been a considerable amount of forward selling on the part of the bear contingent, under which the three months' option has yielded, causing important backwardation. The close is weak at £101 7s. 6d. for spot, and £98 12s. 6d. for three months'.

For refined and manufactured sorts, we quote: English tough, £107@108; best selected, £111@112; strong sheets, £119@120.

Exports of copper from New York for the week were 470 long tons. Our special correspondent reports exports for the week from Baltimore at 526 long tons copper.

Imports and exports of copper in Germany for the three months ended March 31 were, in metric tons:

	1906.	1907.	Changes.
Imports...	2,142	26,538	D. 5,604
Exports	427	1,111	D. 1,112
Balance ...	24,715	24,427	D. 4,492

The increase shown in 1906 was chiefly from Spain and Italy.

Copper Sheets—The base price of copper sheets is 32c. per pound.

[illegible] per pound.

Tin—Consumers have allowed their supplies to run down to a minimum, and as a result there has been a steady inquiry for spot delivery. The premium, however, has been materially cut down, as the improvement in the strike situation has made it possible to effect better deliveries. The market is steady at 43¾ to 44c.

The foreign market has held its own throughout the week, and closes practically unchanged at £189 10s. for spot, and £185 for three months'.

Exports of tin from the Straits for the first half of May are cabled as follows: United States, 665; London, 1701; European continent, 462; total, 2828 long tons, an increase of 95 tons over the corresponding period last year.

Lead—The market remains unchanged at 6c. New York.

The reports from Europe indicate a very strong position in the lead market, and premiums are being paid for near-by delivery. The close is firm at £19 17s. 6d. for Spanish lead and £20 for English.

The movement of foreign lead in the United States for the three months ended March 30 is reported by the Bureau of Statistics as below, in short tons:

	1906	1907	Changes
In bond, Jan 1....	8,148	5,691	D. 2,457
Imports, three mos.	23,303	19,490	D. 3,813
Total supplies...	31,451	25,181	D. 6,270
Re-exports	10,955	5,299	D. 5,656
In bond Mar. 31	11,556	4,617	D. 6,939
Total deductions	22,511	9,916	D. 12,595
Balance	8,940	15,265	I. 6,325

The balance has presumably entered into consumption in the United States.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 4, that the price of pig lead has been 92.50 reales per quintal; silver, 13.25 reales per ounce; exchange, 27.82 pesetas to £1. The price of lead, on current exchange, is equal to £18 12s. 3d. per long ton, f.o.b. Cartagena. Exports for the week were 600 tons desilverized to London; 66 tons desilverized, and 813 tons argentiferous to Marseilles; 100 tons desilverized to Hamburg; 25 tons antimonial lead to Rotterdam; a total of 1604 tons.

Spelter—Nothing of particular interest has developed in the market during the past week, and the close is steady at 6.35@6.40 New York, and 6.20@6.25 St. Louis.

London cables a weak market, and the quotation has declined to £25 1s. 6d. for good ordinaries and £25 17s. 6d. for specials.

[illegible] The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 600-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Spanish Zinc Ore Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 4, that the market is dull and quiet. No shipments reported for the week. Nearly all the ore mined is covered by contract.

Antimony—On free offerings of metal, with a demand that is only fair, the market is weaker. At the close quotations are about 22c. for Cookson's, 17½c. for Hallett's, and 16½@17½ for ordinaries.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has fluctuated rather sharply and prices are a little uncertain. The latest quotation is $28 per ounce for ordinary metal, and $31 for hard. Scrap is quoted at $20 per ounce, with light demand.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Vincenzo Spirek estimates the quicksilver output of the leading districts of the world as follows, in metric tons:

	1905.	1906.	Changes.
Idria Austria..	519	526	I. 7
Mt. Amiata, Italy. ..	369	418	I. 49
Almaden, Spain.....	800	1,242	I. 442
Nikitowka, Russia. ...	319	210	D. 109
California U. S.	1,043	941	D. 102
Total	3,050	3,337	I. 287

British Metal Imports and Exports

Copper—Imports and exports of copper in Great Britain for the four months ended April 30 were as follows, in long tons; the totals giving the copper contents of all material:

	1906.	1907.	Changes.
Copper ore.....	31,343	32,118	I. 775
Matte and precipitate ..	25,344	22,497	D. 2,846
Fine copper . .	24,656	24,804	D. 847
Total imp. fine copper .	40,420	38,284	D. 2,142
Exports . .	14,672	17,520	I. 3,048
Re-exports	7,662	8,299	I. 637
Total exports .	22,334	26,019	I. 3,685
Balance, imports	18,092	12,265	D. 5,827

Of the imports this year the United States furnished 92 tons of matte and 8030 tons fine copper; against 1611 and 7409 tons, respectively, last year.

Tin—Imports and exports of tin in Great Britain for the four months ended April 30 were as follows, in long tons:

	1906.	1907.	Changes.
Straits.....	11,302	11,719	I. 417
Australia.....	1,527	1,905	I. 378
Other countries...	945	1,236	I. 291
Total imports..	13,774	14,860	I. 1,086
Exports..... ...	2,436	3,142	I. 706
Re-exports... .	10,493	9,546	D. 947
Total exports ...	12,929	12,688	D. 241
Balance, imp	845	2,172	I. 1,327

Imports of tin ore were 6237 tons in 1906, and 6357 tons in 1907; an increase of 120 tons. Of the imports this year 5180 tons were from Bolivia.

Lead—Imports and exports of lead in Great Britain for the four months ended April 30 were, in long tons:

	1906.	1907.	Changes.
United States .	7,161	4,665	D. 2,496
Spain.....	34,462	36,604	I. 2,142
Australia..... ...	17,028	17,406	I. 378
Germany	6,616	2,722	D. 3,894
Other countries.... ...	1,657	3,288	I. 1,631
Total imports ..	66,924	64,685	D. 2,239
Exports..... .	14,286	17,596	I. 3,310
Balance, imports	52,638	47,089	D. 5,549

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Spelter—Imports and exports of spelter in Great Britain for the four months ended April 30 were, in long tons:

	1906.	1907.	Changes.
Spelter....	29,508	30,905	I. 1,397
Zinc sheets, etc.....	5,931	7,277	I. 1,346
Total imports . .	35,439	38,182	I. 2,743
Exports	2,394	1,777	D. 617
Balance, imports..	33,045	36,405	I. 3,360

Imports of zinc ore are not reported separately.

Quicksilver—Imports of quicksilver into Great Britain for the four months ended April 30 were 809,382 lb. in 1906, and 1,612,956 lb. in 1907; an increase of 803,574 lb. Re-exports for the same period were 736,923 lb. in 1906, and 910,131 lb. in 1907; an increase of 173,208 lb. this year.

Missouri Ore Market

Joplin, Mo., May 18—The highest price paid for zinc ore was $50 per ton, on an assay base price of $45 to $47 per ton of 60 per cent. zinc—the same price as ruled a week ago. Floods restricted the output approximately 1500 tons, filling all the Badger mines to the surface, cutting off about 400 tons here alone, and putting many other mines of the district temporarily out of business; at most of them resumption will be possible during the coming week. A protracted restriction of 600 tons per week will be partially overcome by six new mills that will output about 200 tons per week. The average price was $45.34. The highest price for lead ore was $82, with medium grades ranging from $78 to $80 per ton, and an average of $78.68 per ton.

Following are the shipments of zinc and lead from the various camps of the district for the week ending May 18:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	[illegible]	[illegible]	[illegible]
Joplin	2,521,020	487,470	75,709
Galena-Empire	[illegible]	171,890	38,904
Alba-Neck City	1,260,210	11,760	31,339
Duenweg	[illegible]	170,750	26,355
Oronogo	619,100	[illegible]	[illegible]
Prosperity	[illegible]	116,850	16,951
Spurgeon	547,370	[illegible]	[illegible]
Aurora	[illegible]	11,[illegible]	10,141
Badger	[illegible]	[illegible]	6,216
Carthage	253,960	[illegible]	6,222
Granby	[illegible]	[illegible]	[illegible]
Baxter Springs	[illegible]	[illegible]	[illegible]
Zincite	62,860	11,[illegible]	1,[illegible]
Stottville	59,630	[illegible]	1,371
Playter	43,790	7,460	1,298
Reeds	42,760	[illegible]	[illegible]
Totals	[illegible]	[illegible]	[illegible]
20 weeks	242,033,580	37,736,910	$7,253,158
Zinc value, the week,	$286,11[illegible]	20 weeks,	$[illegible]
Lead value, the week,	[illegible]	20 weeks,	1,[illegible]

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	76.13	79.76
May	40.51	.....	May	78.40	. . .
June	43.83	.....	June	80.96	. . .
July	43.25	. . .	July	74.31	. . .
August	43.56	.....	August	75.36	. . .
September	42.58	. . .	September	79.64	. . .
October	41.55	.....	October	79.84	. . .
November	44.13	.....	November	81.13	. . .
December	43.68	.....	December	81.89	. . .
Year	43.24	.....	Year	77.40	. . .

Wisconsin Ore Market

Platteville, Wis., May 18—The week shows a net gain in the zinc production. The pyritic ore shipped, which formerly constituted all of the tonnage reported, decreases monthly; today the ore shipped is largely 60 per cent. ore, although there is considerable pyritic ore represented in the tonnage as shown in the report below. The consensus of opinion among local mining men is that it will not be long before nearly all of the ore from the Wisconsin district will be high grade. Development and improvements tend to this conclusion. The deciding point to this end is that the ore generally admits of magnetic separation. Present indications are toward heavier production and in spite of the general cry of over-production there is no surplus to be found at the mines.

The price of 60 per cent. ore held the same as last week $47@48 per ton. The market was strong; buyers were active. Authorities have it that Platteville camp will be producing, within a year, as much as the entire district put together is now turning out. At the present time every pound of ore shipped from Platteville runs 60 per cent. or over, with the exception of that shipped from the St. Rose Unfavorable road conditions prevailed and prevented the hauling of all ore to the shipping points.

[illegible] production normal. The new lead mill is expected to start before the first of the month.

The shipment for the district, by camps, [illegible] follows:

Camps.	Zinc.	Lead.	Sulphur.
Platteville	197,821	[illegible]	[illegible]
Linden	184,940	[illegible]	[illegible]
Galena	171,890	[illegible]	[illegible]
Benton	165,510	[illegible]	[illegible]
Livingston	111,000	[illegible]	[illegible]
Mineral Point	97,710	[illegible]	[illegible]
Rewey	61,[illegible]	[illegible]	[illegible]
Cuba City	39,500	3,[illegible]	[illegible]
Total for week	1,029,081	112,120	[illegible]
Year to May 18	[illegible]	1,[illegible]	189,[illegible]

As the wires were down no report was received from Hazel Green and Buncombe camps. There were several of the camps unable to ship all the ore produced, on account of the shortage of cars.

Chemicals

New York, May 22—The general market continues active, almost all heavy chemicals being in strong demand.

Copper Sulphate—There is no change in demand, and supplies are not increasing. The quotations remain unchanged, at $7.50 per 100 lb. for carloads or over, and $7.75 per 100 lb. for smaller lots.

Nitrate of Soda—There is no change in the market. The demand continues good and prices remain for spot $2.70 per 100 lb. with 96 per cent. for all positions of 1907 at $2.50. The price for 95 per cent. is $2.45 for both 1907 and 1908. Stocks are extremely low, and spot nitrate is not to be had just now.

Phosphates—Exports of phosphate rock through the port of Savannah during the month of April are reported by J. M. Lang & Co. as follows, in long tons: Germany, 9708; Holland, 3687; Italy, 2269; Great Britain, 1521; total, 17,185 tons.

British Chemical Trade — Exports of chemicals from Great Britain for the four months ended April 30 were as follows, in cwt of 112 lb. each:

	1906.	1907.	Changes.
Bleaching powder	324,402	361,347	I. 36,945
Muriate of ammoni[illegible]	[illegible]	68,042	I. 22,393
Soda ash	511,893	715,197	I. 203,304
Bicarbonate of soda	101,899	142,715	I. 40,816
Caustic soda	473,381	488,451	I. 15,070
Soda crystals	55,691	46,702	D. 8,989
Soda sulphate	[illegible]	285,762	I. 19,300
Sulphuric acid	33,193	27,333	D. 5,860

Exports of copper sulphate were 25,721 long tons in 1906 and 29,123 tons in 1907, an increase of 3402 tons this year.

Imports of chemicals and raw materials into Great Britain for the four months ended April 30 were, in long tons:

	1906.	1907.	Changes.
Nitrate of potash	[illegible]	[illegible]	I. [illegible]
Nitrate of soda	35,348	54,693	I. 19,345
Phosphates	[illegible]	[illegible]	I. [illegible]
Sulphur	[illegible]	[illegible]	I. [illegible]
Pyrites	[illegible]	[illegible]	I. [illegible]

Estimating sulphur contents of pyrites, the total sulphur imports were 113,909 tons in 1906 and 114,157 tons in 1907, an increase of 248 tons this year.

Mining Stocks

[illegible] can be found in the general stock markets, and several days of the week were covered by a bear raid, which was rather successful. The markets continue professional mainly, and the present conditions are not tempting to outsiders. At the close there is a steady pressure to sell, which is not favorable to any improvement in quotations.

Amalgamated Copper sold down to $91 and American Smelting and Refining common to $122¼. United States Steel closed at $34½, with $98½ for the preferred. Utah Copper closed at $27½, a loss.

The curb market was dull, with selling orders in evidence, and prices inclined to yield. The copper shares were comparatively quiet; the larger dealings being in Nevada stocks and those of the Cobalt companies.

Boston

May 21—Copper shares wound up today with a smash in sympathy with the break in the New York list. The market has been passive the past week, until today, with slight fluctuations. Copper Range had a period of strength, stiffening $1.50 to $84.37½, on renewed reports that the Cole-Ryan interests were still looking for control. The price tonight, however, was off to $79.75. Amalgamated is off $6.75 net and $8 gross for the week, closing at $88.62½. Calumet & Hecla is off $35 to $835 on light trading. Dividend action will come within the next 10 days. Three months ago $20 was declared.

North Butte is off $6.25 to $85.75. The usual quarterly dividend of $2 has been declared. Old Dominion broke $5.50 to $49; Butte Coalition $2, to $25; Calumet & Arizona $9, to $166; Boston Consolidated, $4.12½, to $25.87½; Franklin $2.75, to $14.75; Isle Royale $2.25, to $16.75. Mohawk moved up $2.50 to $89, but is back to $83.

Shannon has maintained a firm tone, closing a trifle above a week ago, at $18.12½. Dividend action will be taken in the next fortnight. Arizona Copper people are to build a railroad which will obviate interruptions during the flood season. The Shannon will benefit in concesions in freight charges.

The Mass Mining Company will commence prospecting with diamond drill on the Riddle farm, with a hope of striking the Baltic lode. A circular to Adventure mining stockholders is rather discouraging, showing a loss of $21,034 in mining operations for the first four months of this year. Stockholders will have to decide the expediency of further operations at the coming annual meeting. Raven mining stockholders have voted to increase the capital 500,000 shares more. Of this 400,000 shares will be retained in the treasury and 100,000 shares imme-

to $11 on the curb.

Colorado Springs

[illegible] trading on the local mining [illegible] has been dull the past week, but prices have held quite firm. On both sides of the market there seems to be a disposition to wait for development in the drainage-tunnel project. The desultory tactics of the management of the tunnel scheme is having a damaging effect on Cripple Creek stocks which it will take several months of active and continuous tunnel work to overcome.

STOCK QUOTATIONS

NEW YORK	May 21
Name of Comp.	Clg.
Alaska Mine	....
Am-Nev. M. & P. Co.	....
Amalgamated	88
Anaconda	6
Balaklala	9
British Col. Cop	7
Buffalo Cobalt	....
Butte & London	....
Butte Coalition*	25
Butte Coal. & Zinc	....
Cobalt Contact	....
Colonial Silver	2
Cum. Ely Mining	3
Davis Daly	14
Domanion Cop	6
El Rayo	3
Foster Cobalt	1
Furnace Creek	12
Giroux Mines	1
Gold Hill	1
Granby, New	....
Greene Gold	....
Greene G. & S	1
Greenw'r & D. Val.	....
Guanajuato	3
Gregory Exp	2
Hancock	....
McKinley Dar	1
Mason Val	....
Mines Co. of Am	1
Mitchell Mining	2
Mont. Shoe C. New)	8
New Utah M. & S	3
Newhouse M. & S.	....
Nipissing Mines	11
Old Hundred	3
Silver Queen	1
Stewart	17
Tennessee Copper	....
Union Copper	....
Utah Apex	....
West Columbus	....

N. Y. INDUSTRIAL	
Am. Agri. Chem.	1
Am. Sugar & Ref.	115
Am. Sm. & Ref., pf.	105
Bethlehem Steel	....
Colo. Fuel & Iron	28
Federal M. & S., pf.	8
Inter. Salt	....
National Lead	6
National Lead, pf.	....
Pittsburg Coal	....
Republic I. & S.	2
Republic I. & S., pf.	8
Sloss-Sheffield	54
Standard Oil	....
Tenn. C. & I.	1
U. S. Leather	....
U. S. Steel	9
U. S. Steel, pf.	....
Va.-Car. Chem.	....
Va. I. Coal & Coke	....

ST. LOUIS	May 15
Name of Comp.	Clg.
Adams	....
Am. Nettle	.05
Center Creek	2
Cent. C. & C.	....
C. C. & C., pfd.	....
Cent. Oil	....
Columbia	5.00
Doe Run	....
Esmeralda	....
Granby	....
Iron Mountain	17.00
Kennett	....
Missouri Lead Oil	....
Missouri Smelting	....
Stewart	....
Unexcelled Fire Brick	....
United Zinc	....
Victor-American	....
Western Clay	....

BOSTON	May 21
Name of Comp.	Clg.
Adventure	....
Allouez	....
Am. Zinc	37
Arcadian	6
Atlantic	12
Bingham	17
Boston Con	26
Calumet & Ariz.*	166
Calumet & Hecla*	805
Centennial	....
Con. Mercur	40
Copper Range	79
Daly-West	....
Franklin	14
Greene—Can. cffs.	14
Isle Royal	16
La Salle	16
Mass	6
Michigan	14
Mohawk	83
Mont. C. & C. (new)	3
Nevada	14
North Butte	86
Old Colony	....
Old Dominion	50
Osceola	145
Parrot	21
Phoenix	1
Quincy*	113
Rhode Island	5
Santa Fe	2
Shannon	18
Tamarack*	116
Trinity	21
United Copper	59
U. S. Oil	10
U. S. Smg. & Ref.	51
U. S. Sm. & Re., pd. *	44
Utah Copper	60
Victoria	8
Washington	1
Winona	8
Wolverine	135
Wyandotte	....

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Ahmeek	....
Ariz. Com	....
Black Mt	6
Cananea Cent	....
East Butte	10
Hancock Con	....
Keweenaw	10
Majestic	3
Raven	11
Shawmut	.75
Superior	....
Superior & Pitts	13
Troy Man	17

LONDON	May 22
Name of Comp.	Clg.
Anglo-Am. Corp.	£1 18 0
Broken Hill Pty.	0 3 3
Chartered Shd.	0 3 3
Cons. Rand	1 2 6
Esperanza	1 10 0
Lyndhurst	1 18 9
Mexican	1 0 0
Rio Tinto	1 6 3
Tharsis	0 19 0
Tronoh	1 1 3
Utah Apex	1 8 9
Ariz. Copper, pfd.	3 6 8
Ariz. Cop., def.	3 0 0

Quoted through Hayden, Stone & Co., N. Y.

SAN FRANCISCO	May 15
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.33
Best & Belcher	.90
Caledonia	.24
Challar	.10
Con. Cal. & Va	.92
Crown Point	.20
Exchequer	.35
Gould & Curry	.18
Hale & Norcross	.16
Mexican	.59
Ophir	2.10
Overman	.17
Potosi	.15
Savage	.60
Sierra Nevada	.36
Union	.44
Utah	.02
Yellow Jacket	.85
TONOPAH STOCKS	
Golden Anchor	.25
McNamara	.31
Montana-Pitts.ex.	.15
North Star	.28
Rescue	.16
GOLDFI'D STOCKS	
Black Ants	.06
Blue Bull	.31
Columbia Mt	.58
Comb. Frac	2.95
Conqueror	.13
Daisy	1.30
Florence	4.20
Frances-Mohawk	.90
Goldfield Con	6.00
Grandma	.18
Great Bend	.70
Red Hills	.35
St. Ives	.96
BULLFROG STOCKS	
Amethyst	.35
Bonnie Claire	.44
Mayflower Con	.54
Montgomery Mt	.15
Original	.11
MANHAT'N STOCKS	
Gold Wedge	.06
Manhattan Mg.	.12
Pine Nut	.10
Ruby Wonder	.25
Stray Dog	.15
Yellow Horse	.03

NEVADA (Weir Bros. & Co., New York)	May 22
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	15.62½
Tonopah Exten	1.75
Montana Tonop'h	3.07½
Belmont	3.62½
Tonopah Midway	1.35
West End Con	.95
Jim Butler	.84
GOLDFI'D STOCKS	
Sandstorm	.48
Kendall	.31
Red Top	3.25
Jumbo	3.25
Goldfield Mining	1.30
Dia'dfield B. B. C.	.28
Atlanta	.58
Mohawk	14 00
Silver Pick	.68
Laguna	1.35
BULLFROG STOCKS	
Mont. Shoshone C.	8 00
Tramps Con	.58½
Gold Bar	68
Bullfrog Mining	.17
Bullfrog Nat. B.	.25
Homestake Con	.80
MANHAT'N STOCKS	
Manhattan Con	.60
Manhat'n Dexter	.14
Jumping Jack	.14
Stray Dog	.16
Indian Camp	.13

COLO. SPRINGS	May 22
Name of Comp.	Clg.
Acacia	10
Black Bell	....
C. C. Con	....
Dante	....
Doctor Jack Pot	8½
Elkton	55½
El Paso	45
Findlay	67
Gold Dollar	7¾
Gold Sovereign	7¾
Isabella	24¾
Index	....
Jennie Sample	6½
Jerry Johnson	10
Mary McKinney	58
Pharmacist	6
Portland	1.17
Un. Gold Mines	8½
Vindicator	84
Work	18

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	May 27	$2.00	$3,061,758
Am. Smelters Sec., pf., B	June 1	1.25	375,000
Beck Tunnel Con	....	0.10	40,000
Butte Coalition	June 26	0.50	500,000
Col. & Hocking C. & I., pf.	July 1	1.50	3,000
Colorado Con., Utah	....	....	40,000
Grand Central, Utah	....	0.04	10,000
Lehigh Coal & Nav	May 27	2.00	395,110
Lower Mammoth, Utah	....	....	9,500
Mexico Con. Mg. & Sm	May 25	0.50	120,000
National Lead	July 1	1.25	186,318
National Lead, pfd.	June 15	1.75	263,620
North Butte	June 10	2.00	800,000
N. Y. & Hon. Rosario	May 25	0.10	15,000
Quincy, Mich	June 10	4.50	93,750
Sloss-Sheffield S. & I	....	1.25	1,730,000
Standard Oil	June 15	9.00	495,000
U. S. Cast Iron Pipe & Fdy.	June 1	1.00	150,000
U. S. C. I. Pipe & Fdy. pfd.	June 15	1.75	262,500
U. S. Steel Corp.	July 1	0.50	2,541,513
U. S. Steel Corp., pf.	May 31	1.75	6,304,919
U. S. Cast Iron Pipe & Fdy.	June 1	1.00	125,000
U. S. C. I. Pipe & Fdy., pfd.	June 1	1.75	218,375
U. S. Reduction & Ref., pfd.	July 1	1.50	59,187
Utah (Fish Springs)	....	0.03	3,000

Assessments

Company.	Delinq.	Sale.	Amt.
Benson, Cal.	June 9	June 29	$0.10
Bullion, Nev	June 10	July 2	0.05
Con. Imperial, Nev.	May 7	May 29	0.01
Little Chief, Utah	May 14	May 30	0.01
Lyon, Utah	May 13	June 3	0.02
Lost Packer, Idaho	May 6	May 27	1.00
Lucky Dutch'n, Nev.	May 4	May 25	0.01
Mabel Gravel, Cal.	June 3	June 25	0.10
N. Y. Bonanza, Utah	May 11	May 31	0.03
Overman, Nev	May 17	June 7	0.10
Potosi, Nev	May 13	June 5	0.10
St. Joe, Utah	June 13	July 3	0.02
Sierra Nevada	May 28	June 18	0.10
Union Con., Nev	May 8	May 29	0.10
Utah, Nev	May 27	June 17	0.05
Wabash, Utah	May 11	June 3	0.05

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.765	65.462	29.984	30.253
May	66.976	....	30.968	....
June	65.394	....	30.185	....
July	65.105	....	30.113	....
August	65.949	....	30.529	....
September	67.927	....	31.483	....
October	69.523	....	32.148	....
November	70.813	....	32.671	....
December	69.050	....	32.003	....
Year	66.791	....	30.868	....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.386
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	24.224	18.688	25.260	84.793	98.625
May	18.476	....	18.724	....	84.867	....
June	18.442	....	18.719	....	83.994	....
July	18.190	....	18.585	....	81.167	....
August	18.380	....	18.706	....	83.864	....
September	19.033	....	19.328	....	87.831	....
October	21.203	....	21.722	....	97.269	....
November	21.833	....	22.398	....	100.270	....
December	22.885	....	23.850	....	105.226	....
Year	19.278	....	19.616	....	87.282	....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	....
February	36.403	42.102	August	40.606	....
March	36.662	41.313	September	40.516	....
April	38.900	40.938	October	42.852	....
May	43.313	....	November	42.906	....
June	39.260	....	December	42.750	....
			Av. year	39.819	....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.938
February	5.464	6.000	16.081	19.531
March	5.350	6.000	15.922	19.703
April	5.404	6.000	15.959	19.975
May	5.685	....	16.736	....
June	5.750	....	16.813	....
July	5.750	....	16.525	....
August	5.750	....	17.109	....
September	5.750	....	18.266	....
October	5.750	....	19.350	....
November	5.750	....	19.281	....
December	5.900	....	19.609	....
Year	5.657	....	17.370	....

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.066	6.687	24.563	26.094
April	6.078	6.685	5.931	6.535	25.781	25.900
May	5.997	....	5.846	....	27.000	....
June	6.096	....	5.948	....	27.728	....
July	6.006	....	5.856	....	26.800	....
August	6.027	....	5.878	....	26.938	....
September	6.216	....	6.056	....	27.563	....
October	6.222	....	6.070	....	28.075	....
November	6.375	....	6.225	....	27.781	....
December	6.593	....	6.443	....	27.938	....
Year	6.198	....	6.048	....	27.020	....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

The Engineering and Mining Journal

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Zinc Oxide and Zinc-Lead Pigment Manufacture

How the Process Requiring Pure Zinc Ores and Anthracite Fuel Was Made Suitable for Complex Ores and the Use of Soft Coal

WILLIAM F. GORDON*

The successful production of zinc oxide from ores dates back to the issue of the patent of Samuel Wetherill, for the furnace process (November, 1855) and the patent of Samuel Jones for the collection method. The furnace is an arched chamber of rectangular horizontal section, the hearth of which is composed of perforated grate bars of special construction.

The closed space under the grate is supplied with air under pressure which passes up through the perforations in the grate bars and through the charge resting on them. Upon the grate is placed a bed of coal, about 2 in. thick, covering the grates.

Oxidation and Collection of the Zinc

In blowing the air into the charge, through the perforated grates, a high degree of heat results. At about 1280 deg. C. (2350 deg. F.) in the presence of incandescent carbon, zinc oxide is reduced and the metallic vapor rises as a blue flame. The top of the furnace has an opening which connects with a main flue. Into this main flue all the furnaces open. The metallic flame, upon passing into the cooler portions of the flue, below 1290 deg. C., combines with oxygen. It is probable that the zinc secures its oxygen from carbonic dioxide gas, inasmuch as the nature of the

CRUSHING MILL AND ROASTING FURNACE HOUSE

OXIDE-FURNACE HOUSE

Upon this bed of coal is placed about 5 to 6 in. of mixed coal and ore making a total depth of charge of 7 to 8 in. In a furnace whose grate area is 72 sq.ft. the total charge of ore and coal weighs 2200 lb. on the average. Such a charge is worked off in five to six hours. The residue, or slag, consists of the ash of the coal, the gangue of the ore and some zinc which has failed to be volatilized, the proportion of zinc being about 3 per cent.

After finishing the working of a charge, which is manifested by no more zinc flame appearing, the furnace is completely cleaned out and a new charge is introduced, the furnace remaining sufficiently hot to ignite the new charge.

*Mining engineer, Magdalena, N. M.

furnaces would not admit of the presence of much atmospheric oxygen.

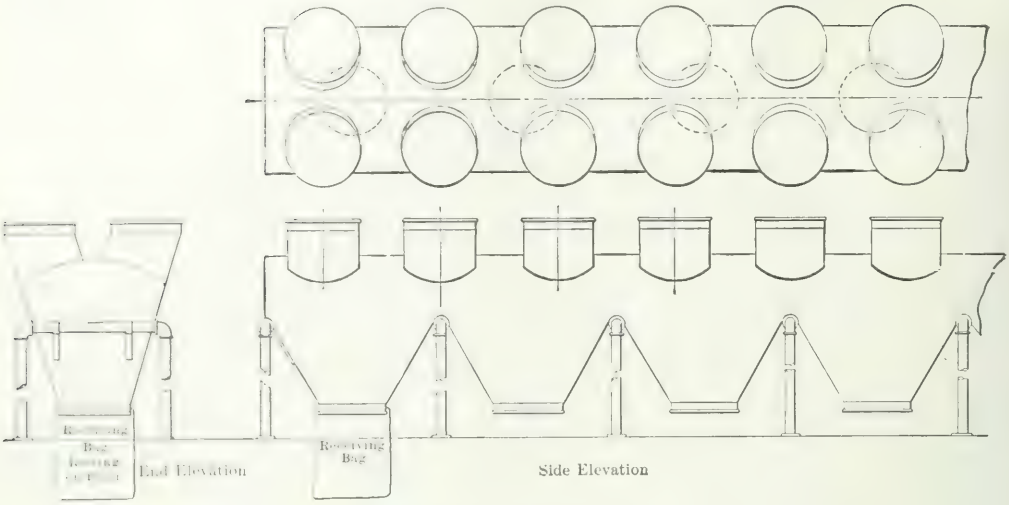
The zinc after combining with oxygen becomes a floating, amorphous powder, whose composition is 80 per cent. zinc, and 20 per cent. oxygen. This floating powder is drawn by exhaust fans through the various clarifying rooms where the heavier impurities are settled out, and then through long sheet-iron cooling pipes, after which it is finally drawn into the collecting or bag room.

The collecting process in the bag room consists of a large number of muslin bags (30 ft. long and 2 ft. in diameter) attached to sheet-iron conveying pipes. The oxide and gases are driven into these muslin bags, where a filtration takes place, and the zinc oxide remaining behind. The bags are shaken at intervals, and the zinc oxide which has collected on the inner surface of the bag becomes detached and drops to the bottom. When a quantity has accumulated in the bottom of the bag it is removed and conveyed to the packing room, where it is barreled, using the same packing machinery as in flour mills.

Importance of Fuel

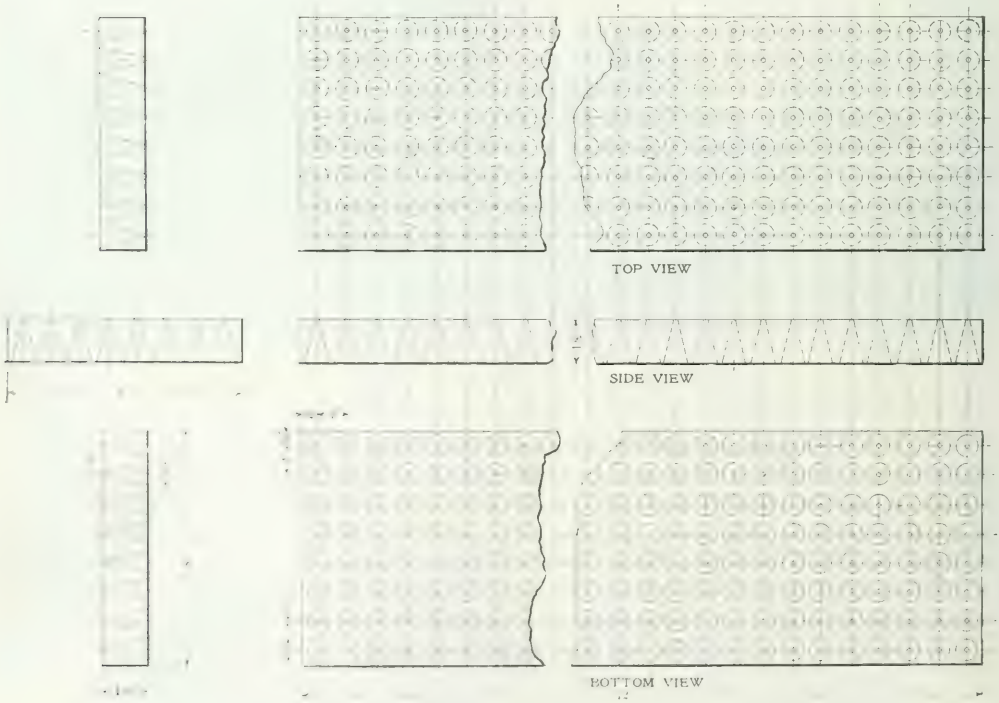
The above is an outline of the zinc oxide process, as usually practised. It requires a very pure ore and anthracite coal. The process appears very simple, but in fact is one of great difficulty. Much care must be exercised to have the oxide chemically pure, as very small portions of sulphur dioxide (SO_2) or of zinc sulphate ($ZnSO_4$) render it worthless. Also, the color is of vital importance, and this is subject to great deterioration from very slight causes. A very delicate balancing of all parts of the process is necessary, and careful relations between the various parts of the works when designing and constructing must be observed. Even a change in the direction of the wind frequently has a marked effect upon the process.

About [illegible] after [illegible] I came to the conclusion that the softer



Plan, End Elevation and Side Elevation.

BAG-ROOM HOPPERS



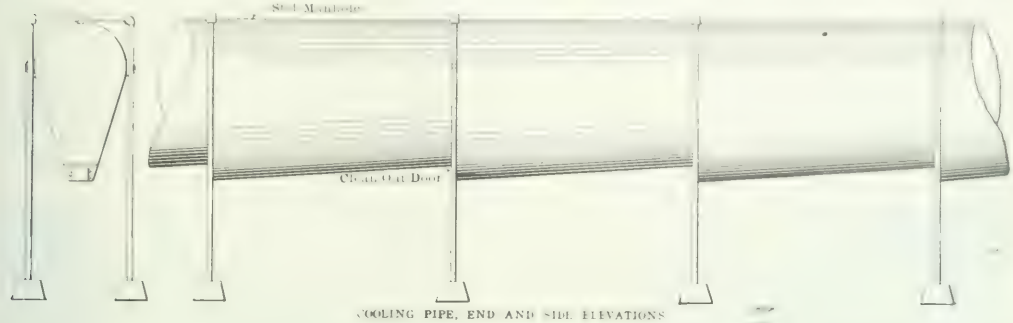
GRATES FOR OXIDE FURNACES

coals of the West might be used in the manufacture of zinc oxide. A small company was organized and a works with four furnaces was built at West Plains, Mo. A fair quality of oxide was produced, but the company was too weak financially to stand the necessary expense necessary to change much of the anthracite process, owing to the necessity of destroying the hydrocarbons which discolored the oxide.

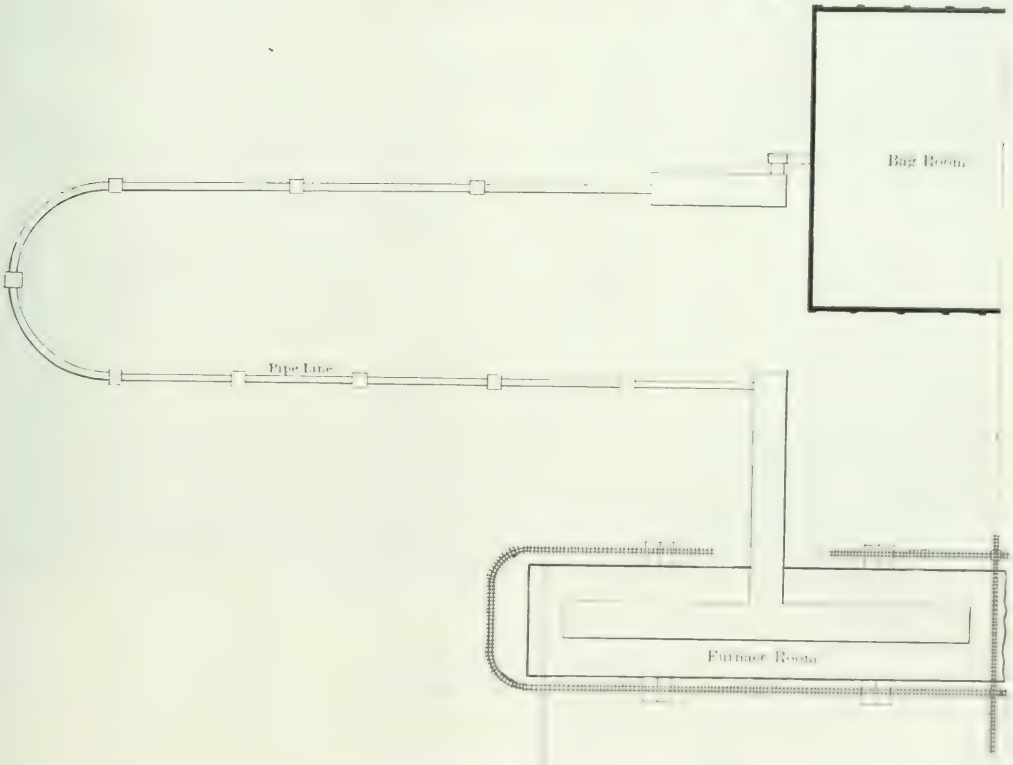
The Use of Zinc-lead Ores

The high price and scarcity of pure zinc ores forced a gradual use of an ore which contained some lead, and it became apparent that a smelter built along proper lines would treat very complex ores without the necessity of separating them. I was given the opportunity, and planned a smelter to use western ore, which was built at Coffeyville, Kan. This plant went into operation in April, 1906, and was a great success. It is now producing a high-grade pigment from the previously almost worthless ores of zinc and lead.

The ores used are the sulphide, carbonates and silicates of zinc and lead, and may be a combination of any of these, the only requirement being that the combined assay of zinc and lead be not under 30 per cent. (for example, an ore having 20 per cent. zinc and 10 per cent. lead). Below 30 per cent. of zinc-lead content, ore is too low in grade to be profitable. There



COOLING PIPE, END AND SIDE ELEVATIONS



PARTIAL PLAN OF WORKS, COFFEYVILLE, KANSAS

of corrections and experiments. However, enough was done to show the probable success of the process, the company was organized at St. Louis, and a works was built at Joplin, Mo. After many trials and changes, good results were finally attained. In using soft coal it was

tionship between the zinc and lead be observed. All grades of ore can be used, varying from those containing no lead up to those containing equal proportions of zinc and lead. It has been found by mixing ores from various districts that an average will contain one-third lead and two-thirds zinc. From such a charge a pigment is produced containing very nearly one-third basic lead sulphate and two-thirds zinc oxide. In preparing the charge, ores high in lead are mixed with ores low in lead, the amount of lead that may be used being calculated from the zinc content as a basis.

[illegible] considerable extent, and am of the opinion that the lead is also volatilized and, having a greater affinity for sulphur than for oxygen, combines as the sulphate. The reason for so believing is that an ore charge of zinc and lead carbonate may be used and sufficient sulphur in form of iron pyrite be added. It is hardly probable that a chemical combination takes place between the lead as carbonate, and the sulphur in the pyrite before they are volatilized.

After passing from the pigment furnaces the floating zinc and lead is conducted as in the zinc oxide process to the bag room. In this process about 150 sq.ft. of muslin in the bag room is used for every square foot of grate surface in the pigment furnaces.

and silver are retained in the slag. The slag is then smelted in an ordinary blast furnace.

Ores are purchased outright, a basis of 35 per cent. being used. A fixed value per unit is added above 35 per cent., and deducted below 35 per cent. The average assay of the ore treated is about 38 per cent. In case of ore containing gold, silver and copper a special arrangement is made.

The zinc-lead pigment is one of great beauty. Its covering capacity is equal to the same amounts of white lead (carbonate) and zinc oxide. Since neither the zinc oxide nor lead sulphate is affected by atmospheric conditions it is very durable. It does not darken by contact with sulphur gases, and therefore holds its color in coal burning cities.

VIEW OF PIPE LINE COFFEYVILLE PLANT

IN COURSE OF CONSTRUCTION

Principles of the Process

The ores are sized and carefully roasted to a proper sulphur content, the amount of sulphur left in the ore depending on the amount needed to combine with the lead to form basic lead sulphate. The roasting furnaces used are McDougalls, furnished by the Allis-Chalmers Company.

After roasting, the ore is taken to the pigment furnaces, and the zinc and lead are volatilized, the zinc going through the reaction as above described, and producing zinc oxide. The lead, which theoretically should also produce an oxide, does not do so, but unites with the sulphur left in the ore and forms basic lead sulphate.

Saving Copper, Gold and Silver

Another practical part of this process is the saving of copper, gold and silver in highly zinkiferous ores. Zinc has been a great detriment in many copper-gold-silver ores, and in some cases has rendered them valueless. The average zinc permitted in such ores without penalty is rarely over 10 per cent., and often as low as 5 per cent. In this pigment process the zinc is volatilized and the copper, gold

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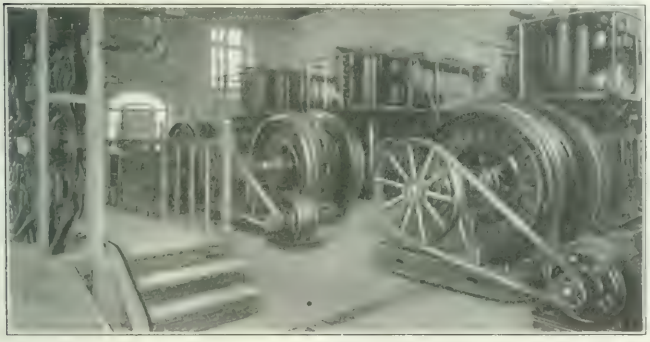
When electric lights are used in lighting the main drifts underground, the globe placed at each chute should be placed at the end of a drop wire of sufficient length to allow the trammer to move the light where he desires. When boulders block the chute a few feet above its mouth, the trammer wishes to see how they are caught; at other times, while loading, the light is best at one side, out of the way.

Novel Equipment of Tywarnhaile Copper Mine

Dynamos Driven by Producer-gas Engines Furnish Power and the Vacuum Process Serves to Concentrate the Low-grade Ore

BY EDWARD WALKER

The greatest production of copper in Cornwall is at the Levant and other mines where tin is the chief product, and Tywarnhaile, situated four miles north of Redruth, is the only mine now in operation where nothing but copper is found. It also has the distinction of affording the most up to date practice in power production and concentration to be found in Cornwall. The power is all provided by suction gas producers and gas engines which are coupled directly to electric generators. The pumping, hauling and metallurgical plants are all driven electrically with excellent results in the way of economy. The concentration of the copper ore is effected by the Elmore vacuum flotation process. This process is in its infancy and has only within the last month or so been running continuously on these ores and should not be confused with the Elmore oil concentration process, which proved a failure in practice, owing to the cost of the plant and the large consumption of oil. The principles of the present process were described in a recent issue of the JOURNAL.



A 75-KW. GENERATOR SET.

A SUCTION GAS PRODUCER.

APPLICATION OF THE ELMORE VACUUM PROCESS

The process is one of the family of flotation processes in which gaseous bubbles are used for carrying sulphides and native metals to the surface and so separating them from the gangue. Frank Elmore, in experimenting on these processes, discovered that the gases liberated when water is placed under a partial vacuum would act on the sulphides in this way, equally as well as gases generated by the action of acid on the gangue, as in the Potter and Delprat processes. In developing this he found that the vacuum could be adapted for circulating the material to be treated, and thus he developed a continuous and automatic process, in which the material is drawn up one arm of a siphon into the separator, and the tailings and concentrates discharged down the other arms of the siphon.

In order to get a siphoning action the plant is built on a series of floors, the separator at the top, and the supply and discharge tanks at the bottom, about 30 ft. below. The supply tank from which the material is drawn is a few feet above the discharge tanks. The pulp from the battery is delivered directly into a mixer on the first floor, consisting of a rotating barrel. Oil drops slowly into the pulp as it passes into the mixer. The rotation of the mixer brings the oil into contact with the surfaces of the particles, so that the particles shall offer more adhesion for the bubbles. After passing through the mixer, the pulp is discharged into a tank from which it is drawn up a pipe to the separator on the top floor. The separator is kept under a vacuum of 28 inches. By the arrangement of the siphon arms and the vacuum, the lifting and circulation of the pulp, concentrates and tailings is quite automatic. The diameters of the various pipes have to be calculated exactly. In order to maintain the proper level of the pulp, valves are placed at the bottoms of the discharge pipes, which can be regulated by the separator attendant. It is advisable in order to assist in this inspection and to help the agglomerated concentrates down the gallery, to have a supply of clean water entering at the top of the concentrator.

DEGREE OF FINENESS OF GRINDING.

The question how much water is to be in the pulp depends on circumstances. In many cases it is the custom to send the pulp through a settler so that some of the water may be extracted. At Tywarnhaile this is not done, but the pulp passes directly from the battery to the mixer.

Another point is the amount of oil used. Originally 15 lb. of oil to the ton of ore was specified, but W. R. Thomas, the manager of Tywarnhaile, cut this down to 5 lb. The oil used is a medium petroleum product, which drops easily, and is much more fluid than the oil used in the old Elmore oil process.

In order to make the oil have its proper effect on the surface of the sulphide particles, it is necessary that the water should contain some acid. In his first experiments Mr. Elmore added a few pounds of acid per ton. Since the plant has been in operation at Tywarnhaile Mr. Thomas has found that the natural acidity of the mine water is sufficient to achieve this end.

The power required to operate the plant is small. The motor which operates the vacuum pump and rotates the mixer is rated at 5 h.p. The separator is a small vessel, measuring five feet in diameter and standing about five feet high. Rather over a ton of ore is passed through it in an hour, the actual figures being from 25 to 30 tons a day. The stamp battery contains ten heads of 1050 lb. each, and crushes this amount to a fineness of 25 holes to the linear inch.

The process was first tried on slimes, but in practice it is found that coarser material will flow up the pipe in a perfectly satisfactory way. Mr. Thomas is

of ascertaining how coarse a material can be effectively treated.

At Tywarnhaile the ore treated up to the present time comes from the dumps, and assays on an average 0.5 per cent. of copper. After passing through the vacuum plant a concentrate averaging 9 per cent. is obtained, and the tailings assay about 0.08 per cent. These figures have been obtained by averaging over a month's run. Before very long the ore in the mine will be available. This ore is of comparatively low grade, not averaging more than 2 per cent.

Power Plant

The Tywarnhaile mine has been in possession of the present owners for nearly ten years. A year ago, when the Elmore vacuum plant was erected, it was decided to open up the mine once more, and to adopt the latest methods of power generation. The steam engines were abandoned and gas-power plant was substituted.

ELECTRICALLY DRIVEN TURBINE PUMP READY FOR LOWERING

Three Dowson producers have been erected, each rated at 160 h.p. The coal used is South Wales anthracite, which is broken to size from ½ in. to 1¼ in. There are three sets of gas engines and dynamos combined, of the Westinghouse type, each set consisting of three single-acting cylinders. Each set has a normal capacity of 130 brake h.p. The dynamos are alternators of the three-phase type, and the current is 90 kw., 440 volts and 50 period. The illustrations given herewith show the gas producers and scrubbers, the power house, and the new centrifugal pump.

The electric current has so far been used for driving the pump, and for operating the stamps and concentrating plant. In the course of a few weeks the hauling gear and aërial transport will be completed, and then the power plant will be in full operation.

The pump which was bought when the gas plant was erected is a Worthington two-stage turbine pump, and is driven by a 100-h.p. motor. The first work it had to do was to unwater the mine. The operations were complicated by the continuity of some of the workings into adjacent mines, so that a great deal more water was raised than the Tywarnhaile mine was responsible for. It took three months to unwater the mine from the adit level to 200 ft. below. The inflow of the water against which the pump has now to work is 600 gal. per min., which is about two-thirds of its possible capacity.

It is impossible to give exact results as yet relating to the economy of the gas-power plant, for the full power has not yet been required. Judging by the results up to date, it would appear that the coal consumption is about one-third of what it was when steam engines were used, and that the consumption is just a fraction above 1 lb. per brake h.p. The actual results when the full plant is in operation will be looked forward to with great interest.

The Brazilian government has recently established a bureau of geological and mineralogical research as a branch of the department of ways and public works. Among other duties this bureau will prepare maps, diagrams and statistics, and issue them for the benefit of statistical bureaus.

The Phosphates of Northern Arkansas

By A. H. Purdue*

The phosphate deposits of northern Arkansas occur over the area between the towns of Hickory Valley, northeast of Batesville, Independence county, and St. Joe, Searcy county. The phosphate bed, which is practically flat, outcrops on the hillsides above the streams. As prospecting and careful geological field work have been confined to that part of the area lying within Independence county, it is not known whether or not workable deposits occur to the west of this area.

Only one company, the Arkansas Fertilizer Company, is operating in the region. The developed deposits are near the mouth of Lafferty creek, in the western part of Independence county. Operations were begun in 1900, when a phosphate plant was established at the mines. After a few months the plant was destroyed by fire, but later it was decided to erect a new plant at Little Rock, and to ship the crude phosphate there for manufacture into acid phosphate. The new plant, which has an annual capacity of 40,000 tons of acid phosphate, was not completed until the latter part of 1906.

Nature of the Deposits

The phosphates occur as bedded deposits and probably are of Ordovician age. The total thickness of phosphate rock usually is several feet, but the only bed sufficiently rich to work with profit is from 18 in. to 6 ft. thick. Within the vicinity of the developed deposits this bed is a compact, homogeneous, light-gray rock. The color is due to small white particles thoroughly mixed with dark-gray material. The white particles apparently are the ground-up fragments of shells and to them is probably due the phosphatic character of the rock. The dark-gray material consists of small, angular to subangular fragments and gives the rock, on close inspection, a conglomeratic appearance.

Only about 3000 tons of crude phosphate were mined in 1906, but with the completion of the new plant the output for 1907 should be considerable.

In the purchase of zinc ore the returning charges which have been made by European smelters on American, Australian and Canadian ores during the last two or three years have ranged from $11.40 to $13.16 per 2000 lb., these figures corresponding to 53@60 marks or 65@75 francs per 1000 kg.

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*Professor of Geology and Mining, University of Arkansas, Fayetteville, Ark.

The Use of Coolers in Air Compression

By Frank Richards

The chief function of the cooler attached to an air compressor is the reduction of the volume of air to be compressed, the reduction of volume entailing a direct proportional saving in the power required. A reduction of 5 deg. F. means a reduction of 1 per cent. in the power required to compress any given quantity or weight of air. There are also important incidental advantages, which will appear later. The air may be cooled before compression by means of an "antecooler;" between two stages of compression, by an "intercooler; or after compression, in which case the apparatus is called an "aftercooler."

The antecooler is regarded by many as a mere refinement in air compression; yet it works quite as cheaply as the intercooler and there are many cases in which it could be employed with profit, especially in summer and in all cases where very cold water is available.

The Intercooler

The intercooler implies the compound or two-stage compressor, the two stages having the double purpose of avoiding high and dangerous temperatures and of saving power in the second compression on account of the considerable reduction of volume. The intercooler also, until very high pressures are reached, is apt to be regarded as an unprofitable refinement. The question of its utility is, however, not to be determined by opinion or prejudice. It should be approached in the same spirit as the question whether a given compressor should be a single-stage, a two-stage, a 20-in., or a 24-in. machine, the ultimate question in either case being as to which is the best machine for the purpose intended.

The precise pressures which should be reached in two stages is an open question; also the upper limit of single-stage compression. In the plants employed in the tunnel work, now going on about New York, we generally find two different systems, and two entirely separate and different sets of compressing apparatus, one for high and the other for low pressure, the former going up to 125 lb. gage, and the latter being expected to go no higher than 50 lb. In the service here referred to, the low-pressure compressors work most of the time at 20 to 30 lb., but there are many places where 50 lb. is the pressure to be constantly maintained, and then the value of two-stage compression may be worth looking into.

Comparative Cost

Suppose that we have to deliver compressed air constantly at 50 lb. gage, taking in air at 60 deg., and compressing in a single cylinder. Take a 30-in. diameter cylinder at 400 ft. piston speed. The free air capacity will be 1963 cu.ft. per min., the mean resistance for the compression stroke (adiabatic compression) will be 27.39 lb. sq.in., and the horse-power required will be 234.67.

Let us compare this with a system of two-stage compression, with an intercooler between the stages. The diameter of the first cylinder and the piston speed are the same as before, giving an equal free air capacity. We compress in the first cylinder to 25 lb., this pressure being fixed by the relative capacities of the first and the second cylinders and remaining constant regardless of the final or delivery pressure. The mean resistance, then, in the first cylinder (adiabatic compression) will be 17.01 lb., and the horse-power will be 145.74.

If the air thus compressed is then cooled to the original temperature, the pressure being maintained, the reduced volume will be inversely as the increased absolute pressure, 40:15, or 8:3, and for the second cylinder the piston area ratio should be the same, which would make it 18⅜ in. diameter. The mean effective resistance for the second compression, from 25 to 50 lb., would be 20.84 lb., and the h.p. would be 66.99, say 67, making the total h.p. 145.74 + 67 = 212.74, which is apparently a saving of 9 per cent. over the single-stage compression. As the intercooler would probably not cool the air quite to the original temperature, and as the friction of the mechanism as a whole would be slightly increased, the saving would probably be not more than 5 per cent. at the best, so that in compressing to 50 lb. it is doubtful whether two-stage compression with intercooling would be profitable.

When the Two-stage System Is Preferable

The great majority of compressors in use work at higher pressures than this, say from 75 to 90 lb. gage, this being the working pressure for rock drills, and for most of the air-operated tools of the shops. With the same cylinder data as before, 30 in. diameter and 400 ft. piston speed, the mean effective resistance in compressing adiabatically to 75 lb. single stage will be 35.23, and the h.p. 301.85. With two-stage compression compressing in the first cylinder to 30 lb., the mean effective resistance for this compression will be 19.4 lb., and the h.p. 166.3. For the second cylinder the diameter would be 17.32 in., the mean effective resistance 34.56, and the h.p. 98.7, making the total h.p. 265, or a little more than 12 per cent. less than for single-stage compression. Taken inversely, the power cost of single-stage over two-stage compression to 75 lb., with perfect intercooling, is nearly 14 per cent.

To compress to 90 lb., single stage, the mean effective resistance would be 39.18 lb. and the h.p. 335.71. Using the same two-stage cylinders as in the preceding case and compressing to 90 lb., the work of the low-pressure cylinder would be the same as before, and the h.p. the same, 166.3. For the high-pressure cylinder, compressing from 30 to 90 lb., the mean effective resistance would be 43.41 lb., and the h.p. 123.97, making the total h.p. 290.27, or nearly 14 per cent. below that for single compression, while in terms of the two stage compression the excess of h.p. for the single stage would be more than 15½ per cent. The gain here would seem to be beyond question.

Dry Air and Lubrication

The intercooler does more than reduce the horse-power required for a given compression and to secure safe and comfortable working temperatures. It does much to remove what is in some cases the most serious objection to the employment of compressed air. Dry air cannot freeze up, and the intercooler helps to dry the air. This drying of the air is the special function of the aftercooler. The dryness of air is always comparative. The air is at its highest pressure, when it leaves the compressor. If it can then also be reduced to the lowest possible temperature its moisture-carrying capacity will be at a minimum. The air will then be so wet that it will deposit moisture. The water should at this stage be given every chance to drop out, so that, when the pressure falls and the temperature rises, the same air will remain dry air while in use.

If the air is not cooled, and thus dried before it starts on its course through the pipes, it will begin dropping water as it goes along. In freezing weather in outdoor work, as in quarries, and especially in switch and signal work, the moisture will freeze and gradually choke the pipe, or some of the ice will be carried along to an elbow or to some depression and form a solid obstruction. When the moisture is not in excess in the air there can be no freezing up. In weather which is not freezing the moisture *which is precipitated* is the cause of "water hammer" and leaky joints. Air which has not been dried by cooling also interferes with lubrication. Oil and water will not mix, and when moisture condenses upon surfaces requiring lubrication the oil cannot get at those surfaces.

Overpoled copper looks like slightly underpoled copper under the microscope. The mechanical properties are satisfactory, but there is a slight decrease in conductivity and castings are bad, due to the expulsion of gases as the metal sets. An overpoled bath is, however, in a very unstable condition, and it is usual in such a case to start at the beginning of the refining operation and oxidize the metal to set copper again. The chemical reasons for these facts are not fully understood. The fact that molten copper is so sensitive chemically to its surroundings, and that it chills so readily, due to its high thermal conductivity, makes it a difficult metal to handle.

The Russian Platinum Industry

E. De Haupick, of the Imperial Russian Engineers, in a paper in the *Mining* [illegible] gives the following valuable data as to the platinum industry in Russia.

The principal centers of platinum placers are Goroblagodatsk, on the Asiatic slope of the Ural, north of the basin of the River Iss (placers of Count Schouvalov) and Nigni-Tagilsk, on the European slope, the basin of the rivers Vissim and Martian (placers of Prince Demidof). Placers of the second rank are scattered about Verk-Issetsk, Cherno-Istchinsk, Ekaterinbourg, Kytim, Solva, Slatoust, and on some affluents of the river Toura.

The Urals have produced from the first days of the platinum industry until 1907, six million ounces troy of crude platinum, and to these official figures we must add about 1.5 million ounces of platinum stolen by the miners, which has secretly found its way to the market, and is not accounted for by the Government statistics. The production at the Nijni-Tagilsk district is twice as great as that of the Goroblagodatsk, and the quality of the gravel is better than that of the latter.

The development of the Ural platinum industry has been very uneven. From 1828 to 1846 the platinum output was pushed from 6500 oz. to 110,000 oz. per annum, but after the Russian Mint suppressed the coining of platinum, the output fell in 1852 to 6400 oz. It was revived again by the English in 1862, when they began to export Ural crude platinum to London.

The total output of the last few years is given in the accompanying table.

PLATINUM PRODUCTION OF RUSSIA.

Year.	Ounces.
[illegible]	[illegible]
1895	203,250
1896	200,000
[illegible]	203,100
[illegible]	212,500
1903	226,000
[illegible]	190,120
[illegible]	200,450
1906	210,318

In 1906, 120 platinum placers were exploited, employing 6200 workmen, who washed 1,860,000 tons of alluvium, with an average of 0.09 oz. crude platinum per ton of gravel. In olden times the placers were richer in metal: from 1825 to 1829 the average extraction was 2.7 oz.; in 1829—1838, 0.5; in 1838—1850, 0.4; in 1850—1883, 0.33; in 1883—1894, 0.1; and in 1894—1907, 0.09 oz.

The Ural platinum market since 1862 has been in foreign hands. Johnson, Matthey & Co., of London, control the Nigni-Tagilsk placers; another English company (the Anglo-Russian Platinum Company, Limited) exploits the Cheridinski placers, the property of the Schaidourof Brothers; a German firm (Heraus & Co.), of Hanau, and a French one (Desmoutis, Lemaire, & Co.), of Paris, also control a great many placers. But the most important of the Ural firms is the Compagnie Industrielle du Platine, a French company, which has 40 different platinum placers on the rivers Iss, Peschanka, Toura, Schumakka, Gussevo, Melnitchoi, Taliza, Viy, Kissloi, Mokroy, and others. This company also has bought until 1915 the whole output of numerous placers of Count Schouvalov, in the Goroblagodatsk district.

The Compagnie Industrielle du Platine has a contract with another French company, the Compagnie des Metaux, to which it transfers the whole output of platinum for its disposal on European and American markets. The yearly production of this company amounts to 70,000—90,000 oz. Russia does not consume more than 6000 to 7000 oz., and this amount is used by two firms in St. Petersburg—the Kolbe & Lindfors and the Tentelef Chemical Manufacturing Company. Germans import Ural platinum only for their own consumption, without taking part in speculation. About 80 per cent. of the whole platinum output goes from the Ural to France and England.

The whole import of platinum into the United States is made from Paris, where the center of gravity of the world's platinum market is at present. As the whole yearly Ural platinum output is about 200,000 oz., the United States is the greatest consumer of Russian platinum.

The large profits from the prevailing high prices for platinum do not benefit the Ural mine owners, because the entire output for a varying term of years has been bought up under contracts at very low prices—about £2 6s. per oz. for 82 per cent. crude platinum—and they are excluded from participation in any gain in the rise of its value. Consequently the mine owners are not anxious to increase the platinum supply, awaiting the time when they can dispose of their product to better advantage. We can thus explain the fact that, in spite of the unprecedented ascent in prices, the output of platinum during the last 10 years has not increased. If we now study the figures relating to platinum ingot prices, we observe that before 1898 it was £2 2s. per oz., and since that time it has increased to £3 13s. 6d. in 1898, £4 4s. in 1902, £4 10s. 4d. in 1905, and £7 19s. 8d. in 1906. We can account for this when we bear in mind that the Compagnie Industrielle du Platine began its activity in 1898 with 65,500 shares representing a capital of £1,000,000, which pays a high dividend, as well as the shares of the Compagnie des Metaux, which sells the platinum of the Compagnie Industrielle du Platine.

The handling of over 65 per cent. of the Ural platinum output is controlled by a coterie—the so called Platinum Trust—which can manipulate the market almost at will. Yet, so far as can be ascertained by diligent inquiry, the recent break (early in 1907) originated in the United States, which accumulated during 1906 a considerable stock of platinum. At present American consumers are convinced that the prices will decline, and are placing as small orders as possible. To the impartial critic of the situation it would seem that the market actually is weakening, and we can expect for some time a decline in the price of platinum, but only for a time. It may be confidently predicted that the causes above mentioned—viz., the increase of the platinum price, the limited number of placers, the diminution in their yield, and the speculative tendency of the French company—do not give us cause to expect in future a decrease of the price of the metal to a reasonable figure, as its demand for almost all purposes increases every day with the development of the industry.

AVERAGE PRICE PER OUNCE TROY FOR PLATINUM INGOTS.

Year.	£	s.	d.
1874	1	5	2
1888	1	13	8
1890	1	15	8
1893	1	17	9
1895	2	2	0
1898	3	13	6
1900	3	19	9
1901	4	1	11
1902	4	4	0
1903	4	6	1
1904	4	8	1
1905	4	10	4
1906 (Jan.)	4	15	2
1906 (Oct.)	7	19	8
1907 (Jan.)	7	0	0
1907 (Feb.)	6	19	6
1907 (Meh.)	6	19	0
1907 (Apr.)	6	18	8

PRICE FOR CRUDE PLATINUM OF 82 PER CENT. IN URALS.

Year	Rubles per pood.	£	s.	d.
1874	4,800	0	19	0
1888	6,000	1	4	0
1890	6,200	1	4	8
1893	6,500	1	5	10
1895	6,600	1	6	7
1898	6,800	1	7	9
1899	7,000	1	7	8
1901	16,200	3	3	9
1902	17,300	3	9	4
1903	18,500	3	13	3
1904	21,000	4	3	8
1905	22,000	4	7	9
1906 (Jan.)	22,000	4	7	9
1906 (Oct.)	34,000	6	15	8
1907 (Jan.)	30,000	5	18	11
1907 (Feb.)	29,000	5	15	8
1907 (Meh.)	28,000	5	12	0
1907 (Apr.)	27,000	5	8	0

Electrolyte for Refining Copper

The ideal electrolyte for refining copper would be one chemically inert as a solvent but capable of electrochemically dissolving copper, and of zero specific resistance. These conditions are most nearly met by an acidulated sulphate solution, and this has the additional commercial advantage of employing one of the cheapest of chemicals, sulphuric acid. A sufficiently high percentage of sulphuric acid may be carried to make the specific resistance very low. There is a slight re-dissolving of the cathode copper, but not in serious amount. Gold is untouched and silver practically so. It is customary to carry a minute percentage of some soluble chloride as a constituent of the electrolyte which would throw down as chloride any silver which might be dissolved and also tend to slime antimony as oxychloride. Some claim that smoother cathodes result from the presence of chlorine.

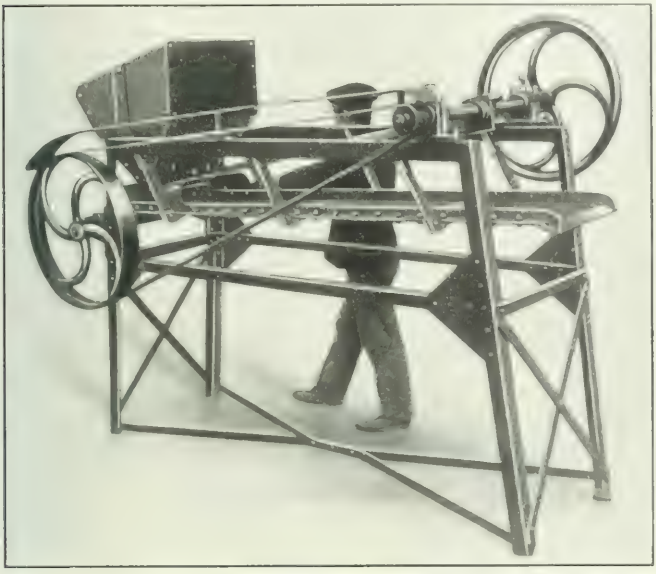
A Hand Screen Used at Monteponi, Sardinia

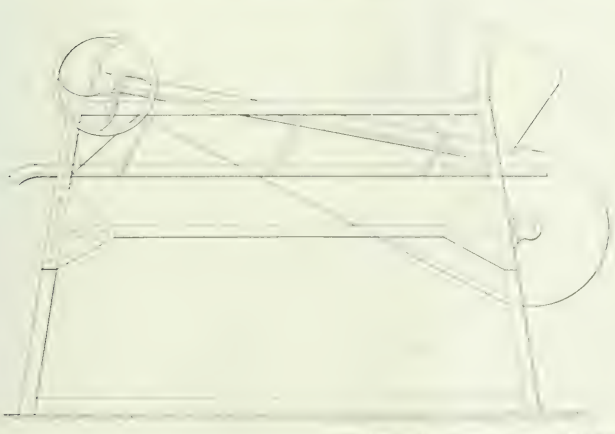
By Ermino Ferraris*

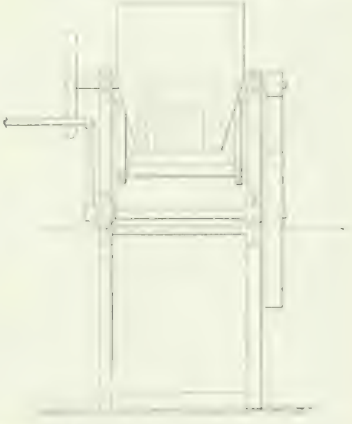
An efficient hand screen is often a great help in a mining camp where the ores are scattered at many points and no milling plant is at hand. The accompanying drawing and photograph show a hand screen used in Sardinia and other Mediterranean countries, which was first introduced at Monteponi about six years ago. It is designed on the principle of the Ferraris shaking screen, but is driven by hand and a belt. The eccentric gives by means of two wood connecting rods 300 oscillations per minute to the screen, which is supported by six wooden springs. The ore is delivered from a hopper to the screen, and is moved forward by the rapid diagonal oscillation of the screen.

If more than one size is required the screen is provided with two or more sizes of wire cloth, the space under the screen, between the four legs of angle iron, being divided correspondingly by wooden partitions. A wooden platform is placed in the framework near the bottom, on which heavy stones are loaded to keep the apparatus steady during operation.

Ores to be sifted by this apparatus must be dry. The work done by it is the same as by the machine-driven Ferraris screen, which has come extensively into use. The screen can easily be operated by a boy, and two men shoveling cannot overload it. The weight of the machine, as shown in the photograph is 300 kilograms.







*Director-General, Società di Monteponi, Monteponi, Sardinia.

Gold in China

With the object of stimulating gold production and coinage in China, the board of finance and the director of the Chinese Imperial Mint have passed the following order:

1. That more mines be prospected for, so as to insure a sufficient supply of gold.
2. That the provinces be ordered to make purchases of the metal and quickly transport same to Tien-Tsin for minting. Rewards will be granted to the provinces which make the largest purchases.
3. That experimental coinage be made first at Tien-Tsin and extended to other provinces, should it prove to be satisfactory.
4. That a uniform rate of exchange be fixed.
5. That one-tenth of the pay of officials of all grades above 100 taels be in gold.
6. That the gold coins be accepted for payment of customs and likin.
7. That gold, either in bullion or coin, is prohibited from being exported.
8. That the metal is prohibited from being used for the coating of idols.
9. That a law be passed to prevent the destruction of gold coins for any purpose.

The Muho and Kuanying Shan gold mines in Heilungkiang have been restored to China by Russia on the repayment of expenses incurred by the latter during the last several years.

Taotai Liu, director of mines, requests his Excellency Yuan to consult the Tartar generals of Fengtien, Kirin and Heilungkiang regarding the raising of funds for the reorganization of the mines.

Zinc and Lead in Upper Mississippi Valley

An old and famous mining region in the upper Mississippi valley is the area including Grant, Lafayette and Iowa counties in Wisconsin, Jo Daviess county in Illinois, and an irregular narrow belt of territory in Clayton and Dubuque counties paralleling the Mississippi river in Iowa. Dubuque, Galena, Platteville and Mineral Point are the leading cities. A recent publication (Bulletin No. 294) of the United States Geological Survey, entitled "Zinc and Lead Deposits of the Upper Mississippi Valley," by H. Foster Bain, State geologist of Illinois, is primarily an account of the present condition of the district and a statement of ideas relatng to the formation of the ores.

It is estimated that from 1821 to 1904 the total lead production of the district was 611,975 tons, which sold for approximately $50,000,000. The maximum production was between 1840 and 1845. In 1845 and again in 1847 more than 27,000 tons of lead were shipped. The total production of zinc up to 1905 is estimated at 450,000 tons, which probably did not bring much over $10,000,000. The early prices paid for the ore were very low—$3 to $8 for the carbonate and $4 to $12 for the blende. In recent years the product has been entirely blende, which has sold for much better prices. The zinc production of the district is now rapidly increasing, and for the year 1905 approximated 33,000 tons.

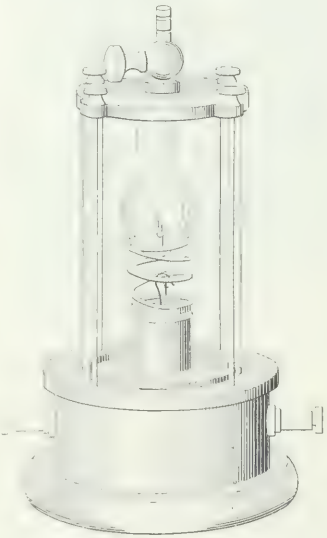
The scientific conclusion of Mr. Bain's consideration may be summarized as follows: "The ores of this region are believed to represent concentrations of material originally disseminated through the surrounding rocks, particularly the Galena and upper Platteville beds. It is believed that the zinc and lead originally present in the crystalline rocks of the Lake Superior district were delivered by rivers to an especially favorable portion of the Ordovician coast, where in warm, shallow waters they were partially concentrated by evaporation and were locally precipitated in quantity. The agents of precipitation were hydrocarbons or hydrogen sulphide, or both, derived from decaying masses of algae of a peculiar type irregularly accumulated within certain shallow basins on the sea floor. The rising hydrocarbons continued to be effective throughout the period of deposition of the Galena dolomite.

"As the algae matter became compressed the beds above broke and settled, leaving open spaces of peculiar form for the ultimate reception of the orebodies. The beds were slightly deformed, whereby the basins were accentuated, and deep joint cracks were developed. The area was subjected to peneplanation and later to gorge cutting, whereby the overlying shale was cut away and a vigorous underground circulation was brought about. This circulation resulted in a concentration of the disseminated material, and with the fall of ground-water level the ores were successively reconcentrated until the present type was produced."

The Tommasi Electric Safety Lamps

By D. Tommasi*

The ordinary incandescent lamp does not offer absolute safety in inflammable surroundings for if the globe breaks the filament burns in contact with the air. Even though this combustion is not instantaneous, it gives rise to the production of extremely small particles which in themselves are sufficient to start the distillation and explosion of certain mixtures of air and gas, and also of air and dust.



TOMASSI ELECTRIC SAFETY LAMP

To prevent absolutely all possibility of explosion, it is necessary to make it impossible for the filament to come in contact with the explosive gas. This end I have accomplished in the lamp shown in Fig. 1. The lamp proper is mounted within a glass cylinder which is closed at one end by the base of the apparatus and at the other end by a lid which is provided with a stop-cock. The whole arrangement is air-tight. The conducting wires are fastened to the binding posts on the base of the lamp as shown. Within the supporting pedestal there is a pair of little rubber bellows. When the bellows are not inflated they raise a little metallic tappet which is hinged at one end and in so raising the tappet, the current is broken.

In order to put the lamp in working order, it is necessary only to inflate the bellows and this is done by putting a piece of rubber tubing over the stop-cock and forcing in the requisite amount of air. The compression thus produced causes the bellows to dilate and close the circuit.

It follows, that if from any cause the glass cylinder breaks the pressure drops, the bellows contract, the tappets separate and the lamp goes out. On the other hand, if the globe itself breaks instead of the glass cylinder, the air within the cylinder expands by a volume equal to the volume of the globe or enough to cause the two tappets to separate and break. In any case, the filament remains inclosed either in the globe or in the protecting glass envelope.

For portable lamps the apparatus is provided with a light storage battery.

*Electrical engineer, Avenue d 'Italie, Paris.

The Thermit Patents

Special Correspondence

A patent suit has just been decided in London in connection with the thermit process. The company owning Dr. Goldschmidt's patents brought an action for infringement against a company called Weldite, Ltd. This latter company holds no patents but used silicide of aluminum, or a mixture of silicon and aluminum, for reducing iron oxides and so producing heat and metal suitable for welding steel rails. The only difference between this and the thermit process was the addition of silicon to the mixture. Weldite, Ltd., also contended that the thermit patents were not good in law, as the process was a matter of common knowledge, and relied on Claude Vautin's patent of 1894 for this statement. By the way it was Mr. Vautin and Messrs. Sulman and Picard who were at the back of Weldite. Mr. Vautin's patent of 1894 shows how iron and other oxides can be reduced by application of metallic aluminum, but it says nothing about any method, process or apparatus for utilizing the reaction for welding purposes. Also, the reaction was never used practically by Mr. Vautin, as he had devised no method of igniting the mixture which would not blow the whole charge away. Personally, I believe that the knowledge of the reaction dates from an earlier time than Mr. Vautin's patent. The judge before whom the action was tried upheld the thermit patents, declaring that the application to welding, the apparatus used, and the method of ignition were good inventions, and that the defendant's admixture of silicon with the aluminum was a colorable imitation. Consequently an injunction was granted against Weldite, Ltd.

Santa Cruz, a New Copper Camp in Sonora

BY F. J. H. MERRILL*

In the Magdalena district of Sonora, about 27 miles by wagon road southeast of Nogales, are the Santa Cruz mountains, which occupy a broad bend of the river of that name. On their western slope extensive discoveries of copper sulphide ores have brought in a swarm of prospectors and miners. Col. W. C. Green has just completed the denouncement of 4000 *pertinencias*, C. Sandoval & Co., bankers of Nogales, have taken up 190 pertinencias, Arnold & Co., of Cananea, have 50 pertinencias, and Geo. Derrick, of Cananea, 200 pertinencias—in all, claims numbering more than 5000 pertinencias have been filed by about 15 persons.

The claims are chiefly on the southwest slope of the mountain, which is furrowed by three large gulleys. The area in which the new claims have been filed is approximately five miles by two. I have not had an opportunity to visit the region, but the following general details are supplied by a graduate of the Freiberg mining school:

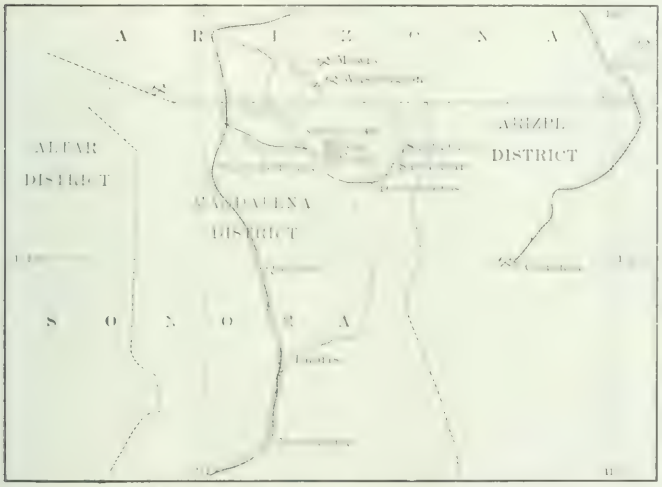
The country rocks are described as granite overlain by porphyry, ore being, it is said, found in both. The surface indications were faint parallel lines of malachite; on sinking a few feet, chalcopyrite ore was found. The first discovery was made by Edward Arnold, mayor of Cananea, a Mexican citizen of Swiss descent, shortly before Christmas of 1906. He has a shaft down 100 ft. The vein began with a width of 4 ft. at the surface. It is now said to be over 20 ft. wide. A tunnel has been started to meet the bottom of this shaft at a distance of 180 ft. from the side [illegible]

In this tunnel sulphides of copper and iron were encountered at a distance of 7 ft. from the surface and, although it has been driven 120 ft., nearly all of it is in ore.

Samples taken from these workings are said to carry 20 to 40 per cent. copper and average 0.7 oz. gold.

Twenty or thirty prospect holes have recently been opened, many of which have struck ore. This new camp will be watched with much interest by all interested in the production of copper. The test of development must now be applied to determine the facts.

*Mining geologist, New York.



MAP SHOWING LOCATION OF SANTA CRUZ CAMP.

The Mountain Copper Company

The Mountain Copper Company, owning deposits and smelters at Keswick, Shasta county, Cal., and smelting and chemical plant at San Francisco, has issued its report for 1906. This company is controlled by Matheson & Company, of London, which also controls the Rio Tinto in Spain.

The profit for the year, subject to income tax, was £94,948, against £158,168 last year. The sales of copper for delivery during the year were 2854 tons, against 4564 tons last year.

It will be remembered that in accordance with the policy proposed by the board and adopted in 1904, the old smelting works at Keswick were closed in 1905 and a new establishment erected in the neighborhood of San Francisco, in which not only the copper contained in the ore could be recovered, but also the sulphur contents utilized. This policy, a good one in itself in respect to the rich ores, was rendered necessary by the Government injunction which was threatened and subsequently issued on account of alleged smoke nuisance, and also by the desirability of creating a market to be available in years to come, when the rich copper ores would in all probability be worked out and the company would have to depend upon its sulphur ores and products for its chief source of profit.

The closing of the Keswick smelting works has proved to have been not inopportune, as it has left for treatment in these times of high prices a quantity of rich copper ore which would otherwise have been smelted and marketed during a period of comparatively low prices.

The new smelting works and the acid and fertilizer factories were brought into operation in the spring and summer of last year, and have proved efficient.

Directly it was realized that the world's consumption was likely to keep the price of copper at or near the high price to which it has recently risen, the general manager intimated that he could at a moderate outlay start up and work, at any rate for a time, part of the old Keswick smelting plant, and as, by the company's successful appeal the Goverhment injunction was lifted pending further action the board naturally decided to take advantage of the good prices to resume smelting at Keswick. One of the old furnaces has lately been blown in. The sale of acid has come up to the board's anticipation, and all the fertilizers made thus far have been sold.

The earthquake and fire at San Francisco greatly upset all business in California. The demand for refined copper has been limited, as all the factories were destroyed. The copper has had, therefore, to be chiefly marketed at the centers to which it was formerly sent from the old smelting works.

The share capital of the company stands at the nominal sum of £20, and the yearly profits are employed in paying interest on the debentures and in redeeming them. This somewhat unusual arrangement came about in 1902 when it was found that the copper deposits at Keswick were of limited extent, the shares then being converted into redeemable debentures amounting to one million pounds. Of these debentures £250,000 have been redeemed, leaving £750,000 outstanding. Owing to the difficulty at Keswick about the fumes, and the necessary removal of the works to San Francisco, much of the profit during the last years has gone to expenditure on capital account. Including the balance brought in from 1905 and the profit for 1906, the company has £150,000 in cash resources at the present time.

At Wardner, Idaho, miners are paid $3.50 per day; shovelers, $3; foreman, $6 @7; shift bosses, $4@6; timbermen, $3.75 @4; hoisting engineers, $4; head blacksmiths, $4.50; generally eight-hour shifts. The rate for board is $1 per day.

The Mining District of Asientos, Mexico

A District Situated Near Two Smelting Plants Which Includes Promising Copper, Lead and Silver Deposits in Rhyolite and Limestone

BY BRUNO NEWMAN*

The Asientos district is located about 40 miles northwest of the city of Aguascalientes. The mines are about 5 miles from the nearest railroad stations, San Gil, on the San Luis Potosi branch of the Mexican Central, and Cobre, a spur of the main line of the Mexican Central. The distance to the nearest smelting works is 40 miles from the American Smelting and Refining Company plant, at Aguascalientes, and about 75 miles from the works at San Luis Potosi. This insures low freight rates and makes it possible to ship low-

ers, striking about 10 deg. northwest, with numerous smaller branch veins varying from north 10 deg. east to north 50 deg. west, and the most eastern system strikes about north 55 deg. west. This latter produces a silicious lead-silver ore of good silver grade and large, fairly uniform width. The general dip is from 60 to 75 deg. to the southwest.

The whole district outcrops plentifully with good surface indications, and has been prospected very little and for only about 4000 m. of its length.

The formation of the district is a gray-

of the geology of the district. The deepest workings in the copper deposits are only about 125 m., and are still in the limerock exposed at the surface.

Santa Francisca Mines

The Santa Francisca mines on the most easterly split, are by far the largest and most developed mines in this district. It is an "Antigua," and records tell of work having been done 200 years ago by the Spanish priests. A considerable accumulation of water in the old workings was at first encountered, but the property is

MINES, ASIENTOS; OLD WORKINGS OF SPANIARDS ABOVE PRESENT MINE

Character of Deposits

The main dike strikes across the district in a direction of about 30 deg. northwest-southeast, but at the most southeastern point of the camp it breaks up into three main vein systems, each of which again splits into numerous smaller veins. The three main splits strike about as follows: One, the most western, north about 45 deg. west. On this system are located the Guggenheim mines at Cobre and the Fortuna mines at Santa Clara. On the other two systems the mines at Asientos are located. The western and middle mines are the copper-ore produc-

black limerock along the copper-producing veins, while the lead-silver split has a surface capping of rhyolite to a depth of about 200 m., varying from pinkish color at the surface to a more compact olive green in depth. Below this depth the limestone formation has been encountered once more, indicating the rhyolite to be a later local flow of limited extent. As the deepest workings in the district are only about 225 m. deep, and this only in one shaft at the lead-silver property of the American Smelting and Refining Company, the Santa Francisca mines, which shaft has passed through the surface rhyolite, and is now in the country limerock, comparatively little is known

now thoroughly unwatered and work is being carried on vigorously. The mine is pumping about 600 gal. of water.

The upper three level workings are all in rhyolite, but at the fourth level, limerock was encountered. Through this a crosscut has been driven toward the vein. The rock encountered in this crosscut changed to a carbonaceous shale, much foliated and slickensided. The vein has, however, been reached and is producing ore, although the output is retarded because of the large amount of water encountered.

The vein matter is silicious, having a banded appearance, the bands alternating from quartz to lead-zinc streaks. The

vein varies [illegible] ft., with an average of about 20 ft. of ore. The lead, 2 to 3 per cent. being the average, carries most of the silver, about 1 kg. per ton, the zinc content being small, about 3 to 5 per cent., and silica about 58 per cent.

Mining has been carried on with square sets, owing to the loose ground in the old workings, but the country rock is sufficiently strong to omit timbering in virgin ground. All the ore is hand-sorted on the patio and shipped to the smelter at Aguascalientes by the Mexican Central Railroad, from San Gil, the mine's 10 kilometer railroad carrying the ore to the bins at San Gil station.

The output is steadily increasing, and will be very much augmented by the stoping ground to be opened in the fourth and fifth levels, in which latter crosscut is now being pushed from the main shaft toward the vein. The mine is owned by the American Smelting and Refining Company.

Merced y Anexa and El Orito

The largest copper-producing property is the property of the Aguascalientes Metal Company. It is located on the central vein system and consists of the Merced y Anexa and El Orito claims. Albert Doerr, the manager of the mine, who furnished the data given below, states that the present company has been exploiting the property for the past eight years. The Merced property has two veins, averaging 3 and 5 m. in width, the ore occurring in lenticular shoots. The vein matter is siliceous lime, the footwall consisting of a porphyritic dike and the hanging wall of slaty limestone. The silica content of the vein filling increases with depth, the average ore running 3.5 per cent. Cu, 250 gram Ag, and 5 gram gold per metric ton.

The ore is mined mostly by overhand stoping, being hoisted by electric power from one shaft and by horse whim from another, which is now being replaced by an electric hoist. Practically no timbering is required underground. The ore is shipped to the railroad by burros and carts, the property at present shipping 1500 to 1800 tons per month to the Aguascalientes smelter, its ore shipped by burro going to the Guggenheim branch railroad at Cobre, and the carts carrying

SANTA ELANDIA MINE

PLANT AND MINE, AGUASCALIENTES METAL [illegible]

The Asientos Mining Company also owns several properties on the same vein and some of its branches. Its principal claims are the Nopensada, Alta Palmira [illegible]

electric power, located at the Nopensada mines, has been shut down, for several years, but is about to resume, with new owners, who are putting up a plant at Alta Palmira also. The Nopensada and Alta Palmira mines are "Antiguas," the latter, according to reports, having furnished very high-grade silicious silver ore below its surface copper ore. Its old square masonry shafts are filled with water, and no work has been done for several years. Several prospects on the Alta Palmira vein have recently encountered good ore and bid fair to become good properties if properly developed.

The Nopensada is a copper producer, and before its shutdown shipped considerable ore, although no great depth has yet been obtained. The new company is now unwatering the mine and expects soon to be operating again.

Other Mines

The Mitchell Mining Company, of New York, has recently obtained several mines, prospects, and a large amount of surrounding ground east of the Nopensada mines, and is now developing some of its prospects with good indications of success.

A few prospects in the district, the Los Angeles, Lulu, Mascota, Patricio and Tepozan, especially on the branch vein called "Alta Palmira vein," are opening good ground, and good ore has been encountered in some of these prospect shafts and

workings at comparatively shallow depth. With a reasonable outlay of money spent in systematic development work, the prospects in the camp should rapidly become producers. Some good ore has also been encountered on the extension of the Santa Francisca vein, by some new prospects working on this siliceous silver vein system.

The town of Asientos is located in a beautiful valley about one and a half miles from the mines, and has a population of about 3000. The American colony in the camp numbers about 30 people, and supports an American school. The elevation is about 7000 ft., and the climate is most agreeable throughout the year. The San Gil railroad station of the San Luis branch of the Mexican Central, is about four miles from the town, and the Cobre station on the spur of the main line about three miles.

Labor is of fair grade, the miners coming originally from the Zacatecas camps, and there is no difficulty in securing sufficient labor at a reasonable price. Most of the work is done on contract or meter system, the miners receiving from $1 to $1.50 per meter drilled on the latter system.

Because of its ideal climate, plenty of labor, its nearness to both railroad and smelting works, the camp offers unusually favorable opportunities for the mining of its low-grade ore. The present lack of development of the camp is due to lack of outside capital for vigorous working of the prospects in the district, but several companies have taken up considerable property lately, and before long activity on a larger scale than heretofore is confidently expected.

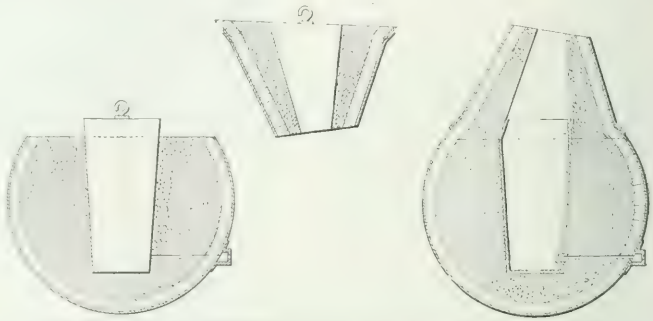
Lining and Drying Copper Converters

By H. L. Charles*

A new method of lining and drying copper converters, invented by H. L. Charles does away with the old method of drying the lining with fuel aided by blast pressure. The new method effects not only a saving in expense, but also in the time of drying and in the operation of the converter. The fuel-drying method consists in filling the newly lined converter with wood and when the fire has started, a light blast is introduced at the tuyeres. Then about 250 lb. of coke is put in and more blast applied until a high heat is attained. This method requires the use of at least two tons of coke for each lining, and then does not completely dry the wet lining in 24 hours. Moreover, the uneven drying prevents uniform corrosion and injures the life of the lining.

In the new method the converter is lined by tamping the lining material around cores inserted in the shells as shown in the accompanying drawing, after introducing one layer of fire-brick in the usual manner. The tuyeres are plugged on the inside with clay and the converter is filled with molten slag. Converter slag is preferable, but slag or low-grade matte from blast or reverberatory furnaces may be used. The converter is set away for one, two or three hours, and the molten slag is poured out to allow the shell, formed on the inside, to cool gradually. In about eight hours the converter is ready for service. Numerous vent holes in the shell permit the steam and water to escape.

The bottom should be tamped in about two inches deeper than when fuel is used, to allow for the proper depth below the tuyeres for the shell that will naturally freeze on the bottom. The core should also be three inches longer and two inches wider than when formerly used, to allow for the shell formed on all sides. The slag shell should be knocked off on the tuyere side to prevent the first charge from spilling out and also running cool.



CORES IN POSITION IN CONVERTER PARTS, AND SLAG SHELL IN DRIED LINING.

The process insures a more even corrosion of the lining, as well as a longer life to each lining. No caving of the lining will occur. Four and sometimes five shells for each stand are usually required when fuel is used, while with the slag process only two and one-half or possibly two are necessary. The longer life of the lining enables me to make from one to three charges more than when fuel was used for drying.

The process is now in use at the Butte Reduction Works at Butte, Montana, the Boston and Montana smelter at Great Falls, Montana, at the Bingham Consolidated smelter in the Salt Lake valley, and many others are considering adopting the method.

Monazite sand exporters in Brazil have been having more or less trouble with tax matters with State governments of late. The exhaustion of the best deposits of the mineral is likely to lead to some important changes in the course of the business in Brazil in a short time.

Columbia River Gold

The occurrence of finely divided gold associated with magnetic iron in the river sands of northeastern Washington is described by A. J. Collier of the U. S. Geological Survey in "Contributions to Economic Geology, 1906" (bulletin 315).

Placer claims were worked at many points along the upper Columbia river 20 to 30 years ago, but since the exclusion of Chinese laborers these old mines have been abandoned.

The placer gold along the Columbia is confined to the lower benches and river bars. It is associated with black sand containing a large amount of magnetite and smaller amounts of ilmenite, zircon, garnet, and other heavy minerals. Platinum probably also occurs in small quantities, though its presence was not detected in the field. It is claimed that the ultimate source of the Columbia River gold is to be found in the areas of crystalline and metamorphic rocks to the north and east, which are known to contain gold-bearing quartz veins, as well as other orebodies of various kinds containing gold.

The outlook for mining along the Columbia river is not encouraging; the possible profits from mining these lands would undoubtedly be less than the value of these lands for agricultural purposes. It is believed that the total amount of gold contained in the river bed and adjacent benches never exceeded $28,000 per linear mile, and the total amount in the 90 miles between Kettle falls and Nespelem could not have been more than $2,500,000. This gold is not uniformly distributed, and even if the bench lands were known to justify mining, it would not be advisable as they are not adapted to any relatively inexpensive process of mining. Hydraulicking on a large scale is ruled out by the absence of bed rock and the scarcity of water pressure; dredging, by the hight of these deposits above the river and the impossibility of floating the machinery over them.

*Consulting engineer, Consolidated Mining and Smelting Company, Salt Lake City, Utah.

The Auriferous Black Sands of California

By J. A. Edman

The periodically occurring outbreaks of popular excitement in reference to new discoveries or re-discoveries of auriferous material have, at various times, been directed toward the actual or imaginary value of the heavy sands derived from gold-bearing gravel deposits, and generally known as black sands, by reason of the preponderance of dark-colored iron minerals among them.

The first and most notable popular excitement of this kind occurred in April, 1851, about the beach deposits at Gold Bluff, Humboldt county, and led to a rush of San Franciscans to that locality. Seven years later 25,000 Californians rushed to the lower Fraser river, in British Columbia, to seek wealth in somewhat related deposits of recent river gravels—a search which resulted disastrously to many, and led to the return of most of the California prospectors during 1859. Since that time the black sands rested in obscurity, except in isolated cases, when feeble attempts were made to extract the metallic value from various beach deposits along the coast of California and southern Oregon, until 1893, when public attention was again directed to the gold-bearing beach sands, as capable of furnishing a supply of economically valuable iron ore, besides gold and platinum.

The fallacy of this expectation was clearly shown during the discussion that followed, but attention was thereby directed to the gold present in the tailings from the extensive placer, drift, and hydraulic mines operating in the ancient and recent auriferous gravels of California, and which in their concentrated form carried values in association with the black sands. Lacking the element of novelty and speculation, public attention was not again directed to the subject until 1899, when Dr. David T. Day, of the United States Geological Survey, visited California and southern Oregon to investigate the occurrence of platinum and its related metals, chiefly on the beaches and in the stream gravels of northern California[1]. This again called attention to the black sands, although no attempt was then made to ascertain their gold value.

Dr. Day's Experiments

Meanwhile the constantly increasing scarcity of platinum led to efforts to exploit the known occurrences of that metal on the Pacific coast, and Dr. David T. Day was again placed in charge of a laboratory established by the Geological Survey, at the Lewis and Clark Exposition, in Portland, under a liberal appropriation made for the purpose, the object of which was to examine and report exhaustively upon the black sands of the Pacific coast. Numerous samples of the heavy sands from the mines of the Western States were collected and tested in the laboratory mentioned, and some of the results have reached the public through press reports, apparently emanating from the chief of the laboratory. Some results obtained from California sands were also published in Bulletin No. 38, "Structural and Industrial Materials of California," of the California State Mining Bureau.

The official report of these investigations made by Dr. David T. Day and R. H. Richards, was finally made public about March 1 last, and contains in tabulated form the mineral composition and metallic values of the 931 samples of sands examined by the commission.

While containing much of value in relation to the mineralogical composition of these sands, the report gives but few practical suggestions for their mechanical or metallurgical treatment in the field or at the mine. It gives, however, the record of several interesting laboratory experiments in the production of crude iron and steel from the iron sands by the use of the electric furnace.

Since the close of the Portland Exposition in October, 1905, there has appeared a host of actual or pretended inventors of machinery to manipulate the black sands, and also a number of patent or secret process men or corporations, among which many have put forth the most extravagant claims of their ability to extract metallic as well as other values from these golden sands, and manufacture high-grade steel from the waste; all to be done cheaply and effectively.

In view of the erroneous and misleading impressions already created a brief statement of the origin, distribution, and probable value of the heavy black sands, from the standpoint of the miner and metallurgist, has been prepared.

Origin and Physical Characters

The popularly so-called black sands comprise the minute particles of the heavy, hard, and resistant minerals originally existing in the rocks that form the various gravel deposits of California, as well as of any other country where metamorphic and igneous rocks exist or predominate, and are found in small quantities in all water-borne sands and gravels, in beach, river, creek, gulch, and hill deposits, both ancient and recent. In their original condition they form but a small percentage of the gravels, varying from 0.25 per cent. up to, but seldom exceeding, 2 per cent.; are frequently distributed all through the mass of deep gravel beds, but by virtue of their generally high specific gravity occur somewhat concentrated in the lower strata and on the underlying bedrock. They seldom, if ever, become visible except through the operations of the gravel miner, when they undergo a partial mechanical concentration in the resultant tailings. The tailings deposits in their turn become further concentrated in contact with free-flowing streams, when a concentration may be effected up to 5 per cent. and occasionally but rarely up to 10 per cent.

The black sand of the beaches represents nature's work of concentration on the slightly auriferous gravel beds of fluviatile origin, as at Gold Bluff, in Humboldt county, and at other points on the coast, and more rarely from direct erosion by wave action on the auriferous rocks of a coast line. The concentration here, as depending upon the surf, is fitful and changing, but frequently results in the formation of a thin layer of almost pure black iron sands, occasionally rich in gold and to less extent in platinum.

Any deep and extensive deposits of iron sands have not yet been discovered on this coast, and so far exist only in the vivid imaginations of unscrupulous promoters of mining schemes or patent processes. If, however, they did exist, such sands are of little commercial value for the manufacture of iron in any country where pure iron ores in mass are relatively abundant, as is the case even in California. They could not, even under the most favorable conditions, compete with the iron ores of Lake Superior.

The black sand of the beaches, as well as of the interior, consists largely of tifaniferous iron as well as chromite, which minerals can not be successfully eliminated for commercial uses, even by the best magnetic separation. After concentration and separation, a briquetting of the sand would be imperative.

The black sand derived from the gravel deposits of the interior carries, in addition to the gold and platinum, other elements of value, such as gold amalgams, nickel, iron, various auriferous sulphides and selenides, and occasionally metallic copper. Various heavy silicates and oxides are found mingled with the iron sand, of which, however, only a few occur in quantity enough to be commercially valuable, such as zircon, tantalite, and cassiterite. Diamonds in microscopic sizes are occasionally met with in the black sand, and larger sizes will probably be found by working over many tailings deposits.

The chief value in stream black sand will always be found in gold, platinum metals, and amalgams. In some localities, however, certain iron minerals carry gold included within their mass, in which case the gold value rises far above the average.

In general, the valuable black sand may be described as consisting of hard minerals ranging in specific gravity from 3 to 7, mingled with small percentages of metals and metallic minerals reaching from 7 to 20 in specific gravity. Most of the value will be found in the sand below one eighth inch diameter.

[1] From a bulletin issued by the California State Mining Bureau.

[1] *Transactions*, American Institute of Mining Engineers: Vol. XXX, p. 702.

The black sands should be considered as the concentrates of the gravel deposits, and may be compared with the concentrates obtained in milling the metalliferous ores to which they are related and from which they are partly derived. Their treatment should in essentials follow the rules that experience has dictated in the manipulation of gold ores.

Treatment will naturally fall into two divisions; concentration, and reduction. It will not in general be practicable to concentrate direct from the gravel deposits, except in the case of dredge mining, wherein the first stage of concentration, by grading to a determined size, is already performed. The vast tailings deposits occurring in California, as well as in other gold-mining states, already partially concentrated, offer the best and most inviting field for the recovery of black sand.

The first step should be grading to a definite size, by means of grizzlies, riddles, and screens; the next concentration in water by gravity to a definite range of specific gravity.

In reduction, the first step should be a separation of the magnetic from the non-magnetic minerals of the sands, after previous drying. For this purpose we now possess several efficient magnetic separators.

Part of the metallic values may be recovered during the process of concentration. The final recovery of gold, platinum, and amalgam can not be effected by mechanical means alone, although grinding of the coarser sand may be required. In many instances a moderate roasting will be required, and a subsequent treatment by chlorination or by cyanide solution. As in all other mining and metallurgical operations, the points to be determined are: First, the percentage of heavy minerals present in a certain body of sands or gravels; next, the average values of these when concentrated; and, finally, the cost of their extraction.

Approximate Value

The value contained in the heavy sands after suitable concentration can scarcely be stated, even approximately, as it will vary within indefinite limits, depending upon the character of the gravel deposit from which the black sand is artificially or naturally concentrated, the range of its concentration, and its contained minerals. In general, the highest value is found in the heavy sands derived from the ancient Tertiary deep-gravel channels, where great chemical changes by leaching and re-precipitation have originated various secondary auriferous compounds as yet scarcely known.

In most cases it must be taken for granted that the black sands will be concentrates from the tailings of gold-bearing gravels, already stripped of the value obtainable by ordinary methods of gravel mining, such as practiced in hydraulic, drift, and shallow placer operations, among which the first is always most wasteful of gold. In contradistinction, the gold-saving system of washing the gravel, applied in dredge mining, may be said to be the most rational as well as most perfect metal-saving method in present use, and as a result the concentrates from dredge tailings may be expected to carry but little gold and platinum. The black sand obtained from the shallow ravines and gulches is generally the poorest, and when chiefly composed of magnetite and chromite, often practically worthless.

Subject to the above limitations as to composition, the properly concentrated heavy sands of California's gravel deposits may be said to carry from $5 to $200 per ton, and probably average near $40 per ton. Well-authenticated but rare cases occur, however, where concentrates from drift mines on deep-gravel channels have exceeded $1000 per ton.

No definite information is available relative to the average value of the concentrated black sand of the ocean beaches, which, differing so much in physical features, would require a method of treatment radically different from that of the stream sands.

When fully understood and intelligently developed, the above described heavy sands of the gravel and beach deposits should add much to the mineral wealth of California. It should, however, be borne in mind that these auriferous sands exist not as a natural product, ready for the miner, the investor, or the speculator, but must be brought forth by the intelligent efforts of man, assisted by the forces of nature.

Iron and Steel in Wales

According to a U. S. consular report from Cardiff, the iron and steel industry of Wales, which ranks third in importance, gives employment to 12,000 men, who were on April 1 given an increase of 6 per cent. in wages. There are 49 iron furnaces in Wales. Those of north Wales average 21,234 tons a year, but those of south Wales are more modern and average 40,166 tons. The total pig-iron production for 1906 was 980,243 tons, an increase over 1905 of 8709. Of the output, 99,343 tons were forge and foundry, 793,321 tons hematite, and 86,157 tons basic. Practically no Welsh iron ore is mined, the furnaces being dependent upon foreign ores. The imports into Cardiff in 1906 were 926,994 tons; Newport, 591,393 tons, and Swansea, 131,907 tons, making a total of 1,650,294 tons, being an increase of 29,750 tons over 1905. Practically all the imports come from Spain, but France, Greece, and Sweden furnish small lots. The Spanish ore is delivered at $4.86 to $5.23 a ton at Cardiff.

Notes on Mining in Humboldt County, Nev.

Special Correspondence

Humboldt county, in which for many years the mining industry has been dormant, is now showing the activity in evidence in other parts of the State. In the sixties there were several properties which produced large amounts of silver, some of the ore being rich enough to haul by wagon to Sacramento. The county has also produced several million dollars in placer gold.

Bonanza gold ore has been found by prospectors north of Lovelock at the camp called Seven Troughs. The ore and conditions are similar to those found in several of the southern camps. There are silicified zones in andesite which show low values over considerable widths, and in places small veins which carry thousands of dollars to the ton. Many properties have been floated here, and considerable development work is in progress. A dozen or more automobiles run between Lovelock and the three townsites comprising this camp. Salt Lake City parties are up to the present the most heavily interested. Several other localities in the same neighborhood are being prospected thoroughly.

At Rosebud, which is about 30 miles east of Seven Troughs, there is also considerable excitement. Both gold and silver ores have been discovered and some prominent southern operators have paid large sums for undeveloped claims. The orebodies occur with brecciated dikes, the cementing material being silica.

Further north prospecting work is being prosecuted on several copper properties, and some of the old silver properties are being reopened. East of Lovelock, in the Humboldt range, there is also great activity. Some important strikes of both gold and cinnabar ores have been made in American cañon. This cañon is famous for the production of about $9,000,000 in placer gold. All of this was taken out by Chinamen. The paystreaks in the gravel in places carry enough cinnabar to pay for working, but until recently the source of neither this nor the gold had been discovered. An important body of cinnabar ore is also being developed in Eldorado cañon, which lies on the west slope of the Humboldt range, near Rye Patch.

Brazil in 1906 exported gold to the amount of 4,547,940 grams (gram = 15.43 grains), as compared with 3,879,000 grams in 1905. There is still continued complaint both as to taxation upon the gold-mining industry and the unsatisfactory state of Brazilian mining legislation.

The Franklin Air Compressor

The new Franklin air compressor manufactured by the Chicago Pneumatic Tool Company, shown in the accompanying illustrations is of the duplex pattern, with simple or cross-compound steam cylinders and simple or two-stage air compressing cylinders according to working conditions. A variety of combinations is obtainable for varying pressure conditions, and machines are also built for motor or water-wheel drive, either direct or by belt, gear or chain. The machine is built in sizes ranging in capacity from 30 to 200 cu.ft. of free air per minute, for 10 to 125 lb. working air pressure.

The frames are heavy box-shaped castings, strongly ribbed to withstand the strain when working at maximum load. The bottom surface bears upon the foundations throughout its entire length. The cross-head guides are bored, and provision is made for catching and draining the drip from the bearings and stuffing boxes. The steam cylinders have interior walls covered with asbestos or mineral wool, and are lagged with planished iron.

Cylinders and Pistons

The air cylinders and cylinder heads are completely water-jacketed, and the pistons are of the solid type with cast-iron spring rings. The shaft is of the center crank type, with exceptionally heavy crank arms.

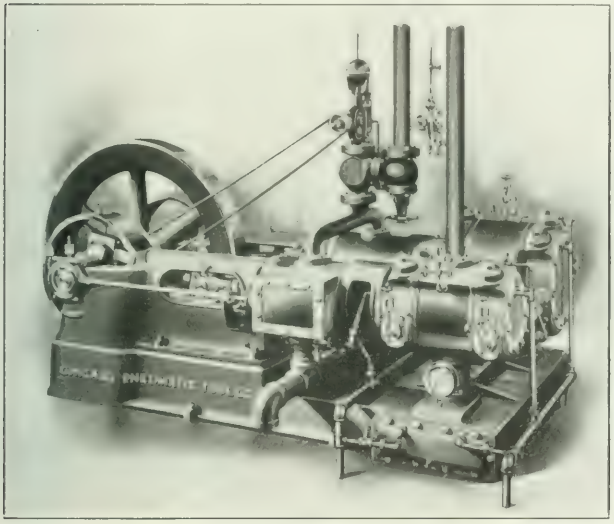
The box cross-head is provided with taper shoes, turned to fit the cylinder guides. These shoes have screw adjustments affording a means of taking up the wear. Oil guards at each end of the lubrication to the lower shoe, while a sight-feed oil cup on top of the bed provides the necessary oil for the upper shoe. The piston rod is screwed into the cross head and secured by a lock nut. The connecting rod has on the solid cross-head end wedge and adjustment screws. The crank end is of the marine type, with heavy bolts and brass liners.

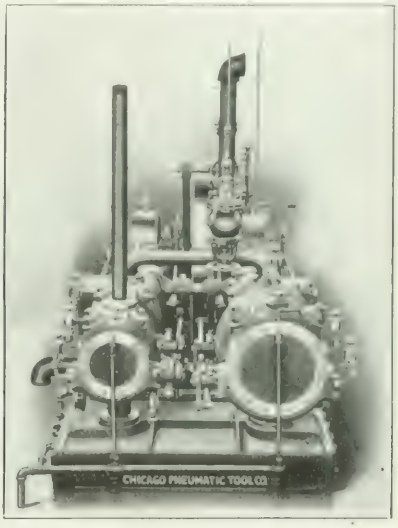
The single compressor has two balance wheels, one on each side. The duplex and cross-compound compressors have heavy fly wheels made in two sections, bolted together at the hub and at the rim.

The steam-driven compressors are provided with a pressure-regulating governor to control automatically the operation of the compressor in accordance with the demand for air, working in connection with a speed governor which regulates the speed of the compressor. The single-steam and belt-driven compressors also have an unloading device to relieve the compressor of all load when the desired air pressure is obtained, and to cause it automatically to resume delivery when the receiver pressure becomes reduced. The smaller steam-driven machines have plain "D" slide-valves accurately scraped to the seat and fastened to the rod with adjustment for wear. Steam cylinders 12 in. in diameter or larger are provided with the Meyer adjustable cut-off valves, the main valve being balanced.

Cut-off and Valves

The balance plate and steam chest cover are both designed to provide the necessary rigidity to prevent their deflection under steam pressure. A graduated scale indicates the point of cut-off, which may





FRANKLIN AIR COMPRESSOR

while the compressor is running. All valve rods, eccentric rods and links are made of steel, with steel heads bushed with bronze and provided with take-up.

The air-inlet valves of the poppet type are made from steel and have removable seats and guides. They are placed radially in the cylinder.

The valve stems and heads are forged in one piece, thus avoiding the use of flange nuts, jam nuts, split pins or other contrivances intended to serve as a head for the stem.

The valve seat is entirely separate from the cylinder proper and may be removed, replaced or renewed whenever occasion requires. The valves and seats are placed in position after the heads are attached to the cylinder, and are held securely by large screw plugs. The valve springs are of steel, and the proportion of the valve area enables the cylinder to fill freely at each stroke without volumetric loss or impaired efficiency due to the wire-drawing effect of insufficient area.

Air Discharge and Intercooler

The compressors of larger size are also built with mechanically moved intake valves of the semi-rotary Corliss type, placed in the cylinder heads and driven by gears from eccentrics on the main shaft. These positively moved valves combine large area with short ports and minimum clearances. They open and close without impact. These valves are driven by separate eccentrics, which on duplex, steam-driven machines have the advantage of allowing adjustment of the air-valve gear without disturbing the setting of the steam valves. All bearings through-

bronze bushings adjustable for wear. Inlet as well as discharge valves can be removed and inspected without disturbing

All air discharge valves are of the poppet type, cup-shaped, pressed from high-grade steel and fitted with light tension springs. These valves have removable seats and guides.

The intercooler provided with two-stage compressors, forms a part of the compressor base, being located directly under the air cylinders, minimizing the piping and floor space required and rendering the compressor self-contained. The [illegible] of charcoal iron expanded into steel tube sheets. [illegible] is [illegible] water heads and [illegible] between the tubes [illegible] of both water and air.

Hartville Iron Range, Wyoming

The [illegible] and the iron ore deposits of the iron range at Hartville, Wyo., are described by S. H. Ball of the U. S. Geological Survey in "Contributions to Economic Geology, 1906."

The range lies north and east of North Platte river, in Laramie county, in east-central Wyoming. It forms a portion of the Hartville uplift, a broad and low domal mountain mass similar in many respects to the Black hills in South Dakota. The maximum hight of the uplift is about 6000 ft. above sea level, and the region is one of comparatively small relief.

The iron range extends from Guernsey to Frederick, a distance of 8 miles, and [illegible] having rocks [illegible] a maximum [illegible] The productive area extends from Sunrise northeastward [illegible] from the same point southeastward 1 mile. The towns of the iron range are Sunrise, Hartville, Ironton, and [illegible] The principal mine of the range and the local offices of the Colorado Fuel and Iron Company are at Sunrise, a [illegible] people. The Colorado & Wyoming and the Chicago, Burlington & Quincy railroads pass through the district.

Most of the valuable claims are controlled by the Colorado Fuel and Iron Company, which is rapidly developing the Sunrise and Chicago mines. These now furnish the greater portion of the ore used at this company's smelters at Pueblo, Colo. In 1905 the Sunrise mine ranked twentieth in production in the United States, only two mines outside of the Lake Superior region exceeding it. The ore of this range is a high-grade hematite frequently analyzing 68 per cent. iron but probably averaging not more than 60 per cent. The iron content in the Sunrise mine increases perceptibly with depth, indicating, perhaps, a considerable redeposition of iron at depths through secondary processes. The ores of this range examined by early writers were low in phosphorus, many samples showing only a trace, whereas much of the ore shipped at present is of a non-bessemer grade. Some of the ore is high in silica, its only other detrimental constituent. Sulphur, so far as known, is absent, while the copper minerals occupy such restricted areas that their presence is not troublesome in sorting ores.

Lake Iron Ore

The usual yearly statistics gathered by the *Marine Review*, of Cleveland, from the various dock managers at Lake Erie ports show that the amount of ore on Lake Erie docks, May 1, was, in long tons:

	1906.	1907.	Changes.
Toledo	52,550	147,397	I. 94,847
Sandusky	29,320	5,439	D. 23,881
Huron	80,728	98,106	I. 17,378
Lorain	140,452	176,300	I. 35,848
Cleveland	350,382	447,573	I. 97,181
Fairport	266,162	134,246	D. 111,916
Ashtabula	462,564	568,485	I. 105,921
Conneaut	148,528	139,853	D. 8,675
Erie	169,488	189,276	I. 19 788
Buffalo	90,960	50,313	D. 40,647
Total	1,791,090	1,976,988	I. 184,898

The stocks on docks, Dec. 1, were 6,252,455 tons, so that winter shipments to furnaces were 4,275,467 tons. Adding the summer shipments, gives a total of 30,099,769 tons of Lake ore which reached the furnaces through Lake Erie ports during the year ended May 1, 1907. The following table shows the total ore shipments from Lake Erie ports to furnaces for eight years, with the stocks on docks at the close, May 1, of each year:

	Shipments.	Stocks.
1900	15,882,881	1,750,656
1901	14,408,260	3,050,183
1902	17,216,065	2,848,194
1903	21,905,251	3,592,367
1904	18,739,995	4,534,103
1905	20,057,070	2,251,631
1906	28,984,358	1,791,090
1907	30,099,769	1,976,988

The shipments in the year ended May 1, 1907, were the largest on record.

Conditions in the Transvaal

SPECIAL CORRESPONDENCE

Depression still hangs as a heavy cloud over the country, and the money market is so tight that it is almost impossible to raise cash for new enterprises. Those development propositions which expected to float off some of their shares to raise capital to carry on operations, find it impossible to dispose of these shares for a reasonable figure, and in consequence some of them will be compelled to close down. There are several mines on the Rand now idle, which could be made to pay well were it possible to raise capital to get them to the producing stage, and provide sufficient labor to keep the mill going. Unless things improve, very few of the mines now in the development stage will be able to stand the strain.

The distress in Johannesburg is most apparent, reminding one more of an old city like London or New York, than a young community like this. Men are seen begging in the streets who never begged before. The charitable institutions are all taxed to the uttermost, and the unemployed camp is well filled. Beside the indigency commission now sitting, the Government has appointed another commission to investigate the labor question, and to report how far white labor can be used in the mines. The depression will not be driven away by the appointing of commissions. The keynote of the trouble is the feeling of insecurity and uncertainty that exists throughout the country. European investors are beginning to look askance at a country where they never know from one year to the other what is going to happen. There is every indication that the cloud of depression will hang over South Africa for a long time to come.

Mining in Egypt

BY EDWARD WALKER

From time to time I have referred to the operations of the few gold-mining companies in Egypt, and have recorded the progress of the Nile Valley Company, the consulting engineers of which are Messrs. Lake and Currie. A short time ago the company came to the end of its resources and by means of reconstruction £36,000 new working capital was provided, for the purpose chiefly of exploration and development. Unfortunately this money has all been spent and further supplies are required. In fact, the company is in a very precarious position, and although there is over 20,000 tons of ore ready for stoping, running $8 per ton, the operations are in danger of sudden termination. There is no hope of a further assessment, and as the £1 shares are now quoted at 1s. it is impossible to issue new shares at par. As a last resource, the directors are proposing to create 250,000 new shares of nominal value of 1s., and to offer them to shareholders at 18d. The new shares will rank equally with the old shares of £1 each. If all shareholders subscribe, the further capital thus obtained will amount to £18,750, but the directors are not sanguine of raising more than £5000. The mine is now down to 400 ft. and the veins are as patchy as ever. In the past some remarkably rich pockets have been struck, and there is still the hope that others may be found. The fear is, however, that the mine will not live much longer.

The decrease in the Chilean production of copper in 1906 is ascribed to scarcity of manual labor, which is absorbed by the nitrate industry, now very flourishing.

Colliery Explosions and Their Causes

Disasters Are Due to Many Combined Causes of Which Seismic Forces Are Believed to Be More Important Than Barometric Changes

BY JAMES T. BEARD

As well might one attempt to define natural law and prescribe limits to its action as to presume to explain all the influences that combine to produce a mine explosion. One may point out contributory causes and enumerate conditions that unquestionably lend their influence to produce the dread result; but too often it happens that one or another of these influences is emphasized to the almost utter exclusion of other conditions of equal or even greater importance.

The subject of mine explosions is a broad one and must be approached from many sides before one can hope to arrive at a true estimate of the relative importance of the numerous causes. Indeed, what is sometimes adjudged a cause may prove on closer investigation to be but the contemporaneous result of some hidden phenomenon that is at once the direct cause of both the explosion and its supposed agency. I use the word explosion here not as meaning the actual occurrence, but the conditions that make the occurrence possible.

Because two occurrences or phenomena are of record almost invariably contemporaneous proves no more than the fact of their association. It still remains to be shown whether the association is one of cause and effect, or whether they are both alike the effect of a hidden cause as yet unknown, perhaps even unsuspected.

I have prefaced what I am about to say as to the causes of mine explosions by the above remarks because of the frequent proneness of mining men to accept almost any theory that seems to afford a solution, or throw any light on the difficult problems met in mining. Much confusion is often caused by the careless statements or wrong reasoning of writers in the treatment of this subject, in respect to which we are all but learners.

The inquiries lately revived in reference to the influence and bearing of atmospheric changes on the outflow of gas in mine workings, and other causes contributing to mine explosions, are of increasing importance year by year. Not in the brief history of American mining has there been a time when knowledge on this subject has been more eagerly sought than it is at the present. In Pennsylvania, be it said to the credit of a broad-minded management, conditions that have been growing worse each year have been met by an ample and efficient ventilation that has in the majority of the mines defied serious accident arising from the ignition of gas. It is true there have been numerous minor accidents from this cause, but an ample ventilation has arrested and localized the trouble in each case and prevented what would in many instances have proved a mine explosion.

Dangerous Mistakes

Before considering further this part of

New River and Pocahontas Consolidated Company's Plant, at Minden, West Virginia.

Red Star Coal Company's Tipple on Loup Creek, West Virginia.

TYPICAL MINES IN A REGION WHERE DUST EXPLOSIONS ARE MOST FREQUENT

mine management, careful to a fault, it may be, about less important matters, should in this regard commit the safe keeping of the mine to the miner, who is left to exercise his own judgment as to whether or not it is safe to use a naked light in his chamber. It is true that in some cases he is instructed by the fire-boss to use his safety lamp at the face, but the records of the courts show that such instructions are constantly disobeyed. In many instances it is a fact that the mine foreman as well as others of the mine officials are willing to allow the miner to run his own chances, trusting that he alone will suffer if he accidentally fires the gas above him.

I believe this attitude of many mine officials is the result of misapprehension on

*Principal school of Mines and Mining Division International Correspondence Schools, Scranton, Pa.

ment in the efficacy of an ample circulation may be betrayed at any time by the oversight or lack of faithfulness of fire bosses, lack of judgment or foolhardiness of miners, or by one or another of the many unavoidable occurrences common to mining. The margin of safety in the operation of a mine generating explosive gas is very small—so small, indeed, that a very slight occurrence may in an instant develop a highly explosive condition of the mine air. The custom that is common in a large number of mines generating gas of permitting the use of mixed lights cannot be regarded in any other sense than hazardous. Anyone familiar with the movement and behavior of gas in mines must admit that the risks are so great they should not be assumed.

Working in Gas

The entire question of working in gas resolves itself into something like the following: The average miner does not understand, nor can he comprehend, the true nature and behavior of mine gas. It is to him as a mysterious presence; and yet he firmly believes his experience as a miner has made him superior to the situation. He is often heard to claim in all sincerity that he can not only taste and smell, but *feel* and even *see* the gas; and seldom is it possible to convince him to the contrary. In an address delivered only this week before a body of miners at Wilkes-Barre, Penn., I was interrupted by one of the fire bosses present, who stated that he could detect the presence of gas by feeling it on the backs of his hands. The man who cannot taste, smell, feel and see gas has simply no standing below ground. On the other hand, however, the fire boss who essays to find anything less than 3 per cent. of gas when examining a mine is scorned and derided; he is told he does not know what gas is; he is, in fact, the butt of ridicule.

In view of these facts, coupled with the urgency of the demand for coal, is it strange that the operation of a gassy mine is a hit-and-miss proposition—a cross somewhere between the responsibility of the management and the liability of the men underground? I believe the present system of examining a mine for gas to be wrong. In the daily examination of the workings the fire boss ordinarily is compelled to cover more territory than it is possible to inspect properly. His examination is necessarily very far from complete or thorough, owing to lack of time. In the examination of a chamber only occasional tests are made where the fire boss supposes gas may have accumulated, and these are made hurriedly. Only accumulated gas receives the special attention of the fire boss.

Carrying a Naked Light While Inspecting

In many mines the fire boss carries a Davy lamp in one hand, and a torch in the other, when examining the mine. He is supposed to leave his torch on the floor at the mouth of a chamber, but more than once has it happened that fatal results have come from his failing to do this. The accident in the Central Shaft mine of the Delaware, Lackawanna & Western Company, Nov. 21, 1906, in which Mine Foreman Benjamin Evans and Fire-boss Evan J. Williams lost their lives, was of this nature. The explosion was apparently caused by the gas being ignited by the naked torch carried by Evans. Williams carried a Davy lamp. Both men were burned almost beyond recognition.

The fire-boss reports invariably "no gas" when he does not observe a cap on his Davy about ¾ in. in hight, which would mean 3 per cent. of gas. If the cap is from 1.5 to 1.75 in., indicating for ordinary mine gas about 4 per cent. of gas in the air, he perhaps cautions the men and tells them to use their safeties. As the Clanny lamps used by the men, however, are poor testing lamps, the miner sees no gas on his lamp and concludes his naked lamp, which gives him better light, is safe. He therefore substitutes the latter for the safety lamp shortly after the fire boss has departed, if, indeed, the fire boss has gone up into the chamber at all with the men.

THE WOODWARD MINE, NEAR KINGSTON, PENNSYLVANIA, SCENE OF A RECENT EXPLOSION

The Effect of Dust

Another factor that does not enter the reckoning of the fire boss is the effect of the dust thrown into the air by the ordinary operations of the mine, and which increases the explosive condition of the mine air so that it is possible for an atmosphere that appeared safe when examined by the fire-boss in the early morning to become dangerous when laden with fine dust a few hours later. Such was the probable cause of the fatal disaster in the Harwick mine, at Cheswick, Penn., Jan. 25, 1904, when 178 men were lost. The mine had been examined by the regular fire bosses only 3 hours previous and reported safe.

A Bad Practice

In some mining districts the practice is advocated of reducing the circulation in the mine by slowing down the fan or short-circuiting a portion of the air-current passing into the mine on the main airways, about 15 min. previous to the time of firing. Only a short time ago this practice was openly recommended by a State mining board. Nothing could be more foolhardy than to tamper with the circulation in a mine at the very time when an efficient ventilation is needed at the working face to prevent the backward expansion of the products of blasting. The weakened air-current, staggered by each successive blast is no longer able to oppose the large volumes of combustible gases, generated by the burning of the powder, which crowd back into chambers where shots are yet to be fired. Such a condition is a menace to safety.

I have mentioned a few only of the many practices which have become so common in our mines that mine officials have seemingly come to disregard their danger. Many others equally hazardous could be named, but let us turn now to consider briefly some of the natural agencies that affect, or are supposed to affect the explosive condition of mine air and are therefore an indirect cause of mine explosions.

Barometric Pressure as a Cause of Explosions

Much has been written on the supposed relation of changes in barometric pres-

sure to the occurrence of mine explosions. Evidently this would be difficult to prove, being much like the proverbial Irishman's flea. Reason will not confirm any invariable or even general relationship of such changes in atmospheric pressure to recorded mine explosions, because of the simple fact that many explosions are caused by accidental occurrences that are in no way associated with atmospheric changes, such as derangement of the ventilation in the mine due to an open door, a fall of roof, a breakdown of the fan or engine, etc. On the other hand, explosions do not necessarily follow an increase in the gaseous condition of the mine air, which might accompany a fall of barometric pressure. When overzealous advocates of the barometric theory think they have found new and convincing proof that cannot fail to establish the truth of their argument, there is sure to occur a considerable number of explosions on a rising barometer, which offers a sharp challenge to the theory and presents an insurmountable obstacle.

SEAT OF THE MOST RECENT WEST VIRGINIA [illegible]

Before deciding the question of whether a true relationship may reasonably be expected to exist between barometric changes and mine explosions, facts must be shown to form the basis on which to build such a theory, or else the logical results of the theory must be shown to be facts themselves.

The barometer is an index of the pressure of the atmosphere; a fall of barometer indicates a decrease of atmospheric pressure. In accordance with the laws of fluid pressure, a decrease of atmospheric pressure is accompanied by an expansion of all free air and gases at or near the surface of the earth, the expansion being directly proportional to the decrease of pressure. Expressed simply, "the volume ratio is equal to the inverse pressure ratios." This is the acknowledged relation between barometric pressure and the volume of free air and gases.

The amount of expansion produced by a given fall of barometer is important as showing the practical effect in the mine to change the gaseous condition of the mine air. For example, free air supporting simply an atmospheric pressure corresponding to, say, 30 in. of mercury will expand in the ratio $\frac{30}{29}$ for a fall of 1 in., $\frac{30}{28}$ for a fall of 2 in., or $\frac{30}{29.9}$ for a fall of 0.1 in., etc.

In blower ventilation the mine air, under a 2¾-in. water gage, is supporting a pressure of 0.2 in. of mercury above the atmosphere, and a fall of 0.1 in. barometer produces an expansion of the mine air and gases in the ratio $\frac{30.2}{30.1}$. Likewise for the same conditions in exhaust ventilation the corresponding expansion ratio is $\frac{29.8}{29.7}$. These ratios show clearly that for each 0.1 in. of fall in barometric pressure at sea level there is an increase in volume in all mine air and gases of $\frac{1}{301}$ of the original volume in blower ventilation, and $\frac{1}{297}$ of the original volume in exhaust ventilation, for a 2¾-in. water gage.

At various elevations above the sea level these ratios would change accordingly: thus, at an elevation of 10,750 ft., the barometer corresponding to 30 in. at sea level is 20 in. The increase in volume corresponding to the above conditions is then $\frac{1}{201}$ of the original volume in blower practice and $\frac{1}{197}$ of the same in exhaust practice. The ratios show the increasing effect, for the same fall of barometer, as the absolute pressure supported by the air or gas is decreased.

The effect of barometric change thus far shown applies to all free air and gases filling the abandoned parts of mines. Abandoned mine workings should be ventilated as thoroughly as the conditions will permit, but it is not possible to maintain a safe condition of the air in these workings, and as a consequence a large area of abandoned workings is always more or less of a menace to the safety of the mine. The principal danger lies in the volume of accumulated gases that is liable to be forced out of these old workings into the airways and roadways of the mine, which may thus be rendered unsafe in a short space of time.

It is in respect to these dangerous reservoirs of gas that barometric changes produce their chief and in fact their only appreciable effect to cause an explosive condition of the mine air.

A Practical Assumption

It is therefore important to consider to what extent or in what degree is this effect operative? In other words, what is the practical significance of a stated fall of barometer with reference to producing an explosive condition of the mine air, waiving the actual occurrence of an explosion? In answering this question it is necessary to state that barometric changes are gradual; a fall of 0.1 in. in from 3 to 5 hours is a rapid fall of barometric pressure and does not occur except at infrequent intervals.

I will assume for the sake of illustration an extremely bad case such as could not occur in any justifiable mining practice. Say there are 10 acres of abandoned workings standing, and full of pure marsh gas, in a 6-ft. seam, at an elevation of 10,000 ft. above sea level; and the barometer falls from 20 in. to 19.9 in. in 3 hours. Approximately the gas set free in this case is

$$\frac{10 \times 43{,}560 \times 6}{200 \times (3 \times 60)} = 7.26 \text{ cu.ft.} \text{ per min.}$$

during the time in which the barometer is falling. This quantity of gas is the amount in excess of what is given off regularly. To show the proportion of this increase of gas due to a sudden fall of barometer, I will assume the velocity of the air-current passing in the airway skirting the old workings is, say 600 ft. per min. and the airway has a sectional area of 50 sq.ft., giving a circulation of $600 \times 50 = 30{,}000$ cu.ft. of air per min. If this air-current carries ordinarily 2 per cent. of gas, the mine is producing 600 cu.ft. regularly, which is increased to 672 cu.ft. during the fall of barometer. The increase in the percentage of gas in the air-current is, in this extreme case, only from 2 to 2¼ per cent., which increase could not be detected on the flame of a Davy lamp.

In usual mining practice today any dangerous goaves are so far ventilated as to prevent large accumulations of gas in them, and as a consequence what gas is thrown out from such places owing to a fall of barometer or other cause is not pure marsh gas or even feeder gas, but

of gas. Under such normal working conditions workings in a 6-ft. seam and a fall of barometer from 29.1 to 29 inches, the volume of air and gas thrown off is

$$13,500 \times 6$$

Assuming this contains as high as 20 per cent. of gas, which is not likely, the increase of percentage of gas in the air-current of 30,000 cu.ft. per min., assumed previously, is only from .2 to 2.003 per cent., an inappreciable increase. The actual gas given off in this case is increased only 1 cu.ft. for 600 cu.ft. regularly produced.

There are so many other causes that are liable to happen at any time, and which in their effect are a hundred fold more dangerous than any results that can reasonably be attributed to any possible fall of barometer that it is idle to consider the latter. For example, roof falls, which are of frequent occurrence in old workings, may set free a large volume of gas, sufficient to render the mine air in the workings immediately adjoining highly explosive. The regular daily extraction of coal, accompanied as it is by the continuous movement in the overlying cover, opens fresh feeders which not infrequently become a menace to the safety of the workings. The outpouring of the gas is at times so abundant that it becomes necessary to abandon those portions of the mine for a few days to give the gas an opportunity to drain off before resuming work.

THE SUCHEN WEST VIRGINIA PLANT

But I have yet to mention an agency that is probably responsible for explosive conditions in mines to a greater extent than any yet named. I referred a year ago, in an article on mine explosions, to the variation of pressure of gas that may occur within the strata, from whence mine gases emanate. I believe as the result of several years' close observation that internal pressure is the cause of larger, spasmodic emissions of gas. The ground for this belief, which is at least reasonable, is as follows: It is a matter of general observation that the flow of gas in all mines located in regions or districts where gas may be expected is spasmodic. Even in districts producing large quantities of gas and which therefore appear to furnish a constant emission, there is a very perceptible ebb and flow, causing periods or fluctuations in the gaseous condition of the mines. In other districts and mines there are corresponding periods in which much gas is given off, followed by intervals where there is almost an entire absence of gas in quantities to cause alarm. Often these periods of the ebb and flow of gas from the strata are quite local, that is, restricted to a limited area or district, and at times appearing in a single mine or portion of a mine only. Several instances have recently occurred where the flow of gas increased in a portion of the mine so rapidly that the men were withdrawn from that district and not permitted to return for nearly a month when the flow ceased almost entirely.

Observations such as the foregoing prove quite conclusively the existence of conditions or agencies that affect the emission of gas locally and from within. No atmospheric changes could produce local phenomena such as these. We possess very little exact knowledge of the condition of the interior of the earth, but the evidence of volcanoes in action and our knowledge of the agency of heat and pressure make it certain that tremendous activities are in constant operation within the earth's sphere. It is both natural and reasonable to suppose that the pressures in subterranean channels that will discharge molten material under the great head due to the hight of a volcano, can make themselves felt in other quarters, and incidentally augment the outflow of gas from strata already pregnant. No one familiar with underground conditions and who has listened with awe to the mysterious "poundings" in the overburden of a mine, caused, as is well known, by the working of gas in the foliations of the strata, can study the phenomena of earthquake waves and shocks without being convinced of the close relationship of the different phenomena. The conclusion is fairly certain that gas generated by the chemical and physical activities within the earth plays an important part in all these phenomena.

I have previously drawn attention to the close association of volcanic activity and mine explosions, and will only briefly refer to these here. The theory of spasmodic or irregular earth breathings, as just explained, if true, would give rise to periods of frequency of mine explosions, more or less closely associated with volcanic activity. That such is the actual fact is shown to be highly probable by the remarkable coincidence in their occurrence. That there are isolated or errant mine explosions occurring in a period of rest and entirely dissociated from seismic disturbance, does not argue against the theory, since it is not claimed that all mine explosions are the result of such disturbance. The causes producing explosive conditions in mines are too numerous to invite such an expectation. But when periods of marked seismic troubles are almost invariably accompanied by the appearance of gas in increased quantities in mine workings, and the occurrence of one or more mine explosions, the fact is significant of something more than mere chance.

Recent Mine Disasters

The terrible eruption of Mt. Pelée that devastated the island of Martinique, West Indies, May 20, 1902, was accompanied by four prominent mine explosions in a period of less than three months, causing the loss of 550 lives. Two of these explosions occurred at practically the same time as the principal eruption of the volcano. The record is as follows: May 19, 1902, Frayterville, Tenn., explosion, 184 lives; May 20, 1902, Mt. Pelée, eruption, 28,000; May 23, 1902, Fernie, B. C., explosion, 127; July 10, 1902, Johnstown, Penn., explosion, 112; Aug. 1, 1902, Wallangong, N. S. W., explosion, 127.

This was followed by two or three years of comparative rest, only to be succeeded by a still more terrible and prolonged season of disquiet. From early in the year 1905 to the present time there has been an unbroken succession of seismic disturbances marked by some of the most terrible mine disasters ever recorded. The record of the principal occurrences is as follows: Jan. 4 to 24, 1906, three mine explosions,

United States, 54 lives; Feb. 8, 1906, Parral, W. Va., explosion, 27; Feb. 19, 1906, Maitland, Colo., explosion, 10; Feb. 21, 1906, Columbia, S. A., earthquake, 2000; Feb. 27, 1906, Piper, Ala., explosion, 9; Mar. 10, 1906, Pas-de-Calais, France, Courrières explosion, 1200; Mar. 17, 1906, Formosa, Japan, earthquake, 3000; Mar. 22, 1906, Century, W. Va., explosion, 21; Mar. 28, 1906, Takashima, Japan, explosion, 307; April 3 to 17, 1906, Vesuvius, Sicily, 500; April 7, 1906, Formosa, Japan, earthquake, 109; April 18, 1906, San Francisco, Cal., earthquake, 2000; April 20, 1906, Calumet, Mich., fatal; April 20, 1906, Honolulu, fatal; April 21, 1906, Trinidad, Colo., 23.

Other mine explosions occurred June 6, Red Lodge, Mont.; July 19, Huger, W. Va.; and the memorable earthquakes at Valparaiso, Chile, Aug. 16; Porto Rico, W. I., September 27, and in the bed of the Indian Ocean, Oct. 1, followed by mine explosions at Pocahontas, W. Va., Oct. 3, Blosburg, N. Mex., Oct. 5; Wingate, Eng., Oct. 15; Johnstown, Penn., Oct. 24. Mt. Pelée was again in action from Oct. 6 to 11, when a violent eruption took place. In January, 1907, occurred two violent earthquakes at Kingston, Jamaica, W. I., on the 14th and the 28th, respectively, and a mine explosion on Jan. 23 at Primero, Colo. On Jan. 28, the day of the second shock at Kingston, there were two mine explosions in Europe, one of these occurring at Essen, Germany, with a loss of 275 lives, the other at Lille, France, with a loss of 20 lives. The day following, Jan. 29, the Stuart mine exploded, at Fayetteville, W. Va., with a loss of 75 lives, and Feb. 4, the Thomas mine, at Elkins, W. Va., loss 38 lives. March 1, Costa Rica experienced a severe earthquake shock, and the following day two explosions of gas occurred within an hour of each other, in the Holden colliery, Taylor, Penn., and the Woodward mine, Kingston, Penn., the two mines being but a few miles apart.

These terrible records tell significantly of the danger that exists in mine workings during periods of seismic unrest. Undoubtedly much trouble has been avoided by the increased vigilance and care exercised of late in mines by reason of the attention that has been drawn to the subject, and it is to be hoped mine officials will not relax precautions for the present at least.

Besides paying machine miners, shotfirers and loaders according to the number of tons of coal mined, some Nova Scotia collieries also pay the drivers, bratticemen, road-makers and other shiftmen by tally, according to the tonnage produced in the section in which they work. When this scheme is adopted, it is found that the interest of these latter men is more concerned in maintaining good ventilation, keeping the roads in good shape, and getting out as many cars of coal as is possible, so as to increase their earnings.

Barometric Pressure and Simultaneous Explosions of Gas in European Collieries

By M. Mascart

The recent explosions of gas at Reden in Germany, and Liévin in France, were evidently due to a single and similar determining cause, which this time is shown with such evidence that those most opposed to the theory of the influence of seismic and meteorological phenomena upon explosions of gas must be almost convinced of their error.

Since 1877, I have, in successive communications to the Academie des Sciences, claimed that earthquakes and falls of the barometer have an influence on the freeing of gas in mines, and also on the liberation of gas in hot springs; I have also shown that all barometric falls are not necessarily followed by the escape of gas. In order for such an explosion to occur, it is necessary to have a period of compression, that is, a period of high barometric pressure, for some time before the depression occurs.

In short, I have succeeded in formulating the law, and pointing out that the depression must be rapid. The dangerous conditions that lead to a liberation of accumulated gases formulate themselves as follows:

1. Establishment of a period of high barometric pressures over a continent; or earthquakes in any part of the globe.

2. Sudden and continuous atmospheric depression.

I have proved that the gas-dust explosion of Courrières was preceded by a period of high pressure, followed by a sharp fall. Here is a new observation; I give a table of barometric pressures from Jan. 10 to Jan. 27, the eve of the accidents at Reden and Liévin, which were simultaneous. One will recall this period of fine days, calm and sunny, during the month of January.

TABLE I.

Date	Mm.	Inches.
Jan. 10, 1907, noon	774	30.500
Jan. 11, 1907, noon	776	30.578
Jan. 12, 1907, noon	775	30.539
Jan. 13, 1907, noon	777	30.617
Jan. 14, 1907, noon	777	30.617
Jan. 15, 1907, noon	777	30.617
Jan. 19, 1907, noon	777	30.617
Jan. 16, 1907, noon	775	30.539
Jan. 17, 1907, noon	775	30.539
Jan. 18, 1907, noon	778	30.656
Jan. 20, 1907, noon	778	30.656
Jan. 21, 1907, noon	778	30.656
Jan. 22, 1907, noon	772	30.422
Jan. 23, 1907, noon	776	30.578
Jan. 24, 1907, noon	774	30.500
Jan. 25, 1907, noon	775	30.422
Jan. 26, 1907, noon	771	30.383
Jan. 27, 1907, noon	774	30.500

It will be observed that in the last seven days there were numerous fluctuations of 2 or 3 mm., but the general tendency was to a lower level. It is these little fluctuations which are the preliminary signs, while the equilibrium continues. It is at

*Notes submitted to the French Academy of Sciences; translated from *Echo des Mines*.

should act, and all mine directors order the necessary precautions. I have proved by repeated observations that, at the moment of low pressure, it is too late to act, since the effects of the depression of the barometer do not make themselves felt until five or six hours after the fall in atmospheric pressure has already begun. In short, the barometers are always a little late.

It is interesting to note the suddenness there was in the phenomena of fall on Sunday, Jan. 27, and again on Monday, Jan. 28, the day of the accidents. Saturday, all day, the pressure was 774 mm.; Sunday at noon it was still 774 mm.; then the fall began. The accidents occurred, and the fall continued.

TABLE II.

Time.	Mm.	Inches.
Sunday Noon	774	30.500
Sunday 2 p. m.	[illegible]	30.461
Sunday 6 p. m.	[illegible]	30.422
Sunday 8 p. m.	771	30.383
Sunday 10 p. m.	771	30.383
Sunday Midnight	770	30.344
Monday 2 a. m.	[illegible]	30.305
Monday 4 a. m.	769	30.305
Monday 6 a. m.	[illegible]	30.266
Monday 8 a. m.	[illegible]	30.227
Monday 10 a. m.	[illegible]	30.188
Monday Noon	[illegible]	30.149
Monday 2 p. m.	[illegible]	30.110
Monday 4 p. m.	[illegible]	30.071
Monday 6 p. m.	[illegible]	30.071
Monday 10 p. m.	751	29.593
Monday Midnight	750	29.554
Tuesday 2 a. m.	[illegible]	29.515
Tuesday 4 a. m.	[illegible]	29.476
Tuesday 6 a. m.	[illegible]	29.437
Tuesday Midnight	747	29.320

From this time, midnight on Jan. 29, the pressure increased. From Sunday to Monday the record was so typical, and showed so clearly the imminence of danger, that all the chiefs of mines in Belgium, and M. Reumaux, director of the mines of Lens, in France, ordered the dangerous chambers to be evacuated. "The observatory of Uccle," says *L'Etoile Belge*, "telegraphed to all the collieries of the basin of Charleroi and the Center, warning them of a quick fall of barometer. Measures were immediately taken; these consisted in doubling the watchfulness in the mines, and in speeding up the fans to expel the bad air and gas. Besides, miners were forbidden to go into places where it was believed that there was danger. These measures were enforced until new orders were given."

Unfortunately in Germany, the same precautions were not taken, and the colliery of Reden was the scene of a terrible explosion of gas, almost at the same hour as that at Liévin in France. The natural conclusion from this disastrous lesson is that we ought to observe in France, as is done in Belgium, the periods of high atmospheric pressure, and the beginning of the depression which inevitably follows.

In driving a tunnel or sinking a shaft, satisfactory ventilation may be easily obtained by using a steam jet.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

Two electric winding engines which are being installed at a Belgian colliery, will be capable of raising 600 tons of coal per day [illegible] depth of 3040 ft.

Past records show that in the United States there have been more explosions of fire damp in the months of May and October than in any other months in the year, while the most serious colliery disasters in Great Britain from 1778 to 1886 were in June and December.

At the Whipple mine of the New River Coal Company in southern West Virginia, where an explosion recently occurred, the barometer fell from 30.20 on April 29 to 29.98 on May 1, the date of the disaster. The atmospheric pressure again increased on May 2, the barometer reading 30.22.

At a dry and dusty colliery during the winter months, it is often advisable to use steam jets at the top of the down-cast shaft, the principal object being to raise the temperature of the air so as to make it capable of taking up more moisture. This practice also causes the saturation of any particles of dust which may go down from the pit top.

Rubber belts are cheaper than leather belts and should be used in wet places; in dry parts of a mine, leather belts are more suitable as they last longer than rubber belts. The latter should be kept free from grease or animal oils. When a rubber belt slips, apply boiled linseed oil to the inside of the belt and sprinkle powdered chalk on the oil.

The arrangement of mine-car tracks at the head of a shaft should be much the same as in the mine. The empty track for easy running by gravity should have grades toward the shaft varying from 2 to 0.25 per cent., while the loaded track should have a grade of from 1.25 to 0.75 per cent. away from the shaft. The minimum radius for curves should be 25 feet.

It has been found that coking coals lose that property when exposed to the atmosphere for an extended period, or by heating to about 570 deg. F. The slack of a non-coking coal can be made into a coherent cake by exposing it suddenly to a high temperature. Some coals which cannot be made into coke in beehive ovens are easily coked in modern gas-heated ovens.

The Thomas Dun breaker, near Larksville, Penn., has installed a 75-h.p. electrical motor. The process of hauling coal at this breaker is a new one in the anthracite region. A large continuous conveyer, operated by electricity, runs into the slope and from there to the working faces. The present output is about 300 tons per day, but it is expected to increase the output to double that figure in a few months.

The chief advantage in using steel rope as compared with iron rope is that the former has greater tensile strength than iron rope of the same diameter. For equal strength, steel rope can be made lighter, consequently it can turn around sheaves, pulleys and drums with less wear and tear. For all hoisting ropes in and about mines, the safe working load should be about one-sixth of the ultimate tensile strength of the rope.

The hoisting engine of a shaft should be located at a sufficient distance from the shaft to allow the rope to wind evenly on the drum, so that the coils on the latter will not loosen when the cage rests on the landing. Too great a distance from the shaft to the engine should be avoided, or the cage will be raised a few inches by the tension of the rope when the loaded car is removed. In general, the location of a hoisting engine should be one to one and one-half times the difference in the elevation of the center of the drum and the center of the sheave wheel.

In ventilating rise and dip workings with one fan, the air regulators should be carefully adjusted when the water gage varies. When the pressure is increased, experience has shown that the rise workings take more air than their share, and the dip workings less. The reverse is the case when the pressure is decreased. This is due to several causes, among which may be mentioned the fact that in dip workings the motive column is greater than in rise workings, and the difference in temperature of the intake and return is also greater in dip workings than in rise workings.

One of the large anthracite coal companies in building underground barns composed of a row of stalls, single or double, specifies that the dimensions of all single stalls shall be 5x10 ft., while the double stables are built 10x10 ft. The floors of the stalls have a grade of not more than 2 in. to insure drainage when cleaning; sometimes it is necessary that the stalls have a side slope, but that should not exceed 1 in. for a double stall, so that the difference in elevation between the highest and the lowest corners of the floor will not injure the feet, and cause lameness among the animals used underground.

A new system for preventing coal-dust explosions was recently tried at an English colliery. The plan was to saturate the main air current passing down the down-cast shaft with exhaust steam. This latter was mixed with the air by an arrangement of small jets, so as to mix the whole air current with the steam. This practice could only be followed when the pit was idle, because of the fog caused by the steam. The moisture from the steam was deposited upon the roof, sides and floor, and was satisfactory for a limited distance upon the roadways; but had the usual effect in rotting the timbers and injuring the strata which composed the roof and sides, thereby causing an increased number of roof-falls.

A 6-in. wrought-iron pipe is generally used in flushing anthracite culm into old workings. The life of a pipe depends largely upon the size of the culm and the speed with which the culm flows in the pipe. Sulphuric acid is nearly always present in flushing water, and it readily attacks the pipe. In general, the life of a pipe is from six to 18 months for culm, but if the culm is mixed with ashes, it lasts only from two to six months. The amount of water used in flushing depends on circumstances; 400 gal. of water is required to flush 1 cu.yd. of culm to level and down-hill places; 800 to 2400 gal. of water to 1 cu.yd. of culm to flush up-hill for any hight varying from 25 to 100 ft. above the "shaft level." Figures from four collieries show that on an average, 4680 gal. of water were used per cubic yard of culm flushed, while the average cost of labor per cubic yard of culm flushed is $0.052.

In all coal mines, the most dangerous dust is to be found upon the roofs, timbers, and sides of the roadways, rather than on the floors. For this reason, the practice of gathering the dust that lies on the floor into trams or cars does not remedy the trouble. In several instances mine managers have tried brushing the dust from the roof and sides before loading it into cars. This system did not prove satisfactory, owing to the fact that there are many inaccessible places above the roof timbers where dust accumulates; moreover this work could be done only when the mine was idle, since no men could be allowed to work in the air current of the roadways undergoing the periodical brushing. Furthermore, this practice of brushing causes a large quantity of the finest dust to be carried forward with the air current and deposited upon the interior portions of the roadway, causing an increased danger.

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*Illustrated.

The Situation in Copper

We have now reached the end of May, and the stagnation in the copper market resulting from a deadlock between the producers and the consumers continues. It is useful to summarize what is precisely the situation. It must be recognized immediately that the position of copper is by no means so strong as it was 10 weeks ago. At that time most of the producers had sold the bulk of their output for three and even four months ahead at the highest prices. Since then there have been no large sales, except for a brief period, about a month ago, when there was a reawakening of the foreign demand, which it was hoped would prove the forerunner of a new domestic demand, but those hopes were doomed to disappointment.

We have now reached the point where the output has been contracted for only a little way ahead. To make a broad generalization, it may be said that on the average about one half of the June output is under contract. Some producers have sold further ahead, while others have sold less far. In fact, some producers have already reached the point where they have unsold copper on hand; in other words, a stock of unsold metal is now beginning to accumulate.

As to the statistical position of the metal, nothing very definite can be said. It has been heralded that there has been a decrease in the production since Jan. 1, and it is true that there have been difficulties in Montana and Arizona, which probably have resulted in a diminished production in those quarters; but, on the other hand, there has probably been an increased production in Michigan, and also in many miscellaneous quarters, unimportant individually, but of considerable importance in the aggregate, which are completely ignored in casual and irresponsible estimates. On the other hand, we know definitely that the exports to Europe have fallen off materially, and while we have no statistical information as to consumption, it is significant that the consumers who a few months ago thought it necessary to make their purchases for three months ahead, are distinctly of a different opinion now. It is possible that in their previous excitement the consumers overestimated their requirements and are [illegible] out of the market for a considerable time after existing contracts have expired. The fact that certain consumers have requested postponement of shipments of copper already purchased, while a few have actually offered copper for re-sale, is indicative that they are in no immediate need to replenish their supply.

Nevertheless, some of the largest producing interests hold a different view, although it is uncertain whether they are now so strong in their opinion as they were a little while ago, and are acting consistently upon the theory that if they make no concessions in their offerings the consumers will have to meet their terms in the market. It is still a question whether they are correct, in which event there will be an upward turn in the price of copper, or whether they are wrong, proof of which would be followed by a sharp break. However, as time proceeds, and consumers refrain from appearing in the market, the prospect increases that we must make up our minds to a continuance of the downward tendency, which has already been manifested for a month or more.

Colliery Explosions and Their Causes

At the time of the explosions at Reden, in Germany, and Liévin, in France, which occurred nearly simultaneously a few months ago, we remarked that it would be interesting to have knowledge as to the atmospheric conditions existing when the explosions happened. This has been supplied by M. Mascart in a paper printed elsewhere in this issue. It appears that the two explosions occurred under conditions which make them strikingly confirmatory of the hypothesis that there is a particular liability to developments of gas when a period of high barometer is followed by a rapid drop in the pressure. However, Mr. Beard in a carefully prepared contribution, which is also printed in this issue, is decidedly skeptical of the barometric hypothesis, and believes rather in the connection between gassy conditions and earthquakes, which are manifested by earthquakes. In fact as the [illegible] temperature, pressure of earthquakes and volcanic manifestations [illegible] colliery explosions are concerned. Mr. Beard makes out a strong case. It is rational to believe that there may be a connection

with a common cause. However, there is nothing in such a hypothesis to argue against barometric conditions being a strongly contributory factor, perhaps the most directly governing factor, and we are disposed to think that Mr. Beard unduly belittles that side of the question. Certainly the conditions of air pressure do not affect merely the accumulations of gas in old workings, but may in quite similar manner affect the many "feeders," which are constantly discharging gas into the mine.

Everyone will agree with Mr. Beard that an explosion may occur on a rising barometer, especially an explosion due to a blown-out shot or other accidental cause. Nevertheless, it is true that more than 95 per cent. of the explosions in our coal mines during the last two years occurred immediately after a fall in barometric pressure. From the latter part of Mr. Beard's list of recent explosions we find 12 to which we have called attention as having occurred after a fall in barometric pressure.

One point in M. Mascart's paper is open to discussion, viz., whether a fan should always be speeded up during the danger periods. Many managers contend that the fan should be slowed down if an exhaust, and its speed increased if a blower.

With reference to the attitude of European countries as to the question of the influence of barometric pressure on outflows of mine gases, it is worth while to mention that the British meteorological service has at times notified the operators of approaching barometric changes. In a summary of the work of this department it is shown that 32 warnings were issued during one year, 19 of which were justified by subsequent events; 12 were followed within less than three days by 15 explosions, causing 139 deaths; two explosions, causing 43 deaths, occurred on the fifth day, and 23 lives were lost on the sixth day, a total loss of 205 lives in six days from the time of the issue of warnings. Colliery warnings based upon approaching atmospheric conditions have now become a regular practice in certain countries of the Continent. We are gratified to observe that our esteemed contemporary, the *Echo des Mines*, of Paris, has recently inaugurated a special service of its own in this direction.

We do not argue that the connection between gas outflows and atmospheric conditions is definitely proved. We have been interested in collecting and presenting facts which seem to bear out the idea that there is such a connection, and we hope soon to be able to offer some new and highly important evidence. The most essential thing at present is to direct the attention of colliery engineers to the question, which will lead to the accumulation of a mass of data from which some useful conclusion can be deduced. If there be a connection between gas outflows and atmospheric pressure, and the laws can be determined, it will be of immense practical importance, because atmospheric changes can be accurately forecasted, while earthquakes can not be. This is the reason why it is more important to study the former phase of the question than it is the latter.

Labor and Prosperity

The Reclamation Service, a department recently divorced from the United States Geological Survey, has issued a circular complaining of the hardships attending the present industrial boom in the far West. The demand for labor and materials of all kinds is so urgent that the service cannot secure reasonable bids for constructing its big irrigation works. The service hesitates to undertake the work itself, for the Government is as helpless as are its citizens confronted with the same difficulty. The circular sets forth that "Wages are from 40 to 60 per cent. higher than two years ago, while efficiency has decreased rather than improved by the unlimited demand for laborers. Owing to the remoteness of much of the work from centers of population, labor is not attracted and as a rule the Government gets only the leavings of the most undesirable class of laborers. The steady and skilful workers are all busy."

This sounds like the plaint of a forlorn mine manager explaining matters to the home office. The effect of extreme prosperity upon the labor situation is a serious question among mine owners. In Montana, in Arizona, in the Lake Superior district, in Missouri, and elsewhere the men are demanding more pay. An increase of 20 per cent. in the West recently brought out the complaint that the cost of living had risen in even greater proportion. Still the regular cost of board in the western camps remains the same, $1 per day, as it was in 1869, and has been continuously ever since. The wants of the laborer have increased, if not his needs, and the ability to enforce his demands has reduced his efficiency.

We have, thus, a case in which unusual demand retards production, an unhealthy state of affairs. Impaired productivity of labor is a loss to the country, for inefficient workmen, like inefficient machinery or undeveloped natural resources, represent factors of wealth production imperfectly employed.

A GOOD DEAL OF TALK is made by some of the financial and daily newspapers as to increase or decrease in the production of copper in the United States month by month. These estimates deserve no attention. There are no reliable statistics of copper production collected monthly for any of the districts, and even after the end of the year it is a matter of several months before the final figures can be reliably presented, although we are able at the end of the year, upon the basis of reports received from the producers by mail and telegraph, to present approximate statistics, which last year were inside of 1 per cent. of the total finally reported. Few of the producers make monthly reports, and as to the majority the estimates of their output which are published are often grossly inaccurate. It would be possible to arrive approximately at the production month by month, if all of the producers were willing to communicate their figures, as formerly used to be done, but at present such is not the case.

THE COSTLY EXPERIENCE of the mine operators in the foothill counties of California during the recent storms, when the power lines went down, and the mines rapidly filled with water, has served to teach them a lesson. On every hand the mine-owners are now preparing to meet any future emergency. They will not trust to electric power, steam or any other power alone, but will be prepared to operate their pumps and hoists in a variety of ways. In the Grass Valley district particularly, a number of mines are arranging improvements in their pumping systems. It is to be hoped that the new (and commendable) plans will progress sufficiently far to insure their consummation. Similar troubles have been experienced in previous years, good resolutions have been made, and then have been forgotten.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

The Great Boulder Perseverance Mine

In the JOURNAL, May 18, in the London letter dated May 4, I note the following remarks about the Great Boulder Perseverance Gold Mining Company, Ltd., viz.: "It will be remembered that this company nearly came to grief two years ago through the carelessness, or worse, of the old controllers." The first part of the letter referred to explains the situation fully, as follows: "The most interesting point in the report (referring to the report on the Great Fingall Gold Mining Company, Ltd.) is the confession by the managers, Bewick, Moreing & Co., that they cannot give a dependable estimate of the contents of the ore reserves, owing to the irregularity of the deposit and its contents."

As I was in charge of the Great Boulder Perseverance property at the particular time mentioned, I wish to take exception to the above remarks of your correspondent. I am responsible for the report made to the shareholders upon the property in the year 1904, although the sampling and measurements were not made by myself, personally. The tonnage of ore included in the measurement made at that time has been shown to be within the tonnage claimed, but the values were over-estimated. This matter was carefully gone into by a royal commission appointed by the government of Western Australia at the time, to investigate the situation, the results of which commission were published and given to the public. The Great Boulder Perseverance was selected as the one mine for investigation, and the results of this did not turn out as anticipated by those who demanded the investigation. The above company was supposed to be the only one carrying a bullion reserve to even the monthly output, but the royal commission found that nearly every company in Western Australia carried the same bullion reserve and for the same purpose. The above facts, if not familiar to the writer of the letter in question, may be verified if he will refer to the said report of the commission.

Another noticeable fact is that all the annual reports of the principal mines of Western Australia showed a falling off in values similar to that of the Perseverance mine in 1905. This is shown in the publication of reports by the secretary of the Mine Owners' Association of Western Australia. From this report it is clearly shown that the Great Boulder Perseverance Gold Mining Company, Ltd., from the time it started paying dividends until the end of my management, paid a greater percentage of the gross value of gold won in dividends than any other mine in the whole of Western Australia. The mine was taken over after my management by my assistant, whom I recommended for the position, and who carried out the changes in the mill inaugurated by me before leaving. I will state here that after the royal commission had made its report I met the directors and shareholders at an extraordinary general meeting held in London, and was asked by them to return as their general manager at the mine. They held the position (which I agreed to accept) open for me for three months, but, unfortunately, I had personal business in London at the time which I could not neglect, and which interfered with my return and, as before mentioned, my assistant became manager. When a change in management was made about a year ago I was again asked by cable if I would be willing to take charge of the property, so that the insinuation in the letter of your correspondent is entirely without foundation. Now Messrs. Bewick, Moreing & Co., according to the letter referred to, make use of the same remarks as I made in my annual report to the Great Boulder Perseverance shareholders in 1898, as follows: "Owing to the nature and occurrence of the ore, rich lenses of telluride occurring through the vein, it makes it most difficult to accurately determine the value of the reserves."

The cheapening of costs all along the line has been going on since the inception of operations in Western Australia, but it is unfortunate that in getting out costs per ton they are not always reliable, as, in most instances, estimated tonnages are used, as I pointed out to the readers of your JOURNAL in a recent letter on the subject; and, until accurate weighing of ore going to the mills is resorted to, the published results of costs must be more or less unreliable.

The fact should not be lost sight of that the mines of Western Australia are generally well equipped for economic results in mining and treatment of ores, and as those ores become lower in grade, further economies are sure to be put in force that will still further reduce costs; but the method of treatment inaugurated at the Great Boulder, Great Boulder Perseverance, Kalgurli and other mines, of roasting, amalgamation, cyanidation, fine grinding and filter-pressing (or some better method of filtering introduced to replace filter-presses), is the method which will prevail, and any further reduction in costs will probably be along the lines of mechanical handling of the materials, and not in their metallurgical treatment.

What happened to Great Boulder Perseverance also happened to nearly every mine on the Westralian fields, and the grade of ore going to the mills had to be lowered on account of falling off in values generally, and the consequent earnings have fallen off, except where tonnage treated have been materially increased.

[redacted]

Gabriel, Durango, Mexico, May 23, 1907

[It was far from the intention of our London correspondent to reflect in any way upon Mr. Nichols, whose professional record is too highly esteemed to allow him to be the subject of any insinuation. The reference was simply to the former "control" of the company, as to which there was no imputation that Mr. Nichols was responsible. We are glad to print his interesting letter.—EDITOR.]

Italians as Coal Miners

Recent articles have dealt with the employment of Italians as metal miners, but little has been said concerning their ability as coal miners. In the coal mines of Colorado and New Mexico, the labor is mostly foreign and comprises principally Italians, Hungarians, Slavonians and Japanese. The majority of the miners, however, are Italians. Men of this latter race as a rule make good coal diggers, but are inclined to be reckless in many cases such as not properly supporting the roof in the working places, and not guarding against the fall of coal while mining; they are tractable, however, and easy to manage.

Italian miners seldom get above the position of diggers, for they cannot be depended upon to hold positions requiring a cool head, because of their excitable nature. Their many holidays, or "big Sundays," as they call them, are a constant source of annoyance to the operators, for the simple reason that after one of their holidays they are apt to be unfit for work for several days. After pay-day the production drops off for several days, as the men commonly take that length of time to sober up.

They are not particularly cleanly, as can be readily imagined from the fact that as many as ten persons often live in three

or four rooms. Somehow they seem to prefer living in a tumble-down shack to a modern cottage. Equip their houses with bath tubs, and they would keep coal in them.

The majority of the Italians marry, and apparently do not believe in race suicide. As soon as their children are of sufficient age to enable them to work in the mines, they are withdrawn from school, and put to work, beginning as trapper boys until they can help their fathers dig coal.

The Italians have no established boarding houses, but hire women to cook for them, they themselves buying the supplies and paying the women to do the cooking. As few try to learn to speak the English language, some system must be devised to handle them on the pay roll; most coal companies use an identification check stamped with the miner's pay-roll number. I have seen them bring a pay or time check on one company to another to be cashed, thinking as long as it calls for money, it is good anywhere.

Notwithstanding all their faults, they make good workmen, and the West, in most cases, is thankful for the Italians.

W. F. MURRAY.

Denver, Colo., May 10, 1907.

Adiabatic Volume Change of Gases

In my "Note on the adiabatic volume-change on mixing two gases," in the JOURNAL of May 18, 1907, I regret to find an error in one of the formulas, which, however, can hardly obscure the meaning to the intelligent reader.

The second expression should be

ALFRED J. LOTKA.

Laurel Hill, New York, May 27, 1907.

Furnaces for Roasting Wisconsin Zinc Ores

I have read the article by Frank H. Trego in the JOURNAL of March 30. Evidently he must be in error when he states that an all-steel building of sufficient size to operate a roaster can be built for $1000. In regard to the relative merits of the furnaces which he describes, it is enough to say that none of the roasters built by Mr. Trego at the Mills mine, Square Deal mine, Roosevelt mine and the Platt mine is now in operation.

In contrast note that all of the roasters built by the Galena Iron Works Company are now in successful operation, viz.: Joplin Separator Company, Kennedy Mining Company, Hazel Green Mining Company, Tripoli Mining Company, the Dall Lead and Zinc Company, and several others, while three are under contract and in course of construction at the present time. The Dall Lead and Zinc Company produced a carload of ore on the first run that assayed as follows: 61.8 per cent. zinc, finished product containing 1.2 per cent. iron. The iron tailings from this product assayed only 0.8 per cent. zinc.

C. C. MATHEY.

Galena, Ill., May 3, 1907.

Concentration of Manganese Ore

In the correspondence columns of the JOURNAL of Feb. 9, under the heading, "Manganese Ore in Newfoundland," J. J. Whittle in alluding to the large proportion of silica (17.56 per cent.) contained in the ore, adds: "This I am told can be got rid of and the ore brought up to bessemer standard." This is a most important consideration with many holders of manganese-bearing properties in India who cannot either work or dispose of them on account of high percentage of silica, and owing to the fact of not knowing how to reduce it, and bring the ore to the standard. INTERESTED.

Calcutta, March 29, 1907.

The following is Mr. Whittle's reply:

I have been informed that silica in manganese ores can be reduced, in the first place by washing thoroughly the ore as soon as it is mined to rid it of all clay and some of the silica, and that a great part of the balance of the silica can afterward be separated by concentration after pulverizing the ore.

J. J. WHITTLE.

New York, May 5, 1907.

Antimony Ore

Being interested in an antimony mine, I beg to inquire if you can give me information as to the market for antimony ore, the names and addresses of concerns which buy it, and the value of the ore.

C. A. H.

Lincoln, Tooele county, Utah, May 14, 1907.

The smelters of antimony in the United States are: Mathison & Co., New York; Chapman Smelting Company, San Francisco, Cal.; C. Solomon, Jr., Oakland, Cal. There are other concerns which buy ore for export, whose names and addresses may be found in the advertising pages of the JOURNAL.

The antimony ore produced in Idaho, Utah, Washington and Nevada in 1906 averaged 60 per cent. antimony, and fetched from $2.25 to $2.50 per unit, f.o.b. cars at the mines. Ore of lower grade is marketable, but much depends upon the cost of transportation. The antimony smelting industry, and the conditions governing it, were fully described in the JOURNAL of Dec. 1, 1906.

The Price of Spelter

The difference between settlement on the London and New York markets is a very important consideration to the American, Mexican or Canadian exporter of zinc ore. Although the London price has been at certain times in excess of the New York price, the average over a long series of years has been lower than the average at either New York or St. Louis. Whenever the London price has been higher, the United States has exported spelter, and the new supply of metal from this source has reduced the London price below the American level. There is no shortage of ore supply available to European smelters. On the contrary not only the ore supply, but also the smelting capacity, are going to be immensely increased by the operations of strong companies owning enormous reserves of ore at Broken Hill, New South Wales, which are already developing their plans. So long therefore as the United States maintains a duty on the importation of spelter, it is to be anticipated that the London price for spelter will continue to average a little lower, in the long run, than the American price. Joplin is still the most important source of supply for American zinc smelters, although since 1901 its relative importance has been diminishing, and probably will continue to do so. However, the Joplin district will doubtless continue to have a dominating influence on the general ore market for a long while to come, and its prices will to a large extent be used as a basis.

Platinum on the Fraser River

SPECIAL CORRESPONDENCE

The provincial mineralogist of British Columbia lately received from Lillooet, on the Fraser river, two ounces of black-sand concentrate containing platinum, which he forwarded to Philadelphia, Penn., where it was sold for $49.50. No information was received as to the source of the sand from which the concentrate was obtained, but it was probably the Fraser river. Heretofore no platinum has been reported as having been found in any other tributary of the Fraser than the Quesnel, which joins the Fraser near Barkerville, Cariboo, about 200 miles north of Lillooet. It is not known to occur about Barkerville, either in the Fraser or its tributaries north of Quesnel; neither has it been reported as having been discovered in streams in the Lillooet district emptying into the Fraser. Failing any other explanation, it would appear that if found in the Fraser, near Lillooet, the platinum was carried down that river from the Quesnel.

New Publications

MAP OF [illegible] NITRATE AREA & LIST OF MINING COMPANIES, 1907. 20x25 in.; mounted on cloth. Price for wall map, $1, or folded, 50 cents. Denver, Colo., 1907: Clason Map Company.

THE ENGINEERING [illegible] ANNUAL [illegible] Pp. 366; 6½x9½ in.; cloth, $2. New York and London: *The Engineering Magazine.*

The index to engineering literature of all kinds, compiled by the *Engineering Magazine*, has heretofore been published at intervals of five years, Volume IV, the latest, making a bulky book of 1236 pages. With the present volume the plan has been adopted of a yearly issue. This seems to us a much better plan. It makes a much more convenient book to handle, and it brings the information much more directly to the engineer who desires to use it. Five years is a long period in engineering history in these days and covers the publication of a great number of papers, articles and periodicals. Each year adds largely to the list, and to wait for five years until they can be conveniently found is too long. In other words, the five-year volume savors too much of ancient history, and we believe that the profession will appreciate the yearly arrangement much more. The index is based upon that published weekly in the *Engineering Magazine* and is classified according to the chief branches of engineering work—civil, marine, mechanical, mining, railroad, etc. The book will find a place on the shelves of many engineers, who want to keep track of current literature on their many-sided profession.

EXAMINATION QUESTIONS FOR CERTIFICATES OF COMPETENCY. By the editors of *Mines and Minerals.* Pp. 568; illustrated. 6x9 in.; cloth, $3.50. Scranton, Penn., 1907: International Textbook Company.

Contents: Surveying. Geology and prospecting. Mine gases. Safety lamps. Inspection and regulation of gaseous mines. Explosives and blasting. Elementary principles and calculations of mine ventilation. Comparison of airways. Splitting air currents. Establishing a circulation of air in mine ventilation. Mine fans. Practical points in mine ventilation. Opening a mine. Method of working coal beds. Coal pillars. Timbering. Steam and steam boilers. Steam engines. Hoisting. Haulage. Hydraulics and pumping. Compressed air. Electricity. Duties of mine officials. Miscellaneous. State regulations governing certificated positions.

The book is not intended to replace textboks on mining, but to be used as a supplement to such textbooks. For this reason only those principles and theories are given that have been asked for by specific questions. The compilation reprints questions given in examinations for certificated mine positions in the United States and Canada during the last two years. The position for which the examination was held and the locality are denoted at the end of each question.

The essential purpose of the book is to be of assistance to candidates for the position of mine inspector, mine foreman, mine manager, fire boss, or hoisting engineer, and with this end in view a section called "Suggestions to Candidates" is designed to give practical advice to those who expect to appear before any State examining board. Another chapter in the book gives the regulations of the various States governing certificated mine positions, while in addition to a complete table of contents an elaborate cross index is included. The field covered is broad in scope, and the arrangement and treatment of the subjects are of such character that the book must prove of benefit to those engaged in coal mining.

Nipissing Mines Company

This company has just issued its report covering a period of 11 months, from May 1, 1906, to March 31, 1907. The corporation is a holding company, owning all the stock of the Nipissing Mining Company, Ltd., an Ontario Corporation. The Nipissing Mines Company was originally capitalized at $12,000,000, but only $6,000,000 stock was issued, and the other half is to be canceled. The property consists of large holdings in the Cobalt district in Ontario, which have frequently been described.

The income account of the Nipissing Mines Company for the 11 months is as follows:

Dividends on Nipissing Mng Co stock	$1,000,000
Interest	636
Total receipts	**$1,000,636**
Administration expenses	$25,059
Dividends paid, 16 per cent	**960,000**
Total payments	**$985,059**
Surplus, May 1	**$15,577**

The report states that the stock of the company is widely distributed, there being over 8000 stockholders on the books.

The account of the Nipissing Mining Company shows that in the 11 months there was mined 1103 tons first-class ore, 1296 tons second-class and 33 tons cobalt ore; a total of 2432 tons. The income account was as follows:

	Amount	Per Ton
Ore production	$1,073,299	$433
Interest	8,232	4
Total	$1,081,531	$437
Min'g and other exp'n's	195,436	80
Net earnings	$886,095	$357
Su'pl's from prev's year	624,628	....
Total	$1,490,723	....

Out of this dividends were paid amounting to $960,000, leaving a surplus of $490,723 at the close of the year.

An [illegible] of operations for the year 1906 is as follows:

[illegible]	[illegible]	[illegible]	12,207
Total	[illegible]	[illegible]	[illegible]

The average for first-class ore was 1339 oz. silver per ton; of the second-class ore, 193 oz. per ton.

The report of President Samuel Newhouse says, in part: "There is a large area yet unexplored, and to come to any accurate knowledge as to its value it will be necessary to extend operations considerably. Already accommodations for an additional 300 miners are well under way. When completed there will be sufficient room for 600 men. Such a force will permit the prospecting of the unexplored parts of the property, at the same time allowing us to continue the deep mining which is now under way, and the surface work later when the snow is off the ground.

"Experiments looking toward economy in the smelting and refining of ore are now being made, with a view of ascertaining whether it would be profitable to the company to erect its own smelter, but the settlement of this question can only be reached after thorough and definite tests have been made. There has accumulated at the mine a large quantity of low-grade ore, which is not of sufficient value to make it profitable to ship and smelt at present. The board of directors now has under consideration a proposition submitted by a reduction company for the concentrating of these low-grade ores, and will test and experiment with other systems.

"The activity of the surrounding profitable mines, of which the property of the Nipissing Company is the center, has been of much interest. On many of them bonanza veins have been opened up which run into this company's ground.

"During the year there has been improvement in the equipment of the property. New accommodations for the manager and his staff were made; a new office, water works and steam-heating system were installed; a hydraulic plant was set up and operated during the open season, and a new compressor plant was placed in operation. To protect the company more thoroughly and insure economy of operation, sampling works were constructed and should be in operation soon. Shaft-houses, engine-houses and sorting rooms were erected on seven of the veins.

"Since the first of the year the sinking of shafts and crosscutting to determine the depth to which values extend has been pushed forward and the results have shown the advisability of continuing this work."

Personal

[illegible] and MINING, [illegible] and appointments.

Washington B. Vanderlip, who has been examing copper properties in Nevada, California and Montana, has returned to New York.

C. W. Purington, mining engineer, of Denver, Colo., left London, May 18, for eastern Siberia, where he is to examine placer deposits. Mrs. Purington accompanied him.

Captain Thomas Pollard, for a long time in charge of the Wolverine mine in the Lake Superior copper country, has resigned that position, to take charge of the Victoria mine.

Leo Gluck has been appointed assistant to the president of the Pittsburg Coal Company. He has been for some time chief engineer of the coal mines of the Chicago, Milwaukee & St. Paul Railroad.

F. F. Sharpless, mining engineer, of New York, left May 25 for the West, where he will be engaged on professional work for six to eight weeks. He will visit Colorado, and also will investigate property in Idaho.

Lewis E. Ashbaugh has resigned his position as associate professor of civil engineering at Iowa State College, Ames, Iowa, and is now engineering assistant in the development of water power to Robert McF. Doble, with office at Colorado Springs, Colorado.

George Sydney Binckley, late chief engineer and manager of construction of the Monterey Water Works and Sewer Company, and the Monterey Railway, Light and Power Company, at Monterey, Mexico, has accepted the position of manager of the mining properties and smelter of the Douglas Copper Company, in the State of Sonora, Mexico.

Francis J. Peck & Co. have opened an office as mining engineers, chemists, assayers and metallurgists, 731 Williamson building, Cleveland, O. Mr. Peck was formerly of the firm of Crowell & Peck, which was recently dissolved without formal succession, Mr. Crowell entering the firm of Crowell & Murray and Mr. Peck entering the firm above mentioned.

Hood McKay, superintendent of Short Mountain and Summit Branch collieries at Lykens and Williamstown, Penn., has tendered his resignation to take effect June 1, to accept a similar position under the Lehigh Coal and Navigation Company, with headquarters at Lansford. Wm. Auman, superintendent of William Penn colliery, Shenandoah, succeeds Mr. McKay, and D. V. Randall, division engineer for the Nanticoke & Glen Lyon Coal Company, takes Mr. Auman's place at William Penn.

Obituary

Wm. M. Cook, of Cullman, Ala., president of the Globe Coal and Coke Company, died suddenly in Chicago, May 13. He had operated extensively in Alabama coal lands.

John A. Walker, vice-president and treasurer of the Joseph Dixon Crucible Company, died at his home, at Jersey City, May 23. He was born in New York city, Sept. 22, 1837, the son of Andrew Walker, a sea captain. He entered the employ of Joseph Dixon & Co. in 1867 as a bookkeeper and accountant and in the following year became secretary of the newly organized crucible company. He was chosen secretary and general manager in 1890 and two years later was elected to the positions he held at the time of his death. To his ability was credited much of the success of the concern. The Joseph Dixon Crucible Company has been for many years the largest producer of graphite in the United States, in connection with which it operates extensive mines in the Adirondack region, New York. Mr. Walker became recognized as the leading authority in the United States upon the mining, preparation and manufacturing of graphite, upon which subjects he made various contributions to the JOURNAL and THE MINERAL INDUSTRY. Mr. Walker was vice-president of the Colonial Life Insurance Company and a director of the New Jersey Title Guaranty and Trust Company. He was appointed a member of the Board of Education by ex-Mayor Gilbert Collins in 1885 and for two terms acted as president of the board. Mayor Mark M. Fagan appointed him to the Board of Free Public Library Trustees in 1902. He resigned the position three years later. He belonged to the Board of Trade, the Union League Club, the Cosmos Club, the Carteret Club, and the Twilight Club of New York city. He leaves a widow.

Societies and Technical Schools

American Institute of Mining Engineers—The Ninety-third meeting of the Institute will be held at Toronto, Canada, beginning on Tuesday afternoon, July 23, 1907. W. G. Miller, Provincial geologist, Bureau of Mines, Toronto, may be addressed as the representative of the local committee in charge of the program and excursions. The following program is provisionally announced, subject to such changes as may be found advisable: Tuesday, July 23—Afternoon, session at the King Edward Hotel; evening, reception in the Parliament buildings. Wednesday, July 24—Morning and afternoon, sessions; evening, departure by special train at 9 p.m. for Cobalt. Thursday, July 25—Visits to mines, and an evening reception in the opera house. Friday, July 26—Additional visits to mines, and optional excursions in the afternoon to points of scenic or scientific interest. Saturday, July 27—Steamboat trip up Lake Temagami, or optional trips to mining districts. Sunday, July 28—To be spent by those who so desire at the hotels at or near the lake. Monday, July 29—Visit to Sudbury, etc., to be continued on Tuesday, the party returning to Toronto by train leaving Sudbury Tuesday night.

Industrial

The Davenport Locomotive Works, Davenport, Ia., has commissioned architects to draw plans for a new foundry to be built on property recently purchased near the present plant. The building will be 104x220 ft., of brick, concrete and steel construction.

At the annual meeting of the stockholders of the Jeffrey Manufacturing Company, Columbus, O., J. A. Jeffrey, R. Grosvenor Hutchins, Robert H. Jeffrey, C. W. Miller and Frederick Shedd were re-elected directors. The board organized by the election of J. A. Jeffrey, president and general manager; R. Grosvenor Hutchins, vice-president and manager of the mining department; Robert H. Jeffrey, vice-president, assistant general manager and purchasing agent, and C. W. Miller, secretary and treasurer.

Trade Catalogs

Receipt is acknowledged of he following trade catalogs and circulars:

Fulton Iron Works, San Francisco, Cal. Catalog No. 106. Machinery for Gold and Silver Milling, Amalgamating, Concentrating. Pp. 94, indexed, illustrated, paper, 7½x10 in.

Brown & Sharpe Manufacturing Company, Providence, R. I. B. & S. Cutters. Pp. 79, illustrated, paper, 3x6 in. B. & S. High-speed Steel Cutters. Pp. 48, illustrated, paper, 3x6 in. New B. & S. Machinists' Tools. Pp. 7, illustrated, paper, 6x9 in.

Construction News

Ophir, Colorado—The Morning Star Mining Company will shortly install compressors and drills, and will utilize a water-power for their operation. The company also comtemplates the erection of a mill before long. H. L. Brown, Ophir, Colo., is superintendent in charge.

Alta, Utah—Regular ore shipments will be inaugurated from the Albion mine before the middle of June. A great deal of high-grade ore has been opened in this property during the past few months. Plans are being discussed for the erection of a mill. William Hatfield, Provo, Utah, is manager.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

May 22—The Los Angeles Chamber of Mines is preparing to coöperate with the Chamber of Commerce, Jobbers Association, and the Merchants and Manufacturers Association in order to make a joint excursion to the new mining camps of southern Nevada to promote closer business relations. This is a similar move to that made some months ago by the San Francisco business men.

The United States Gold Dredging Company has been organized at Redding, Shasta county, by W. D. Egilbert, P. W. Mark and S. D. Farber who are having a dredge built under the patents of G. A. DuBois, of the same place. The machine will operate at Middle creek, a few miles from Redding. This is a suction dredge of larger size than the one now operated by Mr. DuBois at Middle creek.

The new Masonic camp in Mono county is expected now to come to the front rapidly as Geo. S. Nixon and Geo. Wingfield, of Goldfield, Nevada, have purchased for a large sum the principal mine there—the Pittsburg-Liberty. On this mine considerable development has been done within the year and the results have been very favorable. The sellers are J. Phelps, J. M. Bryan, Caleb Dorsey, W. H. Paul and L. G. Campbell.

The Bay Counties Power Company has commenced construction of the line which is to carry electric power from the Rome powerhouse, on the south Yuba river, near Hoyt's crossing, to the Alaska mine near Pike City, Sierra county. The line will be ten miles in length. Previous operations at the mine have been with steam power and the expense was heavy because of the great flow of water to be handled, resulting in the profits being cut to a minimum. This power line will probably be extended to Alleghany and Forest, where there is great activity in mining developments, and need of cheaper power.

The test run of the new electric iron-ore smelter at Heroult, Pitt river, Shasta county, will begin on June 15. The buildings are all completed and the kilns are in readiness. The furnace itself is completed and with the exception of one carload of carbons, which has gone astray en route, all the material is on the ground, and there should be no trouble in turning on the current at the time announced.

Purchasers of the southern Nevada stocks are making trouble for San Francisco brokers by turning back many drafts for payment of stocks ordered by them and repudiating their orders to buy, thus leaving the brokers to cope with the loss as best they may. It may be necessary to institute a black list, so some brokers say. The falling off in the selling prices for mining stocks has led buyers to repudiate their orders. Thousands of dollars have been represented in each of a number of transactions of this sort. The abuse has become so common that the brokers are liable to take some concerted action in their own behalf.

The suits of the 30 or more residents of Benicia and vicinity against the Selby Smelting Company for alleged damages to livestock and crops from the ravages of the poisonous fumes of the big smelter at Vallejo Junction are to be prosecuted in Court unless Ex-District Attorney T. C. Gregory, who has become associated in the handling of the various claims, can compromise matters with the smelting corporation.

Since the closing down of the mines at Angels Camp, Calaveras county, owing to labor troubles, the place is without commercial activity. It is said that under no conditions will the mine operators consent to anything other than the resumption of the mines under the old pay basis, and this the miners as emphatically insist shall never be. The closing of the mines means that $50,000 per month has been put out of circulation, and not only the business men who by thrift and economy, have built for themselves small homes, are seriously contemplating moving to other fields. The non-resident and alien elements are causing the greater part of the trouble. The Utica, Angels and Lightner companies, the largest producers in the camp, say that rumors of compromise are idle talk, and that the mines will not resume except under the old order of wages.

At Grass Valley, the most productive gold-mining camp in the State, while no strike has taken place, the miners have demanded an extra 50c. per day wages. The Mine Operators' Association, and the local miners' union are trying to settle the matter, but no conclusion has yet been reached. The North Star and the Empire companies could doubtless stand the raise but the other mines of the camp could not well do so, and be worked at a profit. Meantime numbers of miners are leaving for the southern Nevada camps, where wages are higher.

A syndicate of Pasadena men headed by J. Edward Kent, Dr. A. B. Royal, J. D. Klepper, C. E. Chamberlain, H. J. Rowe and Alfred Larsen, has secured control of [illegible] district, in San Bernardino county, and will proceed at once with the development of their claims, which are within twelve miles of the old town of Ivanpah. Ivanpah was one of the famous silver-producing districts of the early days before the increase in the country's gold production caused a slump in the demand for the white metal.

Salt Lake City

May 24—Stockholders of the Gibraltar Mines Syndicate, operating the Gibraltar mine in the Bullfrog, Nev., district, have received notice of the annual meeting which will be held at Goldfield on June 4. Aside from the election of a new board of directors a resolution will be presented and which will probably be adopted, changing the headquarters of the corporation to Salt Lake City, where a majority of the stock is held.

In Beaver county, there has been a decided improvement, where several new and important producers, are being brought to the front. Among the number may be noted the Talisman, Moscow, Cedar and Commonwealth, all of which are now regular contributors to the Salt Lake ore markets. The Newhouse Mines and Smelters corporation is getting out a larger tonnage.

A special meeting of the shareholders of the Nevada-Utah Mines and Smelters Corporation has been called to meet in Portland, Maine, on June 10, at which time there will be a reorganization of the board of directors. An effort is being made to bring about a coalition, if not a consolidation of this company with the Ohio-Kentucky Mining Company. Both have their principal interests at Pioche, Nevada.

It has been learned that the management of the San Pedro, Los Angeles & Salt Lake will take up the construction of a branch line into the Deep Creek mining district in western Utah, with Ely, Nev., as the probable destination, soon after the completion of the Pioche & Caliente branch.

Shareholders of the Star Consolidated Mining Company, operating in the Tintic district, have accepted a proposition to join interests with the Black Jack Mining Company. If ratified by the shareholders of the latter, the Black Jack will be reorganized and the assets of the Star Consolidated transferred in consideration of a half interest in the capital stock of the new company.

The United States Smelting, Refining and Mining Company's lead and copper smelters have been practically closed for a week on account of labor difficulties. The employees of the plants struck for higher wages. The management is inclined to grant some concessions. The plant of the American Smelting and Refining Company is being operated at capacity again, the difficulty there having been settled.

The machinery of the first unit of the Utah Copper Company's new mill at Garfield is being tried out and the management expects to have the plant in regular commission soon.

Denver

May 21—The trial of an important suit has just commenced in the United States court, that of the Portland Gold Mining Company against the Stratton Independence Company, the former claiming that, since 1904 the Stratton company has trespassed on its property in 15 different places, and abstracted nearly a million dollars' worth of ore.

There are indications that a sale of the Pennsylvania and the Lotus groups of mines in the Russell district of Gilpin county, to a New England syndicate, will be consummated within a few days, involving about $1,500,000. The property covers a large area and extensive development work will probably be undertaken before long.

The El Paso & Southwestern Railway Company, the property of the Phelps-Dodge interests, has acquired about 60 miles of the Chicago, Rock Island & New Mexico Railway, giving a continuous trackage from the Dawson coal mines to Bisbee, Arizona, and it is stated that the output of its northern New Mexico mines will be increased largely.

The Federal grand jury, which is at present in session in this city, is continuing the investigations of the coal and forest land frauds, and the United States attorneys of the affected States are said to be acting under direct orders from the department of justice, in Washington. Interesting developments are expected when the report is made and indictments against very prominent men are probable. The Federal Government expects to regain possession of large areas of forests, which are now held by lumber operators, and of thousands of acres of coal land, obtained by fraud.

Scranton

May 28—At a meeting of the Conciliation Board, held in Wilkes-Barre last week, a grievance was settled without being submitted. It was that of a pumpman employed at one of the Lehigh Coal Company's collieries at Derringer, who claimed that according to the award of the Anthracite Commission, he was entitled to seven shifts a week, and that he was not paid the extra shift. The representative of the mine workers brought the matter up for an informal discussion and it was agreed that there was no necessity for filing a grievance and that it could be taken up with the district superintendent, and satisfactorily adjusted.

Mr. Richards suggested that they should proceed with the Lattimer grievance and that Mr. McElhenny take the miners' side of the case, whereupon he declined, remarking that he did not represent non-union miners. Mr. Richards took exception to this stand, claiming that he represented all the miners whether union men or not. This opens up an interesting argument. The three miners' representatives were appointed to represent the miners at large, but they are officers of the United Mine Workers and there would be trouble of the most serious kind were they to act for the non-union men. At the same time if the non-union men are not represented they are debarred from the benefits of the award of the Anthracite Commission, although represented by counsel before the commission.

No. 2 breaker of the Jermyn Coal Company at Old Forge, near Scranton, was destroyed by fire last week. The colliery employed 800 men, who will be idle until a breaker is built. The other breaker of the company was destroyed by a windstorm six months ago, and has not yet been rebuilt.

The Black Diamond Coal Company, of which T. V. Powderly is president, has sold its colliery in Schuylkill county to Cornelius E. Parker, of Boston, for $34,500. After spending $150,000 in developing the tract of land and building an expensive breaker, it was found that the company was practically penned in by the big tracts owned by the large companies and the stockholders have been glad to sell out at a small fraction of their investment.

The Delaware, Lackawanna & Western Railroad is placing larger cars in the Auchincloss mine. The narrow places in the workings are being widened and the gage is being widened from 30 to 36 inches.

London

May 18—The reports of various copper companies continue to show excellent results. This week the Namaqua and the Tilt Cove companies have issued their reports. The former operates in Cape Colony and the mine adjoins that of the Cape Copper Company, while the latter works in Newfoundland. The ores and matte of both are treated at the works of the Cape Copper Company at Briton ferry, near Swansea.

The Namaqua Company made a profit of close on £100,000 during 1906 and distributed £69,000 as dividend, being at the rate of 35 per cent. on the share capital. The output for the year was 2648 tons of copper. A great deal of the lower-grade ore which gave so much trouble in concentration is now being smelted direct, and an additional furnace is being erected in order to extend this part of the work.

The Tilt Cove mine made a profit during 1906 of £99,340, of which one half goes to the Cape Copper Company for management and smelting. The share holders in the Tilt Cove Company receive the remainder and dividends for the year amounting to 26¼ per cent. were distributed. The Tilt Cove ore contains gold and silver, and 35 per cent. of sulphur, which is utilized in making sulphuric acid at the Cape Company's works. The output of the Tilt Cove mines is not given.

Cable advices are to hand giving the result of the half year's working to March 31 of the Mount Lyell Mining and Railway. Of Mount Lyell ore 140,963 tons were treated and of North Mount Lyell ore 63,035 tons, being a total of 203,998 tons. The average contents were 2.18 per cent. copper, 1.65 oz. of silver and 0.94 dwt. of gold. Metal-bearing fluxes to the extent of 2172 tons and purchased ore to the extent of 571 tons were also treated. The production of blister copper was 3839 tons. The net profit was £264,935, out of which £210,000 was distributed as dividend. The cost of producing the blister copper was 14s. 5d. per ton, being 1s. 5½d. less than in the previous six months. The proposition to take up tin mining and smelting has fallen through owing to the Blue Tier property that was taken on lease having proved to be of too low grade. The chemical business connected with the company has been fairly good, and the demand for superphosphates in South Australia has been so great that the company intends to erect a chemical works at Port Adelaide.

Several properties at Cobalt, Ontario, have been introduced in London recently. One is called England's Premier Cobalt Mining Company, Ltd., a Canadian company located at Toronto. The mine is in the neighborhood of the Nipissing. As far as I can ascertain, no development work has actually been done, but it is stated that the veins of the neighboring mine can be traced over the surface of the Premier property. Another property is the Casey Cobalt mine, which is locally known as the Bucknell mine, and is situated seven miles from New Liskeard, which in its turn is seven miles from Cobalt. Sufficient development is stated to have been done to warrant the expenditure of money on machinery of all sorts. The veins are said to carry cobalt, nickel, silver and bismuth. Neither of these properties is being introduced in London by very influential people, and it is difficult to judge of their actual values.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alaska

PRINCE OF WALES ISLAND

The Government Alaska road commission decided upon a road between the east and west coasts of this island, the point selected being Chalmondeley portage. Some work was done last season; at present the engineer in charge has a large number of men and horses at work there, and expects to rush it to completion.

Crackerjack—This mine at Hollis is adding a compressor to its mechanical plant.

Hydah—The cars and sheaves have arrived for tramway at this mine and ore shipments to the Hadley smelter will commence immediately.

Niblack Copper Company—This company is sinking an additional 100 ft. down to the 325-ft. level. The expectation is to crosscut from there and develop the ore shoot disclosed on the 225-ft. level.

Rush & Brown—This property, at Karta bay, under the new management of John Rigby, is putting a large force of miners at work. Some 15,000 tons of ore were already broken in the mine, when the company was forced to reorganize. This ore will now be raised, sorted and shipped; 10,000 tons already being contracted for delivery at the Tyee smelter, in British Columbia.

REVILLAGIGEDO ISLAND

A company owning some 20 claims upon Revillagigedo island, and near the town limits has announced that it will soon install a plant of machinery consisting of a 35-h.p. hoist, boiler and compressor. The company expects to do considerable development on several of the prospects this coming season.

Arizona

YAVAPAI COUNTY

Independence Mill—This mill has again resumed after an idleness of over a month on account of the failure of the railroads to deliver supplies.

Peerless Mining Company—This company has been organized during the last week by local people for the purpose of taking over the Peerless group of mines, situated in the Turkey Creek mining district, about 8 miles southwest of the town of Mayer, on the Bradshaw Mountain Railway, a branch of the Santa Fe system. This group of mines has not been worked since about 1889. During the time it was worked the ore shipped had to be hauled by wagon a distance of over 100 miles. The property is developed by a number of shafts, open cuts and holes, covering a distance along the ledge of about 4500 ft. It is the purpose of the new owners to equip the property with modern machinery. C. S. Bottorff is the president of the company and the secretary and treasurer, W. L. Fox.

California

AMADOR COUNTY

Zeila Mining Company—This company at Jackson has closed down its chlorination works and will hereafter ship its sulphurets to the Selby smelter for treatment. Uncertainty of fuel supply is given as the cause of this change.

BUTTE COUNTY

Yukon Gold Company—This company has filed articles of incorporation with the county clerk. The directors of the company are all residents of the State of Maine. They are Joseph Williamson, E. L. McLean, Louis A. Burleigh, Paul Cross, I. E. Chadburne and W. H. Simmons. This is supposed to be a subsidiary Guggenheim corporation, these gentlemen having transferred to it recently certain mining interests at Oroville.

EL DORADO COUNTY

Short Handle—This mine at Spanish Dry Diggings, owned by Lewis Sites, is being equipped with hoisting and pumping apparatus.

INYO COUNTY

Keane Wonder—This property at Keane Springs, on the Death Valley slope of the Funeral range, is showing up a large body of high-grade ore. The company owns 25 claims. Machinery for a 20-stamp mill is on the ground and a cyanide plant is being installed. Homer Wilson is manager, and 25 men are at work.

KERN COUNTY

Greenfield—In this new desert mining section J. Cunningham and T. E. Champion have bonded one of their eight claims to San Francisco men for $17,000.

LASSEN COUNTY

Milford—Developments at this place are satisfactory as at first reported. The claim being worked by McNab and partners has a 3½-ft. vein. which averages $16 per ton in gold.

MARIPOSA COUNTY

Mount Gaines Mining Company—The old quartz mill and the hoist have been moved to No. 8 mine at Hornitos, which is an extension of the famous No. 9. The new 100-stamp mill for the Mount Gaines has arrived at the railway station.

NEVADA COUNTY

Niagara—At this mine men are drifting both ways in the ledge. A hoist is being built and when completed the shaft will be sunk 100 ft. deeper.

Inkmarque—A rich strike in this mine near the North Star mine, Grass valley, is causing great interest in the district. The mine is owned by John Rosenfeld's Sons, of San Francisco, who have been reopening it for the past three years.

Iron Mountain Copper Mine—This property, under bond to E. A. Wiltsee and associates, has been sold to C. L. Wilson, who will put a force of men at work and will soon begin to ship ore. The mine is owned by Taylor Bros., of Grass Valley.

PLACER COUNTY

Three Queens—Another rich strike has been made in this mine in Forest Hill district, owned by Geo. Wingfield, of Goldfield.

SHASTA COUNTY

Great Western Gold Company—It is reported that a large body of ore, carrying gold, silver and copper, has been struck in the Afterthought mine of this company. The second smelter is under construction at Ingot.

SIERRA COUNTY

Mott—This claim, along the old Bald Mountain Extension channel at Forest, is to resume work. It is owned by C. E. Mott and M. Morrison. When this claim is opened, the Copeland claim adjoining will also be again worked.

STANISLAUS COUNTY

Oak Hill—Ore is being hauled from this mine, near La Grange, for shipment to the Selby smelter. A new level is being run at 300 ft. depth.

[redacted]—[redacted] shipping copper ore to the smelter from his claim in the foothills east of Lindsay.

TUOLUMNE COUNTY

Montezuma—In this mine, at Table mountain, the new owners will run the tunnel an additional 4000 ft. to cut completely across the ancient gravel channel.

Colorado

LAKE COUNTY—LEADVILLE

[illegible] the Sunday shaft has been completed and is now down 450 ft.; the vein opened at this depth is well defined. A drift is being run north to connect with the old shaft. Work has been resumed on the Elma Alva, Tiger, Green mountain.

Breece Hill—The Fanny Rawlins, Big Four, Elk lease, Highland Chief, Penn President, etc., are all shipping from 15 to 30 tons daily of ore.

Cleveland Shaft—New Monarch Mining Company, South Evans gulch. The work of cutting two large stations and installing pumps at the 600-ft. level has been completed, and drifting on the new ore-shoot opened in the shaft has been started. The shaft has opened four distinct ore channels.

Coronado—Two hundred tons daily are being shipped from this property and an extensive system of exploration is being carried on to determine the location of the orebody to the west.

Fitzhugh—East Fryer hill. At the 450-ft. level a good body of ore has been opened and 30 tons daily of silicious carbonate ore is being shipped. In the Jimmie Lee, another body of the same character has been opened from which 15 tons are being shipped daily. The silver in this orebody frequently reaches 500 oz. per ton.

Little Jonny—Two or three sets of lessees at work on Nos. 2 and 4 shafts have opened up bodies of copper. The copper runs from 3 to 15 per cent. At the 1300-ft. level of No. 4 shaft copper is found in small streaks running high in gold.

Placer Mining—Lord's ranch, situated below Leadville on the Arkansas river, has been examined by a Chicago capitalist. The river has been turned on the ground to wash off the surface dirt preparatory to installing a dredge to work the gravel.

Indiana

GREENE COUNTY

Linton Bituminous Coal Company—The German American Trust Company, of Indianapolis has been appointed receiver for this company, of Linton. It is said the property of the company, near Linton, is one of the most productive in that territory. It is under lease to the Diamond Coal Company, of Chicago.

[illegible]

Indiana & Kentucky Fluorspar and Lead Mining Company—This company has been incorporated with headquarters at Evansville. The company proposes to mine lead, fluorspar, zinc and other ores, and construct and operate smelting plants. The business will be conducted in Indiana and Kentucky. M. M. Haas, Harry Watkins and J. S. Beeler are directors.

VIGO COUNTY

Seeleyville Coal and Mining Company—This company has gone into voluntary dissolution. W. W. Ray is president.

SULLIVAN COUNTY

Recent discoveries of coal and gas have brought about a boom in this county, and speculators are buying and leasing land freely.

Sullivan county now leads all other counties in the production of coal. A few years ago only a few carloads were mined, but now the total value of the output is estimated at close to $10,000,000 a year. There are now 40 mines in operation in the county and a number of additional mines will be opened this year. Most of these mines are reached by branch railroads, although some are still "wagon mines."

Kentucky

MUHLENBERG COUNTY

Nelson Creek Coal Company—This new company has bought 1500 acres of land on the Illinois Central Railroad near Nelson, said to contain three distinct veins of coal, two of which are 4 ft. and one 5 ft. thick. It is to install a plant having a capacity of 1000 tons of coal per day, equipped with electrically driven machinery. Officers of the company are R. A. Lytle, president, and John W. Bastin, Nelson, Ky., general manager.

Michigan

HOUGHTON COUNTY—COPPER

Globe—The development shaft being sunk by the Copper Range Consolidated Copper Company on the Globe property has encountered the ledge at a depth of 228 ft.

This eliminates the possibility of the loss of the work of two years; and if good values are found Copper Range will be greatly benefited. The Globe property has been under option from the Stanton interests for about two years.

Hancock—The shaft is now down 100 ft. from the 1000-ft. level, which was the bottom of the old workings. Good copper rock is found at this depth. The hoisting and compressing machinery is beginning to arrive.

Superior—Shaft No. 1 is now down 70 ft below the fifth level and good mill rock is being taken out. Drifting on the fifth level extends 200 ft. in each direction, north and south, and values continue better than in the upper levels. The rock contains about 20 lb. refined copper per ton, but the metal is in a finely divided state with little mass or barrel copper. No sinking is being done in shaft No. 2 below the 200-ft. level on account of considerable water in the shaft. This is being pumped and sinking will soon begin.

Missouri

ZINC-LEAD DISTRICT

Slushman Land—James H. Luke, of Carthage, who is operating on this land, two miles west of Joplin, has disposed of the southeast—10 acres of the lease to J. C. Stineman, Charles J. Burggraff, J. D. and Clyde Wentworth and John S. Wicks, for a consideration of $16,000. This company has been operating on the tract for some time, and has it developed by sinking a shaft on a drill hole, which showed ore from the 150-ft. to the 178-ft. level, and which the shaft proved up. The company will immediately let the contract for the erection of a modern 300-ton concentrating plant.

Nevada

ESMERALDA COUNTY—GOLDFIELD

Goldfield Consolidated Mines Company—George Wingfield, a director, states that this company will probably not pay any dividends during 1907, and no ore will be shipped. The directors propose to build a new reduction plant in Goldfield at a cost of between $600,000 and $700,000, and the mill will have a capacity of from 600 to 1000 tons per day.

Jumbo Extension—The Mohawk-Jumbo Lease Company has struck a bonanza ore shoot at a depth of 400 ft. on the Gold Wedge Fraction claim. Assays of samples of the ore average over $5000 per ton.

Mohawk—This mine has been re-timbered, and the work of straightening the shaft and erecting a new hoist is nearing completion. Regular mining operations will shortly be resumed. A large body of rich shipping ore has been developed. A shipment of 400 tons of ore secured during recent development operations was sent to Salt Lake during the week. This shipment is valued at $30,000.

St. Ives—The shaft is down 300 ft., and a drift is being started to catch the main ledge. The St. Ives Leasing Company is shipping ore averaging between $200 and $500 per ton.

Vernal—A Chicago company has secured a week's option on the holdings of Thomas G. Lockhart in this property. The stock amounts to 350,000 shares, and the optional price is 50c. per share.

NYE COUNTY—BULLFROG

Croesus—The shaft has reached a depth of 170 ft., and although no regular ledge has yet been encountered, the country rock is carrying numerous quartz stringers, which indicate close proximity to a ledge.

Homestake-King—Drifts are being extended at the 400-ft. level, and three shifts of men are running the shaft down to the 800-ft. level as rapidly as possible. Large

ore reserves have been developed in the different levels, and it is expected that the 400-ft. drifts will soon strike the pay-shoots. A new and more powerful hoist is being installed with the view of raising regular ore shipments.

Puritan—This property is situated a little to the north of the famous May-flower mine, and promises to develop into an important ore producer. During this week a ledge carrying ore of milling grade was cut in a tunnel near the surface. At present, it is over 15 ft. in width and appears to be a well-defined orebody.

NYE COUNTY—MANHATTAN

Manhattan Ore Reduction Company—The whole of the machinery for the new mill has arrived, and men are engaged in erecting it. This mill will have a capacity of sixty tons of ore daily, and is to be supplemented with other batteries as occasion demands. Manager Wolf announces that the plant will be in operation by midsummer. Contracts have been closed for the handling of an ore tonnage approximating $300,000 in value, and other and larger contracts are pending. It is estimated that the ore tonnage on the dump and blocked out in the various mine workings of this camp has an aggregate value close to $10,000,000.

Combination—The shaft has been sunk to a depth of 80 ft., and a trial crushing of the ore amounted to 5 tons, made last week at the Chapman-Mushett mill, at Round Mountain, yielded the average return of $1000 per ton. This remarkable return has stimulated the lessees to enlarge the mining force. The shaft will be run to the 200-ft. level with the greatest despatch, and double shifts will start drifts from the 100-ft. level as soon as it is reached.

Thanksgiving—This property continues to yield high-grade ore, and is one of the "show" mines on the field. There is a prospect of litigation with the Mustang Company over the apex of the vein.

NYE COUNTY—TONOPAH

Hasbrouck—After a period of idleness extending over three years, the Hasbrouck Gold Mining Company has resumed mining operations on its property, situated about six miles southwest of Tonopah. A new shaft is being sunk which has now reached a depth of 80 ft. During the past fortnight a shipment of 400 sacks of ore has been made to the smelters. This ore will average $70 per ton.

Jim Butler Annex—A company has been incorporated in Tonopah to develop this property, which comprises three and a half claims situated on the southern boundary of the Jim Butler mine. A two-compartment shaft has been started, and arrangements are being made to secure a 40-h.p. electric hoisting plant.

Midway—[illegible] in the 800-ft. level at a distance of 520 ft. north of the shaft. It is fully 10 ft. wide and carries ore of milling grade. It is proposed to run drifts on it, both east and west, with the view of developing pay shoots. The ledge is believed to be an extension of the rich Macdonald vein, which has been successfully developed in the Montana-Tonopah mine.

West End Consolidated—Work on the new working shaft has been temporarily suspended at a depth of 100 ft., pending the installation of a new hoisting plant. The old shaft is down 140 ft., and a new crosscut has been started at the 130-ft. level. A shipment of high-grade ore has been despatched to the smelters.

Ore Shipments—Shipments over the Tonopah Railroad for the week ending May 16 were: Tonopah Company, 700 tons; Belmont, 465; Tonopah Extension, 200; Montana-Tonopah, 147; total from Tonopah, 1512 tons. From Goldfield 520 tons were shipped, and from Liberty 16, making a total of 2048 tons. In addition the Tonopah Company sent 2060 tons of ore to its mill.

New Jersey

MORRIS COUNTY

Orchard Mine—This iron mine, which has been idle for more than ten years, is to be reopened by Joseph Wharton, William Phillips, of Hibernia, will be in charge. It is planned to drive a drift from the Hurd mine connecting the workings.

North Carolina

ALEXANDER COUNTY

Mining for gems is being carried on near Hiddenite, with some success.

MACON COUNTY

Franklin Kaolin and Mica Company—This company will erect works at Franklin for preparing mica for market. V. J. E. Fisher is president and general manager.

United States Ruby Company—This company will begin work soon on the ruby deposits of Macon county.

MECKLENBURG COUNTY

What is thought to be a rich gold mine has been discovered on the 43-acre farm of W. H. McQuay, five miles from Charlotte, on the Rozzell's Ferry road. Samples assay well. S. J. Wearn made an inspection of the vein and found it to be 5 ft. wide, running east and west. It is thought to be a branch, if not the main vein, of the Frazier gold mine, which property lies adjacent.

South Carolina

BEAUFORT COUNTY

Tilghman Phosphate Company—This [illegible] capital, with $1,000,000 capital stock, to operate phosphate properties. William B. Chisholm, Charleston, S. C., is president.

South Dakota

CUSTER COUNTY

Ideal—A new Stirling boiler, air compressor, and drills are being installed. The stock is held chiefly by the Van Camps of Indiana.

Niagara—An option has been given on these four claims to John Hazels of Pennsylvania. The consideration is $20,000, the option is to run for one year, and the first payment is due in 90 days.

LAWRENCE COUNTY

Imperial—There is a proposed merger between the Imperial, the Dakota, and the Portland, all in the Bald Mountain district. All companies have been mining and milling ore for from five to twelve years. The Imperial and Dakota each have cyanide plants in Deadwood of 150 and 100 tons capacity each, while the Portland, which has high-grade ore, has been shipping.

Homestake—Flooding of the mine was completed by May 22 and some of the mills will resume operations soon. The 600 stamps in the Desmet, Deadwood-Terra, Caledonia, and Highland will be dropping for the present, while the working is confined to surface and upper level ores. Explorations show that the upper workings are practically free from the gas which has been forced up by the great volume of water and has found its way out by the Savage and North End tunnels. The task of unwatering will commence at once, water being hoisted from the Old Abe and Ellison shafts by means of skips.

Golden Flat—For the consideration of $300,000, this company has obtained possession of a group of claims in Two-Bit gulch. This property was formerly part of the holdings of the Redwater Mining Company which has absorbed the Hardin, Two-Bit, Great Northern and other companies. Litigation ensued and the property finally passed into the possession of George G. Yeomans, of Chicago. The majority of stock in the new company is held by Mr. Yeomans and W. L. McLaughlin, of Deadwood.

PENNINGTON COUNTY

Mariposa—A complete steam plant has just been installed to take the place of the gasolene one and work has been resumed on the property. The tunnel, which has penetrated the mountain 600 ft. still has 200 ft. farther to go before encountering the vein sought for.

Burlington—Considerable surface prospecting is being done, with a view to locating contacts and finding other orebodies. A force of men is at work put-

ting the shaft down to the 100-ft. level where crosscutting will begin.

Auburn—The new mill has just been [illegible]. It has a capacity of 100 tons and employs a new method of extraction—a modification of the cyanide.

Tennessee

MAURY COUNTY

[illegible] Company—This company has been organized to develop a phosphate property on the line of the Swan Creek Railroad. W. B. Greenlaw, J. F. Brownlow, F. D. Lander, James A. Smiser and H. A. Webster, of Columbia, Tenn., are directors.

Utah

BEAVER COUNTY

Pine Grove—This company is developing its property by means of a deep tunnel, which has been run 80 ft. and will have to be driven 300 ft. farther before an orebody can be reasonably expected. D. H. Wenger, of Salt Lake, is manager.

Revenue—The compressor plant recently installed at this property in the Pine Grove district has been placed in commission. The new mill will soon be in commission.

JUAB COUNTY

Eureka Railway—This company, which is building a line to connect all the principal mines of the Tintic district with the Tintic smelter, has several grading camps established and will push construction rapidly.

Bullock—This Tintic mine is reporting in the Salt Lake market with regular ore shipments.

SALT LAKE COUNTY

Utah Apex—A statement from the management indicates that this company has 6000 tons of low-grade mill ore in storage and on the dumps, which it has been necessary to remove from the mine to get at that of shipping grade. The completion of the Markham Gulch mill in the camp has given the company facilities of its own for ore treatment.

Markham Gulch Mill—This plant, owned jointly by the Utah Apex and Utah Development companies, will be in operation soon.

Fortuna—This company is constructing a surface tramway which will carry ore from the mine to ore-bins at a convenient point on the Bingham branch of the Rio Grande Western railroad.

Washington

FERRY COUNTY

[illegible] Mining Company—This has been organized with 1,500,000 shares, par $1 each. The directors are A. L. [illegible], S. L. Bayer, of Danville, Wash.; Dr. S. H. Arthur, of Scranton, Penn.; G. B. Bardwell, of Belle Plaine, Ia.; F. L. Maynard, of Boone, Ia.; and W. Humphrey, of Carroll, Ia. The company will develop a group of silver-lead claims, on Bridge creek, on the south half of the Colville Indian reservation.

OKANOGAN COUNTY

Bluffton—The tunnel contract is completed, the vein having been encountered on the tunnel level at a depth of about 250 ft. The ore contains iron sulphide and assays in gold and copper.

Standard Copper—Articles of incorporation have been filed. J. W. McBride, James A. Caughren, Patrick Welch, E. Garlinger and Fred N. Freer are the trustees. The company has purchased a group of claims on Copper mountain, in Meyers Creek district. Address Bolster P. O., Washington.

West Virginia

MINGO COUNTY

It is reported that F. H. Evans, of Williamson, has made arrangements to sell a large tract of coal land to a syndicate made up of New York and London parties. C. H. Evans, Chicago, Ill., and Russell Palmer, New York, N. Y., engineers, have made examinations of the [illegible].

Canada

ONTARIO—COBALT DISTRICT

Ore Shipments—Shipments of Cobalt ore for the week ending May 18, were as follows: Coniagas, 171,620 lb.; O'Brien, 170,270 lb.; Temiskaming, 54,500 lb.

Colonial—Operations are being actively carried on on the shore of Cross lake, Cobalt, by a force of 90 men working day and night. Drifting under the lake has been done for 40 ft. at the 100-ft. level. Three tunnels are also being driven into the hillside.

Coniagas—Large shipments have recently been made from this mine, at Cobalt, and a car a day has been ordered from the railroad. In all 1450 ft. of drifting and crosscutting has been done at the 75-ft. level, and six veins are being worked. The building for the concentrator is about completed. It will have a capacity of 100 tons daily, and will handle all ore below 300 oz. to the ton.

Foster—Recent changes in the management and prevalent reports of a disquieting character regarding this mine, at Cobalt, which had a depressing effect on the market generally, have resulted in arrangements by the directorate to have a thorough examination of the property by competent engineers. President John G. Kent and Joseph Oliver, one of the board went to Cobalt this week to take measures for the inspection. The services of Frank C. Loring, consulting engineer, have been secured.

Gould Playfair Gold Camp—A company under this name has been organized to work 14 claims in Playfair township, north of the Hight of Land, staked by Frank Gould. The ore on the surface shows $25 gold to the ton.

Larder Central Goldfields Company—A good calcite vein has been discovered on one of the company's properties, Lemieux lake (near Larder), larger than the surface veins usually found at Cobalt. The ore has copper contents besides silver and gold. The vein runs over a hill rendering it easy to work.

Manhattan Cobalt Company—W. F. Brunne, of New York, has returned after a week's inspection of Larder lake for the company, bringing numerous samples of free gold from various points. On the company's properties situated on the trail to Lemieux lake, a shaft is down 20 ft. on a quartz vein rich in free gold. Another shaft has been sunk 14 ft.

University Mine—A strike was made near the surface at this mine, at Cobalt, on May 23, when a network of pure native silver veins was uncovered. The rock round each vein is broken and loose, indicating that they probably unite to form one large vein.

Africa

RHODESIA

Gold production in April was 49,772 oz. bullion, the largest ever reported for a single month, with the exception of August, 1906. For the four months ended April 30 the total was 169,667 oz. bullion in 1906, and 184,189 oz. in 1907; an increase of 14,522 oz. The bullion reported this year was equal to 163,928 oz. fine gold, or $3,388,392.

Other production reported for the four months included 27 tons copper; 216 tons lead; 50 tons antimony ore; 2 tons wolframite; 15 tons scheelite; chrome ore, 4295 tons; coal, 38,164 tons. Exports of diamonds were 1673 carats; other precious stones, 9907 carats.

WEST AFRICA

Gold production reported for April was 25,927 oz., the largest monthly output yet made. For the four months ended April 30 the total was 70,866 oz. in 1906, and 95,380 oz. in 1907; an increase of 24,514 oz. this year.

Asia

INDIA—MYSORE

Kolar Goldfield—The gold production in April was 44,573 oz. bullion, being 29 oz. less than in March, and 1460 oz. less than in April, 1906. For the four months ended April 30 the total was 196,625 oz. bullion in 1906 and 178,409 oz. in 1907, a decrease of 18,216 oz. The bullion reported this year was equal to 160,568 oz. fine gold, or $3,318,941 in value.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, May 29—The coal trade in the West is about in normal condition. The demand for steam coal is good, and railroad conditions are also good, so that coal finds its way to market readily. In fact, there are signs of competition among the different producing districts, which will develop into sharp activity later.

In the East, also, conditions are about normal, and the demand for steam coal is the main feature in both the anthracite and bituminous trades. The coastwise trade is badly hampered by a short supply of vessels, due partly to tying up of carriers by delays in loading, and partly to a demand for boats in other lines more profitable than coal carrying.

It is reported that one or two important combinations in the bituminous coal trade are under negotiation; but it is not possible at present to secure any confirmation or positive denial of these rumors.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to May 18 were as follows, in short tons:

	1906.	1907.	Change.
Anthracite	1,500,684	2,110,163	I. 609,479
Bituminous	12,456,088	14,326,969	I. 1,870,881
Coke	4,877,880	5,595,892	I. 461,512
Total	18,740,652	21,682,924	I. 2,941,872

The total increase this year was 15.7 per cent.

Shipments of Broad Top coal over the Huntingdon & Broad Top Railroad for the year to May 25 were 411,061 tons.

New York

Anthracite

May 29—The anthracite market conditions have changed very little from last week. The strong demand for small sizes still continues. Car supply is up to all demands and movements continue to be regular.

On June 1 prices on the large sizes will advance 10c. per ton over present quotations which are broken, $4.35; egg, stove and chestnut, $4.60. Small sizes are nominally quoted; pea, $3; buckwheat, $2.50; rice, $1.85; barley, $1.50. All f.o.b. New York harbor.

Bituminous

The Atlantic Seaboard soft-coal trade shows little change from last week, the important question being to move the coal when it arrives at tide. Scarcity of vessels is not relieved and shippers are offering 5c. advance over previous rates in order to secure charters of vessels to arrive. In the meantime orders are accumulating and the business doing is largely on season contracts.

Trade in the far East is fairly active and is determined largely by vessel supply. Stocks are not large, as consumers are not laying in any supply at this season of the year. This has brought about in a few instances outside purchases to keep going.

Trade along the Sound is showing some improvement and vessels are a little more available. New York harbor trade is unchanged. Accumulations at tide are pretty well relieved, giving a more healthy condition of affairs. Good steam coal can be purchased around $2.70 f.o.b. New York harbor ports. All-rail business is very dull and consumers appear to have about all the coal they need.

In the Coastwise trade vessels are in great demand and scarce. Quotations are unchanged as follows: Philadelphia to Boston, Salem and Portland $1@1.05; to Providence, New Bedford and the Sound, 90c.; to Lynn and Bangor, $1.25; to Portsmouth, Gardiner and Saco, $1.15; to Bath, $1.10; with towages where usual.

Birmingham

May 27—Coal operations in Alabama continue active. There is demand for all the coal being produced, and the railroads are giving good service. The production at present is at the rate of 14,500,000 tons per annum. All applicants for work in the coal regions of Alabama are finding jobs ready for them.

Governor Comer has appointed the following board of mine foremen examiners: P. J. Rodgers, Pratt City, and J. F. Beattie, Dora, in behalf of the operators; George Barbour, Pratt City, and T. H. Tinney, Hargrove, in behalf of the miners. The State mine inspector is chairman of the board. Examinations are held at stated periods through the year.

Coke is being manufactured in large quantities in Alabama, and prices are still a little weak.

Chicago

Domestic coals continue to sell largely, because of the cold weather and the consumption of steam coals seems to be materially increased. There is a better tone to the market than usually exists at this time of the year, and contract making is progressing favorably. Sales of all grades of coal are large in volume, but the market is fairly quiet because of the steadiness of the demand. Eastern coals are generally in good condition, the market being neither overstocked nor hampered with irregular receipts. Western coals, while low in price, are not weakening with the approach of summer.

Run-of-mine from Illinois and Indiana mines brings $1.70@2.50; lump and egg for $1.90@2.65 and screenings for $1.25@1.75.

Of eastern coals smokeless is perhaps strongest, run-of-mine being held at $3.35 and prepared sizes at $3.65. Hocking holds up to circular price of $3.15 and Youghiogheny continues at $3.15 for ¾ in., somewhat scarce, though not in heavy demand.

Cleveland

May 28—The coal market is very weak, with small prospects of betterment before July 1. Prices have dropped 10c. on all grades of soft coal. This is due to the fact that only small quantities are being shipped up the lake because of large supplies there. Heavy supplies are being carried here, and dealers are selling in order to avoid demurrage fees. Pittsburg No. 8 slack is quoted $1.60 f.o.b. Cleveland; lump, $1.95; run-of-mine, $1.80@1.85. Goshen steam coal is quoted $1.70@1.75 for run-of-mine and $1.60 for slack.

In the vessel trade it is stated that considerable loading is going on for up-lake delivery. Shipments have been light heretofore, but several large orders have been placed this week, including 50,000 tons for Depot Harbor. Considerable chartering is going on at 30c. to the head of the lakes from Lake Erie ports. Shipments to Lake Michigan ports started the season at 40c., but wild tonnage rates at 50c. soon boosted the regular rate to that figure.

Indianapolis

There is an encouraging tone to the coal-mining industry in this State. Orders are coming quite freely and a number are from dealers and consumers in new territory. The output for April was not up to the corresponding period of last year, but it was satisfactory. The demand for steam coal is growing; the industrial consumer is using a better grade for steam purposes than previously. Orders for run-of-mine are now superseding orders for slack coal. The Northwestern trade will be much stronger this

year than last, and Indiana operators are endeavoring to secure a full share of it.

The resumption of work on the 38 miles necessary to complete the Chicago division of the Southern Indiana Railway will begin June 3. It is the purpose to have the line in operation in 90 days. A large coal traffic will be offered this direct line as soon as put in operation.

A case was settled in the Greene county circuit court, May 24, which was brought by the State of Indiana against the Vandalia Coal Company for violation of the mining law. The Brotherhood of Coal Hoisting Engineers averred that the Vandalia Coal Company was hiring men who did not hold certificates as having passed the engineer's examination, as required by the law. The attorneys for the defense contended that the law was not applicable except during the working hours when the mine was hoisting, from 7 a.m. to 3:30 p.m., and that the service of licensed engineers was required only when the mine was in operation. The test case was made on the arrest of a night engineer employed at Vandalia mine No. 3, near Clinton. The judges' instructions were favorable to the defendant and the jury's verdict was in accord with the instructions.

Pittsburg

May 28—There was a slightly better supply of railroad cars during the week, and today about 90 per cent. of the mines in the district are in operation. A shortage, however, is expected, and the uncertainty of deliveries has had the effect of keeping up prices. Quotations are on a basis of $1.20 for mine-run coal at the mine. Nearly all the coal loaded in the pools and harbor got out on the last rise, and for the first time in the history of the river coal trade there will be but little ready for shipment on the regular June rise. All the river coal mines are being operated to capacity, and there is a good supply of empty coal boats and barges.

Connellsville Coke—The production of coke has been unusually heavy, and as the demand was not up to expectations, prices have declined. Some furnaces are stocking coke and sales of furnace coke this week were made as low as $2 a ton, but $2.15 is regarded as the minimum for early delivery. Foundry coke has dropped to $3, but for delivery in the second half from 25c. to 50c. higher is quoted. The *Courier*, in its summary for the week, gives the production in both regions at 420,732 tons. The shipments aggregated 14,606 cars, distributed as follows: To Pittsburg, 4912 cars; to points west of Connellsville, 8937 cars; to points east of Connellsville, 755 cars.

Foreign Coal Trade

Exports of coal from Newcastle, New South Wales, for the quarter ended March 31 were: Commonwealth of Australia, 457,877; foreign, 465,194; total, 923,071 tons. The exports to the Commonwealth and New Zealand increased 59,910 tons over the first quarter of 1906, and were as follows: Victoria, 204,400; Queensland, 11,355; Western Australia, 28,020; South Australia, 115,967; Tasmania, 24,035; New Zealand, 74,060 tons. The exports, 465,194 tons, to places outside the Commonwealth and New Zealand, show an increase of 101,393 tons, principally to Chile, the Philippines, and the United States.

The coal production of the State of Queensland, Australia, was 529,326 tons in 1905, and 606,772 tons in 1906; an increase of 77,446 tons. The greater part of the 1906 coal production was shipped at Brisbane, either for use in ship's bunkers or as cargo for ports within and, in a very small degree, beyond the Commonwealth.

Iron Trade Review

New York, May 29—Activity in pig iron buying has subsided in some degree, though a good deal of business has been booked, running over into the first quarter of 1908. Southern makers are sold much further ahead than usual, and some large companies are practically out of the market for the balance of this year. Imports of pig iron promise to be considerable for some months.

In finished material the strongest demand seems to be for structural steel. Some large contracts are pending, or have just been closed, while there are many small requirements. Premiums are asked and given in many cases. There is also considerable demand for material for electric roads.

The discussion over the quality of steel rails is still going on, sharply divergent views being expressed on both sides. More investigation seems to be needed.

Cuban Iron Ore—A recent consular report gives the following figures of shipments from the Santiago district in Cuba, in long tons:

	Iron Ore.	Manganese Ore.
1903	557,960	23,610
1904	376,470	20,214
1905	554,200	6,771
1906	636,900	8,300

The increase in iron-ore shipments in 1906, as compared with 1905, was 82,700 tons, or 14.9 per cent.

Baltimore

May 28—Imports for the week included 2723 tons spiegeleisen, 1241 tons ferromanganese and 274 casks ferrosilicon. Arrivals of iron ore were 5600 tons from Cuba and 3950 tons from Greece; 9550 tons in all. One cargo of manganese ore, 5600 tons, was received from India.

Birmingham

May 27—If the demand for pig iron for delivery during the fourth quarter of this year and the first three months in next year continues for a few weeks more as it has been during the last three or four weeks, the manufacturers will be out of the market. There has been steady buying, and the manufacturers are convinced that there will be need for large quantities of iron before present contracts held. have been filled. Quotations remain firm. Prices for the first quarter are only about 50c. under those of the iron to be delivered during the fourth quarter in this year. Alabama and Southern manufacturers are not making much more iron than during the past several weeks. Local troubles continue to interfere. The Shelby Iron Company will hardly be able to repair damage done by fire recently at their coke-iron furnace at Shelby within a month. The Tennessee and Alabama Consolidated Coal and Iron companies had troubles at furnaces, but repairs have been made. Much effort is being given to repairs. Labor for this work is rather scarce, and some of the companies are shifting their hands from place to place in order that the furnaces can be got into shape. The railroads continue to handle all the pig iron and kindred products offered easily. The report of the Alabama Car Service Association for the month of April shows an increase of 12,000 in the number of cars handled by the railroads belonging to the association, as compared with April of last year.

Cast-iron pipe and soil-pipe makers report a strong demand with prices up. J. B. Babb, secretary of the Birmingham Commercial Club, is authority for the statement that correspondence is on looking to the removal to the Birmingham district of a large stove plant.

Rolling mills are doing fairly well. The Bessemer plant of the Tennessee company is running short to permit of repairs. The big Birmingham mills will probably also be run on slack operation soon to permit of repairs.

The steel situation continues good. The output is about the same. Talk of sales of steel rails for delivery during 1908 is still giving much encouragement.

Chicago

There are no significant developments in the market for pig iron. Sales continue good on both quick-delivery and future-delivery lots, with perhaps more quick-delivery business. The tone of the market is strong and no weakening seems apparent. Inquiries are large for second-half lots, and iron for the first quarter of 1908 is being freely figured upon. Melters seem to be of the opinion still that prices will weaken through a holding-off policy and are not yet inclined to place orders freely. It is the opinion of the trade that this condition cannot last and that large contracts must be placed within the next month.

The increase in quick-delivery lots is taken to be significant of the fact that

users of [illegible] their contract supplies.

Southern No. [illegible] Birmingham for delivery in the second half, with quick-delivery lots about $23, making the Chicago prices $25.35 for contract and $27.35 for quick delivery. Northern No. 2 is scarce and is quoted at $25.50 for contract and $27.50 for quick delivery.

Coke is quiet, with the demand good and supplies plentiful. Connellsville 72-hour sells for $6 and Southern coke is 25@50c. lower.

Cleveland

May 28—The iron market continues quiet, with no change from last week. The disposition on the part of buyers is cautious as to purchasing for distant delivery, and as many are well stocked up, demand is slow. Movement of ores down the lakes has been heavy of late and docks are commencing to pile up again. The state of the weather has prevented outgoing shipments, and the outlook is for a heavy accumulation for the summer. Most of the wild tonnage offered by Cleveland fleets is for iron ore. The following rates are quoted by the Gilchrist Transportation Company on iron ore: From Duluth to lower Lake Michigan and Erie ports, 75c. ton; from Marquette, 70c.; from Escanaba, 60c. Rates for wild tonnage are the same, and there will be no difference until fall, when legitimate business will stop. The following prices are quoted on pig iron for last-half delivery: No. 1 foundry, Northern, $24.50; No. 2, $24; No. 3, $23.50; bessemer, $23.90; No. 2 Southern, $24.35; gray forge, $22.50 per ton.

Pittsburg

May 28—Interest in the iron and steel trade this week is centered in the demands for higher wages made by the blast-furnace workers' organization and the Amalgamated Association of Iron, Steel and Tin Workers. Strong efforts will be made by manufacturers to arrange terms and avoid a strike. A suspension of operations at the blast furnaces at this time would prove serious. Included in the demand of the furnacemen is an eight-hour workday. This, producers insist, cannot be conceded for many reasons. The principal one is that it will be impossible to get a sufficient number of men to work a third turn. Notice was served yesterday on the United States Steel Corporation, the Bessemer Pig Iron Association, W. P. Snyder & Co., and other independent interests that the proposed scale must be in force on July 1, or a strike will be ordered.

Pig Iron—The demand for pig iron seems to be increasing, and furnaces are making strenuous efforts to help out some concerns that are in urgent need of iron. The accident last week to Furnace 1 of the Eliza group of the Jones & Laughlin Steel Company, has caused that concern a [illegible] and it is not likely that the damage to the furnace will be repaired inside of two weeks. Inability to supply the loss will affect consumers of finished material. The high price for bessemer iron was reached late last week, when a sale of 500 tons was made at $24. Valley furnaces, for May delivery. For small lots for prompt shipment, however, $25 and as high as $26 has been paid. The minimum price for last half was established yesterday when 1000 tons of bessemer iron was sold at $23.50, Valley furnaces. Some inquiries have been received for bessemer for first quarter of 1908 and the Bessemer Pig Iron Association has named a price of $22; but so far sales for next year are confined to malleable bessemer, and the price is the same as for standard bessemer. A few small lots of No. 2 foundry for prompt delivery sold during the week at prices ranging from $25 to $27, Valley furnaces. Gray forge is strong at $22.85, Pittsburg, but there have been no transactions lately of any consequence. New freight rates on pig iron go into effect on June 1, and the rate from the Valley furnaces to Pittsburg will be increased from 85c. to 90c. a ton.

Steel—There is no improvement in the crude steel supply, and prices are still nominal, bessemer billets being quoted at $31.50, and open-hearth at $33, Pittsburg. The Carnegie Steel Company has fixed the price for sheet-bars for June delivery at $31, an advance of $1 over the rate prevailing since the opening of the year. Steel bars continue strong at 1.60c., and plates at 1.70c.

Sheets—Mills are catching up somewhat on deliveries, but new business is still being placed. For prompt shipment sheets command premiums ranging from $1 to $3 a ton. Prices remain at 2.60c. for black and 3.75c. for galvanized No. 28 gage.

Ferro-Manganese—Despite reports to the contrary, ferro for prompt shipment has not dropped below $68, and a sale was made this week at $68.50 per ton

Cartagena, Spain

April 27—Messrs. Barrington & [illegible] report shipments of iron ore for the week: Great Britain, 12,375 tons; Rotterdam, 7150; Philadelphia, 4975; total, 24,500 tons. The mines continue to be fully employed, and one or two new contracts have been made at about the same prices as those previously ruling. There has been a considerable reduction in the amount of tonnage in port.

Quotations for iron ores are: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; low phosphorus, 10s. 9d.; specular ore, 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganiferous ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 14s. 6d. No higher grades on the market.

Metal Market

NEW YORK, May [illegible]

Gold and Silver Exports and Imports

[illegible] Jan. 1 to April [illegible] year

Month	Gold. Exports.	Gold. Imports.	Silver. Exports.	Silver. Imports.
Gold.				
Apr. 1907..	[illegible]	$ [illegible]	[illegible]	[illegible]
" 1906 ..	[illegible]	[illegible]	[illegible]	[illegible]
Year 1907..	[illegible]	[illegible]	[illegible]	[illegible]
" 1906 ..	[illegible]	[illegible]	[illegible]	[illegible]
Silver.				
Apr. 1907..	[illegible]	[illegible]	[illegible]	[illegible]
" 1906 ..	[illegible]	[illegible]	[illegible]	[illegible]
Year 1907..	[illegible]	[illegible]	[illegible]	[illegible]
" 1906 ..	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] statistics [illegible] movement of gold and silver to and from the United States. [illegible] are [illegible] by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

[illegible] week ending May 25 and year [illegible] Jan. 1

Period.	Gold. Exports.	Gold. Imports.	Silver. Exports.	Silver. Imports.
Week....	$ 4,[illegible]	$ [illegible]	$ [illegible]	$ [illegible]
1907.....	1,887,[illegible]	5,[illegible]	[illegible]	710,273
1906	5,321,221	46,[illegible]	26,[illegible]	[illegible]
1905.	92,[illegible]	[illegible]	12,[illegible]	1,[illegible]

Exports of gold for the week were to Peru; of silver chiefly to London. Imports for the week, both gold and silver, were from the West Indies and South America.

The joint statement of all the banks in the New York Clearing House for the week ending May 25 shows loans $1,126,389,500, an increase of $6,129,400; deposits, $1,112,640,500, an increase of $6,539,600, as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie	$[illegible]	$221,[illegible]
Legal tenders	[illegible]	72,[illegible]
Total cash	$[illegible]	$[illegible]
Surplus.....	$ 6,694,150	$ 15,698,878

The surplus over legal requirements shows an increase of $4,216,200 as compared with the previous week this year.

Specie holdings of the leading banks of the world, May 25, are reported as below, in dollars:

	Gold.	Silver.	Total.
Asset New York	[illegible]	[illegible]	$221,[illegible]
England.....	$[illegible]	[illegible]	[illegible]
France.....	[illegible]	$[illegible]	[illegible]
Germany	[illegible]	[illegible]	[illegible]
Spain.....	[illegible]	[illegible]	[illegible]
Netherlands....	26,528,500	27,546,500	54,075,000
Belgium	[illegible]	[illegible]	[illegible]
Italy	[illegible]	[illegible]	[illegible]
Russia	[illegible]	[illegible]	[illegible]
Aust.-Hungary.	227,680,000	63,240,000	290,920,000
Sweden	[illegible]	[illegible]	[illegible]

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables to the *Commercial and Financial Chronicle* of New York.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows, for the year to May 16:

	1906.	1907.	Changes.
India	£ [illegible]	[illegible]	D. £ 1,[illegible]
China	[illegible]	[illegible]	[illegible]
Straits..	1,[illegible]	[illegible]	I. [illegible]
Total.....	£ [illegible]	[illegible]	D. £ 1,[illegible]

Receipts for the week were £10,000 from the West Indies; £74,000 in bars and £11,800 in Mexican dollars from New York; £104,000 in bars and £51,000 in Mexican dollars from China; a total of £340,800. Exports were £104,562 in coin to the Straits, and £395,700 in bars to India; £500,262 in all.

The position of the exchange market and the taking of $775,000 gold for export to France have led to discussion as to further gold exports. At present such shipments seem quite probable.

The Treasury Department on May 24 bought 100,000 oz. silver for coinage purposes, at 67.446c. per ounce, delivered in Denver.

The movement of gold and silver in Great Britain for the four months ending April 30, is reported as follows:

	1906	1907
Gold:		
Imports	£10,102,931	£16,033,862
Exports	12,052,964	10,542,463
Excess, imports	£ 1,951,967	£ 5,511,399
Silver:		
Imports	£ 7,145,703	£ 7,442,720
Exports	7,147,419	6,006,243
Excess, exports	£ 1,716	£ 1,436,477

Of the imports this year £4,029,306, or 63.5 per cent. of the total, were from the United States.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.52	$0.54
Peruvian soles and Chilean	0.47	0.50
Victorian sovereigns	4.85	4.87
Twenty francs	3.86	3.89
Spanish 25 pesetas	4.78½	4.80

SILVER AND STERLING EXCHANGE.

		Silver.				Silver.	
May	Sterling Exchange.	New York, Cents.	London, Pence.	May.	Sterling Exchange.	New York, Cents.	London, Pence.
23	4.86[illegible]	67	30	27	4.8670	67¼	31
24	4.8670	67	30⅛	28	4.8675	67⅜	31⅛
25	4.8675	67	30¼	29	4.8675	67¼	31⅛

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

	Copper.			Tin.	Lead.	Spelter.	
May	Lake, cts. per lb.	Electrolytic, cts. per lb.	Lansdale, £ per ton.	cts. per lb.	cts. per lb.	New York, cts. per lb.	St. Louis, cts. per lb.
23	24 @24	23 @24	[illegible]	44¼	6.00	6.35 @6.40	6.20 @6.30
24	24 @24	23 @24	[illegible]	44¼	6.00	6.35 @6.45	6.20 @6.30
25	24½ @24	24¼ @24	[illegible]	43¾	6.00	6.35 @6.45	6.20 @6.30
27	24 @24	23¾ @24	[illegible]	43¾	6.00	6.35 @6.45	6.20 @6.30
28	24 @24	23¾ @24	[illegible]	42¾	6.00	6.35 @6.45	6.20 @6.30
29	24 @24	23¾ @24	[illegible]	43	6.00	6.35 @6.45	6.20 @6.30

Quotations are per long ton (2240 lb.) for standard copper, which is now the equivalent of the former gamb.bs. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the prices at which transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The London prices are those quoted by the American Smelting and Refining Company for near-by shipments of desilverized lead in 50-ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper—The market is in a very unsatisfactory position. The continued absence of inquiry on the part of consumers is becoming rather trying, and a number of sellers have lowered their limit without, however, being able to stimulate business. The reports from Europe indicate a situation not very dissimilar from the conditions in the home market. Quotations at the close are lower, at 24½@25c. for lake copper; 23@23½c., for electrolytic in cakes, wirebars or ingots, and ¼@22½c., for casting copper.

After the demand from the bear element had been satisfied, a sudden sharp drop occurred in the London standard market, from which there was only a slight recovery at the close, which is cabled as £99 7s. 6d. for spot, and £96 17s. 6d. for three months'. For refined and manufactured sorts we quote: English tough, £105; best selected, £109; strong sheets, £116.

Exports of copper from New York for the week were 1150 long tons. Our special correspondent reports exports for the week from Baltimore at 904 long tons copper. The exports from Baltimore also included 44,925 lb. copper sulphate.

Imports of copper into France for the four months ending April 30 were 20,887 metric tons in 1906, and 19,371 in 1907; a decrease of 1516 tons.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—Owing to heavy arrivals and an improvement in unloading facilities, the premium for spot delivery is gradually disappearing. A good business is doing from day to day for near-by shipment, but consumers have not yet shown any inclination to cover their future requirements. The market closes unsettled at 41¾c.

The foreign market, after going through a number of gyrations, closes almost unchanged at £189 15s. for spot and £185 15s. for three months.

Lead—The market remains unchanged at 6c. New York.

In Europe, the market is very firm, owing to reports from Australia that mining operations are being considerably curtailed on account of a continued drought. It closes firm at £20 for Spanish and £20 2s. 6d. for English lead.

St. Louis Lead Market—The John Wahl Commission Company reports as follows: Lead is dull and lower. The latest sales are on a basis of 5.87½@5.90c. for Missouri brands.

Spelter—A little more interest is being shown by consumers at around the present level of prices, but the business transacted has not been of such volume that quotations have yet shown much effect from it. The close is unchanged at 6.35@6.45c. New York, and 6.20@6.30c. St. Louis.

A surprising weakness is apparent in the European market, where quotations declined at the close to £24 17s. 6d. for good ordinaries and £25 2s. 6d. for specials.

Zinc Sheets — The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 60-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The market continues to droop under the absence of any important buying. Quotations are 20c. for Cookson's; 17@17½c. for Hallett's; and 16½@17½c. for ordinaries.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has declined and is in weak condition. Consumption remains normal, apparently not having been stimulated by falling prices. The latest quotations are: Ordinary metal, $27 per oz.; hard metal, $30 per oz. Scrap is $19@20, with light demand.

Quicksilver — Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Minor Metals—For minor metals and their alloys, wholesale prices are, f.o.b. works:

	Per Lb.
Cadmium, 99.5% f. o. b. Hamburg	1.40@1.46
Chromium, pure (N. Y.)	80c.
Copper, red oxide	50c.
Ferro-Chrome (70)	11½c.
Ferro-Chrome (7-9% carbon, per lb. Cr.)	10½c.
Ferro-Chrome (1% C. for each 10% Cr.)	11@11½c.
Ferro-Chrome (60-64% Cr., 3-4% C.)	12@12½c.
Ferro-Chrome (60-70% Cr., 1% C. or less)	38c.
Ferro-Molybdenum (50%)	90c.
Ferro-Titanium (20%)	80c.
Ferro-Tungsten (37%)	50c.
Ferro-Vanadium (25-50%, per lb. vanadium contents)	$5@10.
Magnesium, pure (N. Y. C.)	1.50
Manganese, pure 98@99% N. Y.	75c.
Manganese—Copper (30@70% N. Y.	45c.
Molybdenum (98@99%, N. Y.)	$1.70
Phosphorus, foreign red (f. o. b. N. Y.)	90c.
Phosphorus, American yellow (f. o. b. Niagara Falls)	42c.
Tungsten (best) pound lots	1.35
Ferro-Silicon (50%) spot. Ex. ship Atlantic ports	$110 ton.

Variations in price depend chiefly on size and condition of orders.

Missouri Ore Market

Joplin, Mo., May 25—The highest price paid for zinc was $40 per ton, on an assay base price of $60 per ton, or 60 per cent. zinc, averaging $46.78. The highest price for lead was $83, medium grades selling at $80@82, averaging $70.68 per ton.

The Picher Lead Company and the Granby Mining and Smelting Company stepped quietly into the market and purchased heavily, the bulk of the purchases, however, being for next week's delivery. Prices were advanced from $1 to $2 per ton—whatever it took to get the ore.

Producers asked for advanced prices on zinc ore, on account of the restricted output occasioned by the inundation of the Badger mines, and the curtailing of the output in various mines by removing night shifts. No advance was definitely reported.

Following are the shipments of zinc and lead concentrate for the week ending May 25:

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	3,971,150	992,410	$144,021
Joplin	2,341,210	442,540	64,899
Duenweg	960,550	302,320	43,497
Galena-Empire	1,059,420	194,480	31,949
Alba-Neck City	1,085,000		26,582
Aurora	954,390	8,800	21,180
Granby	442,510	109,000	16,548
Oronogo	384,900		8,287
Prosperity	296,000	33,110	8,281
Spurgeon	305,020	37,730	7,340
Springfield		128,060	5,122
Carthage	184,110		4,510
Sherwood	72,510	40,000	2,450
Wentworth	101,040		2,050
Badger	68,740		1,685
Zincite	62,170		1,492
Stott City	62,430		1,435
Playter	42,300	1,700	1,040
Baxter Springs	44,130		1,015
Diamond	21,200		488
Totals	12,211,940	2,172,970	$372,410
Five months	254,245,720	39,209,880	$7,625,570
Zinc value, the week, $25.75 per ton; 5 mos.			$5,991,195
Lead value, the week, 86,676; 5 mos.,			1,634,373

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	76.13	79.76
May	40.51		May	78.40	
June	43.83		June	80.96	
July	43.25		July	74.31	
August	45.56		August	75.36	
September	42.58		September	79.64	
October	41.55		October	79.84	
November	44.13		November	81.98	
December	43.68		December	81.89	
Year	43.24		Year	77.40	

Wisconsin Ore Market

Platteville, Wis., May 25—The greater part of the high-grade ores ready were loaded, leaving the lower grades in the bins at the mines. The price of 60 per cent. zinc ore at the beginning of the week did not change from last week's report, but before Friday it had stiffened up per ton. Lead sold at $83. Dry bone and sulphur were steady at last week's prices.

The shipment of the district, by camps, for the week ending May 25 is as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	[illegible]	[illegible]	[illegible]
Linden	[illegible]	[illegible]	[illegible]
Hazel Green	[illegible]	[illegible]	[illegible]
Benton	[illegible]	[illegible]	[illegible]
Lancaster	[illegible]	[illegible]	[illegible]
Rewey	[illegible]	[illegible]	[illegible]
Harker	[illegible]	[illegible]	[illegible]
Cuba City	[illegible]	[illegible]	[illegible]
Cuba City	[illegible]	[illegible]	[illegible]
Livingston	[illegible]	[illegible]	[illegible]
Mineral Point	[illegible]	[illegible]	[illegible]
Total for week	[illegible]	[illegible]	[illegible]
Year to May 25	36,731,840	1,695,420	189,110

An entire week of rainy weather held up the shipments of ore a little, but as far as can be learned, the total production of the district was not materially decreased.

Chemicals

New York, May 29—The general market is steady, with good demand for all kinds of heavy chemicals.

Copper Sulphate—The demand continues steady. The quotations remain unchanged, at $7.50 per 100 lb. for carloads or over, and $7.75 per 100 lb. for smaller lots.

Nitrate of Soda—There is no change in the market. The demand continues good and prices remain for spot $2.70 per 100 lb. with 96 per cent. for all positions of 1907 at $2.50. The price for 95 per cent. is $2.45 for both 1907 and 1908. Stocks are extremely low, and spot nitrate is not to be had just now.

Sulphur—Messrs. Emil Fog & Sons write from Messina, Sicily, under date of May 10, as follows: The election of the permanent board of the Consorzio Obligatorio has not taken place yet, and until it has it will be impossible to report on the probabilities of the future tendency of our brimstone market. Everything depends on the men that will be elected, their capacities and intentions. The provisional board has so far pursued absolutely passive tactics. However, the definite board may show a greater spirit of enterprise and adopt more energetic measures, especially with regard to America. The constant rumors of American exports of brimstone to Marseilles and other continental ports, although most probably incorrect, are creating ill-feeling among the Sicilian producers. They held a protest meeting, at which it was proposed that retaliatory measures should be taken; the stock taken over from the Anglo-Sicilian Company should be dumped at cost price on the American markets. Should this policy of retaliation gain the upper hand, we may witness a lively aspect of affairs. Sicilian producers still consider the brilliant reports of the Louisiana mines exaggerated, especially regarding their future prospects, and therefore insist that Mr. Frasch should buy a certain quantity of brimstone annually from Sicily. The secrecy which is preserved concerning the agreement with Mr. Frasch is also a subject of discussion and discontent, as nobody understands why its terms should not be made public.

Mining Stocks

A certain tone has been characteristic of the general stock markets; culminating in sharp breaks at the close, in almost all classes of stocks. The markets are still largely professional, the public holding out, as a rule.

Amalgamated Copper closed at $85¾; American Smelting common at $112¾; United States Steel at $32, with $96 for the preferred.

The mining stocks dealt in on the exchange showed some weakness, in sympathy with the general market. Balaklala Copper closed at $9½; Tennessee Copper at $36, on light dealings.

On the curb market, trading in mining stocks was light, and prices inclined to shade off. The copper stocks were especially weak. Boston copper sold down to $25¾. The Cobalt stocks were more active but weak, Nipissing closing at $11¼. Tonopah stocks held their quotations better than any others.

Boston

May 28—It has been a week of steady liquidation in copper shares, and prices in the main are off from a week back. In a few cases prices are lower than the low recorded in the panic of March 14 last, and from 25 to 50 per cent. below the highest of the current calendar year. This in face of the fact that there has been little change in the price of the metal and some mining companies are still sold up for a month or more ahead. Most of them are stronger in their treasury position than ever. Amagamated tonight is but $4 above its March 14 price, having broken over $5 this week to $84. Calumet & Hecla is $70 below its price of last March and $170 below its $1000 record price early in the year. Calumet directors will meet as soon as President Agassiz returns from the mine, and take dividend action. Calumet & Arizona is at its lowest of the year, $160. The regular quarterly dividend of $5 was declared last week.

Copper Range closed off $2.50 for the week at $78.50. Its lowest this year was $73.50, and its highest $105. Mohawk fell $2 to $83. Its lowest this year was $74, and the highest $96.50. Directors of this company are expected to meet shortly and increase the dividend from $4 to $5. St. Mary's Mineral Land Company has declared a regular quarterly dividend of $1, and the Champion has declared its seventh $1 dividend this year.

Nipissing and Helvetia were the curb features during the week, both showing strength. The former is up $1.50 to $12.25. Helvetia advanced $1.25 to $6.25 [illegible] week.

Colorado Springs

Mining stocks on the local exchange have been weak and inactive for some time, and seem to be getting gradually weaker. Occasionally, by a united effort of the brokers, some particular stock will show an advance for a few days, but quickly drops back when another stock is taken up and pushed in the same manner. The market will probably decline until late summer.

STOCK QUOTATIONS

NEW YORK May 28	
Name of Comp.	Clg.
Alaska Mine	....
Am. Nev. M. & I.	....
Amalgamated	88½
Am. Zinc	....
Arcadian	5⅜
Atlantic	....
Bingham	16⅜
Boston Con.	25⅛
Calumet & Ariz.*	161
Calumet & Hecla*	830
Centennial	....
Cobt. Mercur.	42
Copper Range	78⅜
Daly-West	16
Franklin	15
Granby Con.	11
Isle Royal	15½
La Salle	15
Mass	....
Michigan	12
Mohawk	82
Mont. C. & C.(new)	....
Nevada	1⅜
North Butte	81⅛
Old Colony	1
Old Dominion	47⅜
Osceola	146
Parrot	20⅛
Phoenix	....
Quincy*	115
Santa Fe	2
Shannon	17⅜
Tamarack*	....
Trinity	20⅛
United Cop., com.	58
U. S. Oil	9⅛
U. S. Sming. & Ref.	51
U.S.Sm.& Re.,pfd.*	44
Utah Copper	58⅜
Victoria	7½
Washington	1
Winona	8
Wolverine	153
Wyandotte	1

BOSTON May 28	
Name of Comp.	Clg.
Adventure	2
Allouez	....
Am. Zinc	35
Arcadian	5⅜
Atlantic	....
Bingham	16⅜
Boston Con.	25⅛
Calumet & Ariz.*	161
Calumet & Hecla*	830
Centennial	....
Cobt. Mercur.	42
Copper Range	78⅜
Daly-West	16
Franklin	15
Granby Con.	11
Isle Royal	15½
La Salle	15
Mass	....
Michigan	12
Mohawk	82
Mont. C. & C.(new)	....
Nevada	1⅜
North Butte	81⅛
Old Colony	1
Old Dominion	47⅜
Osceola	146
Parrot	20⅛
Phoenix	....
Quincy*	115
Santa Fe	2
Shannon	17⅜
Tamarack*	....
Trinity	20⅛
United Cop., com.	58
U. S. Oil	9⅛
U. S. Sming. & Ref.	51
U.S.Sm.& Re.,pfd.*	44
Utah Copper	58⅜
Victoria	7½
Washington	1
Winona	8
Wolverine	153
Wyandotte	1

N. Y. INDUSTRIAL	
Am. Agri. Chem.	85
Am. Sm. & Ref.	84⅝
Am. Sm. & Ref., pf.	106
Bethlehem Steel	....
Colo. Fuel & Iron	38
Federal M. & S.	14
Federal M. & S., pf.	65⅛
Inter. Salt	....
National Lead	20⅜
National Lead, pf.	103⅛
Pittsburg Coal	....
Republic I. & S.	29⅝
Republic I. & S., pf.	87
Sloss-Sheffield	58
Standard Oil	....
Tenn. C. & I.	....
U. S. Red. & Ref.	5⅜
U. S. Steel	13⅛
U. S. Steel, pf.	87
Va.-Car. Chem.	24

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

CHEMICALS, MINERALS, RARE EARTHS, ETC. CURRENT WHOLESALE PRICES.

ABRASIVES—
Bort, good drill quality carat $85.00
Carborundum, f.o.b. Niagara Falls, powd. lb .08
Grains, " .16@.17
Corundum, " .07@.10
Crushed Steel, f.o.b. Pittsburg .05¾@.06
Emery, in kegs Turkish flour .04@.04½
Grains .04@.04½
Naxos flour .04@.04½
Grains .04@.04½
Chester flour .04
Grains .03½@.04
Peekskill, f.o.b. Easton, Pa., flour .01½@.02
Grains, in kegs .02@.02½
Garnet, per quality, ...sh. ton 25.00@30.00
Pumicestone, Am. Powd. lot lb. 1.60@2.00
Italian, powdered " .01¾@.02
Lump, per quality " .06@.20
Rottenstone, ground .02½@.04½
Lump, per quality .05@.25
Rouge, per quality .02@.50
Steel Emery, f.o.b. Pittsburg " .07¾@.07¾

ACIDS—
Acetic 28% lb. .02¾@.02¾
Boric " .09¾@.10
Hydrofluoric, 30% " .02¾@.03
" 48% " .06
" 60% " .10
Hydrochloric acid, 20°, per lb. 1.25@1.50
Nitric acid, 38° per lb 4.25@4.62½c.
Sulphuric acid, 50°, bulk, per ton $12 up.
60°, 100 lb. in carboys .85@1.12½
60°, bulk, ton 16.00@18.00
66°, 100 lb. in carboys 1.00@1.25
66°, bulk, ton 18.00@20.00
Oxalic " .08½@.09

ALCOHOL—Grain gal. 2.46@
Refined wood, 95@97% " .70@.75

ALUM—Lump lb $1.75
Ground " 1.85
Chrome Alum lb .04¾

ALUMINUM—Sulphate, com'l. " 1.25@1.60

AMMONIA—24 deg. lb. .04½@.05½c
" 26 " " .04¾@.05¾c

AMMONIUM—
Bromide lb. .23
Carbonate " .07¾@.08
Muriate grain .06¾@.06¾
Lump " .09@.09½
Sulphate, 100 lb. 3.05@3.10
Sulphocyanide com. " .30
" " chem. pure " .40

ANTIMONY—needle, lump lb. .12@.13

ARSENIC—White, (nominal) " .07½@.07¾
Red " .07½@.07

ASPHALTUM—
Barbadoes per ton. 40.00@80.00
West Indies " 20.00@60.00
Egyptian lb. .14@.18
Gilsonite, Utah ordinary per ton. 60.00
Trinidad " 30.00@40.00
California " 20.00@35.00

BARIUM—
Carb. Lump, 80@90% lg. ton. 30.00@35.00
Powdered, 80@90% lb. .02@.02½
Chloride com'l. ton. 37.50@40.00
Nitrate, powdered, in casks lb. .05½@.06
Sulphate (Blanc Fixe) " .02¾

BARYTES—
Am. Ground sh. ton. 16.00@21.00
Floated " 22.00
Foreign floated " 19.50@22.50

BISMUTH—Sub-nitrate lb. 1.50

BLEACHING POWDER—35% 100 lb. 1.25@1.40

BLUE VITRIOL—(copper sulphate), carload, per 100 lb. 7.50@7.75

BONE ASH lb. .02½@.04

BORAX " .07½@.08

CALCIUM—Acetate, gray 2.35@2.40
Acetate, brown 1.60@1.65
Carbide, ton lots f.o.b. Niagara Falls, N. Y., for Jersey City, N. J. sh. ton 65.00
Chloride, f.o.b. N. Y. " 16.00@18.00

CEMENT—
Portland, Am. 500 lb. bbl. 1.55@1.60
Foreign " 2.25@2.90
"Rosendale," 300 lb. " .85
(in sacks) .65
Slag cement " 75@1.25

CHROME ORE—
New Caledonia 50% ex. ship N. Y. per lg. ton 17.50@20.00
Bricks, f.o.b. Pittsburg, M. " 175.00

CLAY, CHINA—Am. common ex-dock, N. Y. " 9.00@12.00
Foreign " 11.50@17.50

COBALT—Oxide lb. 2.50

COPPERAS—Bulk 100 lb. $0.55
In bbls " .75
In bags " .75

CRYOLITE lb. .06½@.06¾

FELDSPAR (Ground best) sh. ton. 7.00@15.00

FIRE BRICK.
American per M. 30.00@40.00
Imported 35.00@45.00
St. Louis No. 1 16.00
No. 2 14.00
Extra 20.00@23.00

FIRE CLAY.
St. Louis mill, dom. per ton 2.50

FLUORSPAR—
Domestic f.o.b. shipping port:
Lump lg. ton. 8.00@10.00
Ground " 11.50@13.50
Gravel 4.25@4.50
Foreign crude ex. dock 8.00@10.00

FULLER'S EARTH Lump 100 lb .80@.85
Powdered " .90@1.00

GRAPHITE—
American, ore, common lb. .01@.1o
Artificial " .06
Ceylon, common pulv .02½@.03¼
Best, pulverized .04@.08
German, com. pulv .01½@.01¾
Best, pulverized .01¾@.02
Italian, pulverized .01¾@.02

GYPSUM—
Fertilizer sh. ton. 7.00
Powdered " 10.00

INFUSORIAL EARTH—
Ground Am. best lb. .03¾
French lg. ton. 56.00
German lb. .02½@.02¾

LEAD—Acetate (sugar of) brown lb .07¾
Nitrate, com'l " .08½@.09

MAGNESITE—Greece.
Crude (95%) lg. ton 7.00@8.00
Calcined, powdered sh. ton 30.00@40.00
Bricks, domes, per quar f.o.b. Pittsburg M. 160@800

MAGNESIUM—
Chloride, com'l. 100 lb. .80@1.15
Sulphate (Epsom salt) 100 lb. .85@1.15

MANGANESE—
Crude powdered:
70@75% binoxide lb .03
75@85% binoxide " .03¼
85@90% binoxide " .05
90@95% binoxide " .06¼
Ore, 80% @85% sh. ton 35.00@45.00

MARBLE—Flour sh. ton. 9.50@10.00

MINERAL WOOL—
Slag, ordinary " 19.00
Selected " 25.00
Rock, ordinary " 32.00
Selected " 40.00

MONAZITE SAND—
Guar. 9% with 5% Thorium oxide, nominal lb. .08 and up.

NICKEL—
Oxide, crude, lb. (77%) for fine metal contained .47
Sulphate, single lb, .13@.18
" double " .09@.13

NITRATE OF SODA—100 lb. 96% for 1907 2.50
95% for 1908 2.45
95% for 1909 2.40
96% is 5c higher per 100 lb.

OZOKERITE—best lb. .14@.17

PAINTS AND COLORS—
Litharge, Am. powdered " .07½@.07¾
English glassmakers' " .08½@.08¾
Lithopone " .03½@.07
Metallic, brown sh. ton. 16.50@22.00
Red " 16.00
Ocher, Am. common " 8.50@9.00
Best " 16.00
Dutch, washed lb. .02¾@.03
French, washed " .01½@.02¼
Paris green, pure, bulk .26
Red lead, American " .07½@.07¾
Foreign " .08½@.08¾
Turpentine, spirits bbl., per gal. .64@.65
White lead, Am., dry lb. .06½@.07
American, in oil " .07½@.07¾
Foreign, in oil " .09½@.10
Zinc white, Am. extra dry " .06¼@.06¾
Foreign, red seal, dry " .07½@.07¾
Green seal, dry " .08½@.08¾

PHOSPHATES—Acid .65@67½c per unit
*Fla., hard rock 7.50
land pebble 68% 4.50
†Tenn., 78@80% 6.50@7.00
78% 5.50
75% 5.00
68@72% 4.50
‡So. Car. land rock 6.00
" " river rock

*F. o. b. Florida or Georgia ports. †F. o. b. Mt. Pleasant. ‡On vessel Ashley River, S. C.

POTASSIUM—
Bichromate (crystals) lb .09@.09½
Carbonate (granulated) .06@.06½
Hydrate (caustic) .07@.08
Nitrate .11
Permanganate .10
Prussiate (red) .30@.35
Prussiate (yellow) .04@.04½
Salts (crude) 1.90
Chloride (powder) .02@.02½
Crystals " .02@.02½
Cyanide (97½%) 18@19
Kainite, long ton, bulk, 8.50; bags, 9.50.
Muriate (80%) lb .01½
Permanganate .16@.17
Salt .01
Sulphate " 2.15@2.21½

PYRITE—
Domestic, non-arsenical furnace size, f.o.b. mines, per unit 11@11½c
Domestic, non-arsenical, fines, per unit, f.o.b. mines 10@10½c.
Imported non-arsenical, furnace size, per unit .13@.13½
Imported, arsenical, furnace size, per unit 12½@12½c.
Imported fines, arsenical, per unit, 8½@8c.
" " non-arsenical, per unit 10¼@11c.

Pyrite prices are per unit of sulphur. An allowance of 25c. per ton is made when delivered in lump form.

SALT—N. Y. com. fine 280 lb. bbl. .72@1.15
N. Y. agricultural sh. ton. 3@4.40

SALTPETER—Crude 100 lb. 3.75@4.00
Refined, crystals .05.25@5.75

SILICA—
Ground quartz, ord'ry lg. ton 13.00@15.00
Silex " 15.00@20.00
Lump Quartz 3.50@4.00
Glass sand 2.75

SILVER—Nitrate, crystals oz. 44@45½

SODIUM—
Acetate lb. .04@.04½
"Alkali," per 100 lb., 58/48 .80@.87½
Bicarb. soda, per 100 lb 1.20@1.50c.
Soda, caustic, per 100 lb., 76/60 1.80@1.90
" " powdered .02¾@.03c
Salt cake, per 100 lb .65@.85
Soda, monohydrate, per lb 1¼c
Bichromate lb .06@.06½
Bromide " .16
Chlorate, com'l " .08½@.09
Cyanide, (100% basis) 18@.19
Hyposulphite, Am. 1.35 up
German 1.60@1.70
Phosphate 100 lb. 1.80@1.90
Prussiate lb .10@.11½
Sal soda, f.o.b. N. Y. 100 lb. .70@.75
Foreign, f.o.b. N. Y. " .80@1.00
Silicate, com'l 100 lb. .75@1.15
Sulphate, com'l, (Glauber's salt) 100 lb. .45@.50
" " calcined .01@.01½

STRONTIUM—Nitrate lb. .08½@.08¾

SULPHUR—
Louisiana (prime) to New York, Boston or Portland lg. ton 22.12½
To Philadelphia or Baltimore " 22.50
Roll 100 lb. 1.85@2.15
Flour " " 2.00@2.40
Flowers, sublimed " " 2.20@2.60

TERRA ALBA—French & Eng. 100 lb. .90@1.00

TALC—Domestic sh. ton. 15.00@25.00
French " 25.00@30.00
Italian, best " 35.00@40.00

TIN—Bichloride, 50% lb .12½@.13
Crystals " .25 up
Oxide, lb. .46@.49

URANIUM—Oxide " 3.00

ZINC—Metallic ch. pure .15
Chloride solution, com'l. .02½@.04
Chloride, granular .04½@.05
Dust .05@.06½
Sulphate .02½@.02¾

Note—These quotations are for wholesale lots in New York, unless otherwise specified, and are generally subject to the usual trade discounts. Readers of THE ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.

DIVIDENDS.

Metal and Mining Companies—U. S.

Name of Company and Location.	Author-ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Alaska Mexican, g.. Alaska	[illegible]	[illegible]	$1	[illegible]	Jan. 1907	$ .50
Alaska Treadwell, g. Alaska	2,500,000	2,500,000	25	9,235,000	Jan. 1907	1.00
[illegible]	[illegible]	1,800,000	5	306,340	Jan. 1907	0.30
[illegible]	[illegible]	[illegible]	100	[illegible]	May 1907	2.00
Am. Sm. & Ref., con.. U. S.	50,000,000	500,000	100	[illegible]	Apr. 1907	1.75
Am. Sm. & Ref., pf.. U. S.	[illegible]	[illegible]	100	23,588,053	Apr. 1907	1.75
[illegible]	[illegible]	[illegible]	100	1,430,000	Mar. 1907	1.50
[illegible]	[illegible]	[illegible]	100	3,000,000	July 1907	1.25
Anaconda, c.. Mont ..	[illegible]	1,200,000	25	34,850,000	Apr. 1907	1.75
[illegible]	[illegible]	25,000	100	465,061	July 1905	.50
Arizona, c.. Ariz	3,775,000	3,682,520	[illegible]	6,182,561	Apr. 1906	.05
Atlantic, c.. Mich	2,500,000	100,000	25	990,000	Feb. 1905	.02
[illegible]	[illegible]	4,000,000	1	40,000	Dec. 1905	.01
[illegible]	100,000	1,000,000	0.10	535,000	[illegible] 1907	.10
[illegible]	[illegible]	500,000	5	22,500	Apr. 1907	.25
[illegible]	3,750,000	150,000	25	47,875,000	Nov. 1906	12.00
[illegible]	1,000,000	100,000	10	2,558,400	Apr. 1907	.10
[illegible]	3,000,000	300 000	10	8,766,000	May 1907	.50
[illegible]	[illegible]	[illegible]	15	1,800,000	June 1907	.50
[illegible]	[illegible]	[illegible]	10	7,440,000	Mar. 1907	5.00
[illegible]	[illegible]	[illegible]	25	[illegible]	Mar. 1907	20.00
[illegible]	[illegible]	[illegible]	5	[illegible]	Apr. 1907	.25
Carlisa, c.. [illegible]	[illegible]	300,000	[illegible]	50,000	May 1906	.01
[illegible]	[illegible]	[illegible]	[illegible]	778,921	Mar. 1906	.07
Columbus Con. c.. Utah	1,000,000	500,000	5	165,000	Apr. 1907	.20
Combi'tion Co. G'f'd Nevada	400,000	320,000	1	688,000	Sept. 1906	.15
Con. Mercur, g.. Utah	[illegible]	[illegible]	1	1,205,000	Dec. 1906	.02½
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Copper Range Con.. Mich	38,500,000	383,781	100	4,558,896	Apr. 1907	2.00
Creede United, g.. Colo....	2,000,000	1,625,000	1	214,053	July 1906	.01
Cripple Creek Con. g. Colo....	2,000,000	2,000,000	1	180,000	Mar. 1906	.004
Daly Judge, g. s. l.. Utah	[illegible]	300,000	1	225,000	Apr. 1907	.37½
Daly West, g. s. l.. Utah	3,000,000	180,000	20	5,607,000	Mar. 1907	.60
De Lamar, g. s.. Ida	400,000	67,180	5	2,926,370	May 1905	.72
Dillon, g.. Colo....	1,250,000	1,250,000	1	21,875	July 1905	.01
Doctor Jack Pot.. Colo....	3,000,000	3,000,000	1	268,000	July 1906	.004
Doe Run, l.. Mo.	10,000,000	59,662	100	1,128,200	Apr. 1907	.50
Elkton Con., g.. Colo....	3,000,000	2,500,000	1	1,841,960	Feb. 1907	.01½
El Paso, g.. Colo....	2,500,000	2,450,000	1	1,022,750	June 1906	.01
Fed. Sm., con.. Idaho....	10,000,000	60,000	100	2,048,750	Mar. 1907	5.00
Federal Sm., pf. Idaho....	20,000,000	120,000	100	2,651,250	Mar. 1907	1.75
Findley, g.. Colo....	1,250,000	1,250,000	1	325,000	Aug. 1906	.01
Franklin-Mediawk, z. Nevada	1,000,000	1,000,000	1	141,000	Dec. 1906	1.10
Gemini-Keystone.. Utah....	500,000	5,000	100	1,850,000	Jan. 1907	10.00
Gold King, c.. Colo....	5,750,370	5,750,370	1	1,407,604	May 1905	.01
Gold S. verdict.. Colo....	2,000,000	2,000,000	1	10,000	Jan. 1905	.004
Grand Central, g. Utah	250,000	250,000	1	1,196,000	[illegible] 1907	.04
Gwin Mine, Dev., g. Cal	1,000,000	100,000	10	35,000	Mar. 1906	.25
Hecla, s. l.. Idaho....	[illegible]	250,000	1,000,000	0.25	870,000	Mar. 1907	.02
Homestake, g.. S. D....	21,840,000	218,400	100	22,344,040	Apr. 1907	.50
Horn Silver, g. s. l. Utah	10,000,000	400,000	25	5,602,000	Apr. 1907	.05
Inter'l Nickel, pf. N. Y....	12,000,000	[illegible]	5	[illegible]	May 1907	1.50
Iron Silver.. Colo....	10,000,000	500,000	20	4,000,000	Apr. 1907	.20
Jamison, g.. Cal	3,000,000	300,000	10	270,670	Apr. 1907	.03
Jerry Johnson.. Cal	2,500,000	2,500,000	1	61,700	Apr. 1906	.03
Kendall, g.. Mont	2,500,000	500,000	5	1,095,000	Apr. 1907	.03
Liberty Bell, g.. Colo....	700,000	130,551	5	110,857	Jan. 1906	.15
Lightner, c.. Cal	125,000	102,255	1	295,694	Aug. 1906	.05
Mammoth, g. s. l. Utah....	10,000,000	400,000	25	2,080,000	Oct. 1906	.05
Mary McKinney, g. Colo....	1,500,000	1,304,252	1	891,765	Apr. 1907	.03
Mohawk, z.. Mich	2,500,000	100,000	25	900,000	Jan. 1907	4.00
Mont. ore Purch.. Mont	2,500,000	80,833	25	9,437,274	Jan. 1907	15.00
Monument, g.. Colo....	300,000	300,000	1	27,124	Apr. 1906	.01
New Century, z., l.. Mo.	300,000	300,000	1	211,500	Nov. 1906	.01
New Idria, q.. Cal	500,000	100,000	5	900,000	Apr. 1907	.20
New Jersey Zinc.. U. S....	10,000,000	100,000	100	8,400,000	Feb. 1906	3.00
North Butte.. Mont	6,000,000	400,000	15	5,000,000	June 1907	2.00
North Star, g.. Cal	2,500,000	250,000	10	1,336,989	Mar. 1907	.20
Northern Light, g. s. Utah....	2,000,000	400,000	5	20,000	Feb. 1904	.05
Old Dominion Cop.. Ariz....	7,500,000	281,589	25	280,843	May 1906	.50
Old Gold.. Colo....	2,101,150	2,101,150	1	10,506	Mar. 1906	.06
Ophir, g. s.. Nevada	302,400	100,800	3	1,797,400	July 1904	.25
Osceola, c.. Mich	2,500,000	96,150	25	6,362,000	Jan. 1907	3.00
Parrot, c.. Mont	2,300,000	229,850	10	6,692,724	Mar. 1907	.25
Pennsylvania, g.. Cal	5,150,000	51,500	100	284,925	July 1905	.10
Platteville, l. z.. Wis.	20,000	500	40	89,500	Oct. 1905	10.00
Portland, g.. Colo....	3,000,000	3,000,000	1	7,387,080	Apr. 1907	.04
Quincy, c.. Mich	[illegible]	110,000	25	17,160,446	June 1907	4.50
Rexy, c.. Mo.	15,000	15,000	1	9,600	May 1906	.03
Rocco Homest'k, l.s. Nevada	300,000	300,000	1	112,000	Dec. 1904	.02
Sacramento, g. Q.. Utah....	5,000,000	1,000,000	5	245,000	Nov. 1906	.004
Salvator, g. s. l.. Utah....	200,000	200,000	1	6,500	Aug. 1904	.01
St. Joseph, l.. Mo.	20,000,000	1,000,000	10	5,108,357	Mar. 1907	.15
Silver Hill, g. s.. Nevada	108,000	108,000	1	59,400	Feb. 1906	.05
Silver King, g. s. l. Utah....	3,000,000	150,000	20	10,375,000	Dec. 1906	.33½
Sioux, c.. Ariz	3,000,000	300,000	10	300,000	Mar. 1907	.50
Snowstorm, s. l.. Ida	1,500,000	1,500,000	1	135,000	Jan. 1906	.01
Spearfish, c.. [illegible]	1,500,000	1,500,000	1	165,000	Jan. 1905	.01½
Standard Con., g. s. Cal	2,000,000	178,000	10	5,139,061	Mar. 1907	.10
Stray Dog, g. s. l. Tenn	5,500,000	1,000,000	5	4,895,866	Apr. 1906	.12½
Tamarack, c.. Mich	1,500,000	60,000	25	9,180,000	Jan. 1907	3.00
Terrasco, c.. Tenn	5,000,000	175,000	25	1,036,750	Jan. 1907	1.25
Tonopah, g.. Nevada	1,750,000	300,000	5	900,000	June 1906	.48
Tonopah Belmont.. Nevada	1,000,000	1,000,000	1	3,000,000	Apr. 1907	.35
Tonopah Ext. Nevada	2,000,000	1,295,927	1	518,000	Apr. 1907	.10
Tonopah Ext. Extn. Nevada	1,000,000	928,433	1	278,530	Apr. 1906	.15
Tonopah Midway.. Nevada	1,000,000	1,000,000	1	300,000	Jan. 1907	.05
Uncle Sam, g. s. l.. Utah	700,000	700,000	1	130,000	Oct. 1906	.01
United Cop. com.. Mont	75,000,000	450,000	100	5,175,000	Apr. 1907	1.75
United, c. pf.. Ariz	5,000,000	50,000	100	1,500,000	May 1907	3.00
United, z. l., com. Mo.-Kan	[illegible]	92,400	25	27,440	Oct. 1906	.05
United, z. l., pf.. Mo.-Kan	[illegible]	92,400	25	289,550	Apr. 1907	.50
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Un. States, pf. g. s. c. l. Utah	87,500,000	750,000	50	4,281,250	Apr. 1907	.87½
United Zinc, pf.. Colo....	4,000,000	39,458	100	946,817	July 1907	1.50
Utah, g. s. l.. Utah	1,000,000	100,000	10	219,000	[illegible] 1907	.03
Utah, g.. Utah	1,250,000	900,000	5	6,480,000	Apr. 1907	1.50
Victoria, Utah.... Utah	250,000	250,000	1	87,000	Apr. 1907	.04
Vindicator Con., g.. Colo....	1,500,000	1,500,000	1	1,065,000	Apr. 1907	.03
Wolverine.. Mich	1,500,000	60,000	25	4,000,000	Apr. 1907	10.00
Work, g.. Colo....	1,250,000	1,250,000	1	20,000	Apr. 1907	.01
Yankee Con., g.. Utah	500,000	[illegible]	1	140,000	Jan. 1907	.03
Yuba, g.. Cal	[illegible]	[illegible]	[illegible]	913,789	May 1907	.10

*Previous to consolidation $1,436,250 were divided.

Coal, Iron and Other Industrials—United States.

Name of Company and Location.	Author-ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Ala. Con., C. & I., pf. Ala....	$2,500,000	24,638	100	$905,265	May 1905	$1.75
Allis-Chalmers, pf.. U. S.	25,000,000	200,000	100	3,213,750	Feb. 1904	1.75
Amer. Ag. Chem., pf. U. S.	20,000,000	181,530	100	7,375,870	Apr. 1907	3.00
American Cement.. Pa.	2,000,000	200,000	10	1,028,000	Jan. 1907	.40
American Coal.. Md.	1,500,000	50,000	25	2,195,000	Mar. 1907	7.50
Associated Oil.. Cal....	21,000,000	21,000,000	1	630,000	Aug. 1906	.01½
Bethlehem Steel, pf.. Pa....	15,000,000	150,000	100	900,000	Nov. 1906	.75
Cambria Steel.. Pa.	50,000,000	900,000	50	8,212,500	Feb. 1907	.62½
Caribou Oil.. Cal....	100,000	80,000	1	56,000	July 1905	.07
Central C. & C., com. Mo....	5,125,000	51,250	100	1,921,875	Apr. 1907	1.50
Central C. & C., pf.. Mo....	1,875,000	18,750	100	1,265,626	Apr. 1907	1.25
Central Oil.. W. Va.	1,500,000	60,000	25	182,500	May 1904	.25
Claremont Oil.. Cal....	500,000	450,000	1	58,500	June 1905	.01
Col. & Hock. C. & I, pf. Ohio..	7,000,000	69,244	100	176,086	May 1907	1.50
Consolidated Coal.. Ill....	50,000,000	500,000	100	350,000	July 1904	1.00
Consolidation Coal.. Md....	10,250,000	102,500	100	8,955,400	Apr. 1907	1.50
Crucible Steel, pf.. Pa....	25,000,000	250,000	100	1,000,000	Sept. 1906	1.50
Empire S. & I., pf.. N. J....	5,000,000	25,000	100	687,500	Jan. 1907	3.00
Fairmont Coal.. W. Va.	12,000,000	120,000	100	1,384,000	Feb. 1907	3.00
Four Oil.. Cal....	500,000	300,000	1	105,406	July 1906	.01
General Chem. com.. Ch....	12,500,000	74,103	100	1,745,125	Mar. 1907	2.00
General Chem., pf.. U. S.	12,500,000	100,000	100	4,541,178	Apr. 1907	1.50
George's C'k Coal.. Md....	2,500,000	22,000	100	1,188,000	July 1904	3.00
Imperial Oil.. Ca.	1,000,000	100,000	100	880,000	July 1905	.20
International Salt.. [illegible]	30,000,000	182,280	100	927,060	Dec. 1906	1.00
Jeff. & Cl'f C. & I., com Pa....	1,500,000	15,000	100	330,000	Aug. 1906	5.00
Jeff. & Cl'f. C. & I., pf. Pa....	1,500,000	15,000	100	825,500	Aug. 1906	2.50
Kern River Oil.. Ca.	2,000,000	20,000	100	39,600	May 1907	.13
Lehigh Coal & Nav.. Pa....	17,378,500	346,301	50	25,614,038	May 1907	3.00
Maryland Coal, pf.. Md....	2,000,000	18,850	100	1,517,160	Dec. 1906	4.00
Monon R. Coal, pf.. Pa....	10,000,000	100,000	100	3,154,945	Jan. 1906	.97
Monte Cristo Oil.. Cal....	500,000	500 000	1	120,000	July 1906	.01
National Carbon, pf.. U. S.	4,500,000	45,000	100	2,047,500	May 1907	1.75
National Lead, com.. N. Y....	15,000,000	149,054	100	1,974,966	July 1907	1.25
National Lead, pf.. N. Y....	15,000,000	149,040	100	16,324,328	June 1907	1.75
Nat'l Steel & Wire, pf. N. Y....	5,000,000	25,779	100	631,561	Mar. 1906	1.75
New Central Coal.. Md....	1,000,000	50,000	20	350,000	May 1907	.40
New River Coal, pfd.. W. Va.	4,000,000	37,617	100	112,851	May 1907	1.50
Pacific Coast Borax.. Cal....	2,000,000	19,000	100	2,086,500	Aug. 1906	1.00
Peerless Oil.. Cal....	1,000,000	92,000	10	396,320	May 1906	.14
Penna. Salt.. Pa....	3,000,000	60,000	50	14,528,000	Apr. 1907	3.00
Penna. Steel, pfd.. Pa....	25,000,000	168,214	100	7,615,744	May 1907	3.50
Philadelphia Co.. Pa....	28,953,029	579,061	50	7,116,638	May 1907	1.75
Phila. Gas, pf.. Pa....	6,744,813	114,896	50	1,583,505	Mar. 1905	1.25
Pittsburg Coal, pf.. Pa....	32,000,000	297,010	100	11,434,962	Apr. 1905	1.75
Pocahontas Coll., pf.. W. Va.	1,500,000	15,000	100	460,000	May 1907	1.50
Republic I. & S., pfd. Ill....	25,000,000	204,169	100	4,136,612	Apr. 1907	3.75
Sloss-Sheffield, com.. Ala....	7,500,000	75,000	100	9,480,250	[illegible]	1.25
Sloss-Sheffield, pfd.. Ala....	20,000,000	67,000	100	3,177,250	Mar. 1907	1.25
Standard Oil.. U. S.	100,000,000	970,000	100	334,550,000	June 1907	9.00
Tenn. C. & I., com.. Tenn....	22,553,600	226,536	100	3,131,988	May 1907	1.00
Tenn. C. & I., pf.. Tenn....	248,000	2,480	100	385,680	May 1907	2.00
Texas & Pacific Coal. Texas..	2,000,000	20,000	100	1,930,000	Mar. 1906	2.00
Thirty-three Oil.. Cal....	500,000	100,000	5	430,000	July 1905	.10
Union Oil.. Cal....	10,000,000	100,000	100	1,118,766	May 1906	.80
U. S. Steel Corp., com.. U. S.	550,000,000	5,083,026	100	66,041,541	July 1907	.50
U. S. Steel Corp., pf.. U. S.	360,281,100	3,603,141	100	181,149,227	May 1907	1.75
Va. Carolina Ch., pf.. U. S.	20,000,000	180,000	100	11,820,869	Apr. 1907	2.00
Westmoreland Coal.. Pa....	3,000,000	60,000	50	8,580,000	Oct. 1905	2.50

Canada, Mexico, Central and South America.

Name of Company and Location.	Author-ized Capital.	Shares. Issued.	Par Val. $	Dividends. Total to Date.	Latest. Date.	Amt.
Amistad y Conc'rdia.. Mex....	$480,000	9,600	50	$258,064	Jan. 1905	$1.71
Buffalo, g.. [illegible] Ont....	1,000,000	900,000	100	81,000	Apr. 1907	.03
Butters' Salvador, g.. Salv	750,000	150,000	5	600,000	Apr. 1905	.25
Cariboo McKin'y, g.. B. C....	1,250,000	1,250,000	1	546,837	Feb. 1904	.04
Consolidated M. & S.. B. C....	5,500,000	48,338	100	594,100	May 1907	2.50
Coplapo, c.. [illegible] Chile ..	1,125,000	112,500	10	3,000,906	Oct. 1904	1.20½
Crow's Nest Pass.. B. C....	3,500,000	140,000	25	1,581,148	Apr. 1906	.62½
Dominion Coal, com.. N. S....	15,000,000	150,000	100	2,100,000	Apr. 1907	1.00
Dominion Coal, pf.... N. S....	3,000,000	30,000	100	3,330,000	Jan. 1905	4.00
Dos Estrellas, g. s.... Mex ..	150,000	3,000	50	1,020,555	July 1905	13.65
El Oro, g. s.. [illegible] Mex ..	5,750,000	1,080,000	5	2,708,800	July 1904	.15
Esperanza, s. g.. [illegible] Mex ..	2,275,000	455,000	5	6,121,049	Apr. 1907	1.32
Foster Cobalt, s.. [illegible] Ont....	1,000,000	1,000,000	1	50,000	Jan. 1907	.05
Granby Con.. [illegible] B. C....	15,000,000	1,350,000	10	2,158,630	Mar. 1907	.30
Greene Con. Copper.. Mex	8,640,000	864,000	10	5,814,200	Mar. 1907	.40
Greene Con. Gold.. Mex	5,000,000	500,000	10	300,000	July 1905	.20
GreenGold-Silv'r, pfd. Mex	3,000,000	300,000	10	120,000	Mar. 1907	.40
Guanajuato.. [illegible] Mex	3,000,000	540,000	5	74,250	Oct. 1906	.07½
Guggenheim Expl.. Mex	17,000,000	105,000	100	3,172,500	Apr. 1907	2.50
Kerr Lake, s.. [illegible] Ont....	5,000,000	400,000	5	210,000	Oct. 1906	.10
LeRoi No. 2, g.. [illegible] B. C..	3,000,000	120,000	25	716,400	Feb. 1907	.24
McKinley-Darragh, s. Ont....	2,500,000	2,000,000	1	100,000	Mar. 1907	.02
Mexican Coal & Coke.. Mex	5,000,000	50,000	100	600,000	Dec. 1906	3.00
Mex. Con. M. & S. Co.. Mex	2,500,000	240,000	10	480,000	May 1907	.80
Mines Co. of Am.. [illegible] Mex ..	2,000,000	2,000,000	1	2,585,000	Apr. 1907	.02
N. Y. & Hond. Ros.... C. A....	1,000,000	150,000	10	2,272,000	Oct. 1907	.10
Nipissing, s.. [illegible] Ont....	6,000,000	1,200,000	5	960,000	Apr. 1907	.15
North Star.. [illegible] B. C....	1,500,000	1,300,000	1	351,000	Dec. 1904	1.00
N. S. St. & Coal, com.. N. S....	5,000,000	49,876	100	863,414	Apr. 1907	1.50
N. S. St. & Coal, pf.... N. S....	1,030,000	10,300	100	375,950	Apr. 1907	1.50
Penoles*.. [illegible] Mex	250,000	2,500	100	8,213,375	Mar. 1907	20.00
Platandillo.. [illegible] Mex	400,000	206,989	1	5,586	Sept. 1906	.00½
Reco, g. s. l.. [illegible] B. C....	1,000,000	998,689	1	327,082	Apr. 1906	.02
Silver Queen, s.. [illegible] Ont....	1,500,000	1,500,000	1	120,000	Jan. 1907	.08
Slocan Star.. [illegible] B. C....	500,000	500,000	1	575,000	Dec. 1904	.06
St. Eugene Con.. [illegible] B. C....	3,500,000	3,202,000	1	402,120	Oct. 1905	.02
Tezuitlan Copper.. Mex	1,000,000	10,000	100	[illegible]	Apr. 1907	2.00
Tilt Cove, c.. [illegible] N. F....	1,000,000	89,000	2	21,360	Jan. 1905	.48
Tretheway, s.. [illegible] Ont....	1,000,000	1,000,000	1	80,000	Mar. 1907	.04
Tyee, c.. [illegible] B. C....	940,000	180,000	5	136,800	Dec. 1904	.24

*Mexican Currency.

THE MINING INDEX.

The editors of this paper read all the important articles published in the technical and trade journals of the world relating to mining and allied industries, and make abstracts of those articles which are of interest to engineers and miners. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

We will undertake to furnish a copy of any article (if in print) in the original language, for the price quoted. Where no price is quoted the cost is unknown. These papers are not kept in stock, but must be ordered from the publisher; hence there will be some delay for foreign papers.

No accounts can be opened for these small amounts, but remittance must be sent with order. For the convenience of those making small but frequent remittances, coupons are furnished at the following prices: 20 cents each, six for $1.00, thirty-three for $5.00 and one hundred for $15.00. This arrangement will be especially appreciated by foreign readers and men in distant mining camps. Where remittances are made in excess of what is required, the balance will be credited in coupons upon request.

ALUMINUM

3371—ALUMINUM CASTINGS. E. F. Lake. (Foundry, May, 1907; 5½ pp.) Reviews the physical properties of aluminum and compares them with those of cast iron, and discusses the theory and practice of aluminum casting. 20c.

ASBESTOS

3372—ASBESTOS WOOD. C. L. Norton. (Elec. Wld., Apr. 27, 1907; 1 p.) Describes the construction of a non-inflammable and non-conducting wood from the very short fibered varieties of Canadian asbestos. 20c.

ASPHALT

3373—ASPHALT—Some Recent Asphalt Literature. S. F. Peckham. (Chem. Engr., Apr., 1907; 12 pp.) Abstracts several important papers dealing with asphalt and its products, which have recently appeared. 40c.

BISMUTH

3374—ALLOYS—Les Alliages Cadmium-Bismuth. A. Portevin. (Revue de Metallurgie, Apr., 1907; 5 pp.) Studies the properties of some of the alloys of these metals by means of cooling curves and microscopical investigation of polished sections. $1.00.

CEMENT

3375—FRENCH PORTLAND CEMENT INDUSTRY. E. Candlot. (Eng. and Min. Journ., May 11, 1907; ½ p.) Reviews briefly the present status of portland cement production in France. 20c.

3376—PORTLAND CEMENT—The Economy of the Long Kiln. E. C. Soper. (Trans. A. S. M. E., June, 1907; 6 pp.) Shows the economy of long kilns used in producing cement clinker by comparing tests made on 7x60 ft. kilns against 8x110 ft., both burning natural gas.

CLAY

3377—ONTARIO—Clay and the Clay Industry of Ontario. M. B. Baker. (Report, Bureau of Mines, Vol. XV, Part II, 1906; 127 pp.) A thorough review of the clay resources and industry of Ontario, dealing with the mode of occurrence of the clay, and the manufacture of clay products.

COAL AND COKE

3378—CLASSIFICATION OF COAL—A Review of Some Recent Schemes for. A. L. MacCallum. (Can. Min. Journ., May 1, 1907; 1 p.) Paper read before the Nova Scotia Min. Soc. States some of the most important schemes for classifying coal, and discusses their principal features and advantages. 20c.

3379—COAL ANALYSIS from the Commercial Point of View. J. T. Dunn. (Coll. Guardian, May 10, 1907; 1½ pp.) Lecture delivered to the Newcastle-upon-Tyne Commercial Institute. Outlines the principles of the various methods of coal analysis, showing what bearing each process of analysis has and to what extent the results obtained are useful in judging the value of the coal. 40c.

3380—COAL ANALYSIS—The Available Hydrogen of Coal. S. W. Parr. (Journ. Am. Chem. Soc., Apr., 1907; 7 pp.) Discusses the principles of various methods of determining hydrogen in coal, and endeavors to point out a new procedure which will have the added advantage of indicating other properties depending on the structure and composition of the coal. 80c.

3381—COAL CUTTING—Electricity Applied to Coal Cutting. George Farmer. (Sci. and Art of Min., May 4, 1907; 1½ pp.) Discusses the methods of controlling the roof, locating the position of the cut, and the economies of operation which are to be obtained by electric coal cutters. 20c.

3382—COAL HANDLING—Handling Cars with Rolling Device for Dumping. Erskine Ramsay. (Eng. and Min. Journ., May 11, 1907; 2 pp.) Gives details of the mechanism for handling and dumping cars by this device which is used in connection with the Robert Ramsay transfer and rams, and describes methods of adjustment and control. 20c.

3383—COAL MINING—The Technics of Coal Mining. G. H. Winstanley. (Min. Engineering, May, 1907; 3½ pp.) Continuation of article previously mentioned in the Mining Index, dealing in this instalment with applications of gearing in colliery engineering. 20c.

3384—COAL POCKETS of the Salem Mines. (Eng. Rec., May 4, 1907; 1 p.) Describes the design and construction of reinforced concrete coal pockets of this Pennsylvania mine, with plans, elevations and sections. 20c.

3385—COAL STORAGE PLANT at Shadyside, N. J. (Pract. Engr., May, 1907; 2 pp.) A description of the very large coal storage facilities of this plant which is designed to keep in reserve 100,000 tons of anthracite, and 50,000 tons of bituminous, and an account of the various handling devices, which are installed. 20c.

3386—COKE OVENS—By-Product Coke Ovens and Their Field. E. A. Moore. (Iron Trade Rev., Apr. 25, 1907; 1 p.) Brief summary of a paper read before the New England Fuymen's Assn., Apr. 10, in which are discussed the many improvements made in by-product coke-oven installations and the new uses for the gas and the ammonium sulphate which are obtained from the ovens. 20c.

3387—CONVEYER SYSTEM for Loading at the Coal face. F. W. Parsons. (Eng. and Min. Journ., May 18, 1907; 2 pp.) Enumerates the advantages of machines in coal mining and discusses the operating methods and results obtained by using the conveyer system for loading at the coal-face, which results in the profitable working of certain thin and dirty seams. 20c.

3388—DEVELOPMENT of a Coal Mine. W. J. Sherman. (Cornell Civ. Engr., May, 1907; 8 pp.) An interesting account of the operations of renewing production from an abandoned mine, describing briefly some of the complicated problems encountered, and the methods of overcoming them.

3389—ELECTRIC POWER—Notes on the Electrical Installation at Swalwell Garesfield Colliery. J. Swindle. (Iron and Coal Tr. Rev., Apr. 26, 1907; 1 p.) Paper read before the No. of Eng. Branch of the Nat. Assn. of Coll. Mgrs., describing the electrical appliances at this British colliery. 40c.

3390—ELECTRIC POWER PLANT for the Collieries of Durham, England. A. H. Bridge. (Elec. Rev., May 11, 1907; 4½ pp.) A description of the works and system which furnish electric power to the various collieries of the Durham district. 20c.

3391—FUEL BURNING—Allgemeines über direkte Feuerungsanlagen. F. Janda. (Oest. Zeit. f. B. u. H., Apr. 20 and 27, 1907; 4 pp.) Gives an exposition of the principles of scientific firing, with notes on the best means of utilizing the heat of fuel and of testing its calorific power. To be continued. 60c.

3392—GAS POWER PLANTS—Economy of Gas Power Plants for Collieries. F. E. Junge. (Eng. and Min. Journ., Apr. 27, 1907; 3½ pp.) Discusses the value and use of gas power in coal mining, and its application to the production of electric energy from a central gas engine installation using waste gases. 20c.

3393—GAS PRODUCERS—The Utilization of Low Grade Fuel in Gas Producers—II. F. E. Junge. (Iron Trade Rev., May 2, 1907; 4½ pp.) Continuation of article previously mentioned in the Index, describing the construction of several standard types of producers and giving tests upon their efficiencies. 20c.

3394—GERMANY—Das Steinkohlengebiet nordöstlich der Roer nach den Ergebnissen der Tiefbohrungen und vergleichen mit dem Cardiff-Distrikt. Krusch and Wunstorf (Glückauf, Apr. 13, 1907; 12 pp.) Records with great detail the results of prospecting the Aachen anthracite field by deep borings, and discusses the geological relations of the district as shown by petrographical examinations of the borings. Comparison is made between this region and the Cardiff field. 40c.

3395—HOISTING—Colliery Hoisting, Haulage and Power Systems. F. E. Junge. (Eng. and Min. Journ., May 11, 1907; 3 pp.) Compares the cost of individual steam-driven hoists and power units with the central electric power station system. 20c.

3396—KENTUCKY—Mining in the Cumberland Gap Coalfield. John L. Pultz. (Eng. and Min. Journ., Apr. 27, 1907; 33 pp.) Gives general descriptions of the different seams in the Cumberland Gas coalfield, and describes in a general way the methods of mining, ventilating, draining and hauling in use there. 20c.

3397—LOW GRADE FUEL—Burning Fine Anthracite Coal. R. T. Strohm. (Elec. World, May 4, 1907; 2 pp.) Mentions briefly some general principles of low-grade fuel combustion, and cites the experience of a large electric power plant in burning very small anthracite sizes. 20c.

3398—LOW GRADE FUELS—The Burning of. S. F. Walker. (Journ. Brit. Soc. of Min. Students, Apr., 1907; 6 pp.) Discusses some of the points of which account must be taken in the attempt to burn low grade coals for steam production.

3399—MINE FIRE—The Warrior Run Mine Disaster. C. Enzian. (Mines and Min., May, 1907; 5½ pp.) An elaborate account of the methods used in fighting this mine fire which was accompanied by a squeeze and large quantities of explosive gas. The chief agents used were air, water and steam. 20c.

3400—NEW MEXICO—Mescal Canyon Coalfield, New Mexico. Chas. R. Keyes. (Eng. and Min. Journ., May 18, 1907; ½ p.) A few notes on the extent and quality of the coal-bearing section in this district, and on the geology of the beds. 20c.

3401—RESCUE APPARATUS—Arrêté Concernat l'Emploi d'Appareils Respiratoires dans les Mines. L. Barthou. (L'Echo des Mines, Apr. 22, 1907; 1 p.) Detailed review of the present Europ-

commissions appointed to investigate
these reports. 20c.

3402—RESPIRATORS—Neuerungen an Atmungsapparaten. Grahn. (Glueckauf, Apr. 20, 1907; 3½ pp.) Describes and illustrates recent improvements in the construction of breathing

3403—SAFETY LAMPS—New Patent Reflector for Safety Lamps. J. Galliford. (Iron and Coal Tr. Rev., Apr. 26, 1907; ½ p.) Paper read before the Nat. Assn. of Coll. Mgrs., briefly mentioning this aluminum reflector for mining lamps, with enumeration of its advantages. 20c.

3404—SHAFT SINKING—Sinking the Allan Shafts. H. E. Coll. (Can. Min. Journ., May 1, 1907; 5¼ pp.) Paper read before the Nova Scotia Min. Soc., giving a very complete and detailed description of the sinking operation at this Nova Scotia colliery, with illustrations of timbering and methods of blasting. 20c.

3405—SPONTANEOUS COMBUSTION of Coal. A. Lakes. (Paper read before Apr. meeting of the Colo. Sci. Soc'y; 1 p.) Brief comments on the causes and effects of spontaneous combustion of coal in place, which is a characteristic feature of certain deposits of Colorado coal. 20c.

COPPER

3406—ASSAYING COPPER MATTE. The Use of Zinc in. D. M. Levy. (Paper read before the Instn. of Min. and Met., Apr. 16, 1907; 4 pp.) Gives a procedure for determining copper in matte, in which zinc is used to reduce the and precipitate the copper from solution, and compares the efficiency of this process with other methods, by a list of tabulated assays.

3407—BRASS—The Effect of Cadmium on Rolled Brass. E. S. Sperry. (Brass Wld., Apr., 1907; 1 p.) Describes the effects of varying percentages of cadmium in spelter which is to be used in brass production. 20c.

3408—BRASS FOUNDING—The Sheeler-Hemsher Improved Crucible Furnace. J. H. Sheeler. (Iron Age, May 9, 1907; 1 p.) Paper read before the Phila. Edymen's Assn., May 1, 1907, describing the construction of this furnace, with details of working and the blast pressure, the advantage of the latter being that the furnace is made independent of natural draft, and consequently, there is no delay of heats while waiting for favorable

3409—BRASS WORKS—The Langsenkamp-Wheeler Brass Works. (Foundry, June, 1907; 6¼ pp.) Describes the construction of this brass foundry, which has unique features of design and operation, and where large scale operations

3410—BRITISH COLUMBIA—Copper Mining an Important Industry in British Columbia. E. Jacobs. (B. C. Min. Rec., Mar., 1907; 13 pp.) Reviews the general copper situation in this province and describes producing mines in all the principal districts. 20c.

3411—BRITISH COLUMBIA—Mining on Observatory Inlet, Skeena Mining Division. (B. C. Min. Rec., Mar., 1907; 2 pp.) A few brief notes on the local geology of some of the prominent mineral claims, comprising the Bonanza group and the Hidden Creek group. 20c.

3412—BRITISH COLUMBIA — The Boundary District, British Columbia. Forbes Rickard. (Min. and Sci. Press, Apr. 20, 1907; 2¼ pp.) Describes the general mining situation in this district, with special reference to the equipment of the Granby smelter and its scope of

3413—BRITISH COLUMBIA—The Marble Bay Copper Deposit. O. E. Le Roy. (Paper read before Can. Min. Inst., Mar., Brief notes on the geographical position, and general and economic geology of the region with a few facts on the value of the ore found there.

3414—CASTING COPPER—C. Vickers. (Foundry, June, 1907; 1¼ pp.) Gives in condensed form data on the effects of the addition of various metals to copper which is to be used in casting. 20c.

3415—COPPER MINES in Colorado. J. A. Snedaker. (Eng. and Min. Journ., Apr. 27, 1907; ½ p.) Gives some brief notes on the deposits of the Great Basin and other copper mines in the Red Mountain camp of San Juan County. 20c.

3416—COPPER SMELTING WORKS at Humboldt, Ariz. E. H. Hamilton. (Eng. and Min. Journ., May 11, 1907; 2½ pp.) Describes the concentrating, power and smelting plants of the Arizona Smelting Co., which are noteworthy as being electrically driven throughout, and using fuel-oil furnaces. 20c.

3417—DESULPHURIZING — The McMurtry-Rogers Process for Desulphurizing Copper Ores and Matte. T. C. Cloud. (Instn. of Min. and Met., Bull., 32, May 9, 1907; 5 pp.) Discussion by members of the Institution of the above paper, which was previously mentioned in the Mining Index.

3418—MATTE SMELTING—Magnetic Iron Oxide in Copper Matte Smelting. J. S. C. Wells. (Eng. and Min. Journ., Apr. 27, 1907; 1 p.) Records the result of a successful experiment made to produce copper matte from an ore mixture which contained 70 per cent. magnetite. 20c.

3419—MATTE SMELTING—Some Paradoxes of Matte Smelting. D. H. Browne. (Can. Min. Journ., May 1, 1907; 1½ pp.) Describes abnormal conditions which occur in matte smelting and gives reasons why the apparently absurd remedies applied are really the best. 20c.

3420—MEXICO—Cananea Copper Deposits. R. B. Brinsmade. (Mines and Minerals, May, 1907; 4 pp.) Describes the equipment of the concentrating, smelting, converting and power plants of the Greene Cons. Copper Co. 20c.

3421—NEVADA—The Genesis of the Copper Deposits of Yerington, Nev. E. P. Jennings. (Paper read before the 1907 meeting of the Can. Min. Inst.; 3½ pp.) Classifies the ore and rock occurrences of this copper district, and suggests a theory of their origin.

3422—PHOSPHORUS IN COPPER—Kupfer und Phosphor. E. Heyn and O. Bauer. (Metallurgie, Apr. 22 and May 8, 1907; 19 pp.) Records the results of a thorough investigation into the effect of phosphorus on copper and the properties of alloys of these two substances. 60c.

3423—PRODUCTION and Price of Copper for the Period 1889-1906. J. B. C. Kershaw. (Electrician, Apr. 19, 1907; 1½ pp.) Reviews various fluctuations in the prices of copper and discusses probable future prices of this metal. 40c.

3424—PYRITIC SMELTING—Notes and Comments on the Pyritic Process of Mount Lyell, Tasmania. R. Nicholls. (Chem., Met. and Min. Soc. of South Africa, Mar, 1907; 2 pp.) Reply of author to the discussion on his paper, which was read at the November, 1906, meeting of the Society. 40c.

3425—TASMANIAN COPPER COMPANY. Development of the (Min. Journ., May 11, 1907; ½ p.) An abstract containing particulars of the work in progress and the future prospects of several of the principal mines of the Tasmanian Copper Company. 40c.

3426—UTAH Mining at Bingham, Utah. J. W. Abbott. (Min. and Sci. Press, May 11, 1907; 2 pp.) Gives a general outline of mining conditions, as they now exist in this Utah copper camp. 20c.

DIAMONDS

3427—SOUTH AFRICA—On the Vaal Diamond Diggings. (So. African Min. Rev., Mar., 1907; 14 pp.) Outlines the present state of mining conditions in various sections of this new diamond field, with particulars as to operating companies and their production. 40c.

3428—SOUTH AFRICA—Paardeberg Mines and District—II. H. D. Griffiths. (So. African Mines, Mar. 30, 1907; 1 p.) Reviews briefly the prospecting and operating developments of this diamond district, and outlines its possibilities.

FULLERS EARTH

3429—FULLERS EARTH and Its Application to the Bleaching of Oils. C. L. Parsons. (Journ. Am. Chem. Soc., Apr., 1907; 7¼ pp.) Reviews the sources of supply of fullers earth, discusses its properties, and its application to the bleaching of oils. 80c.

GOLD AND SILVER

3430—ASSAYING—Routine Assaying on a Free Milling W. A. Gold Ore. W. B. Blyth. (Ballarat Sch. of Mines Students' Mag., Vol. IX, No. 4, 1906; 2 pp.) Summary of the work connected with the assay office attached to a free gold mill, giving methods of sampling and fluxing the various products as practiced at an Australian mine. 20c.

3431—BLACK SAND—L. A. Maxwell. (Min. and Sci. Press, Apr. 27, 1907; ½ p.) Gives some brief figures as to the cost of collecting black sands in large lots for testing purposes, and describes the apparatus used. 20c

3432—BLACK SAND—Collecting Black Sand. W. Brazenall. (Eng. and Min. Journ., May 11, 1907; ½ p.) Gives a few suggestions as to the use of the Hancock jig, the Martyn concentrator, and sodium amalgam in working black sands. 20c.

3433—BLACK SAND—Utilization of Black Sand. F. H. Hazard. (Eng. and Min. Journ., May 18, 1907; ½ p.) Discusses several aspects of the black sand situation, especially the problem in regard to the economical collecting of the sand. 20c.

3434—BLACK SANDS—La Recherche de l'Or par la Voie humide dans les sables aurifères. A. Fournier. (L'Echo des Mines, Apr. 29, 1907; 1 p.) A few remarks on wet methods of assaying gold-bearing sands, showing how a preliminary treatment with hydrochloric acid to remove iron is likely to result in premature solution of the gold due to a reaction between the acid and manganese mineral, which results in the formation of nascent chlorine. 20c.

3435—BLACK SANDS of New Zealand, the Pacific and Tierra del Fuego. C. C. Longridge. (Min. Journ., Apr. 20, 1907; 1 p.) Mentions some of the occurrences of gold-bearing black sands in these countries, with brief notes upon attempts at working them. 40c.

3436—BRITISH COLUMBIA—The Consolidated Mining and Smelting Co. of Canada, Limited, Rossland, B. C. (Can. Min. Journ., May 1, 1907; 1 p.) Gives an account of the development work accomplished by this company. 20c.

3437—BRITISH COLUMBIA PLACERS: Past and Present—I. H. F. Evans. (Min. Wld., May 4, 1907; 1 p.) Historical sketch, outlining the discovery and development of placers in this province. 20c.

3438—COBALT. (Mines and Minerals, May, 1907; 3 pp). Notes on the number and extent of development of the principal mines in this Canadian silver camp. 20c.

3439—COBALT MINING DISTRICT. Robt. Bell. (Paper read before the Mar., 1907, meeting of the Can. Min. Inst.; advance copy; 6 pp.) Gives a general description of the geological features of this silver district.

3440—COBALT ORES—Richness of Cobalt Ores. Albert R. Ledoux. (Paper read before Can. Min. Inst., Mar., 1907; advance copy; 2 pp.) Gives a number of assays of typical Cobalt ores.

3441—COLORADO—Lake Fork Extension of the Silverton Mining Area, Colorado. L. H. Woolsey. (U. S. Geol. Surv., Bull. 315, 1907; 5 pp.) Brief summary of the general geology and extent of mining operations in this district.

3442—CYANIDATION—Slime Filters. J. R. Blake. (Min. and Sci. Press, May 4, 1907; ½ p.) Sums up some of the unsettled points in the question as to the efficiency of operating the Butters and the Moore filters. 20c.

3443—CYANIDE PROCESS—The Adair-Usher Process. (So. African Mines, Apr. 20, 1907; 1½ pp.) Gives the reports of several metallurgists upon this new cyanide process which depends upon the use of umber to counteract the bad effect of ferrous salts in the solution, and which aims at a perfected method of washing the slimes and a shorter time of treatment. 20c.

3444—DRAINAGE TUNNEL—The Joker Drainage Tunnel. R. L. Herrick. (Mines and Min., May, 1907; 4 pp.) Outlines the revival of mining interest in the Red Mountain district of Colorado, and describes the secondary enriched ore deposits, and the unique prospecting conditions in the camp. 20c.

3445—DREDGING: Sluices and Riffles in Dredging. D. H. Stovall. (Min. and Sci. Press, May 4, 1907; 1 p.) Brief description of sluices, detailed report of riffles used in dredges and their requirements in the matter of head and water supply. 20c.

3446—GOLD DREDGING. C. W. Purington. (Min. and Sci. Press, Apr. 27, 1907; 1½ pp.) A brief discussion of some of the geological principles which the author believes should be applied in the determination of valuable and easy working placer ground. 20c.

3447—GOLD DREDGING. Die Goldbaggerei in Europa. L. St. Rainer. (Oest. Zeit. f. Berg. u. Hütt., Apr. 27 and May 4, 1907; 8 pp.) Gives a brief history of gold dredging in Europe from early Roman times to the present, with a short discussion of the characteristics of some alluvial deposits. To be continued. 60c.

3448—GOLD DREDGING in New Zealand. (N. Z. Mines Rec., Mar. 16, 1907; 3 pp.) Tabulated data on gold dredging operations in New Zealand to the end of 1905, showing the scope and costs of operation. 40c.

3449—GOLD DREDGING PRACTICE in Central Otago. H. R. Macdonald. (New Zealand Mines Rec., Mar. 16, 1907; 10 pp.) Conclusion of article previously indexed, discussing in this instalment sources of power, methods of gold-saving, restoration of dredged land, and enumerating several improved devices which have recently been applied in this field. 40c.

3450—GOLD MINES—The Great Gold Mines. T. A. Rickard. (Min. and Sci. Press, May 4, 1907; 2½ pp.) Gives descriptions of the leading gold mines of the world, with tabulations of their output. 20c.

3451—HYDRAULIC MINING—Hydraulic Elevating and Sluicing in New Zealand. (N. Z. Mines Rec., Mar. 16, 1907; 2 pp.) Tabulated data on hydraulic mining in New Zealand, showing the scope and costs of operation, and giving details of washing equipment. 40c.

3452—MEXICO—History and Development of Batopilas Mine, Mexico. Stuart Tod. (Min. Wld., May 4, 1907; 2 pp.) Reviews briefly the history of this silver mine, and describes the present conditions of mining and milling. 20c.

3453—MEXICO—The Dolores Mine, Chihuahua, Mexico. J. B. Farish. (Eng. and Min. Journ., May 4, 1907; 1 p.) Describes briefly the country rocks of the Dolores district and mentions briefly the character of ore, and methods of treatment. 20c.

3454—MEXICO—The Geology of the Veta Madre. T. A. Rickard. (Min. and Sci. Press, Apr. 27, 1907; 3 pp.) Gives a general study of the geological features of the Veta Madre or Mother Lode vein of Guanajuato, Mexico. 20c.

3455—MONTANA—The Granite Bimetallic and Cable Mines, Philipsburg Quadrangle, Montana. W. H. Emmons. (U. S. Geol. Surv., Bull. 315, 1907; 25 pp.) Treats of the topography, general geology, and distribution and character of the ore deposits of the district in which the above mines are located.

3456—NEVADA—The Seven Troughs District of Humboldt County. T. C. Parker. (S. L. Min. Rev., Apr. 30, 1907; 4½ pp.) Gives a general account of mining conditions in this gold district where operations are very limited, but promising. 20c.

3457—ORE TREATMENT—Metallurgy of Gold Fields' Mines. (So. African Mines, Apr. 13, 1907; 1 p.) Reviews the results accomplished during the last two years in the way of improving gold extraction of the Rand ores. 20c.

3458—PLACER GROUND—Examinations of Placer Ground. R. Chauvenet. (Min. Reporter, Apr. 25, 1907; 1½ pp.) Continuation of article, previously mentioned in this Index, dealing in this instalment with the relative advantages of pits and drills as means of obtaining samples of placer ground; also of panning and fire-assay as a means of determining the value of the samples. 20c.

3459—QUEENSLAND—Annual Mining Review of the Charters Towers Goldfield for the Year 1906. Issued by E. B. Mikes & Co., Charters Towers, North Queensland, 1907; 26 pp.) Reviews the progress of mining and the extension of mine development of the Charters Towers field for 1906.

3460—RUSSIA—A Visit to the Gold Fields of Orenburg. (Min. and Met., Bull. No. 32, May 9, 1907; 6 pp.) Discussion by members of the Institution of the above paper, which was previously mentioned in this Index.

3461—SAND BLAST, DUMET A. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar., 1907; 1½ pp.) Reply by the authors to the discussion of their paper, which was read at the Jan., 1906, meeting of the Society. 40c.

3462—SCREEN ASSAY on the Meyer and Charlton G. Mine. (Min. and Sci. Press, May 11, 1907; 2 pp.) Describes the usual method of making screen assays of cyanide pulp as practiced on the Rand, and compares it with an original method which was developed to overcome the loss due to the amount of gold dissolved out of the sample between the time it was taken and when it was dried for assay. 60c.

3463—SILVER-LEAD SMELTING PRACTICE—III. T. S. Austin. (Min. and Sci. Press, Apr. 27, 1907; 1 p.) Deals in this instalment with furnace practice upon oxidized lead-silver ores at Chihuahua. 20c.

3464—STAMP MILL—Battery Foundations of the Kuk-San-Dong Mill, Korea. C. D. Keeding. (Min. and Sci. Press, May 11, 1907; 2 pp.) Illustrates by many drawings the methods of constructing concrete foundations for a stamp battery in Korea, where distance from a place of supplies introduced some unusual features in the design. 20c.

3465—STAMP MILLING—Some Accessory Stamp Mill Appliances. G. O. Smart. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar., 1907; 1 p.) Reply of author to the discussion of his paper, which was read at the Nov., 1906, meeting of the Society. 40c.

3466—STAMP MILL—Notes on a Modern Stamp Mill. G. E. Brown. (Paper read before the Instn. of Min. and Met., May 16, 1907, advance sheets; 19½ pp.) Gives a detailed description of the usual appliances in a stamp mill working on a free gold ore, with a few figures as to repairs, costs, etc.

3467—TUBE MILL—Feeder for a Tube Mill. N. C. Groch and F. J. Nagel. (Min. and Sci. Press, Apr. 27, 1907; 1 p.) Describes an improvement in vertical spiral feeders for trunnion-mounted tube mills; illustrated by sectional drawing. 20c.

3468—TUBE MILLS—The Computation of the Crushing Efficiency of Tube Mills. S. H. Pearce and W. A. Caldecott. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar., 1907; 1 p.) Reply by the authors to the discussion of their paper, which was previously read before the Society. 40c.

3469—WASHINGTON—Gold-Bearing River Sands of Northeastern Washington. A. J. Collier. (U. S. Geol. Surv., Bull. No. 315, 1907; 15 pp.) Gives a general account of the geography, geology and placer workings along the Columbia and Okanogan rivers, and describes the usual mining methods which have been put in operation there.

3470—WESTERN AUSTRALIA—The Deep Leads and the Old Divide in the Ballarat District. W. H. Callister. (Ballarat Sch. of Mines Students' Mag., Vol. IX, No. 4, 1906; 3 pp.) General description of geological features of the region around the Ballarat district. 20c.

3471—WYOMING—Gold Developments in Central Uinta County, Wyo., and at Other Points on Snake River. A. R. Schultz. (U. S. Geol. Surv., Bull. 315; 20 pp.) Enumerates some of the placer deposits that are now worked along the Snake river in Wyoming, with general statements as to the extent of the operations and discovery of occurrences of platinum in the sands.

GRAPHITE

3472—GRAPHITE: Its Occurrence and Uses. (Bull. Imp. Inst., Vol. V, No. 1, 1907; 14½ pp.) Continuation of article previously mentioned in this Index, dealing with the distribution and occurrences of graphite in Europe, Australia, Canada and the United States.

IRON AND STEEL

3473—ANALYTICAL METHOD [illegible]

3474—BLAST FURNACE—The Application of the Centrifugal Dust Collector to the Blast Furnace. [illegible] (Iron Trade Rev., May 2, 1907; 1 p.) Reviews briefly the development of the art of removing dust from blast-furnace gases, and gives the results on a centrifugal dust collector, which appears to be well suited for this purpose. 20c.

3475—BLAST FURNACE GASES—The Utilization of Blast Furnace Gases for Power Production. A. L. Ellis. (West. Chem. and Met., May, 1907; 12 pp.) Reviews the present condition of the art of utilizing blast furnace gases with analyses of typical gases and tabulations of their thermal values. 60c.

3476—BRAZING of Iron Surfaces. J. L. Bacon. (Engineer, May 1, 1907; 1½ pp.) Gives practical directions for carrying out the different steps of brazing iron and copper surfaces, notably, the preparation of the joint, the fluxing and heating. 20c.

3477—CAST STEEL [illegible] Fabrication des Pièces en Acier Coulé. G. Weyland. (Rev. Univ. des Mines, Mar., 1907; 6 pp.) A study of the principles relating to the design and location of tuyeres, and proper air pressure for the best and most economical results in the production of cast steel from pig iron. $1

3478—ELECTRIC FURNACE—A 24-Ton Induction Furnace for Steel Manufacture. (Electrochem. and Met. Ind., May, 1907; 1½ pp.) Brief notes on the construction and installation of a large Kjellin furnace at the Roechling steel works of Voelklingen, Germany. 40c.

3479—ELECTRIC POWER in Iron and Steel Works. D. S. Bigge. (Paper read before the Iron and Steel Inst., May 9, 1907; 5 pp.) Deals with the development of electricity in iron and steel works, with especial reference to its latest application to reversing rolling mills of high power. Speed diagrams of the rolls when electrically driven are compared with those obtained with steam driven mills. 40c.

3480—ELECTRIC SMELTING—The Electrothermic Production of Steel from Iron Ore. Alfred Stansfield. (Paper read before Can. Min. Inst., March, 1907, advance copy 14 pp.) Gives an account of experiments made to determine whether phosphorus and sulphur can be eliminated from steel during its production directly from ores by electricity.

3481—ELECTROMETALLURGY of Iron and Steel. J. W. Richards. (Electrochem. and Met. Ind., May, 1907; 6 pp.) Gives the solutions of a series of problems in which are included all the essential features attending the reduction of iron and steel by electric means. 40c.

3482—[illegible] Stahl und Walzwerksanlage der Società Anonima delle Alti Forni e Fonderia de Piombino". F. Lurmann, Jr. (Stahl u. Eisen, May 1, 1907; 5 pp.) Describes the equipment of this modern Italian steel plant, also its advantageous location, which gives easy entrance for raw material and permits economic shipment of the product. 40c.

3483—FURNACE CHARGING—Machines a Charger les Fours Métallurgiques a demouler et a transporter les Lingots. C. Dantin. (Génie Civ., Apr. 20, 1907; 3 pp.) Describes the construction of new types of Wellman machines for charging Martin furnaces, and handling ingots and blooms in steel works. 40c.

3484—GERMAN IRON [illegible] Die Eisenerzlagerstätten und die Eisenindustrie Württembergs. C. Geiger. (Stahl u. Eisen, Apr. 24, 1907; 4 pp.) Outlines present industrial and economic conditions in the iron industry of Württemberg and gives geological and geographical notes on the iron ore deposits of this region. 40c.

3485—HIGH-SPEED STEEL TOOLS [illegible] (Engineer, May 3, 1907; 14 pp.) An abstract of various papers on the subject, dealing to considered form, the latest contributions on the subject of making these tools, their life,

of Cleveland. A. E. Pratt. (Instn. of Min. and Met., Bull. No. 32, May 9, 1907; in the Index, together with the author's reply.

Iron Ores in Sweden. G. Walfrid Peters- and Min. Journ., May 11, 1907; 7 pp.) Outlines the condition of magnetic ore treatment in Sweden, giving flow-sheets of various plants and describing the machines used in the Gröndal process of magnetic separation. 20c.

MALLEABLE IRON. The Manufacture of Malleable Iron. G. A. Akerlind. (Foundry, May, 1907; 5 pp.) Paper read before the Scandinavian Tech. Soc. Reviews briefly the discovery of the process for making malleable iron, outlines methods of charging, melting and furnace construction, and gives suggestions for proper inspection. 20c.

3489—MANGANESE STEEL and Some of Its Uses. E. F. Lake. (Am. Machinist, May 16, 1907; 2 pp.) Discussion of the principal features and peculiarities of this special steel, and an enumeration of its advantages over carbon steel for

3490—METALLOGRAPHY—Die mikrographische Untersuchung des Eisens und Stahls. H. Braune. (Eisen-Zeit., Apr. 13 and 20, 1907; 12½ pp.) Conclusion of article previously mentioned in the Mining Index, describing the process of etching the test pieces, and the microscopic examination of the specimens, with notes on the construction and use of the microscope. 40c.

3491—ONTARIO—Plant of the Atikokan Iron Co., Port Arthur, Ont. (Iron Trade Rev., May 2, 1907; 3 pp.) Gives a general description of the works of this Canadian iron company, where the roasting of magnetite ore is a feature. 20c.

3492—OPEN-HEARTH STEEL CASTING PLANT, A Modern. (Foundry, May, 1907; 9 pp.) General description of the important features of the acid open-hearth steel plant of the National Foundry Co., of Erie, Pa. 20c.

3493—OPEN HEARTH STEEL RAILS. B. Talbot. (Indus. Wld., May 4, 1907; 2 pp.) Reprint from Engineering Times Supplement, reviewing bessemer smelting practice in various countries of Europe, and pointing out how in the United States the scarcity of bessemer ores is leading to the adoption of the open-hearth process for making rails. 20c.

SPECIAL STEELS. An Analysis of the Evolution of Modern Tool-Steel. H. C. H. Carpenter. (Engineering, May 3, 1907; 2½ pp.) Traces the evolution of modern tool steels, in the light of the most recent knowledge on the subject, and deals with the eras of carbon tool-steel, of self- or air-hardening steels. To be continued. 40c.

3495—STEEL MANUFACTURE— Diagram of the Processes and Products of Iron and Steel Manufacture. Albert Sauveur. (Iron Trade Rev., May 9, 1907; 2 pp.) Presents in graphical form the operations attending the smelting of iron ore, and the refining of the pig, with comments upon the various steps of the process. 20c.

3496—MUFFLING FURNACE. Furnace for Tempering High-Speed Steel. C. U. Scott. (Am. Machinist, May 9, 1907; 1½ pp.) Suggests various ways of constructing furnaces for hardening different sizes of high-speed steel. 20c.

TUNGSTEN IN STEEL. Volumetric Method for the Determination of. S. C. Lind and B. C. Trueblood. (Journ. Am. Chem. Soc., Apr., 1907; 4 pp.) Investigates the possibility of determining tungsten volumetrically, and tabulates the results secured, when using a procedure modified from the experience of the authors. 80c.

3498—VANADIUM STEEL—Some Properties of Vanadium Steel. E. F. Lake. (Amer. Machinist, May 2, 1907; 2½ pp.) and describes the effects of small quantities on different mixtures of iron and steel, showing by tabulated data of tests the superiority of vanadium steels, over

3499—CERUSSITE—A Curious Deposit or Cerussite in Colorado. R. B. Brinsmade. (Eng. and Min. Journ., May 4, 1907; 1½ pp.) Gives a few notes on the genesis of a deposit of lead ore in Colorado where the mineral is not associated with sulphides or other usual accessory minerals common to lead deposits. 20c.

3500—DESULPHURIZATION OF GALENA—Les nouveaux procedes de desulfuration de la Galene. M. Moslard. (L'Echo des Mines, Apr. 15, 18, 22, and 25, 1907; 4 pp.) Continuation of article previously mentioned in the Mining Index, reviewing the various modern roasting processes which are now used for desulphurizing galena. Discusses in these instalments the theory of the reactions, and the part played by the lime. $1.

3501—ELECTROLYTIC REFINING of Lead and Treatment of Slimes and By-Products. A. G. Wolf. (West. Chem. and Met., May, 1907; 18 pp.) Covers the theory and practice of electrolytic lead refining by the Betts process, and describes the refinery of the Cons. Mining and Smelting Co., of Canada, together with the processes used in testing the slimes and all the by-products of the lead refining. 60c.

3502—OKLAHOMA—Lead and Zinc Mining. W. R. Crane. (Mines and Min., May, 1907; 1½ pp.) A description of the ore occurrence in the Quapaw district of Oklahoma, and methods of mining and milling. 20c.

NICKEL

3503—NICKEL INDUSTRY—L'Industrie du Nickel. R. Pitaval. (L'Echo des Mines, Apr. 29, 1907; 1 p.) A few remarks on the nickel smelting situation, showing its analogy to conditions in the aluminum industry, and how reduction furnaces should be erected near the nickel deposits. 20c.

PETROLEUM

3504—BAKU REFINERIES — Operations of the Baku Petroleum Refineries in 1906. (Pet. Rev., Apr. 27, 1907; 1 p.) Gives the official statistics of the various oil refineries of Baku during 1906. 40c.

3505—CALIFORNIA—The Future of the Oil Industry in California. E. O'Neil. (Cal. Journ. of Technology, Apr., 1907; 2½ pp.) A brief summary of probable directions of future progress in the oil industry of this State. 20c.

3506—CANADA- Le Pétrole au Canada. (Journ. du Pétrole, Apr. 10, 1907; 1½ pp.) Gives a brief history of the discovery of petroleum in Canada, and the development of the oil industry there. 20c.

3507—PANAMA—The Union Oil Company's Panama Pipe Line. A. B. Thompson. (Pet Rev., Apr. 27, 1907; 1 p.) Gives details of the operations of the Union Oil Co.'s pipe-line at Panama. 40c.

PHOSPHATE ROCK

3508—FRANCE—Die Phosphatlagerstätten Frankreichs. O. Pietze. (Zeit. f. prak. Geol., Apr., 1907; 7 pp.) Considers the geological relations of the principal phosphate deposits in France, and gives statistics of production from 1886 to 1904. 40c.

3509—PHOSPHATE ROCK in Utah, Idaho and Wyoming. Chas. Colcock Jones. (Eng. and Min. Journ., May 18, 1907; 2½ pp.) Describes the occurrence and character of the phosphate rock deposits in these States where exploitation has only recently been undertaken. 20c.

PLATINUM

3510—MARKET CONDITIONS OF PLATINUM—E. De Haupick. (Min. Journ., May 4, 1907; ¾ p.) A review of conditions which govern the platinum market for the Ural products, with a discussion of the fluctuations which the metal has undergone during recent years. 40c.

QUICKSILVER

3511—ANALYSIS — Electro determination of Mercury and Its Separation from Silver. H. J. S. Sand. (Min. Reporter, Apr. 25, 1907; 1 p.) Abstract of a paper contributed to the Journ. Chem. Soc., London, giving the procedure used in a method of quantitatively determining quicksilver by electrolysis, and giving the results of three different experiments to test its accuracy. 20c.

RARE MINERALS, EARTHS, ETC.

3512—RARE EARTHS and the Incandescent Mantel. F. Bonnet, Jr. (Journ. Worcester Poly. Inst., May, 1907; 6 pp.) A brief general review of the chemistry of rare earths in their relation to the manufacture of incandescent mantels. 20c.

3513—URANIUM—Sur les Différents Procédés de Préparation de l'Uranium métallique pur ou a l'Etat de Fonte. J. Escard. (Rev. de Chim. Industrielle, Apr., 1907; 6 pp.) Discusses general methods of reducing uranium from ores by chemical means and by electrolysis, and treats of the properties of metallic uranium. 40c.

3514—YTTRIUM EARTHS — A New Method for the Separation of the Yttrium Earths. C. James. (Journ. Am. Chem. Soc., Apr., 1907; 3 pp.) Notes on a procedure for separating yttrium earths one from another; deals also with some of their properties. 80c.

SULPHUR AND PYRITES

3515—ANALYTICAL METHOD—Determination of Sulphur in Pyrite. H. Fay. (Technology Quar., Mar., 1907; 7 pp.) Gives the procedure for determining available sulphur by the Lunge method, and total sulphur by the Fresenius method, with critical comments upon the various steps of the processes. 80c.

3516—PYRITES—The Origin of Deposits of Pyrites. A. B. Willmott. (Paper read before Can. Min. Inst., Mar., 1907, advance copy; 11 pp.) Reviews several of the most important theories as to the formation of pyrites and discusses occurrences of this mineral in Ontario, and the application of the theories to them.

TIN

3517—ANALYSIS—The Estimation of Small Quantities of Foreign Elements in Metallic Tin. P. J. Thibault. (Aust. Min. Stand., Mar. 6, 1907; ½ p.) Gives a brief discussion of procedures used in determining traces of antimony, lead, phosphorus and sulphur in metallic tin. 20c.

3518—CONCENTRATOR — A Cornish Concentrator and a Spray for Rock Drills. Edward Walker. (Eng. and Min. Journ., May 11, 1907; 1 p.) Describes the principle of operation of the Acme slime table, which combines the advantages of convex and concave revolving tables, the combination effecting economy in construction, space and power used. 20c.

3519 — METALLURGY — Fortschritte und Neuerungen in der Metallurgie des Zinns, Speziall in Elektrochemischer Hinsicht im Jahre 1906. (Elektrochem. Zeit., Apr., 1907; 3 pp.) Reviews the progress in the metallurgy of tin during 1906, with a few brief notes on electrochemical methods of producing tin. 40c.

3520—ORE DRESSING—Cornish Methods of Crushing and Ore Dressing. J. F. C. Abelspies. (Eng. and Min. Journ., May 11, 1907; 1 p.) Comments upon the causes and effects of the stagnation in Cornwall mining, and the revival in mining interest. 20c.

3521—TIN ORE DRESSING PLANT, East Pool, Cornwall. Edw. Walker. (Eng. and Min. Journ., May 18, 1907; 2 pp.) Describes the equipment and operation of this English concentrating plant, where tin oxide, wolframite, arsenical and copper pyrites, etc. are separated by stamps, concentrating tables, calciners and magnetic separators. 20c.

TUNGSTEN

3522—COLORADO—The Tungsten Deposits of Boulder Co., Colo. Wm. L. Greenawalt. (Eng. and Min. Journ., May 18, 1907; 1½ pp.). Gives notes on the geological formation of this tungsten district which now produces 80 per cent. of the United States output, and describes briefly the methods of concentration in use, and the present basis for purchasing tungsten ores. 20c.

3523—PORTUGAL — The Panasqueira Tungsten District, Portugal. W. Preus. (Eng. and Min. Journ., May 4, 1907; 1 p.) Brief general description of this Portugal tungsten district, with a few figures of production. 20c.

3524—RARE MINERALS: Their Present Industrial Status. E. C. Riebe. (Min.

Wild May 4 1907. 1 pp. Reviews the present condition of the steam mining of the United States and the use of this metal in steels. 20c.

ZINC

3525—GALVANIZING. Process and Practice of Sherardizing. A Sting (Lead and Zinc News May 6 1907. 1 p.) Discusses the principles of this new process of galvanizing in which the article to be coated is processed in a retort with zinc dust and heated to a high temperature, which causes the zinc to incorporate itself with the other metal, producing a better coating than the ordinary method yields. 20c.

3526—NEW SOUTH WALES—Broken Hill Zinc Field New South Wales. R. Stokes. (Min. Wld., May 4 and 11, 1907; 2½ pp.) Outlines the conditions in this field, with special reference to the flotation processes of concentration. 10c.

3527—OKLAHOMA—Lead and Zinc Mining. W. R. Crane. (Mines and Min., May, 1907; 1½ pp.) A description of the ore occurrence in the Quapaw district of Oklahoma, and methods of mining and milling. 20c.

3528—PRODUCTION AND CONSUMPTION of Spelter in 1906. Walter Renton Ingalls. (Eng. and Min. Journ., May 18, 1907; 4 pp.) Gives statistics of production and consumption of zinc ore and spelter during 1906, and comments at length upon the interesting features which had bearing upon these factors. 20c.

3529—SMELTING; ZINC BLENDE—Gattierung von Zinkblende und Galmei. F. Juretzka. (Zeit. f. angew. Chem., May 3, 1907. 2½ pp.) Considers the smelting of blende and calamine from an economic point of view, and discusses the principles of smelter operation and administration which result in the highest efficiency. 10c.

3530—ZINC BLENDE—Determination of Sulphur in Roasted Zinc Blende. V. Hassreidter. (Eng. and Min. Journ., May 11, 1907; 1 p. Translated from *Zeit. f. angew. Chem.* 1906, No. 1. Reviews various methods of estimating sulphur in roasted blende, with reference to the best means of getting at the sulphur present as sulphate and as sulphide. 20c.

ECONOMIC GEOLOGY—GENERAL

3531—BRAZIL.—The Sedimentary Belt of the Coast of Brazil. O. A. Derby. (Journ. of Geol., Apr.-May, 1907; 18½ pp.) Discussion of the various fossiliferous districts of the sedimentary belt of the Brazilian coast. 60c.

3532—CONNECTICUT—Preliminary Geological Map of Connecticut. H. E. Gregory and H. H. Robinson. (Conn. State Geol. and Nat. History Surv., Bulletin No. 7; 39 pp.) Sketches the history of Connecticut geology, and gives a summary of the geological formations in this State. 20c.

3533—ECONOMIC GEOLOGY and Mineral Deposits. N. F. Nicholas. (Min. World, May 18, 1907; 1 p.) Enumerates various minerals of economic importance, with a list of indications of their presence useful in prospecting. 20c.

3534—ILLINOIS—The State Geological Survey. H. Foster Bain. (Journ., West. Soc. of Eng., Apr., 1907; 18 pp.) Reviews the work accomplished by the State survey in regard to both geological and topographic investigations. 40c.

3535—INCLINATION OF STRATA—Les Stratamètres Appareils pour mesurer l'inclinaison des terrains. F. Hofer. (Génie Civ., Apr. 20, 1907; 2 pp.) Describes and illustrates the construction and methods of using various types of strata-meters, which are used to determine the inclination of strata at considerable depths. 40c.

3536—KANSAS—Economic Geology of the Independence Quadrangle, Kansas. F. C. Schrader and Erasmus Haworth. (U. S. Geol. Surv., Bull. No. 296; 74 pp.) Notes on the occurrence and development of economic minerals in this section of Kansas, including discussions on oil, gas, coal, [illegible] and mineral waters.

3537—Geology of Santa Eulalia, Mexico. R. T. Hill. (Min. Wld., Apr. 27, 1907; 2½ pp.) Describes the geological material and structure of this Mexican district in Chihuahua, and discusses the fault and fracture systems, also the ore-bodies and their outcrops. 20c.

3538—NEVADA—Resources of Nevada. (Min. and Sci. Press, May 4, 1907. 1 pp.) Gives a general review of the revival of the mining industry in this State and forecasts the probable direction and extent of future prospecting. 20c.

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3540—ORE DEPOSITION IN WITHIN. (Min. and Sci. Press, May 11, 1907; 1½ pp.) Gives a few statements as to the likelihood that carbonaceous matter or hydrocarbon gases may be the reducing agent which has produced the formation of native metal ore deposits. 20c.

3541—ORE DEPOSITS of the Southwest. T. B. Comstock. (Eng. & Min. Rev., Apr. 20 and 27, 1907; 2½ pp.) Conclusion of article previously mentioned in the Index. 40c.

3542—PODOLITE—Ueber Podolit, ein neues Mineral. W. Tschirwinsky. (Centralblatt f. Mineralogie, May 1, 1907; 3½ pp.) A brief account of the discovery and analysis of a new mineral podolite, which was found in South Russia in 1905, and which is a double carbonate and phosphate of calcium with the composition $3Ca_3(PO_4)_2CaCO_3$. 20c.

3543—TEXAS—The Geology and Water Resources of the Western Portion of the Panhandle of Texas. C. N. Gould. (U. S. Geol. Surv., W. S. and I. Paper No. 191; 70 pp.) Describes the occurrence and geological features of the water-bearing formations of this district, and the relation of springs and deep-seated waters to the irrigation problem.

3544—WESTERN AUSTRALIA—The Prospects of Obtaining Artesian Water in the Kimberley District. R. L. Jack. (Geol. Surv. of W. A., Bull. No. 25, 1906; 46 pp.) Gives the itinerary of a prospecting trip in the Kimberley district made to determine the possibility of obtaining artesian water, and gives descriptions of the existing wells and bores.

MINING—GENERAL

3545—AIR MIXTURES—Note on the Admissible Volume Change in Mixed Two Gases. Alfred J. Lotka. (Eng. and Min. Journ., May 18, 1907; 1 p.) Gives a general investigation by mathematical means of the changes which occur in the total volume of two quantities of gases originally at different temperatures, when they are mixed without chemical action. 20c.

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3548—DIAMOND DRILLING—The Deflection of Boreholes in Diamond Drilling on the Rand. A. Zboril. (Journ. So. African Assn. of Engrs., Mar., 1907; 7½ pp.) Considers briefly the advantages and disadvantages of various types of boring tools, and discusses the various factors which cause deflections in diamond drill holes. 20c.

3549—EXCAVATION—Mechanical Excavation by Electric-Hydraulic Mining System. F. C. Perkins. (Western Electrician, Apr. 27, 1907; 1 p.) Brief account of the [illegible] sufficient to allow it to be used for excavating purposes. 10c.

3550—EXPLOSIVES—[illegible] By [illegible] Min. and Met. May 1907; 1 p.) Points out the danger of making explosives by inexperienced persons, and discusses the unreliability of chlorate of potash explosives. 20c.

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3553—LABOR IN MEXICO—[illegible] Min. Rev., Apr. 27, 1907; 1½ pp.) Describes the peculiar characteristics of Mexican native labor and points out the advantages [illegible] pay and of work accomplished on a basis of the means of obtaining greatest efficiency from this class of workmen. 20c.

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3555—LABOR PENSIONS—Insurance of Labor in Germany. (Engineering, Apr. 19, 1907; 1½ pp.) Outlines the development of the present system of compulsory insurance of employees in Germany, and describes the operation of the old age pension system. 40c.

3556—MEXICO—Mines and Prospects of Sierra Almoloya. R. T. Hill. (Min. Wld., May 4, 1907; 1 p.) Very brief description of several of the principal mines in this district. 20c.

3557—MINE SUBSIDENCE—A Richardson. (Journ. Chem., Met. and Min. Soc. of South Africa, Mar., 1907; 9 pp.) States several theories as to the factors which cause mine subsidence, and attempts to determine formulas whereby the amount of subsidence may be calculated, knowing the compressive strength of the rock composing the overlying strata. 60c.

3558—MINE SUBSIDENCE—E. P. Johnson. (So. African Mines, Apr. 20, 1907; 1 p.) Deals with the cause and prevention of subsidences in mines, and shows how various careless practices in mining may result in bad accidents of this character. 20c.

3559—NEW SOUTH WALES—Mineral Industry of. F. S. Mance. (Eng. and Min. Journ., May 11, 1907; 2 pp.) Gives statistics of production of the principal minerals and metals of this state, and comments upon the development which the industry has undergone since 1905. 20c.

3560—NEW ZEALAND—The Mineral Resources of New Zealand. J. McCombie. (N. Z. Mines Rec., Mar. 16, 1907; 12 pp.) Deals with the present condition and future prospects of the mineral resources of this island, and the best means of fostering their development. 40c.

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3562—PROSPECTING in Ungava. J. C. Murray. (Can. Min. Journ., May 1, 1907; 3 pp.) Gives an account of a prospecting trip made by a party in this Canadian region, with descriptions of the rocks and [illegible]

3563—PROSPECTING with Keystone Drill for Copper Ore in the Ely, Nevada, District. C. E. Hart. (Eng. and Min. Journ., Apr. 27, 1907; 1 p.) Gives a general account of the use of churn drilling in this copper district, with statement of drilling costs. 20c.

3564—ROCK EXCAVATION—[illegible] Northampton Quarries of the Atlas Portland [illegible] Mfg. R. [illegible] May 18, 1907; ½ p.) Contains a general account of the methods of blasting rock used by this company, which found it more economical to substitute well-drilling machines for rock [illegible]

3565—SHAFT—Die nachtragliche Retonierung alterer in Holzausbau stehender Schächte. (Bergbau, Apr. 11, 1907; 1 p.) Gives an example of preserving a wood-lined shaft which had started to decay, by lining on the inside with brick and concrete, with but small reduction of the area. Sections of the [illegible] and [illegible] the [illegible]

3566—SIBERIAN MINES [illegible] Mining [illegible]

Conditions. A. L. Simon. (Paper read before the Instn. of Min. and Met., May 14, [illegible]. Gives a brief general outline of conditions in Siberian mining districts, dealing more especially with the methods of traveling, and the supplies necessary to be taken on trips.

3567—SOUTH AFRICA—The Centralization of Power Production on the Rand. Edward Walker. (Eng. and Min. Journ., May 18, 1907; ½ p.) Outlines mining conditions on the Rand where the peculiar [illegible] of the mining situation make it essential to adopt trust methods in the interests of profitable exploitation.

3568—STATE AID TO MINING—W. Broadbridge. (So. African Min. Rev., Mar., 1907; 3 pp.) Brief description of the policy adopted by West Australia in granting state-aid to mining proposi[illegible]

3569—STOPING SYSTEMS at Broken Hill, Australia. A. J. Moore. (Mines and Min., May 1907; 4½ pp.) Describes some of the stoping methods which have been devised to meet the conditions encountered here in mining large bodies of sulphide ores. 20c.

3570—TIMBER PRESERVATION. Preservation of Mine Timber from Decay. J. M. Nelson. (Eng. and Min. Journ., May 4, 1907; 3 pp.) From a lecture delivered before the employees of the Phila. & Reading Coal and Iron Co. A review and discussion of the experiments conducted by the Phila. & Reading R. R. and the U. S. Forest Service to determine the effect of preservatives upon the life of timber. 20c.

3571—UNDERGROUND PHOTOGRAPHY—Camera for Photographing Walls of Bore-holes. J. T. Atwood. (Eng. and Min. Journ., May 18, 1907; 2 pp.) Detailed account of the construction of an underground camera to be used in making a continuous photograph of the formations pierced by drill-holes so as to show the character and distribution of the ore and the intervening strata. 20c.

ORE DRESSING—GENERAL

3572—CONCENTRATING PLANT—The Hercules Mill. Scott Turner. (Min. and Sci. Press, May 4, 1907; 3½ pp.) Describes the equipment and milling practice at this mill which typifies the most improved lead-silver milling methods of Northern Idaho. 20c.

3573—CONCENTRATION — Separating Graphite or Molybdenite. J. F. Latimer. (Min. Wld., May 18, 1907; 1 p.) Describes the claims of a patented device for concentrating graphite and molybdenite and other minerals from gangue, in which the selective action of oil in water and centrifugal force to separate graphitic minerals from rocky mixtures, are the leading features. 20c.

3574 — CONCENTRATION — Vacuum-flotation Process for Concentration. Alexander Stanley Elmore. (Eng. and Min Journ., May 11, 1907; 2 pp.) Discusses the construction and capacity of the apparatus used in the Elmore vacuum concentrating process, describes the method of operation, and tabulates the [illegible] of the process upon a large number of different ores and [illegible]

3575—ORE CONCENTRATION by Oil. (Engineer, Lond., May 10, 1907; 1½ pp.) Gives elevation and sections of a standard Elmore concentrating plant, de[illegible] and gives tests on various ores treated by this [illegible]

[illegible] der Erzaufbereitung. U. Horel (Oest. Zeit. f. B. u. H., Apr. 20, 1907; 4 pp.) Outlines the progress of ore dressing during the last decade in Europe and describes the construction and working of several new types of concentrating tables, such as the Ferraris and the Overstrom. 40c.

[illegible] Press, May 11, 1907; 1 p.) Describes the design and operation of this concentrating table, which was devised to work on [illegible]

METALLURGY—GENERAL

3578—ELECTRIC SMELTING—Present State and Future of Thermo-Electric Metallurgy Generally and Thermo-Electric Siderurgy Especially. Ernest Stassano. (Paper read before the 6th Internat'l Congress of App. Chemistry, 1906; 35 pp.) General review of the present state of development of the art of electric smelting and outlines of probable direction of future progress.

3579 SMELTING PRACTICE—A System of Ore Bedding. (Min. and Sci. Press, Apr. 27, 1907; 1 p.) Describes principally by illustrations the extensive system of ore bedding in use at the Greene Cananea smelter in Sonora. 20c.

MINING AND METALLURGICAL MACHINERY

3580—AIR COMPRESSORS—Portable Electric Air Compressors. F. C. Perkins. (Mines and Minerals, May, 1907; 1½ pp.) Describes two types of electrically driven compressors which make it possible to have compressed air available in any desired part of a mine without the disadvantage of piping. 20c.

3581—AIR COMPRESSORS—Some Important Elements of Economy in the Straight Line and Duplex Types of Compound Air Compressors. L. I. Wightman. (Compressed Air, Apr., 1907; 6 pp.) Conclusion of article previously mentioned in the Index, enumerating in this instalment, the advantages of compounding duplex air compressors, with a discussion of the savings in power and operating conditions by the use of duplex compressors. 20c

3582 — BLAST FURNACE DEVICE — The Cananea Tuyere Valve. (Eng. and Min. Journ., May 4, 1907; 1 p.) Describes with detailed working drawing, the construction of an improved and unpatented tuyere valve which prevents an abnormal waste of air such as occurs with an ordinary ball valve. 20c.

3583—COMPRESSED AIR in Mining. J. H. Hart. (Eng. and Min. Journ., May 4, 1907; 1 p.) States the principles of operation of air compressors which are operated by falling water without the use of moving machinery. 20c.

3584—CONDENSATION—Cooling Towers. J. H. Hart. (Pract. Engr., May, 1907; 2 pp.) Outlines some methods of constructing cooling towers which are designed to avoid abnormal consumption of water for condensing exhaust steam, and discusses the relative efficiencies of various types. 20c.

3585—DIAMOND DRILL as an Ore Finder. James Humes. (Eng. and Min. Journ., May 18, 1907; ½ p.) Brief account of the use of the diamond drill at the Smuggler mine, Colorado, for prospecting purposes, and the discovery of ore which had been lost through faulting. 20c.

3586—DRILLS—Die Verwendung von Gesteinbohrmaschinen in Oberschlesien. (Glückauf, Apr. 27, 1907; 1½ pp.) Describes a few features of air drill practice, and gives costs of their maintenance and operation in the mining districts of Upper Silesia. 40c.

3587 EARTH TEMPERATURE Obus Thermometrique pour la mesure des températures dans les sondages. (L'Echo des Mines, Apr. 29, 1907; 1 p.) Describes the construction, mounting and use of this device for recording the temperatures met with in borings. The apparatus consists of a tube in which are placed ordinary and maximum thermometers. 20c.

3588—FLOW OF LIQUIDS AND GASES—Comparison of Formulas of Flow of Water, Steam and Other Gases. J. A. Donnelly. (Engrs. List, May 1907; 9 pp.) Enters into an analysis of various formulas for determining the velocity of flow in pipes and the capacity of mains, and compares these formulas by graphical charts. 20c.

3589 GAS ENGINES—Modern American and European High-Power Gas Engines. F. C. Perkins. (Can. Engr., May 3, 1907; 2½ pp.) Compares the relative merits of European and American engines, and describes especially the construction of the Nurnberg and Oeschelhoeuser blowing gas engines for iron and steel works. 20c.

3590 GAS MEASURING Messung grosser Gasmengen mittels Differenzdruckes. E. Stach. (Stahl u. Eisen, May 1, 1907; 5 pp.) Discusses the application of the principle of difference in pressure to the measurement of a quantity of gas, and describes apparatus of this nature designed to give a continuous record of the gas produced by a blast furnace or gas producer. 40c.

3591—HYDRAULIC POWER DEVELOPMENT—E. S. Hawkins. (Nat. Engr., May, 1907; 2½ pp.) Consideration of some of the principles applying to dam construction and the storage of water. To be continued. 20c.

3592 — HYDROELECTRIC POWER—Notes on Hydroelectric Plant Organization and Development. F. Osgood. (Proc. A. I. E. E., Apr., 1907; 21 pp.) Considers essential details and principles in the design and construction of all the aspects of hydroelectric plant organization and administration. 60c.

INDUSTRIAL CHEMISTRY

3593 — ATMOSPHERIC NITROGEN The Manufacture of Nitrates from Air. A. J. Lotka. (Eng. and Min. Journ., May 4, 1907; ½ p.) Abstract from *Chem. Ind.* 1905, p. 695, discussing the principles of the Birkeland and Eyde process of producing atmospheric nitrogen. 20c.

3594 WOOD PRESERVATION — La Conservation des Bois par les nouvelles Méthodes d'Imprégnation. L. Lemaire. (Génie Civ., Apr. 13, 1907; 3 pp.) Briefly considers causes of decay in wood and describes and comments on several leading processes for impregnating woods with various preservatives and causing them to resist decay. 40c.

ANALYTICAL CHEMISTRY

3595 ASSAY FURNACE—A Compound Assay Furnace. W. J. Fleck. (Min. and Sci. Press, May 4, 1907; ½ p.) Brief description of this assay furnace wherein the crucibles are heated first in a wood-burning portion then transferred to the gasoline half of the furnace where the fusion takes place with great speed. 20c.

3596 — ASSAYING—Laboratory Crucible and Muffle Furnaces. G. T. Holloway. (Instn. of Min. and Met., Bull. No. 32, May 9, 1907; 2 pp.) Discussion and contributed remarks on the above paper, which was previously mentioned in the Mining Index.

3597 — ELECTROLYTIC DETERMINATIONS and Separations with the Use of a Rotating Anode. J. Langness. (Journ. Am. Chem. Soc., Apr., 1907; 14 pp.) Tabulates comparisons between the ordinary method of determining metals electrolytically and by the use of a rotating dish anode, which has many advantages in the matter of speed and accuracy. 80c.

3598—ELECTROLYTIC PRECIPITATION OF COPPER from an Alkaline Cyanide Electrolyte. A. L. Flanigen. (Journ. Am. Chem. Soc., Apr., 1907; 3½ pp.) Gives the results of a set of experiments made to determine the accuracy and general suitability of the process of electrolysing copper from alkaline cyanide solutions the advantage of which is the adherence of the copper to the electrode, there being no tendency to sponginess. 80c.

3599 IRON On the Colorimetric Determination of Iron with Special Reference to Chemical Reagents. H. N. Stokes and J. R. Cain. (Journ. Am. Chem. Soc., Apr., 1907; 32 pp.) A very thorough discussion of all the aspects of this method of iron determination, including many methods for the concentration of traces of iron from other metals, so as to avoid the errors due to large amounts of salts of these metals being present in the solution. 80c.

MATERIALS OF CONSTRUCTION

3600 CONCRETE Tests of Concrete and Reinforced Concrete Columns, Series of 1906. A. N. Talbot. (Bull. No. 10, Univ. of Ill., Eng. Experiment Station, Feb. 1, 1907; 61 pp.) Records the results of tests upon reinforced concrete columns, with extended discussion on the materials, test-pieces and methods of testing, and a review of the results obtained.

3601 REINFORCED CONCRETE: Its Limitations. C. Gayler. (Journ. Assn. of Eng. Societies, Apr., 1907; 14 pp.) Gives an interesting summary of some of the lines along which the design and construction of reinforced concrete has [illegible] kept pace with other features 40c

The Engineering and Mining Journal

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The Metallurgy of Aluminum in 1906

Reduction Capacity Is Being Enlarged and the Output for 1907 Is Expected To Be Several Times as Great as That of 1906

BY JOSEPH W. RICHARDS*

The year 1906 was a great activity in all details of the aluminium industry. Four firms in Europe and one in America practically control the industry, being owners of a large part of the beds of bauxite, and also of the best water powers conveniently accessible. The unusually high prices of copper, tin, nickel and zinc, as well as the other metals, during 1906, stimulated the demand for aluminium to such an extent that much more could have been sold than the companies were able to produce; this condition held strongly all the year, and was, in fact, most marked at the end of the year.

Note—From advance sheets of *The Mineral Industry*, Vol. XV.

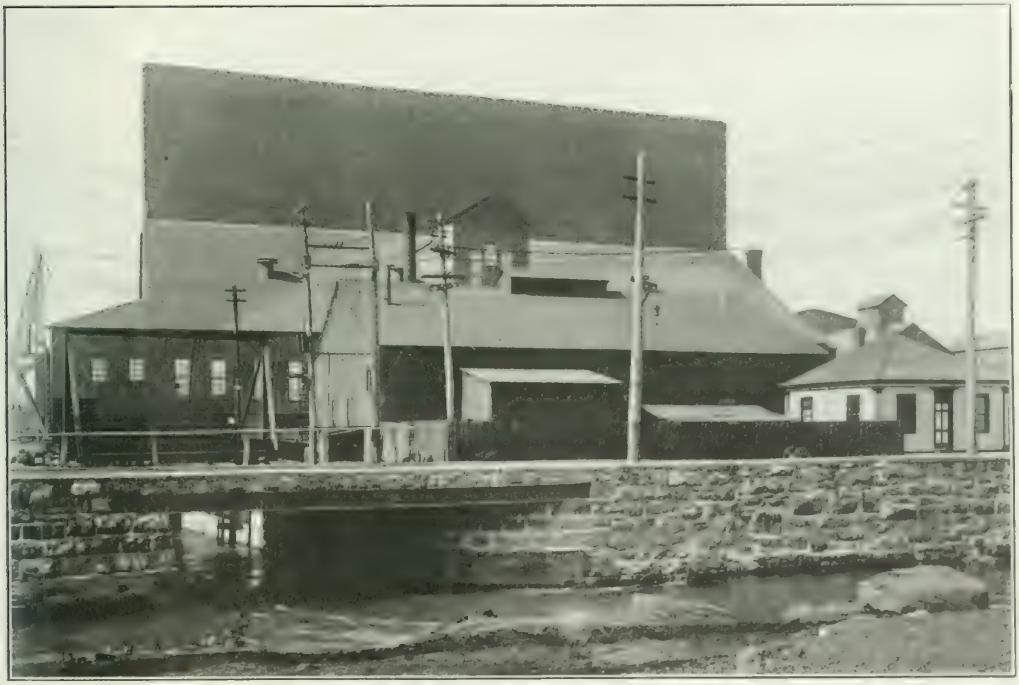
Note—In determining the spelling of Professor Richards has preferred spelling aluminum, but upon the request of the JOURNAL to spell aluminium. Editor.

*Professor of metallurgy, Lehigh University, Penn.

United States—The Pittsburg Reduction Company (now the Aluminum Company of America) was the only producer. It owns large bauxite deposits in Georgia, Alabama and Arkansas, obtaining, however, most of its ore from Saline county in the latter State. It has done a large amount of stripping and development work at its mines at Bauxite, Arkansas, also is just completing there a new crushing, grinding and drying plant, and has built a railroad called the Bauxite & Northern, connecting all of its mines in that region with the Chicago, Rock Island & Pacific Railroad and the Missouri Pacific and Iron Mountain systems. This company has realized that reserve stores of bauxite are as essential to the welfare of a large aluminium company as reserves of iron ore are to a great steel corporation, and it has accordingly spent large sums of money in purchasing bauxite lands both in the eastern district—Georgia and Alabama—and in Arkansas.

Concerning the production of pure alumina, this company has enlarged to great dimensions its chemical plant at East St. Louis. The process used is the same as heretofore, but the capacity of the plant has been increased several times. The power for the plant is furnished by condensing turbine engines; the evaporating plant is the most complete and largest of its kind ever built.

The carbons used in the reduction are now manufactured entirely by this company, being baked in electrically heated furnaces patented by Chas. M. Hall. The old plant for making carbons, at the upper Niagara works, has been practically torn



LOWER WORKS, ALUMINUM COMPANY OF AMERICA

down and rebuilt to three times its previous capacity; the buildings are of steel, with traveling cranes and every up-to-[illegible] the new plant has an equipment and capacity equal to that of any other carbon-electrode plant in the world.

The rolling and sheet mills of the company have been correspondingly enlarged; a new mill for this purpose is in course of construction at Niagara Falls. This is of reinforced concrete, and when finished will be one of the largest and most complete sheet-rolling mills in America.

The work thus done by this company within the last three years, in plants and processes entirely outside of the reduction of the metal, has been on a scale which, remembering the former infancy of the aluminium industry, may be properly characterized as "stupendous." The investments thus made in these accessory enterprises have amounted to several millions of dollars.

Enlarged Reduction Plants

The reduction plants of this company, at Niagara Falls, Massena, N. Y., and Shawinegan Falls, Quebec, Canada, are all in process of being greatly enlarged. At Niagara Falls the lower plant, using power supplied from the canal of the Niagara Falls Power and Manufacturing Company, which has heretofore been reported as of 12,000 h.p. capacity, has been increased by the building of a very large plant to use 45,000 h.p., consisting of five units of 9000 h.p. each. Two of these units (18,000 h.p.) will be in operation by May, 1907, and the whole plant in June, 1907. At Shawinegan Falls the company is quadrupling its already large capacity and expects the new plant to be finished ready for operation in April, 1907. This plant is nominally controlled by the Northern Aluminium Company, which is a subsidiary company of the American company, and manufactures aluminium chiefly for export; it is expected that this increased capacity will exceed the demands for export, but the company is intent upon providing reserve facilities equal to all possible demands of the near future.

At Massena the company has purchased the entire plant of the St. Lawrence River Power Company, with its canal and power house of 40,000 h.p. capacity, and is actively preparing to dredge out the canal to double this capacity. One of the largest of modern dipper dredges and the most powerful elevator dredges ever built have been installed ready to commence operations as soon as the winter is over. The complete dredging plant has cost over a million dollars. A new power house for this enlarged capacity will be started in 1907, and eight large water wheels, to absorb the capacity of the first canal, have been purchased and will be placed in position in the old power house within a few months. The output of this plant in 1907 will be from two to three times the output of 1906.

The difficulty of hurrying hydraulic construction work, and the very great difficulty in getting materials moved and work done on contract time, has delayed the plans of this company, as it did that of business in general in 1906, and the construction and installation work which it was expected to have completed by the end of 1906 will be completed between that date and June 1, 1907. At the latter date it is confidently expected that the output of American aluminium will be several times as great as the average output in 1906. The company has been as sensible of the shortage of aluminium in the market during 1906 as have its customers or would-be customers, and hopes by these liberal expenditures of several millions of dollars to keep ahead of all demands in the future.

European Reduction Works

Great Britain—The British Aluminium Company is undertaking large extensions of its plant in Scotland.[1] It has commenced to construct a dam near Kinloch-levan, which will form a reservoir with a capacity of 20,000 million gallons, supplied by a water-shed of 55 square miles, which has the largest rainfall in Great Britain. This reservoir will be 7.5 miles long by 0.5 mile wide, obliterates three lakes, is 1000 ft. above sea-level and only five miles from the coast. A concrete conduit will convey water 3.5 miles, where it will connect with a short pipe line delivering the water to turbines at about 900 feet head. The dam is of concrete, 0.5 mile long, 80 ft. high in the center, and will cost $2,000,000; the rest of the water power scheme will cost $500,000. The horse-power expected from this expenditure is 20,000, but it should be at least 50,000, to correspond with the cost of the water works. The Foyers works will be enlarged from 6000 to 15,000 h.p., by the hydraulic works there nearing completion. The same company has acquired water power at Sarpsfos, Norway, but how much has not been stated. A plant is also contemplated by it in Wales. United States Consul Guenther, at Frankfort, estimates the output of this company in 1906 as 2250 metric tons.

Germany—The Aluminium Industrie Aktien Gesellschaft, operated mostly by German capital, has works at Rheinfelden, Baden (near Basel), at Neuhausen, Switzerland (at the Rhine falls), and at Lend Gastein in upper Austria. This company is financially very successful, having paid 18 per cent. dividends in 1904 and 22 per cent. in 1905, on a capital of $3,000,000; in 1906 it floated $5,000,000 additional capital stock, which was taken by a syndicate of Berlin bankers at 150 per cent. premium. It employs 88 officials and 661 workmen, and produced 3675 tons in 1905.[2] It operated, however, 24,000 h.p. in 1906,[3] and must have produced with this about 5500 metric tons. Active enlargements of this company's plants are in progress, such that it expects to be operating 100,000 h.p. toward the close of 1907, and 120,000 h.p. in 1908. This would give its probable production for 1907 as somewhere about 13,000 tons, and its capacity in 1908 as 27,000 tons. This company also runs an alumina plant at Deutsch Lissa, Silesia, where 200 workmen are employed.

France—The Société Electrométallurgique Française, at Froges, La Praz and Les Sordrettes (St. Michel) has at its command 20,000 h.p.[4], but is said to be producing only 2300 tons annually, which would correspond to about half that power. Enlargements of 12,000 h.p. at Vénéon (Isère) and 10,000 h.p. at Bissorte (Savoy) are said to be contemplated.

The Société des Produits Chimiques d'Alais et Carmague has 11,000 h.p. at Calypso and 2500 at St. Félix, and is said to be contemplating 12,000 additional at St. Jean (Savoy). Consul Guenther reports its output as 2000 tons, which would correspond fairly well with its reported available power.

A new plant of 30,000 h.p. is said to be proposed for Chippis, in the Valais, French Switzerland. Another plant is spoken of at Aube, in the Pyrénées, of 25,000 h.p.; and one in the southwest of France of 10,000, but they are at present only propositions.

Italy—For some time it has been known that bauxite exists in Italy, though probably not of high grade. A company has been recently incorporated, called the Aluminium Society, which expects to start operations early in 1907 in the Pescara valley, where 30,000 h.p. is available, and 14,000 h.p. is already installed for various electro-chemical purposes. The aluminium plant is reported to cover 40,000 sq.m., and to be connected by cableway with its bauxite mines at Lecce di Marsi. The details so far made public are hazy and somewhat confused.

Other Countries

Canada—It is rumored[1] that a $10,000,000 company is being organized in Canada, to utilize Canadian water powers for manufacturing aluminium.

India—Recent discoveries in the central provinces of bauxite carrying 51 to 68 per cent. of alumina, and of deposits in Bengal and near Bombay carrying 43 to 65 per cent., have revived hopes that eventually an aluminium industry to supply the local market might come into existence in India. Alfred Chatterton, who has done so much in the Industrial School at Madras to teach the native metal workers to manufacture aluminium ware, writes of the present situation, in the Madras *Mail*,

[1] *Electrochem. and Met. Ind.*, Sept., 1906, From the London *Electrician*.
[2] U. S. Consular Report. Consul Guenther, Frankfort.
[3] *Metal Industry*, January, 1907.
[4] R. Pitaval, *Journal de l'Electrolyse*, Oct. 15 and Nov. 1, 1906.
[1] *Metal Industry*, December, 1906.

as follows: At the present time India absorbs less than 100 tons of aluminium yearly; it could be easily increased to 1000 tons. The Indian army uses it for canteens, water bottles, and cooking pots. Most Europeans in India use aluminium cooking utensils. The natives use so much acetic, tartaric and citric acids in their cooking, in combination with salt, that their food rapidly corrodes aluminium. Since 1898, a good market has been started, and if works were established, with the cheap bauxite, power and labor, aluminium could be produced very cheaply, to supply an established and easily enlarged market."

General Remarks

While but few countries are now producing aluminium, yet the prospects are very likely that countries with very abundant and cheap water powers, like Norway, or with cheap labor and water powers like India and Japan, will not long stay out of the ranks of the producers. The total production in the world, in 1906, was probably not far short of 19,000 metric tons, valued at $12,500,000, but 1907 will probably double that output, and 1908 double that of 1907. These figures are admittedly guesses; they are given because they are thought to be intelligent ones.

Aluminium Salts

Carbonate—The existence of true aluminium carbonate has been doubted by some chemists. A. Gawalowski[2] has studied the question and has prepared a carbonate at ordinary atmospheric pressure which is insoluble in water and contains 8 to 9 per cent. of alumina. Prepared at eight atmospheres pressure, a polycarbonate is obtained, completely soluble to a clear solution in water. On reducing the pressure, [illegible] and at atmospheric pressure the carbonate first mentioned precipitates. The filtrate from this still contains some carbonate in solution; on warming it to 25 or 30 deg. C., or keeping it in the air, it deposits a carbonate containing 2 to 3 per cent. of carbon dioxide and 50 per cent. of alumina. The bearing of these facts on the possible *modus operandi* of the hot-spring deposition of bauxite is at once evident. At a depth of 320 ft. a hydrostatic pressure of eight atmospheres would exist, under which alumina would dissolve completely in a carbonated water, and could thus be leached out of aluminous rocks and subsequently deposited at the surface practically as bauxite, where the pressure is relieved.

Processes of Reduction

Hall Process—Francis R. Pyne[3], working in the metallurgical laboratory of Lehigh University, has investigated the melting points of mixtures consisting of cryolite and alumina, thus reproducing one of the mixtures covered by the Hall patents (now expired). In commercial practice more aluminium fluoride than is contained in cryolite is used in the composition of the bath. Mr. Pyne's results were as follows:

MELTING POINTS OF CRYOLITE—ALUMINA MIXTURES

Cryolite.	Aluminum.	Melting Point.	Cryolite.	Aluminum.	Melting Point.
100		1,000° C.	93	7	[illegible]
97	[illegible]	974	[illegible]	[illegible]	992
[illegible]	3	966	90	10	980
96	4	945	85	15	934
94	6	960	80	20	1,045

From Am. Electrochem. Soc., Vol. X, *Electrochem. and Met. Ind.*, November, 1906, p. 435.

The maximum melting point is 1045 deg. C., with 20 per cent. alumina, at 980 deg. between there is a minimum, about 934 deg. at 15 per cent. alumina, corresponding fairly well with the proportions of the possible compound $Al_2F_6.3NaF.Al_2O_3$. The half way point, 10 per cent. alumina is indicated as probably the best for electrolytic reduction.

The original Hall patents, covering the electrolysis of a melted bath consisting of double fluoride of aluminium and a more positive metal, as the solvent, and alumina dissolved therein, expired April 2, 1906, and as such are now the property of the public. The working of these, or of any melted electrolyte for obtaining aluminium without the use of external heat, operated solely by the internally generated electrical heat of the decomposing current, is still covered by the Bradley patents, according to the decision of the courts, and these latter do not expire until February, 1909. The public is therefore free to use the Hall process, as formerly covered by the Hall patents, but in doing so must not infringe on the manner of working covered by the Bradley patents.

UPPER WORKS, ALUMINUM COMPANY OF AMERICA

Gin Process—Gustav Gin[1] seeks to revive the old Deville-Castner sodium-reduction process in a modified form. He would first make aluminium chloride by mixing bauxite with 25 per cent. of its weight of authracite dust and 10 per cent. of tar, compressing into balls, heating in a retort to redness and passing chlorine, thereby volatilizing aluminium chloride, contaminated by ferric chloride. The latter is removed by pouring liquid zinc into the sublimation chamber, which is then closed and slightly heated, resulting in reducing the iron chloride to the metallic

[1] *Metal Industry*, October, 1906.
[2] *Chemisches Central Blatt*, 1906, i, 640.
[3] *Revue Industrielle*, July 14, 1906.

heated to 500 deg. C. and the aluminium chloride vapor allowed to escape through a heated tube, where it comes in contact with melted zinc-sodium alloy, resulting in the reaction:

Both zinc and sodium are said to act as reducing agents under these conditions, giving aluminium containing about 1 per cent. of zinc. This is purified by casting it into the channel of an electric furnace on a refractory hearth, the end terminals being large blocks of aluminium. A channel 10 sq.cm. in cross section by 25 m. total length containing 100 kg. of aluminium needs 10,000 amperes at about 25 volts tension, and is heated to whiteness, so that the zinc volatilizes completely, in a few minutes. The zinc-sodium alloy is produced electrolytically from the slag produced in the reducton, by adding to it NaCl and KCl and electrolyzing it until all the zinc in it and most of the sodium is deposited.

My chief comment on the above is that a person not compelled to use this process could take the same current which produces the $ZnNa_2$ alloy and with it prepare the same 4Al *direct* from a Hall bath, without any of the costly operations of making aluminium chloride, reducing it or refining the aluminium from zinc.

The Sulphide Corporation

In 1906 this company, of Broken Hill, N. S. W., produced 135,742 tons of ore, as compared with 238,166 tons in 1905. The falling off in quantity was due to the creep in the Kintore shaft in the Central mine before the new hauling shaft was completed and ready for service. The extraction of ore was almpst completely prevented for nearly two months. Later in the year a further extensive settlement of the upper and partially disused stopes at the northern end of the mine occurred along the crown of the lode, throwing the ore-dressing mill completely out of work and affecting the workings by closing important gangways down to the 500-ft. level. Extraction and milling operations were consequently entirely suspended during the last month of this financial year.

It is not expected that much future trouble will be experienced from creeps, as the developments in the workings at the 700-ft. and 1000-ft. levels insure a regular extraction for the new mill, and the mistakes made in failing to secure the ground while mining the upper levels will be avoided. The future policy of the management will be the reverse of what it was hitherto. The larger extraction of ore will be made in the lower workings. By restricting the extraction in the upper levels and carefully filling the ground it is believed that in future little trouble will be experienced from creeps.

During the period covered by the report 26,370 cu.yd. of tailing from the re treatment plant were sent into the workings for use in refilling stoped ground. The results being satisfactory, the practice will be regularly pursued in the future.

The new main shaft has been sunk below the 900-ft. level, and will be carried down below the 1000-ft. level to enable the large orebodies between the 800-ft. and 1000-ft. levels being worked. The shaft was equipped during the year with an electrical hoist which is operating satisfactorily. The average cost of the electrical power, which is generated by steam in the mine, is under 1d. per horse-power hour.

The lead-concentrating plant treated 136,172 tons of ore, which produced 24,607 tons of concentrates. The total stock of middling, slime and tailing now at the mine amounts to 1,136,302; the increase in 1906 being 4341 tons. The tonnage capacity of the re-treatment plant is now nearly equal to the output of residues from the lead-concentrating plant. During the year plans were drafted for a new lead-concentrating mill for dealing with ore and its residuals in a single continuous operation. A position which is free from injury from any earth movements in the mines was chosen for a site on the North Central mine, and its erection was commenced. It is expected to be completed and ready for operation early in 1907.

Two products will be obtained from this mill, viz.: lead concentrates and zinc concentrates. The value of the products handled last year was as follows: 24,607 tons of concentrate, forming 18.1 per cent. of the material treated, averaged 31 oz. silver, 60.8 per cent. lead and 10 per cent. zinc; 11,912 tons of slime, forming 8.7 per cent. of the material, averaged 15.5 oz. silver, 16.6 per cent. lead, and 21.7 per cent. zinc; and middlings and tailing, forming the remaining 73.2 per cent. of treated material, assayed 6.6 oz. silver, 5.3 per cent. lead, and 20 per cent. zinc per ton. The milling costs, including crushing of ore and maintenance equaled 4s. 6d. per ton.

The magnetic plant practically exhausted the stock of available middling product. The plant was originally designed for dealing with material carrying 26 per cent. zinc, and as the dump became well worked down it was found that the value of the material in zinc rapidly decreased and much care and attention was required to so modify the machinery as to enable it to make a satisfactory extraction. Last year the magnetic plant treated 33,737 tons of middling, having an average assay value of 9.2 oz. silver, 8.5 per cent. lead, and 24.1 per cent. zinc. The zinc-concentrate returns amounted to 11,465 tons, assaying 14.5 oz. silver, 13.3 per cent. lead, and 35.9 per cent. zinc. This represents a recovery of 53.8 per cent. silver, 53 per cent. lead and 50.8 per cent. zinc.

The tailing plant treated 47,326 tons assaying 6 oz. silver, 5.2 per cent. lead, and 21.8 per cent. zinc, from which 17,753 tons of zinc concentrate were obtained, having an assay value of 9 oz. silver, 7 per cent. lead, and 39.6 per cent. zinc. This is equivalent to a recovery of 55.6 per cent. silver, 50.2 per cent. lead, and 68.1 per cent. zinc.

In the granulation mill 23,709 tons of tailing and slime were treated, the average assay value being 7.4 oz. silver, 6.4 per cent. lead, and 20.4 per cent. zinc. The returns were 8013 tons of zinc concentrate assaying 14.8 oz. silver, 11.8 per cent. lead, and 44 per cent. zinc. This amounts to an extraction of 67.3 per cent. silver, 62.1 per cent. lead, and 72.8 per cent. zinc. During the year numerous improvements were made in the process. It was found that when the ore is regularly crushed to an approximately uniform fineness, action is very rapid, complete and satisfactory, while the recovery is high and the grade of the product is good. The limit of the recovery and economy in costs have not yet been properly ascertained. The success attendant upon experiments made with slime induced the company to undertake the erection of a plant immediately for the exclusive treatment of the dump which now contains about 119,673 tons of the material.

The zinc-distilling plant treated 3029 tons of concentrate for a return of 859 tons of spelter. An additional furnace was placed in commission, and ran without intermission. The spelter produced is of high quality, and is easily disposed of in the Orient. The recovery of silver and lead is satisfactory.

The company's smelter at Cockle Creek, near Newcastle, treated 68,742 tons of concentrate and ore for a return of 21,559 tons of bullion containing 86,594 oz. of gold, and 1,532,486 oz. of silver.

Residue from Zinc Smelting

After the distillation of zinc has been completed, the residue raked out of the retort is a cinder composed of unburned coal mixed with the gangue of the ore, the latter being fused to a more or less degree, according to its ingredients. This cinder contains the major portion of the lead (to some extent as metallic globules, to some extent as silicate and other compounds) and practically all of the silver of the roasted ore. The cinder also contains a varying percentage of zinc, ordinarily from 4 to 7 per cent. The proportional weight of the cinder with respect to the roasted ore charged into the retorts varies with the character of the ore, and the practice in its distillation. In the distillation of ordinary ore, assaying 45 to 50 per cent. zinc, the residue generally amounts to 60 to 70 per cent. of the weight of the ore charged, say 66 2/3 per cent. as a mean. Under certain conditions, however, as at Cockle Creek, New South Wales, it may amount to 100 per cent.

Behavior of Carbon and Phosphorus in Steel

A Discussion of J. E. Stead's Explanation of the Banding of Carbon and Phosphorus and the Theory of Incompatibility

BY HENRY M. HOWE*

In an important paper on the "Crystallization and Segregation of Steel Ingots,"[1] J. E. Stead gives some very valuable information as to the behavior of carbon and phosphorus in steel.

In order to understand what he reports, let us refresh our memory as to what carbon steel consists of. It is necessary not only for the metallurgist but also for the engineer to understand this constitution of steel, if he wishes to treat intelligently the steel which he uses, and to discuss that treatment.

In its normal or slowly cooled state any true carbon steel[2] with less than 0.90 per cent. of carbon consists essentially of a conglomerate, such as is shown in Fig. 1, of masses of free iron or "ferrite," and other masses of pearlite, which latter in turn consists of alternate bands or plates of ferrite and of a hard iron carbide (Fe_3C), called "Cementite," interstratified in the ratio of about 6.5 of ferrite to 1 of cementite. The ferrite is often arranged in a net work, surrounding meshes or islands of pearlite, as shown in Fig. 1.

The composition of the pearlite itself is constant, and so is that of the ferrite. As the carbon present is contained wholly in the cementite of the pearlite, the proportion of the whole mass which the pearlite forms increases with the carbon-content of the steel, so that whereas a very low carbon steel consists of nearly pure ferrite, a steel of 0.90 per cent. carbon consists of pure pearlite without any ferrite.

To distinguish the ferrite which forms part of the pearlite from that which exists apart from the pearlite in the form of a net-work or otherwise, the latter is called "free" ferrite or "excess" ferrite.

These constituents of steel, and the general features of their life history, should be familiar to every engineer.

Changes Brought about by Heating and Cooling

Let us now pass on to consider what happens to these substances, the pearlite and the excess ferrite, when the steel is heated and cooled.

The constitution which I have just sketched remains constant in heating until a critical temperature near 700 degrees C., technically called A_1 is reached (See Fig. 2.)

On passing A_1, the whole of the pearlite is quickly changed into a new substance called "austenite," which is nearly homogeneous, and is what is called a "solid solution" of carbon (or perhaps of an iron-carbide) in iron.

As the temperature rises farther, the excess ferrite in turn dissolves progressively in this austenite, and by the time the temperature has reached the point called A_3, this dissolving of the ferrite in the austenite has completed itself, so that the mass now consists of a single nearly homogeneous substance, austenite. The temperature of this point A_3 varies from about 700 deg. in case of steel of 0.90 carbon, to about 900 deg. in case of steel practically free from carbon.

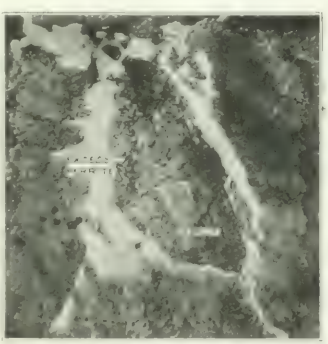


FIG. 1. SLOWLY COOLED CARBON STEEL (B. STOUGHTON)

The white network is the excess ferrite or free iron. The zebra-banded islands or meshes are pearlite with white bands of cementite (the iron carbide Fe_3C) and black bands of ferrite. The ferrite in this pearlite looks black, because in polishing it has been furrowed down into grooves, and these grooves look black, because they are filled with shadow.

When such steel is again cooled, as indicated by the arrows in Fig. 2, the process which has just been sketched is reversed; that is to say, when the steel cools as far as A_3, part of the iron contained in the austenite begins to separate out from that austenite in the form of "free" or "excess" ferrite, often in the form of a network, as shown in Fig. 1. This separation of ferrite continues as the temperature sinks from A_3 toward A_1, so that it is in this region, A_3 *to* A_1, that the white network of ferrite shown in Fig. 1 comes into existence.

By the time that the temperature has finally fallen as far as A_1, the formation of the "excess" ferrite network has become practically complete, and now a new change suddenly takes place. This change is called the "recalescence," and consists in a sudden spontaneous decomposition of the remaining austenite into pearlite. This brings the steel back into the condition with which we started, a network of excess ferrite, formed in the passage from A_3 to A_1, surrounding meshes of pearlite formed in crossing A_1.

The Phenomena of Banding

So much for the general idea of the constitution of steel, and of the life history of its constituents. Now let us pass on to consider the phenomena of banding, concerning which Mr. Stead gives us some new information.

It was shown long ago that the ferrite and pearlite of rail steel were sometimes concentrated in bands parallel with the direction of rolling. As the carbon is contained wholly in the pearlite, this is equivalent to saying that there is a longitudinal banding of the carbon itself.

That such a banding should arise in rolling is readily understood, because of the difference in hardness between the pearlite and the ferrite. The pearlite, because of the extremely hard cementite which it contains, is much harder than the excess ferrite, and we can readily understand that this difference in hardness should cause the harder and the softer constituents to be drawn out into parallel bands in the same way in which the cinder and the metallic iron of common wrought iron are drawn out into such bands in rolling.

It is natural to suppose that rolling can induce this banding only when the steel is below A_3 because only then does it consist of two distinct substances. When it is above A_3 it consists of austenite, and because this is homogeneous or nearly so, we see no way in which rolling should cause banding. When the steel is between A_3 and A_1, it is a conglomerate of austenite and ferrite, of which the latter increases in quantity as the temperature sinks toward A_1; when it is below A_1 it is a conglomerate of ferrite and pearlite. Therefore, the condition which should enable rolling to cause this drawing out or banding, is that the steel should be either below A_1, so that it is a conglomerate of the harder pearlite and the softer "excess" ferrite; or, if above A_1 that it should be only slightly above, so that with the austenite there should be mechanically

*Professor of Industrial Science, School of Mines, Columbia University, New York.

[1] Chemical Institute, 2 Physics Soc. of Lond.

[2] The term "carbon steel" is used to distinguish the structural, rail and other common steels from the "alloy steels" such as the rapid-cutting tool steels, etc. The former [illegible] and iron.

softer excess-ferrite.

[illegible] Phosphorus

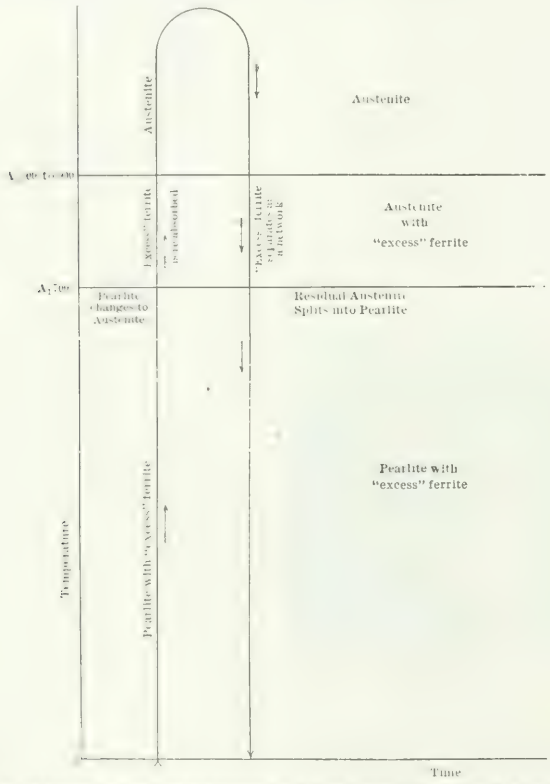
The points to which Mr. Stead calls our attention are (1) that when the steel is heated well above A_3, that is when the ferrite and pearlite merge together as austenite, this banding of carbon is wholly removed if phosphorus is absent; but (2) that it is persistent or at least recurrent if much phosphorus is present. Further (3), that in phosphoric steels there is a persistent banding of the phosphorus itself. Let us take up these three points separately.

(1) *The transitoriness of the banding of carbon in non-phosphoric steel.* If non-phosphoric steel is rolled at temperatures materially below A_1, so that there is much drawing out of the ferrite and the pearlite into bands, with implied banding of the carbon, this banding is slowly effaced if the steel is held long enough above A_3 to allow the carbon to diffuse from the parts which had been pearlite into those parts which had been occupied by the ferrite network, and hence had been free from carbon while the steel was below A_1. And because the banding has thus been effaced, when the steel again cools below 700 deg. and changes into the normal mixture of pearlite with ferrite, these two components are no longer banded, but are uniformly distributed. Thus the fact that the banding of the carbon in steels free from phosphorus is not persistent is readily understood.

(3) *The banding of the phosphorus.* Before going on to consider the second point, the persistence of the banding of carbon in phosphoric steel, we shall do well to examine the third point, the banding of the phosphorus itself, and its persistence. Mr. Stead's explanation seems to be as follows:

When, with the cooling of the steel across A_2—A_1, the excess-ferrite network gradually forms, a disproportionately large quantity of the phosphorus present leaves the austenite to associate itself with this ferrite network, so that, when the steel has cooled below A_1, a large part of the phosphorus has been concentrated into the ferrite network, and an unduly small part of it remains in the pearlite meshes. If in this state of affairs the steel is rolled, the softer ferrite and the harder pearlite are drawn out into bands by that rolling; and the drawing out of the ferrite into bands incidentally involves drawing out into those same bands the phosphorus which that ferrite contains, so that after rolling the steel consists of bands abnormally rich in ferrite and phosphorus and poor in carbon, alternated with bands abnormally rich in pearlite and poor in phosphorus.

The genesis of this banding of the phosphorus thus understood, there is no difficulty in understanding how it comes to persist. This simply implies that when the steel is changed into austenite by heating above A_3, the phosphorus does not diffuse, or diffuses only very slowly, away from the bands into which it has been drawn out by the rolling.



[illegible] THE CONSTITUTION OF CARBON STEEL WITH RISE AND FALL OF TEMPERATURE

Incompatibility of Carbon and Phosphorus

(2) *The persistence of the banding of carbon in phosphoric steel.* The final question then arises, how is it that the presence of phosphorus leads to persistence of the banding of the carbon, so that exposure to a temperature well above A_3, which effaces the banding of carbon in non-phosphoric steel, does not efface it in phosphoric steel? Mr. Stead's explanation, as I understand it, is that even in the austenite state there is a certain incompatibility between carbon and phosphorus, so that in that austenite state the carbon does not diffuse into the bands rich in phosphorus, or diffuses only slowly into them. The consequence is that when the steel again cools below A_1, the phosphoric bands remain abnormally poor in carbon, and the alternate bands relatively free from phosphorus remain abnormally rich in carbon. Hence the former, because of their poorness in carbon, thus become abnormally rich in ferrite; the latter, because of their richness of carbon, become abnormally rich in pearlite.

The sum of this is:

(1) In the passage from the austenite to the pearlite state in cooling from A_3 to A_1, the phosphorus concentrates in the free or excess ferrite network.

(2) Rolling below (or but little above) A_1 causes (A) a banding of the harder pearlite, alternated with the softer ferrite, and (B) with the latter a banding of the phosphorus which had been concentrated in it.

(3) The slowness of the diffusion of the phosphorus in the austenite state makes this banding of prosphorus persist through any reheating.

(4) The incompatibility of the carbon and phosphorus restrains the carbon from diffusing fully into the phosphoric bands in the austenite state, and so makes the banding of carbon persist.

(5) The persistence of the banding of carbon makes the banding of ferrite and pearlite recur in phosphoric steel when the steel cools from the austenite state above A_3 into the pearlite state below A_1.

It is not pretended that the above theory is fully proved, but at least it serves the true purpose of every theory, to group the facts in a comprehensible way and to show the path by which the theory itself can be confirmed or replaced by a better.

The above steps, from (3) on, rest on the assumption of an incompatibility between carbon and phosphorus in the austenite state. This indeed sounds a little like Nature's abhorrence of a vacuum, but the idea is more reasonable than the language. What is implies is no more than that in the austenite state the phosphorus diffuses only slowly, and that the carbon diffuses only slowly into those parts of the austenite which are rich in phosphorus. This latter idea seems to be a necessary part of the explanation; because the mere persistence of the banding of phosphorus due to the slowness of its diffusion, would not explain the persistence of the banding of the carbon which the persistence of the banding of the ferrite and pearlite implies as its own cause.

Additional Evidence

Mr. Stead presents further evidence to show incompatibility between carbon and phosphorus. First, he heated to whiteness a pile composed of plates of pure iron free from phosphorus and carbon, between which was powdered some phospho-carbide of iron containing 1 per cent. of carbon. This treatment welded all the plates together, and after the mass had been slowly cooled it was found that the carbon had left the phosphide joint completely and diffused into the plates of pure iron.

The complete freedom of the phosphoric joint from carbon seems to imply an even greater degree of incompatibility between carbon and phosphorus than the explanation which I have above offered calls for. It seems to imply one of two things.

Either (1), in the austenite state, the carbon and phosphorus, instead of diffusing into each other like two gases, tend rather to draw apart, each withdrawing from the other.

Or (2), there is such mutual repulsion between carbon and phosphorus in the birth of the excess-ferrite network as the steel cools across the region A_2 A_1, as to cause a bodily withdrawal of the carbon from the phosphoric joint.

These explanations certainly remind us unpleasantly of vacuum-abhorrence, and we naturally hope for some easier one. There is a third and easy explanation which, unfortunately, breaks down on examination. It is as follows:

The birth of the network of excess ferrite in the cooling of the steel from A_2 to A_1 indeed implies an expulsion of the carbon from the space which that network occupies. While the steel is austenite, any such pre-existing network is effaced, and the carbon diffuses from the meshes into the space where the network had been. When the network of ferrite re-forms, the carbon is expelled from it, precisely as an impurity contained in freezing water is expelled by the freezing ice and concentrated in the mother water. Here, then, is a forcible expulsion of carbon; those molecules of carbon which had been in the space where the ferrite network now forms, migrate from their position in that space into a new position in the meshes between the network. This migration, though it is in itself astounding like every other operation of nature taken by itself, yet is now as familiar as the falling of an apple to the earth, itself intrinsically as marvelous. Now, may not the presence of phosphorus in the austenite cause an increase in the quantity of this ferrite network which forms in cooling from A_2 to A_1, and thus increase the width of each ferrite band in that network, and narrow the meshes of pearlite between that network, and thus finally increase the distance which the carbon has to migrate in order to remove itself from that network and leave it carbonless? May not the expulsion of carbon which Mr. Stead finds, be of this nature, implying that the pearlite itself is richer in carbon, so that the carbon-content, at which the steel consists of pearlite alone when slowly cooled, instead of being 0.90 per cent., as usual, may be much higher?

The Migration of Carbon

This acceptable explanation breaks down when we consider it farther. If his report is accurate, and there are few metallurgical observers at once so competent and so experienced as he, we are forced to think that the migration of the carbon away from the joints between his plates is not of the kind here considered. Had the carbon, which was initially 1 per cent. in his joints, simply diffused out into the adjoining plates uniformly, so that the percentage of carbon left in the joint was the same as that in the plates between those joints, then when the steel cooled from A_2 to A_1, and the ferrite network formed, even if the higher phosphorus in the joint should cause a thicker network of ferrite and smaller meshes of pearlite there, this would not in itself imply, it would not even suggest, a migration away from the joint, unless for microscopic distances. It would imply only that in the joint the network of ferrite would be thicker, and the meshes of pearlite smaller than elsewhere. There would still be the same quantity of carbon in the joints as in the plates themselves between those joints; and the only difference between the joints and the plates would be (1) that the joints would have more phosphorus than the plates and (2) that in the joints the ferrite network would be thicker, and the pearlite meshes thinner, and hence richer in carbon than in the plates. The carbon would not be bodily removed from the joints into the plates; it would simply be concentrated in smaller and richer meshes of pearlite in the joints than in the plates.

The freedom of the joint from carbon therefore seems to imply something more, a bodily migration of the carbon, not simply from network into meshwork through microscopic distances, but away from the joints into the steel plates between those joints through macroscopic distances, leaving the joint free from carbon for a thickness great enough to permit Mr Stead to take samples which he determined by analysis to be free from carbon if, as I infer from his positive statement that the joint was free from carbon, he proved this freedom by chemical analysis.

In another test by Mr. Stead, in an ingot which contained 0.30 carbon and 0.50 phosphorus, the phosphorus appeared to exist in the form of phosphide eutectic in the center of the ferrite network which surrounds the meshes of pearlite, or of pearlite mixed with ferrite. When this ingot, and also another containing 0.30 carbon and 0.30 phosphorus, were forged out, they consisted of lenticular bands of ferrite rich in phosphorus, and, of course, free from carbon as all ferrite is, alternated with bands of pearlite. This concentration of the phosphorus in the envelops of the carbonless ferrite which surround the meshes of pearlite or of mixed pearlite and ferrite, seems to Mr. Stead so complete as to indicate strongly a sort of incompatibility between the phosphorus and carbon. At least, it would seem to indicate that, when, in crossing the critical range $A_2 - A_1$, the excess ferrite separated out of the austenite, the phosphorus separated out along with it in undue proportion, leaving little phosphorus (and perhaps none), in the eutectoid of pearlite formed when the temperature at last sank past A_1.

The silver-lead veins of the Slocan, British Columbia, are extremely irregular. They are generally narrow and the pay-streaks are thin. Exceptions to this generalization are to be found in certain wide veins, like one at least on the South Fork of the Kaslo, and certain thick stopes of ore such as are to be seen in the Slocan Star mine. The general association of siderite with the ore is highly characteristic of the entire region; there are few of the silver-lead mines which do not show it to some degree. The tendency of the veins toward impoverishment in both galena and blende with depth is strongly marked, the proportion of siderite first increasing and finally the proportion of quartz. The ore shoots are rather short, and the stretches of barren vein between them are rather long; the stoping area of the veins is therefore comparatively small and the cost of prospecting is correspondingly high. The silver-lead ore is generally of high grade in silver, which has made it possible to operate certain of the mines at the excellent percentage of profit that has been shown most brilliantly by the Payne and the Slocan Star.

Alaska United Gold Mining Company

[illegible] Ready Bullion [illegible] Douglas Island, Alaska, with two mills, one of 120 stamps and one of 100 stamps. During the year 1906, which is covered by the report, the company operated the Ready Bullion mine and the 120-stamp mill, the 700-ft. mine being temporarily leased to the Alaska Treadwell Company. This lease will terminate during the current year. The capital stock is $1,000,000 in 200,000 shares of $5 each; 180,200 shares are outstanding and 19,800 are owned by the company.

The statement of earnings for the year is as follows, averages being computed on tons milled:

	Amount.	Per ton.
[illegible]	$290,007	$1.2252
[illegible]	171,393	0.7241
Interest	2,408	0.0102
Rental, 700-ft. claim	3,600	0.0152
[illegible] receipts	$467,408	$1.9747
[illegible] development	$237,768	$1.0046
[illegible]	72,821	0.3077
Sulphuret expenses	25,758	0.1088
General expenses	12,986	0.0548
Construction and repairs	12,762	0.0539
Total expenses	$362,095	$1.5298
[illegible]	$105,313	$0.4449

The balance brought forward from 1905 was $374,716, making a total of $480,029. From this appropriations were made of $75,000 for depreciation and $126,140 for dividends of 14 per cent. on stock; a total of $201,140, leaving a balance of $278,889 undivided.

The average assay value of the ore, based on a large number of samples, was $2.28 per ton, showing a saving of 86.6 per cent.

The mine statement shows 135 ft. shaft sinking during the year; 89 ft. stations and skip chutes; 1171 ft. raises; 14 ft. crosscuts; 2018 ft. drifts. The ore raised and sent to mill was 236,690 tons. Ore reserves at the close of the year were 1,070,944 tons, of which 184,384 tons were broken in stopes.

The mill of 120 stamps crushed during the year 236,690 tons of ore, at a total cost of $72,821, or $0.3077 per ton. The average duty was 5.71 tons per stamp per day. The running time of the full mill for the year was 345 days 7 hours 8 minutes, during which time steam was used for power 266 days 12 hours 7 minutes, and water for power 78 days 19 hours 1 minute.

The average number of men employed during the year was 148, and the average wages paid were $3.13 per day. There were two fatal, two serious and nine slight accidents during the year.

The work of installing water power at the mine was completed during the year, the total expenditure for the year being $3306. On the afternoon of Aug. 1 a fire broke out in the coal bunkers of the steam-power plant and quickly spread to the boiler house, engine rooms and 120-stamp mill. After two hours' work the fire was gotten under control and extinguished. The total cost to date of repairs to steam plant occasioned by this fire is $2953. After the water-power system had been installed the fire mains were so connected that either fresh water under 200-lb. pressure or salt water from the fire pumps, or both, could be used in case of fire. The fire mains were extended to the Ready Bullion main shaft, and all the necessary valves, fire hydrants and giants installed. It is worthy of mention that 15 minutes after the fire alarm sounded for the fire of Aug. 1 there were twelve 1-in. streams of water, under a pressure of 200 lb., playing on the fire and mill buildings. It has been decided to use crude oil as fuel in all of the steam-power plants on Douglas island. For this purpose a steel tank with a storage capacity of 30,000 bbl. is being installed. The foundation for this tank has been completed and the work of erecting is now in progress. The work has been done at a cost of $2382.

The ore reserves in the 700-ft. mine have now sufficient tonnage to warrant again starting the 100-stamp mill. When the new hoist is installed at the Mexican main shaft, the ore for both the Mexican 120-stamp mill and the 100-stamp mill of the 700-ft. claim will be hoisted and crushed at the Mexican No. 2 shaft and the expense divided between the two mines. The trestle connecting the two mills has been completed and the reconstruction of the 100-stamp mill of the 700-ft. claim is well under way and the mill will soon be in readiness to receive ore. The above work has been done at a total expense of $2834 to date.

Copper Range Consolidated Company

The annual report for the year 1906 of the Copper Range Consolidated Company, which also includes reports of the Baltic Mining Company, the Copper Range Company, the Trimountain Mining Company and the Copper Range Railroad Company, shows a net income of $3,193,109.41 and assets amounting to $40,844,737.67. The total production from which the earnings were derived, that of the Baltic, Trimountain and one-half that of the Champion, was 32,382,983 lb., a decrease of 331,876 lb. from the previous year, due entirely to a falling off in the Trimountain.

The average cost of copper sold and delivered was as follows: Champion, 8.21c. per lb.; Baltic, 8.37c.; Trimountain, 11.4c.; Copper Range Consolidated Company, 9c. per lb.

The Copper Range Consolidated Company paid dividends of $6 per share in 1906, amounting to $2,304,810; expended in new construction $392,990.42, and there was left a surplus from the year's operations of $495,308.90.

The Baltic stamped 649,932 tons, an increase of 45,223 tons compared with the year 1905. The yield per ton was 22.15 lb., a decrease of 1.63 lb., so that the increase in the product of the mine was only 12,873 lb. Notwithstanding the increased tonnage of rock treated, the mass and barrel work was less than the preceding year, which, with the decrease in the smelting returns of the mineral smelted, largely accounts for the reduced yield per ton. The first three months of 1907 show an increase in production of about 20 per cent. over the corresponding period of 1906.

The Champion stamped 671,785 tons, an increase of 67,302 tons over the previous year, and the refined product increased 1,247,560 lb. The output here is limited at present by the equipment at the stamp mill and mine, but when contracts for additional machinery already made are filled, which it is expected will be done by August 1, the production should be materially increased.

The falling off in the tonnage of Trimountain rock stamped was due to the necessity of opening a large amount of unproductive ground. The bottom levels of the mine now being opened give indication of considerable improvement, and if the present improvement continues it ought to show a material increase in 1908.

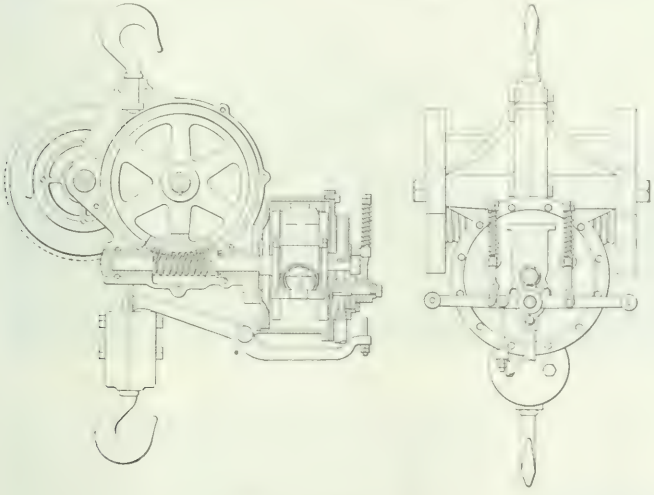
The sinking of the Globe shaft has progressed slowly, due to the continuance of quicksand. The shaft has reached a depth of 223 ft., which is within 5 ft. of solid rock. Preparations have been made for rushing the work after rock is reached. After the shaft has reached solid rock it will be necessary to sink it in rock five to six hundred feet before encountering the Champion lode. This sinking will be accomplished probably within the year, and at the same time crosscuts will be driven to intersect the lode above the point of intersection of the shaft.

Contracts will be let for the building of a generating station on the lake frontage of the Michigan Smelting Company property, from whence electric power for all purposes will be distributed to the different operations. The waste heat of the smelting works will be used as far as possible. The initial installation will give a capacity of 2000 kw. in duplicate, and will supply all the power at present used for every purpose, except for hoisting engines and compressors. A provision will be made so that the power can be increased by installing additional generating machinery.

The insoluble anode slime from which the gold and silver are recovered in electrolytic copper refining is variable in composition, as might be expected, depending on the grade of material being handled. It is chiefly metallic in nature, and a common composition would be: Silver, 40 per cent.; gold, 2; copper, 25; selenium and tellurium, 5; arsenic and antimony, 10; lead, silica, sulphuric acid, etc., 18.

The Imperial Air-motor Hoist

In the Imperial air-motor hoist here shown the motor is a positive reversible air engine with no dead centers and a practically uniform torque. It is wholly inclosed, dust-proof, splash oiling, with every bearing bushed and bathed in oil. The steel worm on the motor shaft runs in an oil pocket, its thrust taken by a roller bearing, and meshes into a worm wheel of bronze, a pinion on the worm-wheel shaft engaging the drum-shaft gear. On the larger sizes there is an additional speed reduction. The hoisting rope under-runs a groove which always permits an exact equalization of the two sides on the drum. The hook turns on ball bearings; the load may be turned in any direction without twisting the ropes. The hoist is made in five sizes with capacities ranging from 1000 to 10,000 pounds, using the ordinary air pressures. It is built by the Ingersoll-Rand Company, 11 Broadway, New York City.



IMPERIAL AIR-MOTOR HOIST

Some attention is being paid to the iron and bauxite deposits in the north of Ireland at present. A good deal of the bauxite used in the manufacture of aluminum comes from this district, and owing to the increased demand for aluminous ores, extensive prospecting operations have been conducted throughout the counties of Antrim and Derry. A company called the Derry & Antrim Ore Company has recently been formed by Scotch and north country people to develop several groups of deposits thus discovered. They are in the neighborhood of Portrush and Bushmills. Some of the ore runs to 56 per cent. of alumina; and deposits of low-grade iron ore have also been opened up. The progress of this venture is keenly watched by those interested in the products.

Gypsum in Northwestern New Mexico

Extensive deposits of gypsum occur at many places in New Mexico, particularly in the southeastern and northwestern parts of the territory, but they are developed open only at Ancho, on the line of the Rock Island Railroad, where a plaster mill has been in operation for several years. Deposits in northwestern New Mexico are described by Millard K. Shaler, of the United States Geological Survey, in bulletin No. 315 entitled: "Contributions to Economic Geology, 1906."

The gypsum along the western base of the Sierra Nacimiento has been known for more than half a century. The Sierra Nacimiento consists of a north-south trending series of even-crested ridges and serrated peaks. It is approximately 35 miles long, extending from the latitude of Gallina, N. M., on the north to the latitude of Cabezon on the south. The gypsum deposits along the western base of the range lie near the top of the "Red Beds" series. They are apparently at all places underlain by a bed of bright yellow, poorly consolidated sand, and are overlain by dark shales and yellowish brown sandstone of Dakota or Jurassic age, from which they are occasionally separated by a thin bed of limestone.

At Gallina, on Gallina Creek, near the northern limit of the gypsum outcrop, a bed of massive white gypsum appears within the limits of the village, where it has been, to a very limited extent, quarried and burned. The gypsum bed may be traced eastward from Gallina for many miles, as it outcrops along Gallina creek in the southward-facing bluff of Mesa Blanca Capulin. It had a thickness here of more than 40 feet. Farther south, be- gypsum bed was observed at many places.

East of Lajara the bed, if present, is completely covered by flat-lying Tertiary sediments, which overlap the Mesozoic section from the west. At Senorita the gypsum bed outcrops above a limestone bed 50 ft. in thickness, from which lime has been burned for local use. A 6-ft. bed, which outcrops about one-half mile west of the gypsum outcrop, furnishes a good grade of sub-bituminous coal. About 3 miles west of San Miguel copper mine, a bed of massive white gypsum 60 ft. thick outcrops. The deposit at this point is easily accessible by the wagon road to Bernalillo, and could be mined over an extensive area.

At the head of a tributary to Rio Salado, at an elevation between 7500 and 8000 ft., the gypsum bed reaches a maximum thickness of about 100 ft. Near the mountains the bed is conformable with the underlying rocks, but within a short distance, the gypsum bed practically flattens out. In appearance the gypsum is identical with that analyzed from near San Miguel mine. For several miles in a zone extending northward from this locality, the gypsum bed outcrops continuously.

Accident and Old-age Insurance

In some continental mining countries of Europe state legislation has provided for accident and old-age insurance. By the provisions of the law in Belgium all mining companies are compelled to pay a compensation equal to 50 per cent. of the actual earnings of the injured person during the time of disability. In the case of total or permanent disability a pension equal to two-thirds of the average annual earnings is granted. In the case of fatal accidents the widow and children of the deceased, or his immediate family, receive an annual pension which amounts to two-thirds of his average annual earnings. Further provisions of the law are that the employers must not make deductions from the wages of the employees to cover this insurance, and must not enter into contracts waiving the right of compensations. To cover their liabilities, employers are required to deposit guarantees of funds in a state bank or with an insurance board. Other countries have similar laws.

A mining cost of $2@2.25 per ton of material may be assumed as a broad generalization of the conditions which obtain in many districts of the West. Such a figure is obtainable in a vein of solid ore of fair stoping width, say 6 ft. The cost of mining increases inversely as the proportion of pay ore to total vein area decreases, and directly as the occurrence of the orebodies becomes small and irregular, all of which factors increase the amount of development work that must be done.

Revival of the South Crofty Tin Mines, Cornwall

A Number of Small Mines Will Be Worked by One Central Corporation, New Equipment and New Methods Being Introduced

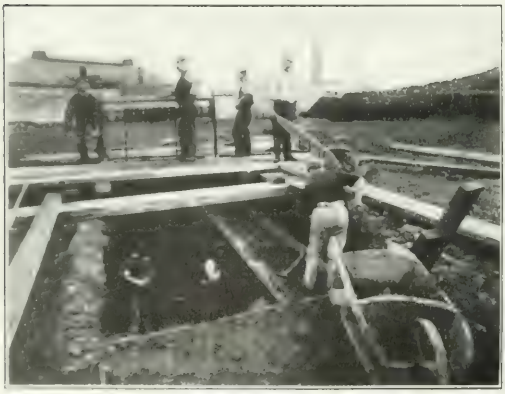
BY EDWARD WALKER

In the Camborne district of Cornwall, modern methods have been introduced gradually, being provided out of the profits of the mine. Its neighbor, South Crofty, affords an example of the policy of the clean sweep, carried out by the reconstruction of the company and by the subscription of a large amount of new capital. Moreover, the reorganization is being effected by London money and by Charleton, Dickinson & Co. So far this company has acquired the South Crofty, the Botallack, near Lands End, the South Phœnix, near Liskeard, and two or three other less important properties. It has also created a stir by acquiring from the landlords mining rights on the Tehidy estate, which includes many of the most important mines in the Camborne district. The policy is to make the mining staffs of the various mines to some extent interdependent, so that the mines may exchange their specialists and the experience gained at each mine may be used for the benefit of all. In this way the aloofness characteristic of the Cornish mining man will be broken down.

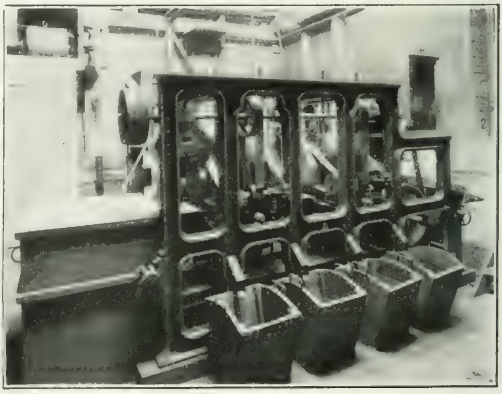
Another interesting point in Mr. Allen's policy is the selection of one of the mines, the South Phœnix, as a center for experiments on the treatment of tin ores. The dressing plant to be erected there will be a remarkably comprehensive one, all possible concentrating tables and slimers being provided. Special provision will be made at all the mines for electric installations, either gas driven or the current brought from other sources.

CORNISH STAMPS AT SOUTH CROFTY

FRAME FOR CALIFORNIA STAMPS, SOUTH CROFTY



HEAD OF NEW SHAFT AT SOUTH CROFTY



HUMBOLDT WETHERILL MAGNETIC SEPARATOR

the advice of a London firm of mining engineers, thus affording a further contrast.

South Crofty is in effect the headquarters of the recently formed Cornish Consolidated Tin Mines, Limited, the leading spirits of which are Francis Allen and E. W. Meyerstein, both of London. The consulting engineers to the company are

For many years the South Crofty mine was controlled by Cornishmen interested in adjoining mines. The mine required further funds and there was no alternative but to sell the property.

Removal of Tungsten

The cause of the non-success of South

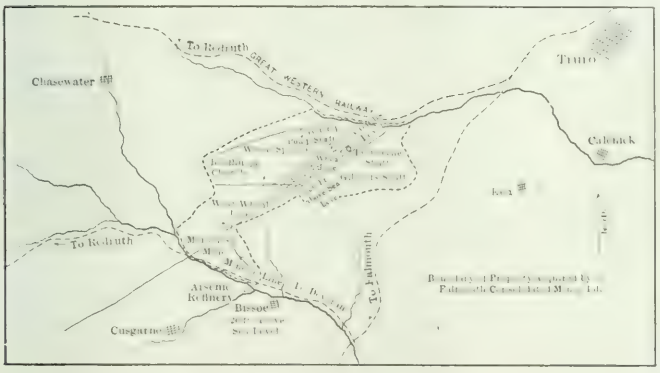
Crofty was the large and varying tungsten contents. The ore [illegible] position from that at East Pool, though the two mines are on the same lode. South Crofty ore in some places runs very high in tungsten; in fact it can in many places be handpicked to contain wolframite almost entirely. At several spots in the mine the ore has been untouched owing to the preponderance of this mineral. Otherwise in respect to tin and arsenic the ore is like that at East Pool.

When Mr. Allen took over the mine the first thing done was to provide a magnetic separator similar to that at East Pool and Clitters, and the practice at the latter mine was followed. At first unsatisfactory results were obtained, and the trouble was attributed to the tungsten existing in the form of scheelite. Recently this supposition has been exploded, and want of experience is now supposed to be the cause of the poor extraction of tungsten.

At the time of my visit the magnetic concentrator was running on material very high in tungsten, with the object of removing the small proportion of tin and iron, and thus producing a marketable tungsten of high grade. As the company now has the services of a high-class electrical engineer, the magnetic concentration difficulty should be removed before long.

It is intended also to operate all the new machinery by electricity, and at first the current is to be supplied by the local electric tramway company. Later on the mine will erect its own electric generators.

The company is now erecting 40 head of California stamps, for which a special concrete foundation has been built. The illustrations accompanying this article show the old stamps still at work and the frames and foundations of the new California stamps. I also give illustrations of the magnetic separator and of the commencement of work in connection with the sinking of the new shaft.



MAP OF FALMOUTH CONSOLIDATED MINES

Other Mines—Modern Methods

The earliest introduction of modern methods of ore dressing was effected by an Anglo-German group at the Clitters mine, near Tavistock. The work at this mine was described fully in a paper by F. Dietzsch, read before the Institution of Mining and Metallurgy a year and a half ago. The group has been working independently and the most important new proposition they have taken up recently is the Wheal Jane and its allied mines.

These mines lie west of Truro; their location is shown in the accompanying map. They were worked more than 50 years ago and yielded enormous amounts of tin and copper. They were worked from an adit level which started near the river at Bissoe bridge, and, as was usual in those days, the vein was followed only as far as it paid. In many parts the vein was broken by quartzite intrusions, which were mistaken for the walls, and recent explorations have shown that the veins are much wider than was originally supposed.

It is now more than 20 years since any operations were conducted and the various levels, shafts and winzes were in bad condition. The manager, Henry C. Jenkins, has spent more than a year tracking out the old workings and clearing things up, and the mine is now in a condition for systematic development. The chief vein is much flatter than is usually found in the Cornish tin deposits, and riding on top of it is a very strong elvan dike, which is so hard that it is possible to mine the tin vein without any timbering.

Falmouth Consolidated Mines, Ltd.

The company which has been formed to operate Wheal Jane is called the Falmouth Consolidated Mines, Ltd. The company has acquired a considerable tract of land, which includes the Wheal Jane, the West Wheal Jane, and the Nangiles mines on one lode, and the Sperries and the Falmouth on another lode.

The Jane lode dips flatly to the north and a spur vein dips similarly. The Sperries vein dips to the south, and the intersection of these three veins at depth will be looked forward to with very great interest.

At the time of writing no surface works have been undertaken, as the whole of the energies have been concentrated on the northern section of Wheal Jane. The company is fortunate in having a large number of shafts at different points, which will save much expense.

A detailed account of all the new moves in Cornwall would occupy more of your space than would be desirable. A great number of properties are being reopened, and the Wilfley and Buss concentrators are the chief new machines introduced at the dressing works. Researches recently made in the Cornish tin mines show that want of capital and the low price for tin were the causes for their former abandonment, and not the exhaustion of the lodes. In fact, I may say that no tin lode in Cornwall shows any exhaustion at depth, and that there is every encouragement to pursue development.

Rights of Crossing Electric Power Lines

So many electric power lines have been built in Shasta county, California, extending to the various mines, etc., that there has been trouble about the crossing of the lines. The old ordinance made it very difficult for a new company to cross with any safety. A new ordinance has now been passed, in which it is conceded that the senior company has a right to maintain its wires above the junior company. The junior company must give 30 days' notice to the senior that it desires to cross its line at a certain point. Within the 30 days the senior company must elevate its wires so that those of the junior may pass under at a safe distance from the ground, and at a safe distance from each other. The expense of raising the wires of the senior company must not exceed $350 in any instance, and this expense must be borne by the junior company. Should the senior neglect or fail to raise its wires within the 30 days, the junior may stretch its wires above the senior wires.

The cost of a modern zinc smeltery in Belgium or Rheinland, for the treatment of blende, i.e., with full roasting capacity, is about $14.50 per ton (of 2000 lb.). Such a plant will be equipped with gas producers and Rhenish regenerative furnaces. A similar plant in the United States would probably cost $17.50@18 per ton. The plant at Pueblo, Colo., which practically duplicates the one at Overpelt, Belgium, cost more than $18 per ton, but there were various misfortunes in connection with its construction.

The Calamine Dressing Works at Monteponi

[illegible]

This mill, which is one of the largest in Sardinia, has now been in operation for just 20 years. It is 74 ft. in hight from the lowest floor to the uppermost, and is 150 ft. in length, not including the engine house at the left. Throughout the mill, the sizing is done by means of the Ferraris shaking screen, shown in the elevation, of which there are two systems, or sets. A third section of the mill, at the right, not shown in the elevation, is intended for the crushing and dressing of the mixed ores from the two principal sections.

The mill treats 20 tons per hour of zinc ore, containing 10 per cent. zinc, with a gangue of dolomite, besides some lead ore. The concentrate, after roasting, shows a yield of 47 per cent., besides which there is considerable mixed ore of zinc and iron, which is sent to the magnetic separator. The water used in the mill is clarified by allowing the mud to settle in large flat basins, after which it is returned to the top of the mill by means of centrifugal pumps. The entire plant requires 195 h.p. for its operation.

[illegible]

CALAMINE DRESSING PLANT, MONTEPONI

Tungsten in Park County, Montana

SPECIAL CORRESPONDENCE

The discoveries of scheelite made in Park county some months ago have been sufficiently developed to show them to be of value. The discovery was made in one of the old tunnels of the mines of the Kimberly-Montana company, formerly known as the Bear Gulch mines, at Jardine. These properties have been extensively worked for several years for gold, and large quantities of scheelite were taken out and and thown on the dump. Now this material is being gathered from the waste and shipped to market. The mineral has also been discovered at Crevasse, a few miles from the Kimberly-Jardine property.

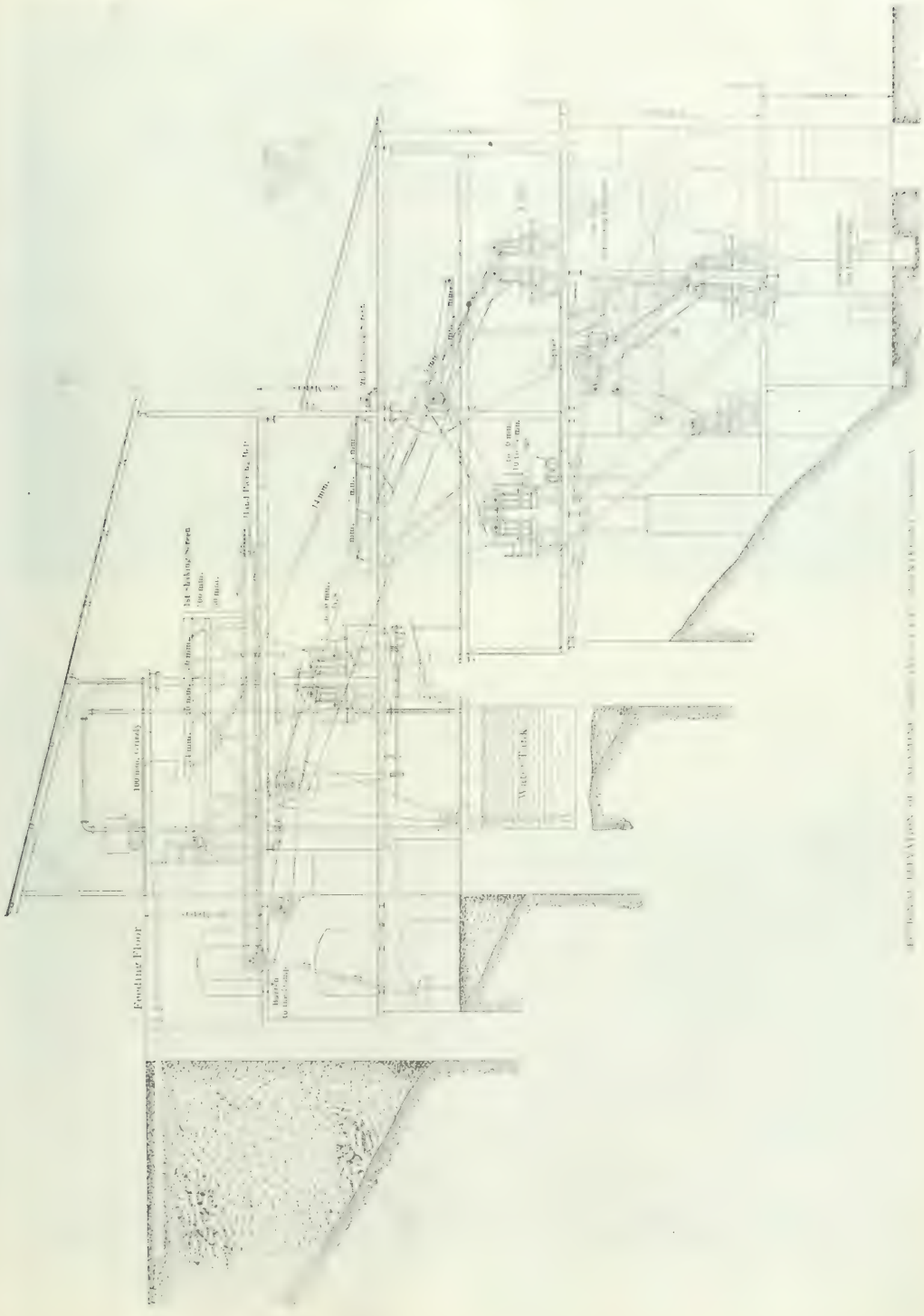
The richer ore from the Jardine mines is shipped to Louis Strauss & Co., of New York, and the lower grades are concentrated before shipping. What few shipments have been made bring a value of from $460 to $1000 per ton, and one car shipped to New York netted over $39,000.

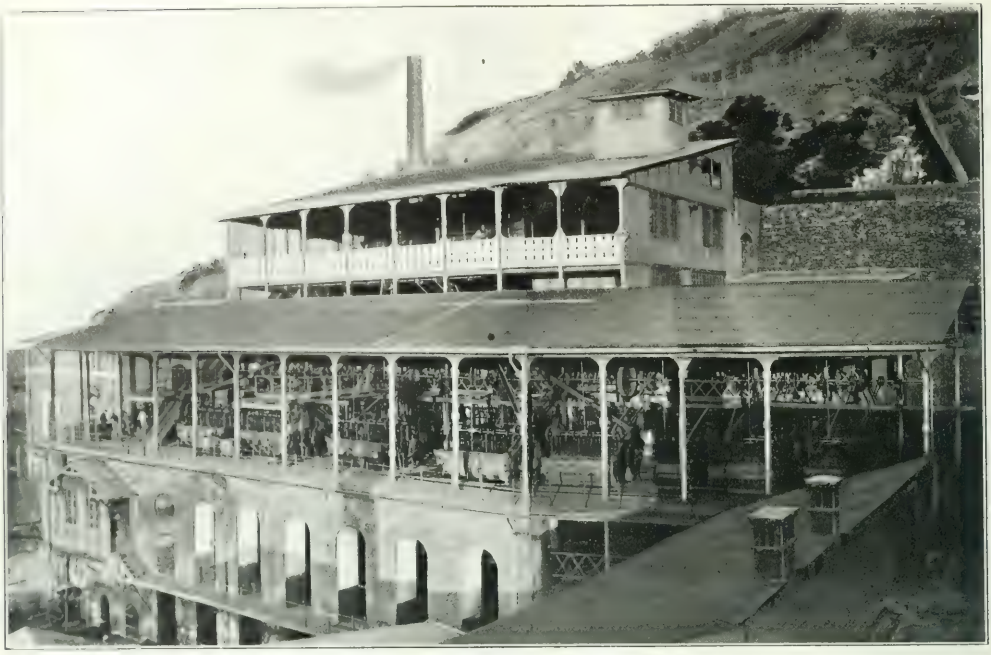
Tungsten has been discovered in different forms in other places in Park county besides Jardine and Crevasse. At the latter place it is found in pockets in the mine. At Jardine most of the scheelite is a hard, flinty substance much resembling quartz.

Collection of California Minerals at Los Angeles

The Chamber of Mines at Los Angeles is beginning to make a collection of specimen ores from all mining districts tributary to that city, it being the intention to exhibit these to illustrate the condition of the mineral industry. San Francisco already has a large collection belonging to the State, at the museum of the State Mining Bureau in the Ferry building, and this is being constantly added to. Some of the counties are preparing sets of specimens from their mines to be placed as separate exhibits in the mining bureau. Another large collection of ores and minerals is that of the University of California at Berkeley, which is open to the public, but is mainly used by the students.

In order to do hand picking effectively there must be a systematic method. The pickers should not have to do any breaking of the ore, which should be done by a jaw-crusher, if the quantity be sufficient to warrant the installation, or otherwise by men sledging with long-handle hammers. The broken ore may be delivered to a stationary picking table, or to a movable one. The former is the cheaper to install. Among the movable tables the circular revolving table is cheap and convenient. A traveling belt is also very convenient to pick from.


Feeding Floor
Water Tank



THE CALAMINE DRESSING PLANT, MONTEPONI, SHOWING OPEN CONSTRUCTION AND JIGS

THE CHIEF TOWN OF THE MINING DISTRICT OF SARDINIA

The Reform of the United States Mineral Land Law

By R. W. Raymond

It needs to be said again that the United States possesses, strictly speaking, no general mining law. What is usually so called is comprised in a few sections of the Revised Statutes and a few supplementary Acts of Congress, governing the sale of the mineral lands of the public domain. Even in the Territories, the insular possessions and the District of Columbia—where the Federal government might constitutionally do what the State governments now do (if it is done at all), namely, regulate the operations of the mining industry under the "police power" of the sovereign—I think little or nothing of that kind has been attempted. When we speak of the United States mining law, its defects and its need of reform, we ought not to forget that we are talking of nothing more than the terms upon which the United States disposes of its public mineral lands. This caution, I think, is now necessary, because some of the proposed schemes of reform go beyond that limited sphere, and include features of mine inspection and regulation which belong to the police power heretofore exercised by the States. Apart from the constitutional and political aspects of the question, any introduction into Federal legislation of such isolated features of foreign systems would be most perilous. Either the whole thing, or none of it. Either let the Federal government create a complete mine-engineering department of the Civil Service, prescribe the training of its members, give them steady employment, regular promotion, and final retirement upon pension, or let it keep its hands off the mining industry altogether. I will not here argue the question, which course would be the wiser. I need scarcely say on which side I stand, as the result of nearly half a century of study and observation at home and abroad. But I wish to emphasize at present only the unwisdom of grafting one system upon the other, and thereby weakening both.

The Mineral-land Laws

Considered simply as rules for the sale of land, the United States mineral-land laws contain numerous provisions which ought to be amended, and numerous omissions which ought to be remedied. In this aspect, they comprise regulations for the free exploration and possessory occupancy of the public mineral lands, their exploitation during such occupancy, and their sale outright. Confining ourselves to the laws governing lode-locations and patents, we find in them many infelicities, obscurities, gaps and positive errors, with regard to the conditions of exploration, the nature and rules of the possessory title, and the character of the rights conveyed by the final patent. I dwell in the United States. I have repeatedly criticized these defects, especially those which are involved in the vague and forever uncertain "extra-lateral right," arising under "the law of the apex." As the original author of these two, now familiar, phrases, I may fairly assume that the opinions with which I accompanied my first use of them are generally known. All the more weight, I trust, will be attached to the present declaration of my judgment that, bad as it is, the "extra-lateral right" ought not now to be the first object of attack, in any endeavor to reform the law.

Extra-lateral Rights

Several attempts at such a reform have been made. They have all failed, for the simple reason that they covered too much. Including amendments of administrative detail with radical changes of principle, they encountered the opposition of the opponents of any of their many provisions. Those who disliked one feature made alliance with those who disliked another feature to kill the whole scheme. It is but fair to add that the abolition of the "extra-lateral right" was the most vehemently disputed proposition. Popular in certain regions, it was regarded with superstitious hostility in many others, as a measure calculated to restrict the freedom of prospecting, and diminish the rewards of private explorers, and the owners of "adjoining locations." After observing the course and fate of repeated attempts to abolish the "extra-lateral right," I became convinced that this question ought to be handled by itself, as a single issue, and fought out, after a "campaign of education," in a battle not complicated with other issues.

Recently, a new difficulty has arisen to confirm my opinion. Namely, I find that good and competent judges, who formerly agreed with me as to the evils of the "extra-lateral right," are now inclined to oppose its abolition. Their reasons are: (1) that the obscurities and uncertainties of "the law of the apex" have been measurably cleared up by decisions of the United States Supreme Court, so that we now know, more accurately than we did, "where we are at;" and (2) that the public mineral land has been, in the lapse of time, so covered with locations made under the present law, and creating vested rights thereunder, that any change in the nature of mining titles would introduce more confusion and uncertainty than it could cure.

While I do not concede that these reasons are conclusive, I must admit that they are formidable, and that they are advanced by authorities entitled to respect. Moreover, I feel that, thus supported, they would probably be fatal, at this time, to any new scheme of legislation, involving the abolition of the "extra-lateral right" of lode-locators. In my judgment it will [illegible] to see it thoroughly exposed and finally abandoned by the United States, as it has been abandoned by all other civilized nations—even those among whom it had been recognized for centuries. It is not creditable to us as Americans that we have adopted by accident, and still embrace with infatuation, a principle so thoroughly tested and unanimously rejected by the rest of the world, and that we should persistently assert the necessity of this absurd system to a small portion of the mining industry of the country, when the overwhelming mass of that industry, carried on in every one of our States, finds the universal modern civilized form of mining titles infinitely more conducive to its security and prosperity. I say "infinitely," because $x + 0 = \infty$, in which equation, let x represent the number (or the cost, whichever you choose) of litigations over mining titles under the "law of the apex," while zero represents the total absence of all such litigations as cannot be at once decided under the ordinary rules of the common law, and upon the simple evidence of surveys.

I would like to see this issue brought to battle. Nevertheless, I think there is, at least, one other which ought not to be put in peril at the same time, and might be victoriously contested first. To indicate this more immediately important issue, and to urge its presentation in advance and by itself, is the chief purpose of this article.

Recording Locations

Under the present United States statutes, and the interpretative decisions of the Supreme Court, the location of a lode on the public domain withdraws therefrom the surface included within the location, together with the extra-lateral right thereto attached. No documentary contemporaneous proof of such an appropriation of public land is required by the United States, the owner of the land. Local legislatures, or the inhabitants of mining districts, may make such rules, not inconsistent with the United States law, for the recording of locations, and the subsequent maintenance of possessory tenure, as they may think advisable; and, in fact, most of the Pacific States and territories now require a record to be made in the office of a county clerk or recorder. But nowhere is it necessary that the fact of location shall be made known to the Land Office of the United States. That office never hears of it until (perhaps after years of possessory occupancy and exploitation) the locator or his grantee applies for a survey, as a step in the proceedings for a patent. Then, for the first time, his claim is brought to the notice of the real owner of the land; and even then it is not certain that the land can be sold to him. There must be first a survey, and then an advertisement of the application

for 90 days, after which, if no unknown prior claimant arises as a contestant, the United States decides that it really owns the tract in question, and proceeds to sell it and give a deed for it.

In other words, there is not today in the possession of the General Land Office a single map or record, showing what mineral lands the Government really owns, and has a right to sell. Was there ever such a ridiculous exhibition of reckless carelessness in the administration of real estate?

Remedy for Present Abuses

The way in which this state of things was reached is an interesting piece of history, and may partly excuse the course of Congressional legislation on the subject. But I will not go into that story now. Whatever excuse once existed has long since passed away; and the simple, feasible remedy should be applied at once, by requiring all persons initiating by location possessory rights to portions of the public domain, to communicate that fact to the United States.

Such a requirement might involve the survey of the public mineral lands—a thing which should have been done long ago, instead of leaving such surveys to be made for the benefit and at the cost of individual applicants, and "tied" to all sorts of natural or temporary "monuments" and "stakes."

Here is a reform which could be carried through. In my judgment it precedes in immediate importance even the question of the "extra-lateral right"; for what is the use of disputing over the way in which, or the terms upon which, the United States shall sell its mineral lands, until it knows what it has to sell?

Iron Ore of Cleveland, England

In the discussion of a paper on "The Ironstone of Cleveland," read before the Institution of Mining and Metallurgy, Arthur E. Pratt stated that the iron in the raw ore is usually between 29 and 33 per cent., the latter figure being reached only in the best deposits. Phosphorus is from 0.65 to 0.75 per cent., sulphur 0.15 to 0.25 per cent., silica 9 to 15 per cent., while moisture varies from below 5 up to 20 per cent., the usual amount being somewhere between 8 and 10 per cent. The highest figure just quoted refers to samples of "small stone," the average moisture in this material running about 17 per cent. The amount of CO_2 present in the ore has been given as 25 per cent., but is more usually 21 to 22 per cent.

In the calcined stone the iron varies from 37 to 42 per cent., being usually just over 40 per cent.; silica is present up to 19 per cent.; moisture and CO_2 are, of course, absent, while all the iron is in the ferric phosphorus, which is unaffected by calcination, is relatively increased, being somewhere between 0.85 and 1 per cent. Sulphur is partially removed, thus counteracting the relative increase.

The composition of a given sample of Cleveland ironstone will depend on (1) from what part or the district it has been mined, and (2) whether the middle seam only is being worked, or portions of the top and bottom seams as well.

As the Cleveland ironstone is of approximately constant composition throughout the whole of the deposit, it is not possible, as with the Northamptonshire ironstones, to obtain a self-fluxing mixture by using together calcareous and silicious varieties. In calculating a furnace-charge it is the usual practice to reckon in the alumina with the silica as an acid.

Oil and Gas in Southeastern Kansas

The earliest exploitations of oil and gas in the Independence quadrangle were begun in what is now Miami county, about 100 miles northeast of Independent. Here oil was first discovered in the spring of 1855, on Wea creek, east of Paola. Wells were drilled from time to time, with varying success, but it was not until after 1893 that much development work was done or the importance of the field was realized. During the last half of 1903 and the first half of 1904 many new companies were formed and much drilling was done. Success followed, principally in Fall River and Verdigris River valleys. Within the immediate proximity of Neodesha almost every well is productive. Montgomery county, which embraces approximately the southern three-fourths of the Independence quadrangle, did not produce much oil until the last half of 1903. Early in July of that year drilling was begun with success on the now famous Banks land, about a mile northeast of Bolton.

Though small bodies of oil are frequently found at depths of a few hundred feet below the surface, the larger deposits occur at greater depths in and near the Cherokee formation. At Coffeyville, where the strata overlying the Cherokee are thinner than at any other points in the quadrangle, three oil sands are encountered at depths of 350, 600 and 900 ft. The best wells, yielding oil of 32 deg. B., derive their oil from the middle or 600-ft. sand.

The oil of the Independence quadrangle has an asphaltum base. It is dark brown or black in color and heavy, but varies greatly in specific gravity from place to place.

Valuation of Zinc Ore

In the purchase of zinc ore the formula $0.95\ P\left(\frac{T-8}{100}\right)-R$ works out as follows in the case of an ore assaying 48 per cent. zinc, the London price of spelter being assumed at £28 per ton of 2240 lb., and the returning charge £2 12s. 6d. per ton of ore:

$0.95\ P = 0.95 \times £28 = 26.6.$
$\frac{T-8}{100} = 0.48 - 0.08 = 0.40.$
$R = £2\ 12s.\ 6d. = £2.625.$
$£26.9 \times 0.40 - £2.625 = £8.015 = \$38.95.$

The value per 2240 lb. of ore is $38.95. Dividing that result by 1.12 gives the value per 2000 lb. of ore, thus: $38.95 ÷ 1.12 = $34.78.

The same result is obtained when the price of spelter and the returning charge are converted into terms of dollars and cents per 2000 lb. Thus, £28 per 2240 lb. = 6.075c. per pound = $121.50 per 2000 lb.; 0.95 per cent. of this is $115.43; the returning charge of £2 12s. 6d. per 2240 lb. is equivalent to $11.39 per 2000 lb. The value of the ore per 2000 lb. is consequently $115.43 × 0.40 − $11.39 = $34.78. Another method, which is very convenient, is to convert the expression $T-8$ into pounds and multiply by the price of the spelter per pound. Thus, $T-8=40$; $40 \cdot 20 = 800$ lb. $0.95\ (6.075 \times 800) - \$11.39 = \$34.78$.

Copper Refining Practice

The output of a refining tank depends upon the total current passing through it, the number of electrodes in series, the time the current flows and the electrochemical equivalent. In the multiple system of electrolytic copper refining the theoretical amount per ampere day per pair of electrodes in series is almost precisely an avoirdupois ounce. The amount actually deposited is always less than this, due to chemical solution of the cathode, grounds and short circuits between electrodes. The re-dissolving of the cathodes will amount in practice to 0.5 to 1.0 per cent. of the amount deposited. This action is chiefly at the surface of the bath. Metallic copper is also slightly soluble in cupric sulphate. If the tanks are well insulated from the supporting piers, and care is taken to break the circulating pipes carrying the electrolyte from tank to tank, by either rubber sections or miniature waterfalls, the current shunted around the tanks by grounds should not average over 1 per cent. of the total. Short circuits between electrodes, caused either by direct contact between anode and cathode or by indirect contact between the electrodes and the tank, will amount to about 5 per cent. under best commercial conditions. In this way the net current efficiency is usually from 90 to 95 per cent.

Method for Analysis of Gold-Silver Bullion

By J. E. Clennell*

The rapid method here described was adopted for the approximate analysis of bullion produced by Mÿnbouw Maatschappij Redjang Lebong, Sumatra. It could no doubt be applied with slight modifications in other cases. It is possible to make all the determinations on the same weighed portion of bullion, but it is preferable to make an independent assay of the gold and silver on a separate portion.

The elements to be determined are: Gold, silver, selenium, lead, copper, iron, zinc.

Gold

Dissolve 1 gram of the bullion drillings in a conical flask with two successive washings (25c.c. each) of 75 per cent. nitric acid, boiling each time, diluting with an equal volume of water, and decanting after again boiling. Finally wash the residue once or twice by decantation with hot water. Treat all the liquid poured off as described under silver. Fill up the flask containing the undissolved residue, invert into a porcelain crucible, drain off the water, dry, ignite and weigh. This residue will in general be nearly pure gold, but it may be examined by dissolving in aqua regia, diluting, allowing to stand for some time for settlement of any insoluble matter, consisting of very small quantities of chloride of silver, carbon and silica. After carefully decanting the dissolved gold and washing with distilled water, the residue is collected, dried at a moderate temperature, and weighed. The weight so found is deducted from the total weight of residue insoluble in nitric acid to obtain the true weight of gold. The minute quantity of silver present is, perhaps, best determined by wrapping this residue (insoluble in aqua regia) in lead foil and cupelling.

Silver

The united liquids poured off in the previous nitric-acid treatment, together with the water washes, are heated to boiling in a flask, *A*, and mixed with about 5c.c. of concentrated hydrochloric acid. Shake well until the AgCl begins to settle clear. Pour off the bulk of the liquid into another flask, *B*, and heat this to boiling. When the small quantity of suspended AgCl in *B* has settled clear, pour the liquid through a filter into another flask or beaker, *C*. Wash the bulk of the AgCl in *A* 5 or 6 times by decantation with boiling water, pouring off the liquid through the filter each time, and retaining the precipitate as much as possible in the flask. See that the filtrate passes through quite clear. Treat all the liquid collected in *C*, as described under selenium.

The silver may now be determined in various ways. It was found with this bullion that tolerably accurate results could be obtained by the method of G. Denigès, carried out as follows: Place the flask *A* containing the bulk of the AgCl under the funnel containing the filter used as detailed above. Measure out a quantity of a solution of cyanide of potassium or sodium, containing a little alkali, and of known cyanide strength, say about 1 per cent. The quantity of cyanide solution taken must be more than sufficient to dissolve the whole of the AgCl according to the reaction:

$$AgCl + 2\,KCN = KAg(CN)_2 + KCl$$

Run this through the funnel into flask *A*; agitate thoroughly without diluting. When the bulk of the precipitate has dissolved, which requires some time, decant the liquid through the same filter, collecting in flask, *B*. Dissolve the small residue of AgCl in *A* by means of a few c.c. of concentrated ammonia; when quite dissolved, dilute and pass through the same filter into *B*, finally washing once or twice with water. To the filtrate add 10 c.c. of 1 per cent. potassium iodide, and immediately titrate the residual cyanide with standard silver nitrate until a permanent yellowish turbidity remains. Deduct the amount of $AgNO_3$ used from the $AgNO_3$ equivalent of the total quantity of cyanide added. The difference is the amount corresponding to the KCN converted into $KAg(CN)_2$, from which the amount of silver may be calculated:

1 c.c. standard $AgNO_3$ (as generally used) = 0.00828 gram Ag.

1 gram Ag requires 1.208 grams KCN.

The silver may be determined much more rapidly and conveniently by Volhard's method, but in this case either a smaller quantity of the bullion must be taken (say 0.1 or 0.2 gram) or the solution must be made up to a definite volume and an aliquot part taken. In using this method it was generally found convenient to add a slight excess of standard thiocyanate and titrate back with a standard silver solution of equivalent strength. The liquid after titration by Volhard's method cannot, of course, be used for the determination of iron, and the estimation of the other elements present would probably be inconvenient. This estimation is therefore always made on a separate portion.

In my experience at Redjang Lebong, the results by Volhard's method were generally lower and those by Denigès' method higher than the fire assay, the latter being made with the usual corrections as described in a former paper. (This Journal, Dec. 8, 1906, p. 1057.)

Selenium

Evaporate the filtrate collected in *C* to dryness on the water bath, adding 0.5 gram sodium chloride. At the finish add about 10 c.c. of conc. hydrochloric acid and again evaporate to dryness, repeating this operation if the residue is considerable. Dissolve in the least quantity of hot dilute HCl; add 5 to 10 c.c. of conc. HCl and boil thoroughly. Hold a piece of paper moistened with KI at the mouth of the flask and continue to boil, with occasional additions of fresh HCl, until the paper no longer shows any discoloration, which indicates that the last traces of HNO_3 are expelled. Then dilute to 50 c.c. or 100 c.c., according to the amount of dissolved salts, boil and filter if necessary, washing well with boiling water. Examine the small insoluble residue on the filter for silica and traces of silver chloride. Treat the liquid as follows:

Pass a current of purified SO_2 gas into the hot liquid for some time until the latter smells strongly. Boil till the red precipitate turns to a dark violet, almost black; allow to settle, covered, for a few minutes and filter while still hot, preferably collecting the precipitate on a paper previously dried at 100 deg. C. and weighed. Wash thoroughly with boiling water, adding a little SO_2 water and HCl from time to time. See that the filtrate is perfectly clear and gives no further reaction with SO_2 on boiling. A crystalline precipitate of lead chloride will probably separate on cooling, but this is of no consequence. Treat the filtrate as described under lead.

This method of separating lead and selenium was found to be much more satisfactory than that described by H. Rose ("Handbuch der Anal. Chem.," Vol. II), in which the lead is precipitated first with sulphuric acid. The liquid cannot be boiled with this acid without loss of selenium, and unless heated to white fumes the precipitation of lead is incomplete. The addition of alcohol also introduces difficulties and complications. So far as I am aware the method of separation here detailed is quite new.

The estimation of the selenium in the precipitate may be made in the ordinary way, by drying in an air oven at 100 deg. C. and weighing the paper and precipitate together, inclosed in a weighing tube or bottle. This is probably the safest method, but it is always advisable to examine the selenium for small quantities of gold, which may have been dissolved in the nitric acid treatment. This may be determined by wrapping the weighed filter paper and contents in a considerable excess of lead foil, scorifying and cupeling.

As the drying and weighing at 100 deg. C. is somewhat tedious, attempts were made to utilize the volumetric method, depending on the reaction of selenious acid with potassium iodide:

$$4KI + 4HCl + H_2SeO_3 = Se + 4I + 4KCl + 3H_2O$$

Under suitable conditions this was found to give good results with pure solutions of selenious acid, but it was found difficult to convert the selenium into selenious

*Metallurgical engineer, London

acid without loss. The method tried was as follows:

Wash the precipitate off the paper as much as possible into a porcelain evaporating dish; drain the water back through the filter into a flask. Add to the precipitate in the dish 10 c.c. of 75 per cent. nitric acid and 0.5 gram of NaCl. Add the water previously poured off and evaporate on the water bath. Digest the paper in another dish with hot 25 per cent. nitric acid, adding the liquid to that in the first dish when the residue adhering to the paper is completely dissolved. Treat the evaporated residue with HCl, as already described, till all HNO_3 is expelled, cool and add 0.5 to 1 gram of potassium iodide and titrate the iodine liberated with $\frac{N}{10}$ thiosulphate (2.48 gram $Na_2S_2O_3.5H_2O$ per liter), with addition of starch indicator near the finish, until the bluish-black tint changes to orange red. It is essential to standardize on a selenious acid solution of known strength and not to depend on the theoretical standard calculated from the equation.

A further check may be made by using the resulting liquid containing the red selenium in suspension for a colorimetric test. Checks are made by taking measured volumes of the standard Na_2SeO_3 solution, adding $HCl + KI$, and removing the iodine by addition of thiosulphate until the resulting mixture has the same tint as the liquid derived from the bullion.

Lead

To the filtrate from the selenium precipitate add 10 c.c. conc. sulphuric acid and evaporate to a small bulk. Finally boil in a conical flask with constant agitation over a spirit flame until copious white fumes are given off. Cool, dilute to about 50 c.c. and add 10 c.c. of alcohol. When thoroughly settled (preferably after standing over night), filter, wash with dilute and finally with absolute alcohol. Treat the filtrate as described under copper.

Wash the precipitate off the filter into a clean flask, add ammonia, then acetic acid in slight excess; boil till all is dissolved, or if any residue remains, filter this off, wash with hot dilute ammonium acetate, and examine. Pass the hot clear filtrate through the original filter paper, first moistening the latter with dilute ammonia. Wash with hot water and a few drops of acetic acid. Again add 5 to 10 c.c. of conc. H_2SO_4 and boil to white fumes.

The lead sulphate should now be pure and the lead may be estimated by the ordinary gravimetric or volumetric methods. After settling for some hours, with addition of dilute alcohol, it may be collected on a weighed perforated crucible containing an asbestos filter, ignited gently and weighed as $PbSO_4$. The quantity is generally too small for satisfactory results by volumetric methods.

$$PbSO_4 \times 0.683 = Pb$$

Copper

Boil the filtrate from the $PbSO_4$ thoroughly to expel alcohol. Pass a current of H_2S gas into the hot liquid till it is saturated. Filter, wash with H_2S water; treat filtrate as described under iron. Wash the precipitate off the paper as much as possible into a clean flask *A*. When settled, pour back the liquid from *A* through the same paper into another flask, *B*, retaining the precipitate in *A*. Add to *A* 5 c.c. conc. HNO_3, warm gently till dissolved, adding a little $KClO_3$ if necessary. Add the liquid poured off into *B* and again heat until only yellow particles of sulphur remain. Filter through the same paper, dry and burn the paper and add the ash. Again heat to boiling. Filter and estimate the copper volumetrically by the iodide method, or when only a little is present, add ammonia in slight excess, filter, and determine copper by the colorimetric method.

The liquid after the latter test may be examined for cadmium by adding KCN till colorless, then H_2S.

Iron

Transfer the filtrate from the copper sulphide to an evaporating basin. Boil to expel the excess of H_2S. Add HNO_3, boil, then add ammonia in slight excess. Boil, filter; treat the filtrate as described under zinc. The iron is generally determined by colorimetric test as follows:

Dissolve the precipitate by passing 10 to 15 c.c. of hot 25 per cent. HCl through the filter, collecting the liquid in a Nessler tube. Wash once or twice with water; cool the tube, add 5 c.c. strong (say 5 per cent.) KCNS. In another tube place an equal amount of HCl and also 5 c.c. of KCNS. Dilute to nearly the same volume as the first solution and run in standard ferric chloride (1 c.c. = 0.1 mg. Fe) to the second tube until the tints are alike.

In rare cases when sufficient iron was present for a volumetric assay, the ferric hydrate was dissolved in dilute sulphuric acid, boiled with aluminum turnings till the iron was completely reduced to the ferrous condition, cooled and titrated with permanganate.

Zinc

As practically no other metal was present in the filtrate from the iron, it would seem that zinc might be determined directly by acidulating with HCl and titrating with ferrocyanide at a suitable temperature. It was generally found, however, that the results were unsatisfactory, perhaps owing to the presence of nitrates, unless a separation was made. This was carried out by acidulating very slightly with sulphuric acid, and precipitating the warm solution (at about 70 deg. C.) with H_2S.

The zinc sulphide is then easily filtered off and the zinc determined by any of the usual methods. Dissolve the ZnS in a slight excess of HCl. Boil, filter, dilute; heat in a porcelain basin to 70 deg. C. Run in standard ferrocyanide till a drop taken out gives a distinct brown color with a drop of uranium acetate on a white plate. Add 1 or 2 c.c. ferrocyanide beyond this point. Allow to stand in a moderately warm place for 10 minutes, then titrate back with standard $ZnCl_2$ until a drop no longer gives a color with the uranium indicator. The standard solutions in use were each adjusted so that 1 c.c. = 0.0025 gram Zn.

General Remarks

An analysis by this method can generally be carried out in two days. On the first day the gold, silver and selenium are determined and the lead precipitated as sulphate in the filtrate from the selenium. On the second day the lead, copper, iron and zinc are determined. The results obtained usually agreed satisfactorily, and left about 0.25 per cent. unaccounted for. This system of analysis is only applicable to the "cyanide" bullion, "mill" bullion containing too large a proportion of gold.

Imports and Exports of Metals in Germany

Imports and exports of metals in Germany for the three months ended March 31 are reported as below, in metric tons:

	Imports.	Exports.	Excess.
Copper	30,740	14,975	Imp. 15,765
Tin	3,067	1,793	Imp. 1,274
Lead	12,751	7,247	Imp. 5,504
Zinc	6,572	21,715	Exp. 15,143
Nickel	621	296	Imp. 325
Aluminum	827	323	Imp. 504

Imports and exports of metallic ores, other than iron, are reported as follows:

	Imports.	Exports.	Excess.
Gold ore	11	.....	Imp. 11
Silver ore	1,124	.....	Imp. 1,124
Copper ore	7,469	788	Imp. 6,681
Tin ore	3,018	70	Imp. 2,948
Lead ore	33,300	511	Imp. 32,789
Zinc ore	46,242	8,077	Imp. 38,165
Manganese ore	90,593	1,170	Imp. 89,423
Chrome ore	4,691	41	Imp. 4,650
Tungsten ore	551	41	Imp. 510
Uranium ore, etc.	285	.....	Imp. 285
Nickel ore	7,824	.....	Imp. 7,824

Imports of pyrites were 145,736 metric tons; exports were 3243 tons, showing net imports of 142,493 tons.

Hand sorting seldom receives the degree of attention which it deserves. It is one of the simple things that is disregarded in the desire to have a mill, do everything by machine, and crowd the ore through. The advantages that may be derived from hand sorting are coming more and more to be recognized and it is being introduced as an accessory process in some of the largest and most expensively equipped mills. A good deal of the zinc ore of Wisconsin, Leadville, Colo., and Park City, Utah, is prepared by hand sorting only. No one need therefore be ashamed to resort to this simple process or feel that in doing so he is not up to date and economical.

Experiences with Austrians as Iron Miners

By Robert B. Brinsmade*

If the proverb "distance lends enchantment" could be expressed "distance creates illusion," it would be more concise, for the opinion formed of far away persons or things may often be depressing instead of enchanting.

In the Rocky Mountain camps one often hears the tales of English-speaking miners from the East concerning the degradation of mine labor wrought by the invasion of Austrian paupers. As this oral testimony seemed to be corroborated by the popular magazines, so full of the subject during the anthracite-coal strike, it was not with a feeling of exhilaration that I took charge of an eastern iron mine employing chiefly that class of labor.

Well conducted native boarding-houses (and such we had) form the key to success in the creation of a stable Austrian mining force. That such was the case was made evident to the rival operators, who attempted to lure away our best men by tempting wage offers. Our men sometimes left, but two or three days of Canadian-French or Irish board at American prices, usually started the truants toward home. The boarders were either single men or those with wives still in Europe. The rule was two men to a bed and these sometimes furnished their own bedding. The crowding apparently was not detrimental to health in the isolated cottages, ventilated by the fresh air of this rural village. When not allowed to come up at the lunch hour, the Austrian miners, going on shift underground, were not only lacking "a full dinner pail" but they were without any. The custom of eating but two meals a day is usual with Slavic peasants.

Racial Characteristics

The men whom till now I have called Austrians, belonged to two distinct branches of the Slavic family. Half were Galician Slovaks from around Cracow; the rest, who called themselves "Russians," were really from northern Hungary and belonged to the Rousniak or Little Russian people. Much alike in dress, in habits of living, and in spoken language, they yet had important differences. The Slovaks were Roman Catholics, used the Latin alphabet, and were better educated than the Rousniaks who were members of the Russian church and employed Greek chirography.

The statement that successful mine management requires some knowledge of ethnology may appear ridiculous to some, but not to the mining engineer, dependent on Slavic miners, who finds his operations half-manned day after day, on account of religious holidays. The Slovak saints' days, from the Roman Catholic calendar, seldom coincided with the holidays of the Rousniaks taken from the Russian church with its old-style chronology; this was a fortunate thing for our mining operations. January 7, 1905, was the Christmas, and January 14 the New Year of the Russians, as a date by old style reckoning, is 13 days behind a corresponding one by our calender. This with 19 Slovak and 30 Rousniak holidays made a total of 49 holidays, only 12 of which fell on legal rest days.

The holidays are generally 24 hours long, commencing at 6 p.m., before the marked date. A few, like the Slovak June 29, last but 12 hours; others last 36 hours until 6 a.m. on the following morning. On the night before a holiday, except on Good Friday and similar fast days, liberal consignments of beer arrive at the boarding houses. However, most of the men will be sober enough to go to work at 7 p.m., and only a few of the reckless will prolong their potations beyond the prescribed limit. At the celebrations accompanying a native wedding or christening, the intoxication is apt to be more unrestrained.

Divided Clans

The Slovaks and Rousniaks always boarded with members of their own race, and did not fraternize freely. During extended drinking bouts, the two races sometimes came to blows. The drill men were mostly Slovaks; the muckers, Rousniaks; this condition may be partly ascribed to the better education and more active mentality of the former. The fact that the Slovaks, who had arrived earlier and had the first chance to learn drilling, disliked to take Rousniak muckers as helpers, had much to do with this backwardness, for our three or four Rousniak drillers were certainly no laggards.

The usual difference in holiday dates made it possible to operate continuously by suspending development. During a Slovak lay-off the few Rousniak drillers would be supplemented by the American scalers and shift-boss to break as much ore from the stopes as the reduced force could handle. When the Rousniaks stayed away, the Slovak drillers would be bunched for drilling the stopes, while their helpers, much to their disgust, would be required to shovel and tram.

Except for occasional internecine brawls from prolonged drinking, the Slavs were quiet and good-natured. Though unruly spirits would sometimes stir up their fellows to disregard their pledged work and disobey orders, yet a little firmness and tact was always sufficient to restore discipline. The boarding-house keepers being older and longer in America than the rest, were the natural leaders, and the only instance where they failed to keep their agreement with the management, was when American busybodies had so [illegible] them temporarily beyond control.

[illegible]

As rock-drill runners, the Slavs are far from ideal. A bright young Slovak, who might on first trial put in one drill-hole a shift, can, after a few months' practice, put in five 6-ft. holes per shift, while a first-class American runner would be finishing six or seven in the same ground. But though the Slovak may learn to put in holes, he does so at the expense of the drill, for whose preservation not only care but some mechanical aptitude is requisite.

This deficiency as a mechanic may arise from the fact that the small holdings and monotonous routine of Austrian peasant life has not developed in him that "gumption" that is the natural attribute of the American pioneer farmer. It may arise from his failure to learn English, due not only to the great difference of our language from the semi-oriental Slavic tongue, but also to his clannish living-habits outside of work. The instructions of the American shift-bosses are thus imperfectly understood, and few competent native bosses can be developed until the younger Slavs, educated wholly or partly in our schools, shall attain maturity. The minor trouble of their unpronounceable surnames, was avoided by disregarding entirely the native spelling, in order to inscribe the pay-roll with the Slavic names spelled phonetically by the English alphabet.

The Slavic drillman's lack of care is very evident. Thus, instead of setting the nuts on a new tripod with the leverage of the appropriate spanner, he will hammer the spanner handle until either something breaks, or the nut thread is so strained that it can never be set in future without a sledge. He invariably prefers a hammer for a stuck bit, to an adjustment of the machine's alinement; and the effect of his fondness for the sledge cure-all is the despair of every drill-repairing machinist.

But in spite of their shortcomings, our Slavs were hardy and industrious laborers, most of them in the flower of youth. They rendered possible the working of a low-grade mine, into which sufficient of the region's Americans could not be tempted, except at prohibitive wages.

Experience has shown that it is easiest for pickers to throw the sorted material in front of them, and this arrangement is easily made with tables of annular form, in connection with which a conical surface may be arranged inside the ring, around the vertical axis, with radial partitions to separate different classes of ore which will slide down the cone into proper receptacles. With stationary tables, and endless belts where picking is done from both sides, it is generally necessary for the pickers to throw the sorted ore backward instead of forward.

*Mining engineer, Lawrence, Kan.

An Alternating-current Coal-mining Installation

The McKell Coal and Coke Company Employs a Central Power Station with High Potential Transmission and Transformers Where Required

BY T. W. SPRAGUE AND C. K. STEARNS *

After operating the Kilsyth mine for a number of years using electric haulage of the rack-rail type and making other uses of electric power in and about the mines, generating the current at 275 volts close to the bank mouth, the McKell Coal and Coke Company, of the Loup Creek territory in the New River field of West Virginia, realized the necessity of supplying electric power for similar and other purposes at their new operations farther up the creek.

The first plan considered was the placing of other power plants at each operation. Lack of water during a portion of the year was an obstacle in the way of this plan; and, further, it meant a large increase in operating expense, each plant requiring its own engineers and firemen. Moreover, the distances between the new operations and from the existing plant to the new operations is too great to allow of direct current or low-voltage transmission. Further than this, the installation of such individual low-tension power plants would only meet the requirements temporarily. The extent of the coal to be mined eventually and handled over the tipples now being installed is so great that the cost of distributing electric power over the entire territory from these stations in the form of direct current would largely offset the economy of its use.

Relative Positions of the Various Plants

A glance at the map (Fig. 8) will show the relative positions of the initial plant at Kilsyth, the new operations opening at Oswald, Sidney Graham and Tamroy, the latter being about one-half a mile south of Graham. The map also shows roughly the outcrop line of the Sewell seam of coal, which is the best known seam of the New River district. It will be noted that the topography is such that this seam outcrops along the branches of Mill creek, a tributary of Loup creek, at distances of over a mile from the pit mouths, as well as along the upper branches of Loup creek, affording an excellent opportunity to convey power over the surface at a high potential and thus reach the distant points of the field.

The establishment of a central station from which power could be distributed to the many points needed was the logical solution of the problem, and naturally the location of this station, other things allowing, should be, as its name indicates, in the center of the entire property. This, as has already been said, was not feasible, owing to lack of suitable water supply. And this requirement led to the final choice of Kilsyth, for the new generating apparatus, being the nearest point to the power center where a water supply was available, and it further offered the advantage of combining the new with the already existing power plant, which it is necessary, or at least advisable, to maintain in its existing shape for the present.

General Station Equipment

The power requirements of the McKell operations, like all mining operations, are steadily and constantly increasing, and this fact, with the present needs, fixed the size of the first unit to be installed for the transmission work at 500 kw., with a station proportioned for a second unit within the same building, and space available for an extension of the building to accommodate a third unit, should it be found necessary.

The existing boiler plant, consisting of four horizontal tubular boilers, was increased by the addition of four Robb-Mumford 72-in.x18-ft. boilers of the same general type, having 4-in. charcoal-iron tubes.

The engine is a Reynolds Corliss 26x42 in. running at 120 r.p.m. with a normal steam pressure of 115 lb. This engine is direct connected to a 500-kw. 24-cycle, 6600-volt 3-phase Bullock generator, revolving-field type, with 24 poles. It is separately excited by a 20-kw. generator wound for 230 volts, direct connected with an 8½x8-in. American Ball engine running at 375 r.p.m.

The switchboard consists of three panels of Vermont marble. The generator panel caries the usual direct-current instruments for the exciter circuit, three al-

FIG. 1. MAIN POWER HOUSE AT KILSYTH

* Engineers, Boston, Mass.

ternating-current ammeters, and a three-phase indicating wattmeter. It also carries the controlling wheel of the field rheostat, its switch, a synchronizing plug for an additional generator, and an operating lever controlling a triple-pole, single-throw non-automatic, 6600-volt oil switch, placed 3 ft. in the rear of the board. A swinging bracket attached to the board carries an alternating-current

current generators already installed may be used for excitation in case the regular exciter is out of commission for any reason.

Lightning arresters are placed where the line wires leave the power house, through ventilating cupolas and disconnecting switches at the same point allow the cutting out of the entire equipment,

ond-growth chestnut 35 ft. in length, with 7 in. top diameter and 12 in. diameter 6 ft. from the butts. At crossings 40-ft. poles are used, and protection is provided in case of breakage. The poles are set from 5 to 7 ft. in the ground.

From the Oswald sub-station (No. 2 on the map) to the Graham sub-station (No. 3 on the map) the same form of construc-

FIG. 2. INTERIOR GRAHAM SUB-STATION.

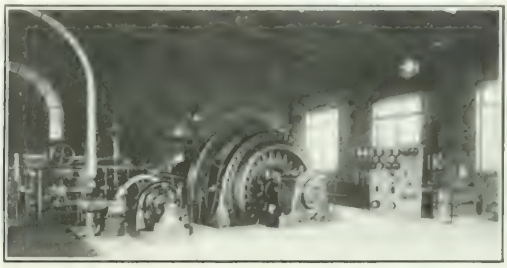


FIG. 3. 500-KW. A.-C. SET IN KILSYTH POWER HOUSE.

FIG. 4. GRAHAM SUB-STATION.

FIG. 5. INTERIOR SYDNEY FAN HOUSE.

FIG. 6. GRAHAM FAN HOUSE.

FIG. 7. MAIN POWER HOUSE, KILSYTH. BOILER ROOM END.

voltmeter with illuminated dial, and a Lincoln synchronizer.

The feeder panel carries three alternating current ammeters, a power factor indicator, a static ground detector, a three-phase recording wattmeter, and an operating lever controlling a triple-pole, single-throw automatic 6600-volt oil switch, with overload relay.

The exciter panel carries the usual direct-current meters and equipment with the addition of a lighting switch and a switch by which current from the direct-

Transmission-line Construction.

The transmission line from Kilsyth to the Oswald sub-station (No. 1 to No. 2. See map) consists of three No. 2/0 copper wires carried on high tension porcelain insulators, supported by iron pins. The three wires are placed in the form of a triangle, in cross section about 28 in. on a side. The top wire insulator is carried on an iron ridge pin, and the other two are held by iron pins supported by a Southern pine cross arm 3 ft. long, 26 in. from the top of the pole. The poles are largely sec-

only No. 4. The amount of copper installed is sufficient to supply double the present capacity of the sub-stations with a line drop of 10 per cent.

At each sub-station are located transformers reducing the alternating current to a voltage of 160 for conversion to direct current at 250 volts, through rotary converters.

At Oswald the sub-station is equipped with a 300-kw. rotary with equivalent transformer capacity, all of Bullock manufacture. This sub-station supplies direct

current for locomotive haulage, coal cutting and minor uses in the Sydney mine close by the station, and also for the same uses in the Oswald mine, the bank mouth of which is across the stream from the sub-station. At Graham a 200-kw. rotary supplies the Graham mine, the pit mouth of which is near the location of the fan shown as No. 6, in Fig. 8.

Sub-station Equipment Details

Each sub-station is designed for an increase in capacity to double the present installation, and each contains a four-panel switchboard. The alternating 6600-volt current first passes through an automatic oil switch placed in a concrete cell at the rear walls of the building and controlled from the switchboard. The same panel carries three alternating-current ammeters and voltmeter on a swinging panel. The second panel carries an ammeter for low-tension alternating current, and three single-pole, double-throw, main switches for the rotary.

In operation these switches are thrown down for starting, thus connecting the rotary to half voltage taps in the transformers, and the regular running position is up. Field break-up switches are placed on the frames of the rotaries themselves as are also the equalizer switches for future equipment. The direct-current panels carry the usual generator and feeder equipment for two main circuits, and an auxiliary lighting circuit. The main circuit and the feeder circuits are protected by circuit breakers, and both alternating-current and direct-current lines are provided with complete lightning-arrester equipments. The incoming and outgoing lines pass through tiled openings in the rear walls and the alternating-current lines are provided with disconnecting switches.

The sub-stations, like the main station, are of stone with concrete floors and foundations. The roofs are of the slow burning wooden type covered with a composition, and supported by steel trusses. The sub-stations are located so as to reduce the direct-current distributing distance as much as possible, and at the same time to place them where the small attention required may be conveniently given by employees at the tipples, or on other portions of the outside works. The main direct-current circuit breakers in each station are provided with a contact device by which a bell, located at any point where some employee is within sound, is rung and lamps are also lighted, when the circuit breaker is out, giving both a visible and audible alarm.

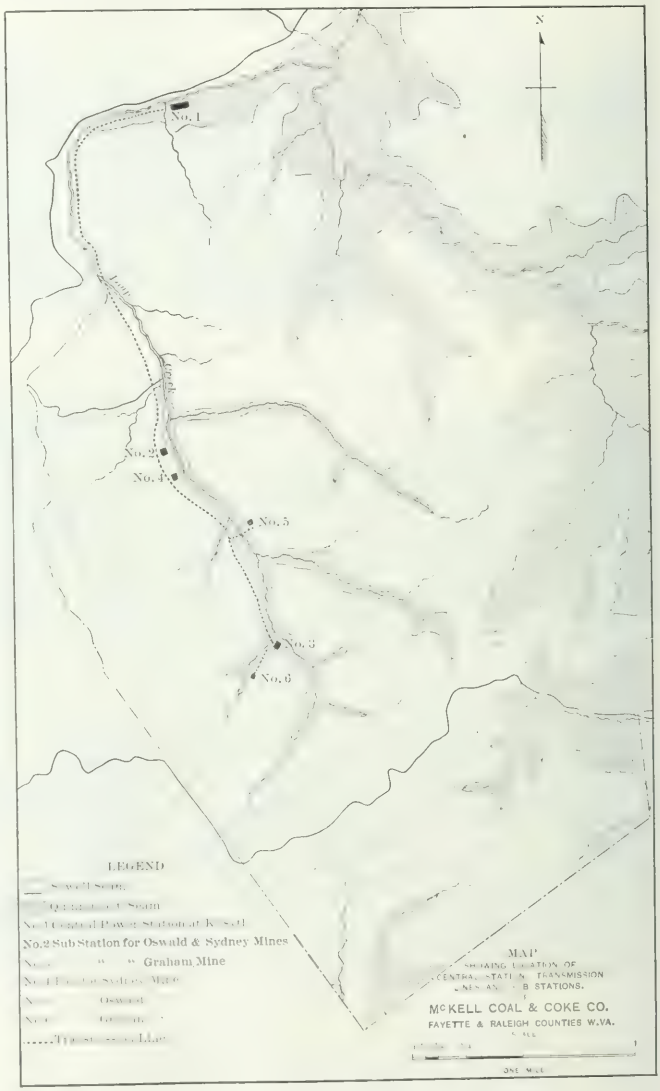


FIG. 8

The three mines are provided with Clifford-Capell fans, and owing to the heavy demand for power which these fans when run at their full capacity will make, they are operated by alternating-current motors entirely independent of the sub-stations. The Sydney and Oswald fans located at No. 4 and No. 5, respectively, Fig. 8, are 11 ft. in diameter 4 ft. 4 in. in width, with a 9-in. shaft, and are rated to deliver 100,000 cu.ft. of air each per min., against a 3-in. water-gage pressure. Under these conditions the fans would run at 230 r.p.m. and require about 80 h.p. each.

The Graham fan is of the same pattern, 9 ft. in diameter, 3 ft. 6 in. wide, with a 7-in. shaft, and is intended to deliver 75,000 cu.ft. of air per min., against a 2-in. gage pressure. This requires a speed of 200 r.p.m., and about 40 h.p. for driving.

All three fans are placed with shafts parallel with the mine entries on concrete foundations, with steel and concrete housings and the motors are placed in concrete houses with wooden roofs. The fans are arranged for exhausting, but can be changed to run as blowers by altering the position of the fan and air-passage gates.

Each fan house is provided with lightning-arrester equipment and disconnecting switches, where the lines enter the fan houses, and the high-tension current is controlled by an oil switch placed so that

it prevents anyone unaccustomed to the plant from accidentally touching the high potential apparatus. From the oil switch the current is carried overhead along the roof to three transformers which reduce the voltage to 440, for which the motors are wound. The fans are belted to the motors, which are of the standard three-phase induction type, controlled by compensators.

Each motor is provided with large and small pulleys, allowing a variation in speed, the present requirements being much below the expected ultimate requirements for which the motors are installed. Banks of lamps on the secondary of the transformers, which lamps are normally to be burning, will show an interruption of the current and a visible signal will also be arranged to show an interruption of the fan itself through the same cause or trouble with the motor or belt connection. The fan motors, transformers and electrical equipment are of the General Electric Company's manufacture.

Flexibility of System

The location of the Oswald fan No. 5 is a good illustration of the adaptability and flexibility of the system. At the time the installation was started, it was planned to place this fan near the sub-station No. 2. Later on it developed that a location more than a half mile away would materially increase the efficiency of the work of the fan. Were a low-tension generating plant installed at No. 2, the cost of copper to connect a fan requiring 80 h.p. at No. 5, would be considerable, and, of course, the same statement is true were it necessary to take direct current from the sub-station. The cost of connecting on the high-tension lines running from Oswald to Graham, and passing within a short distance of No. 5 is entirely negligible, and would not be of great importance had it been found desirable to place the Oswald fan at some other point, even much more remote from the bank mouth.

In the same way induction or synchronous motors for various purposes may be placed practically at any points needed in the entire territory covered by the map, at a nominal copper cost, the voltage of 6600 reducing the size of conductors so that the principal item of expense in such distribution is very materially cut down.

It is equally feasible to place other rotary transformer stations at distant points on the property for direct-current distribution underground, and if such distribution is needed at points in the workings midway between the outcrops on the main creek, and its branches, and those on the head waters of Mill creek, the high-tension current may be carried overhead to a point above the center of such a needed distribution and thence down a bore hole to an underground transformer station similar to the sub-station already described.

The efficiency of the transmission under the working conditions herein described is over 80 per cent., that is of the horsepower delivered by the engine, 80 per cent. is made available at the sub-stations in the form of 250-volt direct current. The efficiency of the fan motor drives is approximately 78 per cent. from engine to fan motor belt.

Other uses of power will probably be added later, and it is also possible that it will be found advantageous to discontinue the small high-speed belted engines at the Kilsyth station, and either run the direct-current generator by induction motors or place rotaries there for the Kilsyth haulage.

Improvements in the Schuylkill Coal Region

Special Correspondence

There are indications of unusual activity in the Schuylkill field of the anthracite region in the matter of improvements at the various collieries. In a number of places some important improvements have been completed. Preparations are being made for a record year so far as the output is concerned.

At the Pine Knot colliery a number of long and expensive tunnels have been driven, opening up new beds. The water from the Mine Hill Gap workings has been located and tapped, and the Payne water-level drift has been reopened. At Thomaston colliery the slope has been reopened to the first level, and a tunnel 1000 ft. long is being driven across the basin to the Primrose vein. All the water has been taken from the Lebar slope and an air shaft sunk to the level of the heading, making the connection. At Glendower colliery a connection has been made between the Skidmore and the Buck Mountain vein.

At the Phœnix Park colliery a tunnel is being driven to the Peach Mountain vein. It will be 810 ft. in length, with an air tunnel from the Diamond to the Tracy veins. A bore hole has also been sunk 770 ft. from the surface to the sixth lift. This will be used for an air line and will carry power to run pumps and air drills. At the Mt. Hope workings, St. Clair, many important changes have been effected. A modern breaker has been erected containing two sets of shakers, two new spiral separators, two sets of small rods and two new jigs. The breaker has a capacity of 400 tons. A tubular boiler of 150 h.p. has been installed in the boiler house in place of the old nest of boilers. A new slope has been sunk to the Mammoth vein, with turnouts at the bottom. The Ellsworth colliery, just above St. Clair, is erecting a breaker with 400 tons capacity. This is [illegible] in the county.

The Darkwater Coal Company, at Broad Mountain, is also expending a large sum in improvements, a double-track tunnel having been driven from an elevation at the head of the breaker to the double-track slope sunk last year in the main basin of the Skidmore vein. An additional slope for hoisting rock and a pump way, 650 ft. deep, has been sunk in the Skidmore vein and a big pair of hoisting engines erected. To tap the water from the old Reppler mine, operated at this point, many years ago, and which has been a menace, two tunnels have been driven. Two Jeansville pumps have also been installed in the pump house. On the surface two steam shovels are in operation, stripping the Mammoth vein in the main basin. At the Pine Hill colliery a new breaker was recently placed in operation to replace that destroyed by fire. The building is of concrete up to the floor line. The old engines have been remodeled, while a new dynamo engine of 892 amp. has been installed. Two pump houses, each 22 ft. high, have been built, and when completed the sides and top will be covered with reinforced concrete. Two Scranton duplex pumps, 40x14x36 ft., will be used. Several long tunnels opening up new veins have been driven. The Red Ash and Black Heath veins have been worked out, but there is ample coal left for working.

At the Lytle colliery elaborate improvements are being rapidly completed. A number of tunnels have been driven, one to connect the Holmes and Four Foot veins, one from the Middle split of the Mammoth to the Black Heath west and on the same level to the Skidmore east. At the Oak Hill colliery the water has been tapped from the workings of the Charles Hill colliery. The main holes run from 22 to 25 ft. in length and are 15 in number. When the valves were opened the pressure at some points was 155 lb. to the square inch. A new breaker has been completed to handle the finer sizes of coal.

At Heckscherville, Cain Brothers have completed a model little plant, the breaker having a capacity of 400 tons. A tunnel has been driven to the Seven Foot vein from the Skidmore level. At the Buck Run colliery a fine electric-haulage system has been established, consisting of a 100-kw. 250-volt General Electric engine, driven by a McEwen machine and operating two 8-ton locomotives.

Fastening the rope to a shaft drum by several coils is not necessary. Experience has shown that a pull of one ton, with one coil around the drum, will resist eight to 10 tons; with two coils around the drum it will resist a weight of 64 to 100 tons, with three coils around the drum it resist 512 to 1000 tons.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

As a general rule, the deeper a mine, the more dangerous the coal dust.

It is possible to initiate an explosion of coal dust by dropping a mass of finely ground coal upon a large flame in the bottom of a vertical box. For the purpose of throwing further light on the action of coal dust as an explosive agent, this experiment is valuable.

The coalfields of North Carolina are confined principally to Chatham and Stokes counties, the coal in each district being associated with Triassic sandstone. The Cumnock mines in Chatham county are the only ones that have thus far been worked on a commercial scale.

The coal-mine death roll in Pennsylvania during 1906 was 500 approximately, 200 dying as the result of gas or powder explosions. In West Virginia, during the same year, mine explosions caused 88 deaths, while in the early months of 1907, the list of fatalities was increased by more than 100.

With two exceptions, May, 1905, and January, 1903, the production of anthracite coal during April, 1907, was greater than that of any other single month. The production for April was 5,916,583 tons. The greatest output for any single month was in May, 1905, when the production was 6,605,159 tons.

For transmission of power a seven-wire iron rope is often used. At several anthracite collieries the driving sheaves of such ropes are lined with flexible material, such as leather or rubber packing, both of which give good results. It has been found by experience that the span should be at least 50 ft. which gives a deflection of about 2 inches.

At several continental collieries, electric generating plants have been established in connection with the mining operations. Steam turbines are employed and electricity is not only generated for the needs of the colliery, but current is supplied for lighting and power purposes in adjoining districts. Some mines in America are located favorably for the successful adop-

The silvery luster shown by many of our best grades of coke is said to be due principally to the decomposition of some of the gases evolved during the process of coking, and the deposition of a thin coating of pure carbon on the surface of the coke cells. This thin coating protects the cells from alteration in the air, and is accountable for the durability shown by many cokes. The carbon coating also adds strength to the coke and improves its appearance.

In mixing good portland cement little water is required to make a good mortar. Neat cement will take, by weight, 17 to 20 per cent. of water, and a quick-setting cement requires more water than one that is slow to set. In case the mixture requires more water it indicates an excess of free lime. Slag and natural rock cements require more water than portland cement. Too much water retards the setting and weakens the mortar.

The demand for coal along the Pacific Coast creates a high price for that fuel. It fetches $2.50 to $3 per ton at Nanaimo, B. C. Values are not stated separately for the collieries of Vancouver island in the statistics of the Minister of Mines for British Columbia, but making allowance for the Crow's Nest production at its known value, the average for the Vancouver island coal appears to have been a little upward of $3 per ton (2240 lb.) in 1904. The coal of Vancouver island is of good quality.

The footings under the buildings about mines ought to be proportioned according to the thickness of the wall. The weight of such buildings as boiler and engine houses will seldom exceed two tons per square foot when distributed uniformly over the footings. The width of the footings for light buildings should be proportional, so that the pressure on the soil will be the same per square foot under all parts of the building. Unequal pressure on the soil due to one wall being higher than another will cause openings or cracks to appear in the foundation.

In driving rooms or chambers where they are close together, and are to be driven over 300 ft., a counter heading should be driven across the chambers or rooms from one of the chambers, which is well adapted for haulage purposes. The distance from the gangway to the counter should be about 200 ft. All the chambers formerly driven from the gangway, are then driven from the new counter. The advantages derived from following this plan are: First, it minimizes the interruption on the main gangway road; second, it gives a quick handling of the loaded and empty cars by drivers, or it saves time in disposing of empties and collecting loaded cars; third, it saves rails.

In working a seam having a thickness of 3 ft. or less, several anthracite companies have found that the most economical method of operation is to drive chambers from 26 to 30 ft. wide, with 45-ft. centers; gob is packed to the roof on one side of the chamber, and the tracks are laid close to the rib, about 6 ft. from the rib to the center of the road. This system saves timber to a great extent, as the gob acts as props. The support offered by the gob is stronger than timber; besides, it gives a permanent support for the roof, while timber decays, and consequently the roof will cave when it is undertaken to rob the remaining pillars. In robbing pillars, it is not necessary to move the gob again because the roads in the chambers are next to the pillars; thus the coal is more cheaply produced than otherwise.

The Crow's Nest Pass coalfield is situated on the western slope of the Rocky mountains. According to Dr. George M. Dawson (THE MINERAL INDUSTRY, Vol. VII, p. 200) it has an area of at least 200 square miles, and contains numerous superimposed coal seams, ranging in thickness from 2 to 30 ft. The chief mining in this field is done by the Crow's Nest Pass Coal Company, the history of which is practically the history of the field. This company was incorporated by Dominion charter in 1897. It owns about 250,000 acres of land. It began mining at Coal Creek in 1897. Legislative restrictions prevent the Crow's Nest Pass Coal Company from charging more than $2 per ton for mine-run coal at the mines. The coal is of good quality. The mining rate in the field in 1905 was 70c. to $1.15 per ton of screened coal.

China can justly claim to be the first country to utilize her coal deposits, but as in many other instances, she has gone through ages without any advance in methods of development. There has been considerable increase in the output during the last decade, but although there are a few modern operations, the vast majority of the mines are still worked by crude methods. The entries are low and winding. The miners carry the coal out of the mines or to the hoisting shaft in baskets, or load it on sleds; sometimes on four-wheel trucks. Where shafts are used, the coal is hoisted by means of a windlass operated by five or six men. In effecting drainage, the water is raised up steep inclines by a gang of boys with small water baskets; at the top of the incline the water flows into a ditch, and is carried away. Ventilation is accomplished by means of a furnace or by driving the air down the shaft or incline by means of wooden box fans operated by men.

Metallics

At some mines the tamping consists of fine drillings packed in paper tubes or cartridges. This is good practice, but if the same time were spent in drilling the hole an inch or two deeper the results might be even better.

Excessive tamping is especially apt to cause trouble in soft ground, where single jack and auger are used; in such ground the miner finds plenty of talcy tamping in the vein filling itself. When a fuse is jerked out by another blast, it is also difficult to find it in such ground.

The drawbacks of tamping are several. The fuse is liable to be injured by sharp rocks in the tamping or by being crushed between the sides of the hole and the tamping stick, and a missed hole results. When a good supply of tightly rammed tamping has been used and the hole misses, it is no enviable job picking the tamping out of the hole.

Important principles in magnetic separation are the production of a magnetic current of the minimum intensity and maximum density; the production of a homogeneous magnetic field; passage of the material to be separated through the magnetic field as near as possible to the attracting pole of the magnet, and in an even, regular sheet, at the proper speed.

At Iola, Kan., the smelting of zinc residue containing 10-15 oz. silver, 0.03 oz. gold, and about 6 per cent. lead, was abandoned as unprofitable after a long trial, although 91 per cent. of the silver, 92.5 per cent. of the gold and 92 per cent. of the lead were recovered. It may be assumed therefore that the cost of smelting was considerably in excess of $10 per ton.

The European zinc smelter will not pay for lead in ore unless it be in excess of 8 per cent. Lead in excess of 8 per cent. is paid for at 50 per cent. of the price quoted in London. It should be remarked, however, that the price paid for silver and lead cannot fairly be considered by itself, but must be viewed with regard to the terms under which the zinc in the ore is paid for. For example, a smelter may make a comparatively low returning charge on the ore, contemplating that a concession in that respect will be offset by a profit on lead and silver for which he pays nothing to the seller of the ore.

Comparatively little copper is put upon the market in cathode form, although this is an ideal shape from which to make brass and copper castings. The wirebars and ingots never give a conductivity equal to that shown by samples from the cathodes from which they are made. This is partly due to the absorption of some impurities from the furnace lining and products of combustion, and partly to mechanical pocketing of impurities in the cathodes during the electrolytic process. These particles of impurities are associated with nodules and a smooth part of the cathode is naturally selected as a sample to draw out into wire.

In general, the European zinc smelter is not disposed to pay more than 60 per cent. of the assay value of silver in the ore, and that rate only on the silver in excess of 150 grams (about 5 oz.) per 1000 kg. If the price of silver be 50c. per oz., or 8.5 centimes per gram, the rate paid will be about 5 centimes; with silver at 55c. per oz., or about 10 centimes per gram, the rate paid will be about 6 centimes. An ore assaying 10 oz. per ton would therefore suffer in the first place a deduction of 5 oz., and the remaining 5 oz. would be paid for at the rate of 36c. per ounce (silver being 60c. per ounce in the market), making the silver value of the ore to the miner $1.80 per ton.

While tamping is recommended by most authorities on blasting with dynamite, it must be done with discretion. The most important service of tamping is to hold the fuse in the hole and to prevent its being jerked out of the dynamite when hit by flying rocks from another blast. Another is to prevent the possibility of flying sparks from the spitting fuse burning the charge before the cap is ignited. For these purposes very little tamping is necessary and that of a clayey nature is best. Burning the charge by a spitting fuse occurs from time to time, and accounts for occasional burned holes, "the stinkers" of the miner, even when strong caps are used and the powder is well thawed.

The presence of much copper in the slime from electrolytic tanks is objectionable in the silver refinery process and must be removed before cupelling the dried slimes to avoid making very rich slags. The other impurities give little trouble, except possibly tellurium, which requires prolonged furnace treatment to burn it off. The copper is present in very finely-divided form, as is shown by experiments in fine screening to reduce the copper contents. Almost all of the copper which will pass a 40-mesh wire screen, will also pass a 200-mesh. This would indicate that the coarser screen removes the fine crystals that have dropped from the cathodes and that the remainder is in the form of a chemical cement.

The principle of all magnetic separators is simple. An electro-magnet, when energized by a current passing through its coils, attracts magnetic substances to one or both of its poles. This is the first step in the separation. The second is to cause the magnetic material to drop off from the pole, separate from the non-magnetic material from which it was removed. The simplest, but most impracticable, method of doing this is to lift away the magnet, cut off the current and allow the attracted material to fall into a separate receptacle. Magnetic separation has been, indeed, effected in practice, on a small scale, in precisely that manner, and it is a useful method for laboratory tests, but for commercial work it is too cumbersome and slow.

Hand sorting has the advantages of saving clean mineral from unnecessary crushing, therefore avoiding loss in slime; of separating the two minerals of equal, or nearly equal, specific gravities, like blende and siderite, or blende and pyrites; of saving in cost of plant. It is not likely to be any more expensive in direct cost than a cheap process of milling, like ore dressing; it is apt to be a good deal cheaper than some of the more expensive processes, like cyaniding. The cost of picking depends chiefly on the size of the pieces of ore and their specific gravity. It is obviously cheaper to pick out lumps of 2-in. size than ¾-in. size, while lumps of a heavy mineral, like galena, weigh up faster for the same expenditure of labor than a light material, like quartz. It is apt to be uneconomical to pick over ore smaller than ½-in. size. Ore of 1-in. size can generallly be picked to advantage. With labor at 30c. per hour the cost of picking galena ought not to exceed 60c. per ton, or 90c. per ton for blende, and it may be considerably less if the ore be favorable.

Cathode copper is exceedingly pure, usually about 99.93 per cent. copper, with hydrogen as the chief impurity. Objectionable cathode impurities are of two classes—those which depress the electrical conductivity and those which make the metal brittle. Arsenic and antimony represent the first class; tellurium and lead the second. Good cathode copper should show but a few thousandths of a per cent. of arsenic and antimony. Experiments have indicated that it takes but 0.0013 per cent. of arsenic or 0.0071 per cent. of antimony to lower the conductivity 1 per cent. Any conductivity troubles in electrolytic copper can almost invariably be traced the presence of undue amounts of one or both of these elements. Impurities of the brittle-making class are rarely met with, and if present are due to mechanical contamination of the cathode, either in the bath or in the subsequent furnace treatment. A third class of cathode impurity concerns the refiner, comprising silver and gold. Cathodes usually show from 0.1 to 1 oz. silver and a trace of gold. This seems to be due entirely to the mechanical fouling of the cathode by particles of anode slime. In fact, it is a question if most of the arsenic and antimony found in the cathodes does not have a similar origin. The slime is very finely divided and the continual circulation of the electrolyte necessary to prevent polarization maintains a slight turbidity. These particles are probably electrostatically attracted to the cathode.

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*Illustrated.

The Amalgamated Report

The report of the Amalgamated Copper Company for 1906, which has been published this week, is distinctive, like predecessors, for what it does not tell, rather than for what it does. The net income for 1907 was $14,154,400, against $9,161,537 in 1906. The net income in 1907 was equivalent to a little more than 9 per cent. on the $153,887,900 outstanding capital stock of the company. On its face, this is not an entirely satisfactory showing, in view of the extraordinarily high price for copper which prevailed throughout 1906. However, it is to be remembered that the Amalgamated is simply a holding company, and that large surplus earnings, upon which it may draw, may be retained in the treasuries of its constituent companies. The peculiar feature of the Amalgamated is the general ignorance as to just what it owns. It is remarkable that so important a company should have continued so long to withhold from its stockholders information as to what is behind its stock.

The interesting statements in the report relate to the production of the company. The output of the Washoe and Great Falls works is given as 275,000,000 lb. in the calendar year 1906, of which the production of the Amalgamated companies was 224,000,000 lb., the remainder being derived from custom ores. The Amalgamated smelted the entire output of the North Butte company, and smelted the output of the Red Metal Company subsequent to July 1, besides which it obtained considerable supplies of ore from smaller companies.

It is interesting to note that the combined production of the Washoe and Great Falls works was just 30 per cent. of the total production of copper in the United States in 1906, while the production of the constituent companies of the Amalgamated Copper Company was a little less than 25 per cent. of the total. These figures are far in excess of those of any other copper producing company of the United States. The Washoe works is the largest single producer of copper in the United States; probably it is the largest in the world. The second place is held by the Great Falls works, and the third place by the Douglas works of the Copper Queen company, but between these two the difference is small.

In the report of the Amalgamated, it is remarked that "The position of the copper metal market during 1906 was highly satisfactory. The price of the metal rose from 18½c. in December, 1906, to 25¼c. in March, 1907." (Evidently these figures refer to the price for the metal on the basis of 30 days, delivered.) "At the close of the company's fiscal year (April 30, 1907) all refined copper that can be produced up to July 1 next by the various companies controlled by this company has been sold in advance." Consequently, the Amalgamated on its last sales realized nearly the maximum price, the maximum having been the average of 25 3/16c. (some small lots selling as high as 25⅝c.) which was attained on March 11 last.

The Present Position of the Zinc Industry

During the last few years, especially during 1906, conditions have been developing in the zinc industry of the world, which are of supreme importance. This relates particularly to the enormous increase in the supply of ore offered to the smelters. New South Wales and Mexico, the former gradually and the latter suddenly, have developed into producers of zinc ore of the first magnitude. The production of zinc ore in New South Wales in 1906 amounted to 102,650 long tons, against 103,000 long tons in the previous year, but going behind the face of the returns, it appears that there was a considerable increase, because of the better grade of the ore produced in 1906, the estimated yield of spelter from the ore exported having been 33,427 tons in 1906 against 30,637 tons in 1905. American smelters received from Mexico 88,900 short tons of ore in 1906 against 32,164 in 1905, and practically none in 1904. Some Mexican ore also was exported to Europe. Besides these large new supplies, European smelters have been recently obtaining a good deal of ore from other new countries, such as Japan (where zinc-smelting works are now being erected) and Turkey; while in 1906, a considerable supply of calamine ore of high grade was for the first time received from Rhodesia, where there appears to be large deposits, which will afford a steadily increasing output.

This plethora of raw material has al-

ready had an important effect upon the world's market for spelter. For one thing, it has cut off all hope that the United States will soon become an exporter of spelter. On the contrary, it is to be feared that, more frequently than usual, the price of spelter in the United States will have to be reduced in order to prevent importations, in spite of the protective tariff of 1.5c. per lb. During the last three or four years the prices for spelter at London and New York have been showing an increasing disparity; at present there is a difference of about 0.8c. per lb. This is easily explained by the position of the European smelters, who in the abundance of their ore supply are able on the one hand to offer spelter at lower and lower prices, and on the other hand bid lower and lower prices to the miners for ore, preserving a large margin for smelting all the time. During 1906 the smelters' margin was so large that the business was unusually profitable. The natural result of this, together with the refusal of the smelters to accept certain supplies of ore, has been to lead several of the mining companies, together with other metallurgical companies, to go into the smelting business on their own account. At the present time there is something like an epidemic in the construction of new zinc-smelting works in Europe. In Silesia and the west of Germany it is reported that six large smelting works (one of which has recently gone into operation) are under construction; one or two new smelters are being built in France; a large works is under construction in Great Britain, and another one is contemplated. A new works was lately completed in Australia, making two now in that Commonwealth, and a works is to be built in Japan.

Some of the new works that are being erected in Germany occupy locations which give them much better facilities for the transportation of ore by canal and river from Rotterdam and Antwerp than any other works in Germany at present possess. Consequently, there is no doubt that some of these new works will capture a good deal of the business of smelting foreign ore. Naturally, the situation is viewed with a good deal of alarm by the existing concerns. The increased competition will doubtless reduce smelting prices to a normal level, and the hope of great profits from the new enterprises, based on existing conditions, probably will fail of fulfilment for that reason. However, the effect on the American market will be obvious. With large supplies of cheap ore, and competition among the European smelters that materially reduces their margin for smelting, there is little likelihood that American smelters will have any opportunity to export spelter; in other words the conditions in Europe will tend to keep the London price steadily below the price in America. As regards the situation in Europe, looking toward the more distant future, the hope will be that the new works will produce no more than to satisfy the annual increase of the demand, while the old works will maintain their present production. This is the most optimistic view that can be taken. Anyway, the change in conditions is not likely to be sudden, inasmuch as only a small portion of the new smelting capacity will go into operation during 1907.

It may be remarked that the United States also will have a considerable increase in smelting capacity in 1907.

The Prevention of Coal-dust Explosions

One of the most difficult problems that now confronts coal-mine managers is the prevention of dust explosions, or of eliminating the possibility of fine coal dust entering as a factor in gas explosions. Various plans have been adopted, and although some systems have met with partial success, there are still many unfavorable conditions to be met.

The most general practice is to spray the roof, sides and floor of the different gangways and chambers, or to saturate the intake air with steam, which is a less satisfactory method. All of these plans have the same effect, causing the floor to swell, or the top rock to weaken and fall; furthermore, the timbers are soon rotted when spraying is used, and the consequent necessity of constantly renewing the roof timbers has a tendency to keep a continual movement upon the roof and sides, which intensifies the danger to the miners.

If watering the workings of a mine cannot be successfully followed, there remains nothing to suggest except that some plan should be adopted to prevent the initial accumulation of dust. This can partially be accomplished by keeping the cars as nearly dust-tight as possible. They cannot be made completely dust-tight, because the fine dust is extremely penetrating; it is a fact that the fine dust from steam coal will find its way into a watch case. A small amount of watering in any mine is sure to prove beneficial, and especially is it advisable to wet the outgoing car of coal once or twice during transit. However, the plan of indiscriminate spraying, besides causing a hot, saturated atmosphere, uncomfortable to work in, is likely to cause a greater loss of life from roof-falls than would perhaps occur from explosions. Wet zones are effectual in mitigating an explosion, but can only be looked upon as a means for preventing the destruction of the entire colliery, and not as remedies to prevent local explosions.

Larder Lake

This district, in northern Ontario, is now attracting a good deal of attention as a rival of Cobalt. Highly optimistic reports have been published in the daily newspapers. As is always the case, the district is tremendously overestimated in the press reports, which result from the work of the boomers in their campaign to sell stock. There are, however, some prospects showing free gold in quartz, and it is possible that some of them may prove to be real mines when developed. So far, however, very little work has been done. Indeed, there has really been no chance. The discoveries were not made until late last summer, and at that time there were no supplies on the ground; moreover, there were no roads into the district, the only means of access being by canoe routes. Several parties got supplies in on the snow during the winter, built camps, and in May were just about to begin work. At Larder City a firm of enterprising merchants succeeded in obtaining a stock of general merchandise, and one of the hardware merchants of Cobalt has established a branch store. The coming summer will doubtless see tremendous activity in prospecting in the new district, and before the summer is over some reliable forecasts should be possible. Until that time, however, the new district should be regarded in a conservative way, and the offerings of the stock of companies should be considered in the light of the facts which are stated above.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

The Eastern Mining Company, Philippine Islands

I would like to call the attention of mining engineers and the public interested in mining, to the methods used by the agent of the Eastern Mining Company, a corporation organized at Manila, in the Philippines, to dispose of stock in the United States, in connection with which, my name, and that of H. D. McCaskey, formerly chief of the mining bureau of the Philippine islands, and now on the United States Geological Survey, is being used.

After three years' service with the Government of the Philippine islands as geologist of the mining bureau, I resigned to take the management of the Eastern Mining Company. I was convinced that the property was worthy of further development, and A. Heise, the president of the company, was sent to the United States to raise a larger amount of money than seemed to be available in Manila. His mission was to put before capitalists a business proposition, to raise funds from the sale of the capital stock which he was authorized to sell, and it was naturally presupposed that only legitimate business methods would be used.

On account of the distance, principally, and possibly through design, it is only recently that I have learned that there are being inserted in papers in the United States, large advertisements which are full of misleading statements regarding the property of the Eastern Mining Company. Some of these I quote as follows:

"Sixteen quartz claims, all demonstrated perfect title, with U. S. patent, and 39 placer claims of 800 acres, averaging 35c. per yard. . . . Over $8,000,000 in sight on quartz claims. . . . $100,000 have been spent in development work in the last five years. . . . A five-stamp mill actually at work, producing over $3000 per month at the present time."

These assertions are gross exaggerations. The number of claims and the acreage is sufficiently accurate, but hardly a dollar's worth of work has been done on the placer ground, and it is wild imagination to place a value of 35c. a yard on the ground. There is not "$8,000,000 in sight on the quartz claims." The figures in my report to the directors are $100,000. The amount of money spent in development work has mysteriously increased fourfold.

There is no "five-stamp mill actually at work on the property." A small (iron-frame, 800-lb. stamps) mill was installed about two years ago, and produced bullion to the total amount of about $5000. It broke down repeatedly, and its final collapse took place long before the person responsible for the advertisements, left Manila for the United States; he was and is perfectly familiar with the fact that it has not been running for over six months, and did run only a few weeks at a time. There was no accuracy in the methods of operation, and all the operators were entirely ignorant of mining or milling, so that calculations of value per ton and the rate of extraction are founded on thin air.

The agent of the company who is responsible for such methods of selling stock was sent to the United States to raise funds by legitimate means, and it is entirely on his own responsibility that he has used such methods. The board of directors has voted its disapproval, and taken steps to end such proceedings, and I, personally, have severed my connection with the company. In order that the true conditions may be learned by anyone interested, I have published an abstract of my report on the property, in the *Far Eastern Review*, a semi-technical journal of good standing, here in Manila. It appeared in the number for May, 1907.

Beyond the figures in that report and the statement of general conditions there, I can assume no responsibility.

A. J. Eveland.

Manila, P. I., April 1, 1907.

The Taylor Hydraulic Air Compressor

In the Journal of May 4 we read an interesting article, headed "Compressed Air in Mining," by J. H. Hart, in reference to a falling-water compressor. We are much interested in the process that Mr. Hart mentions in his communication. Will you kindly advise us if what Mr. Hart advocates is practicable, and what depth of hole would be necessary to obtain an effective working pressure in the reservoir of 80 lb. or more per square inch, and could a greater pressure than that be obtained? If so, what depth of hole would be required, say, for 90 lb. effective pressure? We have a fall of 49 ft., with abundance of water, and we should like to put this process in practice if it is feasible. V. F.

Mexico, May 25, 1907.

[The system to which Mr. Hart referred is in practical (and entirely successful) use at several places. Perhaps the most important installation is at the Victoria mine, in the Lake Superior district, Mich., which was described by D. E. Woodbridge in an elaborate article in the Journal of January 19, 1907. The pressure of air obtainable is independent of the fall of water that is naturally available, the air in the reservoir being under the pressure of the column of water between the latter and the tail-race, i.e., the level at which the water finally flows away. The pressure of air obtainable can thus be readily computed. If increased pressure be required, it is only necessary to sink the air tank deeper, which is a mere matter of shaft sinking. The natural fall and rate of flow determine the rate at which the air is compressed. The process works most efficiently with a large volume of water at moderate head. Under such conditions about 4 cu.ft. of water are required to entrain 1 cu.ft. of air. At Magog, Quebec, a flow of 4292 cu.ft. of water per minute, with a natural fall of 22 ft., and a total depth of shaft of 150 ft. below the normal head of water, compresses 1148 cu.ft. of air per minute and delivers it at a pressure of 53.3 lb. The mechanical efficiency of this installation is nearly 71 per cent., i.e., that proportion of the total energy of the falling water is delivered in the compressed air. This is a high figure, even in comparison with what might be expected from a compound compressor of the best construction driven by a turbine.

At the Victoria mine, in Michigan, a fall of about 70 ft. is utilized. The air is stored in a reservoir excavated at a depth of 300 ft. The pressure obtained is 116 pounds.

Designs and equipment for the Taylor air-compressing system may be obtained from the Taylor Air Compressing Company, Montreal, Canada.—Editor.]

The Elmore Vacuum Process

I note with interest your editorial remarks (p. 917 of your issue of May 11, 1907) upon the article I had the pleasure of communicating regarding the Elmore Vacuum Process of concentration.

Your desire to have data as to working costs of this process is a very natural one, and I hope at an early date to supply you with the fullest details on this all important point.

In this connection, however, it is good evidence of satisfaction on all points (in-

cluding working costs) that after some months of working of one unit it has been decided in several instances to increase the number of our machines—in one case as you will have noted from my article, the installation is now being increased from one to 19 units.

Probably the following figures will be of interest as giving a very fair idea of working costs in America. Naturally the price of acid, oil and labor will vary at different mines: Oil, say 7 lb. per ton of ore treated at 1c., 7c.; acid (where required), 6 lb. per ton, at 1c., 6c.; labor (at $2.50 per 8 hours), 11c.; total, 24c. This is on the basis of a plant of say 200 tons per 24 hours' capacity. To the above the cost of say 0.05 h.p. per ton has to be added, say 10 h.p. for a 200-ton plant.

At a working plant in this country the consumption of oil is at the rate of only 4 lb. per ton of ore treated, and the minute quantity of acid in the mine water used for milling is found amply sufficient.

There is one statement in your editorial which I am anxious to correct without delay, as otherwise wrong impressions may be created in the minds of your readers with regard to our original oil concentration process.

You write of "the failure of the original Elmore oil process." What I wish to emphasize is that that process was not a "failure" in any single instance. It is true that we were most unfortunate in the mines where it was put to work; but in every case the process accomplished all that we had claimed for it. The stoppage of the plants resulted from failure of the mines to produce payable ore or tailings as can be proved by letters from the mine managers in each case. In the case of one mine, however, the plant was never run continuously, as concentration was considered inadvisable before the plant started work, and all trials were promptly stopped. In another instance the value of the ore hauled from the mine was found in regular work to be about $3 per ton, and as the mining costs were just over that figure it was not possible for any process to make a profit on treatment. Again, our old plant was installed to treat tailings from an existing water concentration mill, but when considerable quantities of the dump ore were put through the plant the grade went down, and the tailings were not worth treating.

I send you these particulars in order that the actual facts in connection with the old Elmore process may be known.

THE ORE CONCENTRATION COMPANY (1905) LTD.
A. STANLEY ELMORE, Chairman.

London, May 24, 1907.

[Mr. Elmore evidently misconstrued our remarks. The failure of the orignal oil process, to which we referred, was due precisely to misfortunes (and we may add poor judgment) in its applications, as he states. Although the process itself was in many respects a beautiful one, as we said. We think that our remarks on the subject were sufficiently clear.—EDITOR]

The San Cayetano Mines, Ltd.

I write to correct some inaccuracies in reference to the San Cayetano company and mines, which appeared in your Guanajuato correspondence in the ENGINEERING AND MINING JOURNAL of May 18 last.

First—The name of the company which has been organized to take over the San Cayetano properties is "San Cayetano Mines, Ltd.," not the "San Cayetano Tunnel Mines Company," as stated by your correspondent.

Second — The Mineral Development Company has absolutely no connection with the San Cayetano Mines, Ltd., or the properties. This error is probably attributable to the fact that the writer was formerly president and is now vice-president of the Mineral Development Company. W. MURDOCH WILEY.

New York, May 23, 1907.

Saving Clippings

I have just read the article in the ENGINEERING AND MINING JOURNAL of April 20 last, by G. B. Levings, on a system for saving clippings, which is practically the same as I have used for some time. However, I find it better to put only the headings and numbers on the envelops, and to use an index book where I have room to write the subjects together with what other notes I want. It is easier to refer to the index than to the backs of the envelops, and there is not so much handling. Besides the articles of interest I also find it of value to clip pictures of machinery both from the mining journals and catalogs and file them in the same way. JOHN K. PRATHER.

Cananea, Mexico, May 25, 1907.

Sampling Lake Superior Iron Ore

I am anxious to know if mechanical sampling has ever been tried on the Lake Superior iron ore, and if so, what sampler has been used? G. A. B.

Iron River, Mich., May 16, 1907.

[So far as we are aware, mechanical sampling has not been tried in practice on the Lake Superior iron ores. The subject was discussed in a paper by Edward A. Separk, entitled "Some Aspects of the Analyzing and Grading of Iron Ores on the Gogebic Range," which is printed in the proceedings of the Lake Superior Mining Institute, Vol. X.]

The use of steel elevator casings has largely increased and nearly every large plant throughout the country is adopting the use of them, in place of the old style wooden casings.

Richness of Cobalt Ores*

By [illegible]

I have been asked by several members of the Institute what is the grade of Cobalt ores, as determined by my sampling works in Jersey City. Since January, 1905, we have handled at our works 366 carload lots of this ore, and 52 other lots —less than carloads—including what we call nuggets, the nuggets either coming separately consigned or as part of a carload. I do not feel at liberty to state the assays of any particular lots of nuggets, as there have been some delicate questions concerning the value of some of these bonanza shipments. These nuggets, as you are aware, are not pure silver, but run anywhere from 700 parts to 870 parts of silver in the thousand. There are more or less gangue and other minerals associated with the silver, and the metallic silver itself, visibly free from gangue, runs about 950 fine.

Leaving out of consideration the nuggets and native silver, and including only the lots of regular ore, a review of 394 lots sampled, shows that the highest lot ran 7402 oz. of silver to the ton, the next in order being 6909, 6413, 6163 and 5948 oz. per ton.

DISTRIBUTION OF SILVER IN [illegible] COBALT ORE.

				Per c
Over	[illegible] oz.		4 lots (88y)	1.0
Between...	[illegible]	and 6000 oz.	1 lots (88y)	0.75
Between...	[illegible]	and [illegible] oz.	1 lots (88y)	[illegible]
Between...	3000 oz	and 4000 oz.	1 lots (88y)	4
Between...	[illegible]	and [illegible] oz.	39 lots (88y)	10.0
Between...	[illegible]	and [illegible] oz.	72 lots (88y)	[illegible]
Between...	[illegible]	and 1000 oz.	1 lots (88y)	[illegible]
Between...	[illegible]	and [illegible] oz.	7 lots (88y)	1.75
Between...	[illegible]	and [illegible] oz.	12 lots (88y)	[illegible]
Between...	[illegible]	and [illegible] oz.	28 lots (88y)	[illegible]
Between...	[illegible]	and [illegible] oz.	10 lots (88y)	2.5
Between...	[illegible]	and 500 oz.	14 lots (88y)	3.25
Between...	[illegible]	and [illegible] oz.	29 lots (88y)	[illegible]
Between...	[illegible]	and 300 oz.	41 lots (88y)	11.25
Between...	[illegible]	and [illegible] oz.	66 lots (88y)	17.0
Less than	100 oz.		43 lots (88y)	11.0

While the greater part of shipments of cobalt have come to New York, some have gone abroad and many have gone to Copper Cliff.

It seems to me that this is a remarkable showing for a camp so young as Cobalt, the first car having reached our sampling works about the first of February, 1905.

Silver, of course, in point of value is the more important element. The highest percentage of cobalt found in any one shipment is 11.96 per cent., the average being 5.99 per cent. The highest assay for nickel in any car is 12.49 per cent., the average being 3.66 per cent. The highest percentage of arsenic is 59.32 per cent., the average, 27.12 per cent. Mixed with the nuggets are other minerals; sulphides, arsenides, etc., and the gangue matter.

*From address [illegible] Can. Min. Inst., Vol. X, Toronto meeting, 1907. [illegible] New York.

New Publications

E. Sydney Fawns. Pp. 304; illustrated. 6x9 in.; cloth, $5.50. London, 1907: *The Mining Journal.*

[illegible] a work which has won considerable esteem, as is manifest from the fact that a new edition has been required only about a year after the appearance of the first. In the new edition the book has been considerably simplified, a chapter on tin smelting having been added, while all the material has been brought as far as possible up to date. In the latter particular the author is entitled to appreciative congratulation, inasmuch as the information which he presents, including comprehensive statistics of production and commercial movements, is caused to cover the year 1906. The date of the publication, May, 1907, and the date of the preface, May, 1907, are documentary evidences of sharp work, while the completeness of the latter is evidence that the author is one who has followed his

Having reviewed the first edition in the JOURNAL, it is unnecessary to speak at length as to the second edition. The book contains most of the information that anyone needs to know on the subject of tin, and if the abstracts, digests etc., which necessarily compose its major part, are not always chosen with the nicest discrimination, the student will find that the many and minute references to the original publications are a strongly redeeming feature. Indeed, the author is so generally particular in that respect that it is regrettable to note that in one case, at least, he overlooks to give the reference to a rather extensive quotation. Such criticism as is to be made of the book pertains to the above mentioned lack of discrimination. There is one kind of compilation in which the author carefully filters all his material and presents only the clear filtrate. There is another kind in which the author presents everything as a kind of edited note-book. In some of its parts especially Mr. Fawns' work is of the latter type. However, this is no carping criticism, but simply is by way of explanation, because the author avows as his chief aim the collection of the scattered literature of tin mining. As such an intelligent collection his book cannot fail to be of much practical value to all who are interested in tin mining. We have found it to be a constantly useful work of reference.

THE DESIGN OF WALLS, BINS AND GRAIN ELEVATORS. By Milo S. Ketchum, professor of civil engineering, University of Colorado. Pp. XIV + 394; illustrated. 6½x9 in.; cloth, $4. New York, 1907: The Engineering News Publishing Company.

Contents: The Design of Retaining Walls. Rankine's Theory. Coulomb's Theory. Design of Masonry Retaining Walls. Reinforced Concrete Retaining Walls. Experiments on Retaining Walls. Examples. Cost. Design of Coal Bins, Ore Bins, etc. Types. Stresses in Bins. Experiments on Pressures on Bin Walls. Design of Bins. Examples and Details of Bins. Cost. Methods of Handling Materials. Design of Grain Bins and Elevators. Types. Stresses. Experiments on the Pressure of Grain in Deep Bins. Design of Such Bins. Examples. Cost.

This book will be welcomed by the constructing engineer as the first authoritative and elaborate contribution to technical literature on the perplexing subject of the design and construction of coal and ore bins. In the storage, particularly the overhead storage, of large amounts of material, which is called for increasingly in modern practice, the construction of these bins forms a large item in the structural cost of a works. Some of the conditions to be observed in their design are decidedly peculiar, and while various engineers have evolved rules of their own, there have been few well established and generally known rules to go by. Probably in many cases, perhaps the majority, bin structures have been built superfluously strong, like the general constructions of the engineers, masons and carpenters of old. Consequently it is particularly gratifying to have this systematic analysis of the stresses due to granular materials together with a discussion of the principles of design and the details of the structures which are to contain them. The portion of the book which relates to coal and ore bins is the largest, and this will make it appeal especially to mining and metallurgical engineers. They will find the admirable study of retaining walls to be scarcely less useful.

Professor Ketchum is well known as the author of "The Design of Steel Mill Buildings," which won high appreciation because of its eminently practical character. His present work is one of the same order, and will take a high place.

Mine Timbering *

BY R. W. RAYMOND

It is somewhat surprising that American technical literature contains so little on the subject of mine-timbering. The explanation may, perhaps, be found in the circumstance that our mining engineers have hitherto had, on the whole, an abundant supply of timber. Perhaps it would be more accurate to say that our American methods were adopted when such a supply was available, and continued after they had become financially unprofitable. Certainly nothing could be more wasteful than the "Comstock" system of square-set timbering, introduced when the virgin forest around the mines furnished an apparently unlimited amount of heavy timber. And while this system "held out to burn" (as it literally did in many disastrous and prolonged mine conflagrations), its practitioners did not care to study the safer and more economical methods developed in practice under the stress of less favorable conditions. But the Comstock system has broken down by its own weight; and our mining engineers are everywhere studying how to save timber instead of squandering it.

The first step in such a study is to ascertain exactly what is the practice which needs to be improved; and this book, while it contains valuable suggestions, not a few, of improvement and reform, is largely a picture of American practice as it exists. It is another of those compilations, issued by the ENGINEERING AND MINING JOURNAL, which have proved so convenient to the readers of technical contributions to that periodical, and to THE MINERAL INDUSTRY. But besides the material thus collected for permanent use from these sources, it contains papers from other quarters, notably one by Bernard Macdonald, published originally by the Canadian Mining Institute, and one by Norman W. Parlee, published by the Canadian Society of Civil Engineers. These two, together with the monograph of Wilbur E. Sanders, from Vol. VIII (1899) of THE MINERAL INDUSTRY, are, perhaps, the most valuable, as they are the most detailed and elaborate, of the chapters of the book; and they warrant the special mention of their authors on the title-page. But the book contains many other articles of interest and value, as may be inferred from the following list of its contents:

"Mine-Timbering," by Wilbur E. Sanders; "Mine Timbering by the Square-Set System at Rossland, B. C.," by Bernard Macdonald; "Methods of Mining and Timbering in Large Ore-Bodies in British Columbia and Michigan," by Norman W. Parlee; "Mine Timbering in Section 16 of the Lake Superior Mining Company, Michigan," by C. St. G. Campbell; "The Framing of Rectangular Shaft Sets," by Wilbur E. Sanders; "Square-Set Practice at Bingham, Utah," by Louis S. Cates; "Square-Set Timbering at Bingham, Utah," by Claude T. Rice; "Mine Timbering at Lake Superior," by W. R. Crane; "Timber and Timbering in the Cœur d'Alene," by J. H. Batcheller; "Timbering at the Chillagoe Mines, Queensland," by T. J. Greenway; "Timbering in Tasmania," by Mark Ireland.

It will be noted that, although this list includes no account of European practice, it covers a wide range of conditions in this country, and in others similarly situated, and represents both old and new methods. Incidentally, it contains many practical descriptions and suggestions of constructive details, which are pertinent and valuable, whatever be the general system adopted.

* "Mine Timbering." By Wilbur E. Sanders, Norman W. Parlee, Bernard Macdonald and others. New York and London: Hill Publishing Company. Pp. 189; illustrated. Price, $2.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

C. W. Purington has left St. Petersburg, Russia, for East Siberia.

C. W. Pritchett has returned to Denver from a professional trip to Mexico.

Newton Booth Knox was married to Miss Elizabeth Blossom, April 10, in Yokohama, Japan.

S. F. Parrish has removed from Los Angeles to Tonopah, Nevada, where he has opened an office.

Edgar C. Moxham, mining engineer, of New York, is visiting Colorado and Wyoming on professional business.

H. Vincent Wallace, of Nogales, Ariz., has left for New Mexico to examine copper properties in Otero county.

Leonard Lehlbach, manager of the Lepanto Mining Company, sailed from Manila last month for San Francisco.

Arthur W. Jenks will make Portland, Oregon, his future headquarters, where he has opened an office at 242 Washington street.

James P. Colp, late of Los Angeles, is now superintendent of the White Cross Gold Mining Company, at Leastalk, California.

Col. T. G. Bush, president of the Shelby Iron Company, accompanied by his wife, left on June 1 for an extensive foreign trip.

Horace L. Chapman, of Columbus, O., is acting president of the Sunday Creek Coal Company, in place of John H. Winder, resigned.

A. A. Hassan, mining geologist, New York, is in Toronto, Canada. His purpose is to study the mineral deposits of Ontario and Quebec.

Gordon Grant has lately been appointed inspector of construction on the National Transcontinental Railway (Grand Trunk Pacific).

John M. Roan has resigned as manager of the mines of the Sunday Creek Coal Company, and will accept a position with the Cumberland Syndicate.

W. W. Allen has completed his year of service with the Caucasus Copper Company, Ltd., in Russian Caucasia, and is on his way to the United States.

J. Parke Channing, mining engineer, of New York, has gone West on professional business. He is not expected to return until about the end of August.

Francis C. Lincoln, mining engineer and geologist, New York, has left for Alaska on professional business. He will return to New York about August 15.

J. Bishop Tingle, late of the Johns Hopkins University, has been appointed professor of chemistry and mineralogy at McMaster University, Toronto.

M. P. Boag, of the Risdon Iron Works, is erecting a stamp mill and concentrating machinery on the property of the Eastern Gold Bug Mining Company, Masbate, P. I.

Hood McKay, recently with the Lykens Valley Coal Company, has been appointed superintendent of the Lehigh Valley Coal and Navigation Company's mines at Lansford.

J. W. H. Hamilton, of Hamilton & Hansel, New York, is on a business trip to Vancouver and British Columbia. He will probably be absent the greater part of the summer.

W. E. Defty has resigned as consulting engineer to the Mina Juarez company, Sonora, Mexico, and has no further connection with the company in any capacity whatever.

Frank R. Fisher has been appointed general superintendent of the Illinois Collieries Company. He has been connected with the Consolidated Coal Company and other Illinois mines.

J. W. Astley, formerly general superintendent for the Le Roi Mining Company at Rossland, B. C., has recovered his health and will return to British Columbia about the end of May.

O. E. LeRoy has resigned from the Geological Survey of Canada. It is understood he has accepted a position with a mining company operating in the Cobalt district, northern Ontario.

John H. Winder has resigned his position as president of the Sunday Creek Coal Company, of Ohio, to take charge of the coal properties of the Cumberland Syndicate in West Virginia.

C. W. Merrill, superintendent of the cyanide mills of the Homestake Mining Company, of Lead, S. D., has been a recent visitor in New York. He returned west about the middle of this week.

R. R. Hedley, of Nelson, B. C., has been appointed by the Canadian Government to collect data for British Columbia and the West, for a special report on the mining and metallurgical industries.

W. H. Wiley, who reached Whitehorse from California early in May, is examining a number of mineral claims in Whitehorse copper camp bonded during the winter for a Pennsylvania syndicate.

Otto H. Schultz, for thirteen years assistant treasurer and auditor with the Alabama Consolidated Coal and Iron Company and companies absorbed by that company, has tendered his resignation.

Hon. Adam Beck, of the Ontario Hydro-Electric Power commission, has gone to Europe in the interests of the project, to make a thorough examination into electrical methods in Switzerland and elsewhere.

Charles A. Herbert, for some time past chief engineer of the Chicago, Wilmington & Vermillion Coal Company, has been appointed general superintendent of the company's mines in place of Robert H. Zoller, resigned.

W. W. Leach, of the Geological Survey of Canada, has gone north to resume the work of delimiting the coal and copper areas in the Telkwa Valley section of Skeena mining division, northern British Columbia.

George H. Collins, for 11 years actively connected with mining in the Boundary district of British Columbia, has removed to Vancouver with the object of interesting himself in British Columbia or Alaska coast mines.

W. J. Elmendorf, of Spokane, Wash., manager for a syndicate which last winter purchased the Arctic Chief and Best Chance copper claims in southern Yukon, is at Whitehorse directing development work on these properties.

Morris W. Bush, assistant to the president of the Alabama Consolidated Coal and Iron Company, who has been with the Alabama Consolidated and the companies absorbed, for seven years, has resigned to take service with another corporation in Alabama about June 1.

William Auman, lately superintendent of the Susquehanna Coal Company, has been appointed superintendent of the Lykens Valley and Summit Branch coal companies. D. D. Randall, late engineer, has been appointed superintendent for the Susquehanna company.

Byron N. White, of Spokane, Wash., has resumed mining operations on his Pueblo and Carlisle copper properties near Whitehorse, Yukon Territory. During the winter 700 or 800 tons of ore were shipped to the Tyee Copper Company's smelter on Vancouver island, B. C.

D. D. Cairnes, of the Geological Survey of Canada, reached Vancouver, British Columbia, about the middle of May *en route* from Ottawa to Whitehorse, Yukon Territory. He will work north of Whitehorse, particularly in the vicinity of the coal measures in that locality.

Harold C. E. Spence has returned to Steeple Rock, New Mexico, where he will assume the management of the properties in which the chief owners are Wernher, Beit & Co., of London, and Compagnie Francaise de Mines d'Or et de l'Afrique du Sud, of Paris—Mr. Spence himself having acquired the interests of the Exploration Company while in Europe recently.

Dr. Albert P. Low, director of the Geological Survey of Canada, has been appointed deputy minister of mines, in the Department of Mines, which is now being organized under the new law. He will, for the present, remain in charge of the Geological Survey. The title of Dr. Eugene Haanel, Dominion superintendent of mines, will be hereafter director of the mines branch of the department.

Obituary

Eugene B. Willard, Jr., was killed on May 21 by an explosion at the No. 1 Eliza furnace of the Jones & Laughlin Steel Company, Pittsburg. He had been connected with the iron and steel industry during his entire active life, and had been assistant to the general superintendent of the Eliza furnaces since July, 1906.

Orrin W. Potter, for many years prominent in the iron and steel industry of the West, died at his residence in Chicago on May 17. He was born at Rochester, New York, in 1836, and early became identified with the rolling-mill industry of Chicago. It was at the North Chicago works under Mr. Potter's superintendence, that the first bessemer steel rail was rolled in the United States. In 1871 Mr. Potter became president of the North Chicago Rolling Mill Company, and later chairman of the board of directors, and of the executive committee of the Illinois Steel Company. He was heavily interested in a number of important commercial and industrial enterprises.

W. C. Perry, president of the Central Coal and Coke Company, of Kansas City, died in a street car at the Country Club station, near that city, May 27. Mr. Perry had been at the club, where he played golf. He had been in poor health for some time past. Mr. Perry went to Kansas City in 1899 from Fort Scott, Kan. He was United States district attorney for Kansas in Mr. Cleveland's second term. Since he became president of the Central Coal and Coke Company, which is one of the largest coal-mining companies of the Southwest, Mr. Perry was very active in the development of the business in his charge. Also he had other mining interests in Mexico and elsewhere. He was one of the leading citizens of Kansas City, and an excellent type of the Western business man.

Societies and Technical Schools

Columbia University—Graduating exercises of the class of 1907 will be held in the Havemeyer building, on the campus, New York, on Monday, June 10. The chief address will be delivered by Stuyvesant Fish, of the class of '71; his subject will be: "Some Phases of the American Railroad Problem."

Colorado State School of Mines—The thirty-third annual commencement took place, May 24, in Guggenheim hall at Golden, in the presence of a large audience, and 35 graduates received their diplomas. The principal speaker of the occasion was Frank E. Shepard, president of the Denver Engineering Works Company, and the presiding officer was Dr. Alderson, president of the school.

Industrial

The Western Electric Company has completed its new plant at No. 230 Lee street, Atlanta, Georgia.

The Riverside Iron Works, Denver, Colo., has been incorporated with a capital of $150,000 by A. G. Sutherland, Robert J. Sutherland, A. G. Sutherland, Jr., and Paul G. O'Brien.

The Edison Illuminating Company, Detroit, Mich., has installed in its Beecher avenue sub-station, a 25-ton electric Northern crane, manufactured by the Northern Engineering Works, Detroit.

The Wood Drill Works, Paterson, N. J., are planning a large addition to the present plant. This is made necessary by the remarkable growth of the business; the works being at present six months behind on orders.

The Canada Corundum Company, Ltd., on May 21 removed its main office to the works at Craigmont, Ont. Hereafter no office will be maintained in Toronto. The removal has been found necessary for the more efficient handling of the company's business.

G. U. G. Holman has been appointed manager of the electrical department of the Boston branch of the H. W. Johns-Manville Company. After graduating from the Massachusetts Institute of Technology Mr. Holman was for several years with the Thomson-Houston and General Electric companies.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Buffalo Steam Pump Company, Buffalo, N. Y. Buffalo Mine Pump. Pp. 4, illustrated, paper, 3½x6 in. 1907.

Cyclone Drill Company, Orrville, Ohio. Hollow Rod and Cable Drills. Pp. 96, illustrated, paper, 6x9 in. 1907.

Link-Belt Company, Chicago, Ill. Revised Price List of Sprocket Wheels. Pp. 15, illustrated, paper, 6x9 in.; April 1, 1907.

Allentown Rolling Mills, Allentown, Pa. Bulletins Nos. 13 and 14. The Aldrich Electric Pump. Pp. 8, illustrated, paper, 6x9 in. 1907.

Ingersoll-Rand Company, 11 Broadway, New York. Booklet 20A. The Temple-Ingersoll Electric-Air Rock-Drill. Pp. 18, illustrated, paper, 3¼x5½ in. 1907.

Robins Conveying Belt Company, 13-21 Park Row building, New York. Bulletin No. 44. A Well Ordered Shipping Department. Pp. 4, illustrated, paper, 4x9 in. 1907.

Construction News

Greenwood, B. C.—The Dominion Copper Company, Ltd., has bought for its Sunset mine, near Greenwood, Boundary district of British Columbia, a Rand 10-drill compound air compressor. A 50-h.p. electric hoist has also been purchased for this mine.

Irondale, Puget Sound, Wash.—The charcoal iron furnace at Irondale, near Port Townsend, has been renovated, 60 men having been employed in reconstruction and the installation of new plant and machinery. It is planned to resume operations, after a shut-down of several years, early in July. The greater portion of the ore to be smelted will come, as before, from Texada island, B. C., from a deposit running about 50 per cent. magnetite. Bog iron will again be obtained from Skagit county, Wash. Jas. A. Moore, of Seattle, is at the head of the enterprise.

Dawson, Yukon—Large quantities of materials are being brought in by the Guggenheim mining companies for use in connection with their water supply system for hydraulicking and dredge-mining operations in the Canadian Yukon. About 1,000,000 ft. of timber for dredge construction purposes has been purchased in British Columbia and one-fourth of this quantity is now in transit between Skagway and the head of navigation on the Yukon river. About 100 large pipes, approximately 70 ft. in length by 4 ft. diameter, have been shipped from the Fraser river (B. C.) terminus of one of the transcontinental railways for Skagway. The pipes were manufactured in Pennsylvania and are probably the largest ever taken into the Yukon.

Rossland, British Columbia—It is understood that the management of the Le Roi mine intends substituting electricity for steam as motive power for its two air compressors, which have a combined capacity of 8000 cu.ft. of free air per min. at sea level. This plant has proved an economical one, using steam, for a test extended over a period of 30 days under ordinary working conditions showed a coal consumption of 1.9 lb. per h.p. per hour, and that air was compressed to 95 lb. per sq.in. at a cost (exclusive of interest and depreciation charges) of $1.59 per each 100,000 cu.ft. of free air compressed. It is believed that electric power will be still more economical, now that the West Kootenay Power and Light Company has abundant generating capacity at its Bonnington Falls station for all demands likely to be made on it. Should Le Roi Company use electricity for its air compressors, its winding engines—one of 1000- and another of 500-h.p. capacity—will probably be run by compressed air, using steam to reheat the air.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

May 29—At the last meeting of the creditors of the bankrupt Squaw Creek Mining Company of Gazelle, Siskiyou county, F. A. Wright, of Gazelle, was appointed trustee. The liabilities are $60,000 and the assets about $6000.

The case of Sutter county against Johnson, involving the validity of the Caminetti act permitting hydraulic miners to build dams on all streams of this State, has been transferred by the Supreme Court to the July term, and the San Francisco calendar, where it will be heard by the Supreme judges in bank on account of the great importance of the decision of all mining interests of the State.

A complaint has been filed on behalf of the Rawhide Gold Mining Company, alleging that the Dutch Mining and Milling Company had drifted from a shaft on the Dutch mine, at Quartz Mountain, Tuolumne county, into territory pertaining to the App mine, which belongs to the Rawhide company, and extracted over 20,000 tons of gold-bearing quartz. The complaint, which is sworn to by W. A. Nevills, states that this stealing of ore had been going on for three years, and places the damage at $150,000. Plaintiff asks judgment for $150,000 and costs of suit, and that defendant be perpetually enjoined from entering upon or trespassing upon the property of the Rawhide company.

William Mitchell, an old-time Placer county miner, has begun a suit in the Superior court for the recovery of his mine, which passed out of his hands under a contract, which has not been carried out. Mitchell, who is a man of advanced years, made a contract with Herman Estorff, whereby the latter was to take the mine and pay Mitchell $25 per month and 25 per cent. of the gross yield of the mine. In event of sale, Mitchell was to receive $10,000 as his share. Estorff carried out the provisions of the contract, and subsequently formed a company known as the Blue Gravel Mining Company, and deeded the property to the company. Estorff died, and the original contract was carried out for a time, and then the payments to Mitchell ceased.

The Trinity Sugar Pine Company is not to be disturbed in its holding of about 2000 acres of land entered upon before the local Land Office as mineral land, and which has since been developed as timber property. This decision has just been handed down in the charges preferred by Special Agent Prior against George Lambert, William Lambert and William Prattie, who on the day on which they proved up their claims, transferred the property to G. L. Hoxie, the president of the Trinity Sugar Pine Lumber Company. This case has been before the Land Office for five years, and was the outcome of the several persons taking up land as mineral which on further development was shown to be more valuable for timber than mineral, and which land was held by persons who incorporated the Trinity company. The men who entered upon the land spent considerable money doing development work about what is known as "Murphy's Mine."

The decision concludes that "after carefully considering the evidence in this case, we believe that the lands embraced in the above-described entry are not such as could be classed as mineral lands, and that while the circumstances surrounding the making and disposal of this entry seem suspicious, still the preponderance of the evidence in this case does not conclusively prove to our minds that the entry was made in and for the benefit of George L. Hoxie."

The mines of Amalie and Piute districts in Kern county are trying to bring influence to bear to have the United States Geological Survey map out and describe these districts.

The terminus of the Tonopah & Tidewater Railroad will shortly be established at Zeburski, Inyo county, California, two miles north of the old borax works. The line is wholly completed to that point excepting a little work in the big cut, which has been the cause of the great delay. It is intended to do all of the freighting from there to Greenwater until the permanency of the district is assured, and after the main line has been completed to Beatty to connect with the Brock system on the north. The nearest point is at the Lilla C. mine, 12 miles, while it is 28 to Zeburski.

G. J. Moore and others, who own considerable mining ground on the south fork of Smith river, Humboldt county, are about putting in a flume for diverting the stream so as to get at the river bed. It is the intention of the company to construct a flume 12 ft. wide and 4 ft. high by which the waters of the stream will be carried a distance of 600 ft. across a bend, thus enabling the working of the bars there, which are believed to be rich.

Modoc county is coming to the front as a mining section, as well as in stock-raising and farming. The new mining district on the east side of Goose lake, is producing gold in considerable quantity, [illegible] for extensive operations.

The Alto mine, near Knights Ferry, Stanislaus county, recently re-christened the California-Calaveras, is shortly to have a mill of 100 stamps, to be later increased to 200 stamps. The ledge matter between the walls runs from 80 to 120 ft. in width, and while the property has been in the past productive, large reduction works are necessary to make it profitable. The company by purchasing the old Spanish grant and securing a bond on the Ed. Flowers holdings of 15,000 acres, is in absolute control of 37,000 acres.

The matter of the mining strikes at Grass Valley is not yet settled, the mine operators and miners having failed to come together so far, though the mines are still in operation. At Angels, Calaveras county, the mines are still closed down with little present chance of a settlement of the wage question. About 250 of the miners left the town last week for the newer camps of Nevada. Up in Amador county there is an impression that the miners are about to inaugurate a general strike.

Few of the large mines of the county have been paying any big dividends for some time, and any disturbance of the labor conditions is apt to bring on a general shut-down. Recently the miners of Amador made a demand on the mine owners for a recognition of the union, but no direct reply has been made.

Salt Lake City

May 26—The Honerine Mining Company recently levied an assessment of 20c. a share. The minority shareholders have raised a protest and are taking steps to learn more about the company's affairs.

Suit has been instituted in the Federal court by W. W. Adams, a farmer, against the Utah Copper Company to recover damages to the amount of $5000 caused by the pollution of Bingham creek by tailings from the concentrating mill at Copperton. Water from the stream is used for irrigation on the Adams ranch.

The Ute Copper Company has been formed to develop and operate the old Winnemuc mine in Bingham, which was an important producer of lead-silver ore in the early days of mining in Utah. The officers and incorporators are: Thomas Weir, president; John Weir, Jr., vice-president; J. M. Burt, secretary and treasurer; these, with Henry Catrow, of Salt Lake, and N. J. Catrow, of Miamisburg, O., are directors. The new company will

present the property will be developed through a tunnel belonging to the Bingham Butte Mining Company.

The strike at the lead-silver smelters of the United States Smelting, Refining and Mining Company, which lasted 10r a little more than a week, has been settled by the company granting a slight increase in wages. During the trouble a workingman who had remained loyal to the company was shot by a striker.

The Morton Trust Company, of New York, has filed four answers to suits brought against it by the United States Government to cancel patents on certain coal lands acquired by the Utah Fuel Company and the Pleasant Valley Coal Company, on which the trust company holds first mortgage bonds. A denial that any of the land was illegally procured has been entered, also that the Federal court of Utah has jurisdiction in these cases.

A special meeting of shareholders of the Ohio Copper Company was called for May 30 at Lincoln, Neb., in order to authorize a $600,000 bond issue. The proceeds are being used for the construction of a concentrating mill in Bingham, which will have a daily capacity of 2000 tons of ore.

The mine-owners of the Tintic mining district have granted carmen, trammers and muckers an increase in wages. The miners and other classes of skilled labor received a raise some time ago.

The capacity of the concentrating mill of the New Stockton Mining Company, at Stockton, Utah, has been increased to 100 tons a day and will be placed in commission within a week.

A movement is on foot to organize what will probably be known as the "Utah Society of Engineers." It is proposed to bring into the organization all mining, electrical, mechanical and civil engineers in Salt Lake and other Utah points.

Amended articles of the Iron Blossom Consolidated Mining Company have been filed. The number of shares is increased from 300,000 to 1,000,000. Jesse Knight, of Provo, is president.

The Newhouse Mines and Smelters Corporation, operating the Cactus mine in Beaver county, is taking steps to increase the capacity of the mill to 1200 tons a day, and it is expected that the new equipment will be installed by the end of June. The mine made a net profit in April of $158,000, the mill having treated an average of 800 tons a day. President Samuel Newhouse says the initial dividend will be paid in July, and that the amount will be at least 20 per cent. of the capitalization.

Denver

May 31—It is probable that the Cripple Creek drainage tunnel will be constructed by a syndicate formed by several employees of the El Paso mine. Seven bids were submitted to the executive committee.

In the Teller County court, suit has been brought by the Doctor-Jackpot Consolidated Gold Mining Company, the Work Mining and Milling Company, and the Rose Maud Gold Mining Company to have 20 acres of ground, covering mineral territory disconnected from the townsite of Anaconda.

During the coming summer a corps of about 20 engineers of the United States Geological Survey will work in Colorado. One of the parties which are now preparing to leave Washington, consisting of seven men, will complete the Livermore quadrangle in the vicinity of Fort Collins and after doing so make topographical examinations in the southwestern portion of the State. A second party will survey a quadrangle in the Holy Cross forest reserve between Leadville and Aspen, while a third will be employed to bring the Colorado Springs quadrangle up to date, making a special survey of the Pike's Peak section.

The Federal grand jury, consisting of several prominent business men, is probing into the coal and timber land frauds, and within the past few days the Porter Coal Company and the Calumet Coal Company, of Durango, have been investigated, while it is understood that testimony is at present being taken in regard to lumber companies operating near Pogosa springs and in northern New Mexico.

The engineers who have been surveying for the extension of the Worland branch of the Burlington system to a connection with the Guernsey branch have completed the work, the line running about 8 miles east of Casper, Wyoming. When the line is built, the haul to Montana points for this system will be shortened more than 350 miles.

Recently the Laramie, Hahn's Peak & Pacific Railway Company completed the first 30 miles of its road. It has just purchased the first passenger equipment, which will run between Laramie and Centennial.

Secretary Pulver, of the State Federation of Labor, has sent a communication to Deputy State Labor Commissioner Swanson, drawing attention to the fact that boys under 12 years of age are being employed at some of the coal mines, 14 years being the age limit by the State law.

Active operations will soon commence at the sulphur mines of the Colorado Sulphur Company, near Creede, and if a sufficient supply of wood can be procured the mill and refinery will be run with double shift.

Trains on the Silverton Northern Railroad are again running part of the way and within a short time the track will be cleared to Animas Forks.

Last week the Sunnyside zinc plant at Eureka, 8 miles above Silverton, was destroyed by fire, the stamps and concentrating tables being saved. The Blake-Morscher electric separators were consumed.

The new mill of the Cañon City Mica Mills and Mining Company has been put in operation. The principal product will be mica flour.

The Colorado Gold Dredging Company is preparing for extensive operations in the Swan river valley, below Breckenridge, and will erect two modern dredging boats. At present five churn drills are at work prospecting the ground.

At Rock Springs, Wyoming, the Central Coal and Coke Company, which with the Union Pacific Coal Company has locked out its men for signing applications to become members of the United Mine Workers of America, has begun evicting the employees from the company houses, and the other company, it is understood, will take the same steps shortly. The mines are shut down indefinitely, which will reduce the output of the State about 4000 tons per day.

Toronto, Ont.

May 31—Some excitement has been created in Roblin, Manitoba, over the discovery of iron deposits within a few miles of that town. Claims have been staked by M. J. Galvin, Toronto, and Anthony Wagner, of Buffalo, N. Y., in the Boggy valley adjoining the line of the Canadian Northern Railway.

Transportation conditions at the Cobalt camp have been improved with the advance of the season and shipments for some time are expected to be heavy. Development work on a number of low-lying properties has been much interrupted by water. A good deal of machinery is now arriving and being installed, but the difficulty in obtaining anything like prompt delivery continues to be a serious drawback.

The rush up the Montreal river is still in progress. Last week fully 100 canoes per day left Latchford, carrying prospectors and mining men, and the total number who have gone into that region this spring is estimated at about 2000. Transportation will be facilitated this season by the placing of steamers on the route. They will be put on three navigable stretches of the river, separated by short portages.

Johannesburg

April 15—The returns for March show that the Transvaal produced 538,497 oz. fine gold, valued at £2,287,391, of which the Rand contributed 520,163 oz., valued at £2,909,510. The record output was that of last December, when 550,167 oz. were declared. It is likely that this will remain the high mark for some time to come. During March there were 8540 stamps at work in the Transvaal, of which 8190 were working on the Rand. Twelve of the leading producers recovered 12,000 oz. and over, the first on the list being the Simmer & Jack, which won 23,143 oz. fine gold in March. The Robinson was second with 22,259 oz.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

YAVAPAI COUNTY

[illegible] Boomer [illegible]—[illegible] is reported to have been made at the Storm Cloud mine, property of this company, 10 miles south of Prescott. A ledge was cut and opened for a distance of 20 ft., showing an average width of over 3 ft., and 20 per cent. copper, besides some gold and silver.

Mother Lode Copper Company—This company, operating in the Copper Basin mining district, has uncovered a shoot of ore at a depth of only 16 ft., the width has not yet been determined. An average of the assays is 12 per cent. copper and $6 gold.

New England [illegible] Gold and Copper Company—This company operating in the Big Bull mining district, has opened a new body of ore, in its shaft at a depth of 225 ft.

California

AMADOR COUNTY

Fremont Consolidated Mining Company—At this mine, Drytown, Arthur Goodall, manager, another strike of rich ore has been made. It is "candle-box" ore.

BUTTE COUNTY

Butte Dredging Company—This company has incorporated with a capital stock of $50,000 with the following directors: H. D. Smith, W. S. Noyes, Bert Noyes, E. W. Stebbins and F. Cornwall.

CALAVERAS COUNTY

Blue Gravel—San Jose men have an option on this property and will soon commence work with Chris Anderson as superintendent.

EL DORADO COUNTY

El Dorado Water and Deep Gravel Mining Company—The El Dorado ditch and extensive water rights of this old company will be transferred this month to the Sierra Water Supply Company.

INYO COUNTY

Black Cañon—There is 4 ft. of good ore in the tunnel being run to intersect the foot of the winze.

Southern Belle Mines Company—The New Year shaft is being sunk with machine drills. Water contact will be met at 500 feet.

[illegible]

Golden Eagle—J. B. Miller is about to begin work on this group at Millerville, between Masonic and Bodie. A good ledge has been found in one of the claims.

Hobo—This new camp is six miles east of Fletcher and one mile south of Summit station. High-grade free gold rock has been found there by two "hobos." There is plenty of wood and water.

Nevada-Masonic Mining and Milling Company—This company at Masonic will put on a considerable force of men. Geo. H. Jones, of Lindgrove, Iowa, is president.

Skookum—This section of the county 20 miles south of Bodie is attracting attention. On the Casa Diablo active work has been in progress three years; south of this is the Killiam property. The mineralized zone is a large one. The town of Skookum is near Antelope Springs, and 10 miles west of Hammel on the Nevada-California railroad.

NEVADA COUNTY

Idaho-Maryland Mining Company—Bray Wilkins, manager of this property, has gone East. More money is needed to unwater and retimber the old workings.

Kenosha Mine—Geo. W. Root has gone East to see about larger hoisting and pumping facilities.

Morning Star—There will be an early resumption of operations at this mine at Cherokee. Oakland, California, men have taken hold of it.

Pennsylvania Mining Company—The new big pumps of this company will increase the pumping capacity 1200 gal. per minute.

Union Blue Gravel—In this old property at North Bloomfield, J. H. O'Connor superintendent, a rich body of gravel has been struck.

ORANGE COUNTY

Southern California Coal Company—This company is opening by tunnels a newly discovered bed of coal.

PLACER COUNTY

Rawhide—This mine near Towle is to have a new tunnel 400 ft. lower than the old one. Miners are scarce or more men would be employed.

Tadpole Extension—In this mine, Todds Valley, a rich strike has been made.

Three Queens—From this mine near [illegible] Goldfield, high grade ore continues to be taken. Nuggets and specimen ore to the value of $30,000 were brought to Auburn from the mine this week.

SAN BERNARDINO COUNTY

Avawatz Copper and Gold Mining Company—This company is now operating in the Avawatz range, and has been taking out ore for shipment to the Salt Lake smelter.

Big Five Mining Company—This company has acquired by purchase the old Gold Bronze mine at Vanderbilt.

Crackerjack Bonanza—This mine, Crackerjack district, has commenced shipping ore to the smelter at Roswell, N. M.

Golden Harvest Mining and Milling Company—This company has purchased the Golden Harvest mine at Yemo, four miles from Mannix station on the Salt Lake route.

Mountain Copper Company—The bunkers on the new railroad to the Hornet mine are nearly completed, and ore shipments to the Keswick smelter will soon begin.

SHASTA COUNTY

Stauffer Chemical Company—This San Francisco company has bonded from the Phœnix Securities Company, of New York, the Summit Consolidated, Graves Consolidated and North Mammoth Extension group in Little Backbone district west of Kennett.

SIERRA COUNTY

Homestake—Ben Haskell, of Forest, is planning to put up a cyanide plant on this mine on the Rock Creek section.

Nellie Bly—Oregon men are negiotating for this gravel mine on Oregon creek, three miles from Forest.

Sierra Buttes Mine—This old property, now owned by E. A. Hayes and associates of San Jose, is about to be started again for the summer.

Colorado

LAKE COUNTY—LEADVILLE

Aetna—Iron ore of good grade has been opened at three levels in this property, Carbonate hill. An upraise is being carried to open a body of manganese ore. The shaft is now down 350 ft. and is in the quartzite.

Aurora Mining Company—This company, operating toward the head of Iowa

gulch on the divide between Iowa and Empire gulches, during the week took the Ready Cash into the combination. The main work is being carried on through the Chicago tunnel, which is now in 800 ft. and will be driven another 500 ft., the object being to develop the rich gold veins that extend vertically through the quartzite.

Badger Shaft—This property of the Triangle Mining Company, Adelaide park, has resumed work. A drift is being driven from the 820-ft. level to the south to catch the orebody from south Iron hill. The drift is in the lime-porphyry contact.

Boulder Shaft—This shaft of the Little Evelyn Mining Company, South Evans gulch, has been sunk 38 ft. since it was unwatered and is now 420 ft. deep. The vein of ore found at the bottom of the shaft continues; it is probable that the shaft will be sunk 50 ft. deeper.

Iowa—Two months ago a body of ore was opened in this property, Fryer hill, but it only proved a pocket. The lessees started another drift more to the east and after driving a little over 100 ft. caught the carbonate orebody in place. The ore channel has been opened up for nearly 5 ft. and shows a body 4 ft. wide. The strike proves the continuity of the Fryer hill oreshoots to the north and extending into Big Evans gulch.

Cosmopolitan Tunnel—The owners are driving on the tunnel, Birdseye, following a small streak of ore that runs 8 per cent. copper and 1½ oz. gold per ton. In the same section other properties have resumed work for the season. At Big English gulch the Eagle shaft is being sunk deeper to catch the ore shoot that was opened last fall in the Copper Belle shaft.

Fitzhugh—The body of ore in this property, East Fryer hill, is widening and is shipping 35 tons daily. The ore comes from the 450-ft. level. From the same level the Jimmie Lee, adjoining property, is being worked, and last Saturday a splendid body of ore was opened, some of it running high in silver; from this ore channel 25 tons of silicious ore is being shipped daily.

Forepaugh—Two sets of lessees went to work on this property, Fryer hill, during the week, at the upper and lower levels. From the former silicious ore is being shipped and from the latter sulphides. The American, adjoining the Forepaugh, is hoisting 20 tons daily of sulphides.

Helena—Two new boilers have been installed at this property, Iowa gulch, and the shaft will be sunk another lift. At the 500-ft. level a good body of sulphide has been opened.

Iron Silver Mining Company—Arrangements have been made with the United States Smelting Company and a zinc smeltet at Coffeyville, Kan., to take 1000 tons of zinc per month from the Tuscon. The company could easily ship 250 tons of iron daily, but the smelters have restricted the output to 75 tons daily.

Murphy Shaft — Considerable iron is being shipped from this mine, Rock hill, with an occasional car of high-grade lead carbonates. The lessees on the Crown Point are shipping steadily an excellent grade of oxidized iron. Shipments from all of the properties on the hill are being curtailed on account of the bad condition of the roads.

Indian Territory

Choctaw Nation

Le Bosquet Mining Company—This company which operates mines south of Alderson, is building a track to connect with the Choctaw Electric railroad which line takes the coal to Krebs on the Missouri, Kansas & Texas road.

Oil at Morris—Several new oil wells have been struck recently at Morris and the town is thronged with oil men. The oil is of the same quality as Muskogee oil.

Missouri

Zinc-lead District

Glass Lead and Zinc Company—A tract of 160 acres of the Big Stick Mining Company belonging to Geo. H. Davis, of Joplin, located in Center Creek valley north of Webb City, has been sold to this company. The new owners are developing the land. Mr. Davis, prospected the land by drilling and found ore in the sheet formation in 13 consecutive holes. The company intends this summer to erect two large concentrating plants and will sublease a part of the land on which other mills may be erected.

Pitchfork Mining Company—Senator Benjamin R. Tillman, of South Carolina, has become interested in the Joplin district. A short time ago Burt W. Lyon acting for Senator Tillman secured a lease on the Ideal Mining Company's lease south of Joplin, and the Pitchfork Mining Company was immediately formed. Last week drilling was begun and at a depth of 25 ft. the drill encountered a body of zinc ore. The hole was continued with the hope of finding a deeper run of ore.

Montana

Butte District

Coalition—The ore output is increasing gradually, the present record being about 1800 tons a day. Of the total, 1500 tons is raised through the company's own shafts. The remainder comes from the Nipper, the Red Penn and another vein, the contents of which are sent to the surface through the Parrot and Pennsylvania. The company, in conjunction with the Butte & Boston, is equipping the new shaft on the Tramway with a hoisting engine good for 3500 ft. and adding another compartment to the shaft, making it three. The Boston & Montana Company is raising out 300 ft. of ground directly under the bottom and is driving toward the perpendicular from the 1400-ft. level of the Leonard with a view of raising another 100 ft. It is predicted that by Jan. 1, 1908, Coalition will be in shape to mine not less than 2500 tons of ore a day. Its Corra mine is not looking well. Its output is now about 150 tons a day.

Davis Daly—Work has been resumed in the crosscut going south of the 1800-ft. station of the Original. Up to May 27 the vein struck a few weeks ago had been crosscut 45 ft. and contained about 4 ft. of commercial ore. Development is going ahead in all of the other shafts of the company.

North Butte—Ore production of this company aggregates between 1300 and 1400 tons per day. The face of the crosscut driving north of the 1600-ft. level of the Jessie to intersect the Berlin vein advanced 168 ft. during April. The Berlin vein is still about 300 ft. from the face of the crosscut.

Missoula County

Missoula, Montana—The Cape Nome Copper Mining Company, operating copper-silver properties east of Missoula, is contemplating the erection of a 50- or 100-ton concentrating plant within the next few months. H. T. Wilkinson, Missoula, Mont., is secretary and treasurer.

Nevada

Esmeralda County—Goldfield

Combination Extension—The main shaft has now reached a depth of 320 ft., and the men are working in three shifts. The country rock has considerably changed lately. The mine is well equipped for quick sinking.

Florence—The Mohawk-Florence Leasing Company, which is operating a block on this property, has opened a vein 6 ft. in width, showing free gold, and yielding high assay returns. About 20 tons of high-grade shipping ore is being raised daily. The shaft is equipped with a hoisting plant and a 80-h.p. compressor.

Frances Mohawk—The shaft is now 420 ft. in depth and the crosscut from the 300-ft. level is in 65 ft. from the shaft. Preparations are being made to start a crosscut at the 400-ft. level and to resume shaft sinking to the 500-ft. level.

Jumbo Extension—The Mohawk-Jumbo Leasing Company, which is operating a lease on this property, has cut a rich vein 6 ft. in width at the 415-ft. level. No shipments of the ore will be made until the vein is developed so as to yield a steady output.

Sovereign — The shaft has reached a depth of 185 ft. and is progressing at the rate of 3 ft. per day. The water trouble formerly experienced has been overcome

by the pumps. The shaft is still in the orebody, which, what is of low grade, is of great width.

NYE COUNTY—BULLFROG.

Belle—The vein in the 150-ft. level is over 2 ft. wide. None of the ore is of shipping grade; but the assays are encouraging. The shaft will be carried down to the 300-ft. level before any extensive drifting is undertaken.

Gold Reef—The tunnel in this mine, which is situated in the Mayflower section of the field, is in ore-bearing rock, and it is believed that the vein will be cut within the next few days.

Mogul—The shaft has cut a vein at a depth of 30 ft. Numerous assays show it to be of milling grade. Drifting will not be commenced until the 100-ft. level is reached.

Oasis—The shaft has reached a depth of 75 ft. and is in ore all the way from the surface. The ore assays well, especially near the bottom of the shaft, where free gold is showing. The vein has been prospected for over 2500 ft. on the surface and is gold-bearing all that distance. The working force has been increased.

Plutus—Development operations in this mine are being actively carried on under the supervision of F. W. Nash. Rich ore, which resembles the Tramp ore, is showing in several parts of the workings.

NYE COUNTY—MANHATTAN

April Fool—The Frank Davis Leasing Company has opened a bonanza in this well known mine. The quartz is so rich that it is sacked and stored away as soon as it is broken down. Cabinet specimens of wire and crystal gold are frequently picked up after a shot has been fired. This find has greatly stimulated the development work in the adjoining mines.

Crescent-Eureka—A strike has been made in the main shaft at a depth of 60 ft. The ledge is over 10 ft. in width and carries free gold from wall to wall. Assays run from $500 per ton into very high figures.

Silver Pick—Active development work is being done on this property, with the view of picking up the rich vein which is being developed in the Independence Consolidated adjoining.

Thanksgiving—This company has secured a hoisting plant from Goldfield for the development of the recent rich find. A large force of men has been engaged to erect the plant.

NYE COUNTY—TONOPAH

Ore Shipments—Shipments over the Tonopah Railroad for the week ending May 23, were: Tonopah Company, 550 tons; Belmont, 400; Tonopah Extension, 220; Montana-Tonopah, 145; Jim Butler, 41; Midway, 40. [illegible] from Tonopah, 1396 tons. From Goldfield shipments were 984 tons, making a total of 2380 tons. In addition the Tonopah company sent 3450 tons to its mill.

Oregon

BAKER COUNTY

Cornucopia Camp—The Queen of the West, under the management of Robert Glen, has begun to drift for ore. In the upper tunnel is a good showing of ore.

Last Chance—This mine, lying to the south of the Queen of the West, and parallel to it, has a ledge from 3 to 14 ft. wide. The property is a part of the Searles group, and is about 40 miles from Baker City.

Butler & Platts Company—H. S. Sims, of Arizona, has formed a partnership with Butler & Platts, in Baker City, and is interesting himself in the Baker copper belt.

Cox Property—An exhibit of high-grade copper ore from the Goose Creek Camp, 25 miles east of Baker City, aroused great interest in this camp. The ore was taken from the Cox property, now being operated by the Eagle Mountain Copper Mining Company under the direction of William Henry Harris, of Indiana.

Don Juan Mine—To satisfy debts this property in the Green Horn Camp, has been sold at public auction to Guy L. Lindsay, including five claims, mill site, ten-stamp mill, engine and boilers.

Lockwood Group—George W. Boggs has returned from Weiser, Idaho, where he secured a bond on the Lockwood Group of claims in the Seven Devils copper-mining country bordering on the Kleinschmidt road, near the Peacock mine.

Ronbaugh Group—David Ronbaugh, one of the owners of the group of five claims on Snake river known as the Ronbaugh Group, has sold his half interest for $2500 in cash.

South Dakota

CUSTER COUNTY

New York Mica—Most of the new machinery for this mine has arrived. It includes four new tubular boilers and electric engine of 250 horse-power.

Saginaw—This company has purchased the Phyllis and Solon groups of claims, adjoining its own ground, about 9 miles northwest of Custer. Ten claims are included in the two groups.

LAWRENCE COUNTY

Branch Mint—A strike of good ore is reported on this property in the Galena district. Manager Handin is expected home from the East in a few days.

Homestake—The fire in this mine has been extinguished and the unwatering has been begun. The stamp mills have been put in operation again, 600 out of the 1000 stamps being now in use. These are at work on surface ore, but as soon as the water has been lowered to the 400-ft. level ore will be taken from that point, where there are large accumulations already broken in the stopes, which is of better grade than the surface ore that is now being worked. After that the work of unwatering will proceed slowly, inasmuch as a large part of the hoisting capacity will be employed in supplying the mills, but it is expected that the mine will be entirely unwatered in the course of three or four months.

Homestake South Extension—Drifting and sinking are both in progress. It is not expected, however, to open up much ore until the 300-ft. level is reached. The shaft is now about 175 ft. deep. Electric machinery, consisting of a hoist and air compressor, and other machinery will be put in next month to replace the steam plant now in use.

Dakota—This company holds its annual meeting on the 18th of June, and it is probable that nothing in the way of a Bald Mountain merger will be accomplished before that time.

PENNINGTON COUNTY

Auburn—The new 75-ton concentrating plant has been started and two drills are operating in the tunnel. The mill stands 300 ft. from the mouth of the tunnel and the ore will be carried from that place to the bin by means of a cable tramway.

Texas

JEFFERSON COUNTY

The Baltimore *Manufacturers' Record* says that a discovery of extensive sulphur and salt deposits not far from Beaumont is reported to have been made by Patillo Higgins, of Houston, who has organized the Beaumont Native Salt and Sulphur Company to develop the minerals. It is stated that the company has purchased 1200 acres of land between Beamont and Pine Island. They are said to cover an area of about 400 acres, the sulphur being from 10 to 11 ft. below the surface and the salt about 15. It is understood that the company has contracted for the necessary mining machinery and has arranged for transportation facilities. Wharves will be constructed on the Neches river, it is stated, to which the product will be carried by rail and shipped thence by barges to Port Arthur and Sabine for export.

MAVERICK COUNTY

Lamar Coal Company—This company has been for some time past working on a tract of 7500 acres of coal land near Eagle Pass. The seam is 7 ft. thick, and the coal is of good quality. A shaft is being sunk and the company expects to ship coal by July.

Olmos Coal Company—This company has acquired 3500 acres of land near Eagle Pass, where there is already a small mine

coal. Two more openings are to be made. I. M. Lamar, Sabinas, Mexico, is the chief stockholder.

Utah

Frisco Contact—A drift from the 600-ft. level of the shaft has encountered ore of a milling grade. The mine was recently equipped with an 80-h.p. hoist and a six-drill compressor.

Revenue — The compressor plant installed at this property several months ago is in operation. Some extensive bodies of mill ore have been developed in this mine. L. G. Burton, of Salt Lake, is manager.

[illegible]—High grade sulphide ore has been encountered in the tunnel through which this mine has been developed. One assay showed as high as 800 oz. silver, 40 per cent. lead and 4 per cent. copper. Dr. C. Watkins and associates, Boston, own a controlling interest.

Iron County

Jennie—The mill on this property, Gold Springs, is treating about 40 tons of ore per day. C. A. Short, of Gold Springs, is manager.

Salt Lake County

Bingham Mary—The initial car of ore from this property in Bingham will be in the market within a week.

Castro-Grecian Mining—This company, composed entirely of Greeks, is preparing to develop a property in Bingham situated near the ground of the United States Mining Company. Dr. P. Kassmikos, of Salt Lake, is president.

Markham Gulch Mill—This plant is in operation and is treating low-grade ore from the Utah Apex mine.

Summit County

Daly West—This company has resumed operations in its Quincy mine; ore is again being marketed.

Park City Ore Shipments last week amounted to 3,681,760 lb., as follows: Daly Judge, 1,120,000; Silver King, 1,119,760; Daly West, 1,100,000; Ontario, 342,000 pounds.

Scottish Chief—Work has been temporarily suspended at this property.

Washington

Ferry County

Advance Mining Company—A 7-ft. vein has been intersected by the adit, 860 ft. in from the portal, at a depth of about 400 ft.

Colorado—The company in the San Poil district, is resuming operations on the adit level, where the vein had been cut about 200 ft. from the portal when work was suspended.

[illegible] Mining Company—A new tunnel is in 240 ft. on the Umatilla mine, San Poil district which is intended to drain the shaft and explore the vein on the 100-ft. level. Jasper King, of Keller, is the local manager.

Copper Key—A large body of iron sulphide ore has been intersected in a crosscut from the raise, above the No. 2 tunnel level.

Green—A blind lead, 10 ft. in width, has been intersected in the tunnel, over 200 ft. from the portal, at about 200 ft. deeper than the bottom of the shaft.

Gold Seal—An Iowa company has taken over this mine, on Bridge creek, and is hiring men to begin operations. S. L. Boyer, formerly of Republic, is manager.

Lone Star and Washington—The British Columbia Copper Company, now owning this mine, is opening it up in new places.

Lucille Dreyfus—The troubles relative to the fraudulent issue of stock by Eugene Kressley, the former secretary of the company, have been settled, and the mine, near Danville, is being prepared for the resumption of operations.

Nonpareil—Two shifts are driving a new tunnel.

Oversight—A pumping plant has been installed, and the Pin Money shaft is being drained, to resume sinking.

Stray Dog—The first carload of ore shipped by the new management, to the Everett Smelter, netted over $80 per ton.

Winnipeg—The compressor plant has been completed, and power drills will be in operation in a day or two.

Okanogan County

Apache—The tunnel has intersected the vein, crossing about 3 ft. of ore.

Copper World Extension—The vein on the 200-ft. level improves with development. The company is planning to build a tramway from the mine to Sinlahekin valley.

Pinnacle—The lower tunnel, which enters Palmer mountain near its western base, has cut a vein of iron sulphide ore 8 ft. wide.

Security—Work on this property has been resumed after a long period of idleness.

Grant Consolidated Copper—Articles of incorporation have been filed, the present directors being Geo. A. McLeod, J. A. McLean and John Brown. The capital is $1,650,000. The company has purchased the Double Standard, American Girl, Colon, Chalcopyrite and 10 other claims on Copper mountain, near Chesaw.

Old Germany—The tunnel was driven 246 ft. to the vein, which has since been followed into the hill over 100 ft.

Canada

Ontario—Algoma District

Superior Copper Company—This company, which has expended several hundred thousand dollars in developing the Superior Copper mine, will build a large concentrating plant at Sault Ste. Marie, Ont., just west of the plant of the Lake Superior Corporation and will also construct a railroad 5 miles in length to connect the mine with the Algoma Central railway. The plant will have a capacity of 400 tons per day.

Ontario—Cobalt District

Shipments of Cobalt ore for the week ending May 25 were as follows: Buffalo, 82,770 lb.; Coniagas, 146,000; Nipissing, 247,640; O'Brien, 126,220; Trethewey, 222,460; Cobalt Central, 40,000; Townsite, 6000; total, 871,090 lb.

Duchess—On this property located near the Timiskaming mine, Cobalt, seven veins in all have been discovered. Upward of 1000 ft. of stripping has been done.

McKinley-Darragh—The new Nipissing vein, Cobalt, was struck on May 29 and large quantities of ore are being taken out.

Nipissing—A new vein found on the property, Cobalt, is said to exceed in value anything so far discovered there except vein No. 49. It varies from 4 to 12 in. in width. A 600-lb. nugget taken from it is said to show 70 per cent. silver.

Penn Cobalt Silver Company—An important find is reported on the location of this company, Cobalt, in the 10th concession of Lorraine township, on the shore of Moose lake. An opening in the cliff extends back about 35 ft. and is about 26 ft. wide, the walls appearing to be a continuous body of vein matter. Samples show silver content as high as 268 oz. to the ton.

Progress—An 8-in. calcite vein, the ore from which assays about 56 oz. to the ton, has been struck in the course of drifting from the main shaft at 72 ft. Three other veins have been discovered on the property, Cobalt, and about 500 ft. of stripping has been done.

Silver Queen—On May 25 a 4-in. vein of high-grade ore was struck in crosscutting at the 75-ft. level.

Ontario—Manitou Lake District

Detola Development Company—John Burns, in charge of operations for the company, is arranging for the erection of camp buildings. A contract has been let for sinking the shaft 100 ft. deeper.

Laurentian Gold Mine — The drifting carried on at the 200-ft. level shows that the zone of rich schist, which at 85 ft. was between 35 and 40 ft. long, is enlarging with depth. Fine samples of gold have been discovered on three properties lying northeast of the Laurentian.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, June 5—The coal trade in the East shows nothing new or of special interest. Demand for steam coal continues good, and the continued cold and stormy weather has made the call for domestic fuel an unusually prolonged one.

In the West much the same conditions prevail as were noted last week. Transportation is generally good, and mines are working freely. The Lake trade alone is rather slow.

Pittsburg coal operators are threatened by a strike. The miners have taken exception to the use of the Pate coal dump, which is used on the tipples to facilitate the screening of coal. The miners allege that the dump, which is operated by steam, has a tendency to break the lump coal. As they are paid on the basis of 1¼-in. screened coal, the miners believe they are losing much of their work. An attempt to arbitrate the matter did not succeed. The question remains unsettled whether the coal is broken up in the handling, but the operators took the stand that the burden of the proof now lies with the miners to prove their contention. The operators offered to demonstrate that the coal did not suffer from the new method and the coal miners failed to meet the arbitrators. Hence, it is with some hesitation that the miners announced they would strike for the abolition of the dump or an increase in pay per ton of coal screened. The latest news is that an arbitration has been agreed upon.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to May 25 were as follows, in short tons:

	1906.	1907.	Changes.
Anthracite	1,596,760	2,227,785	I. 631,025
Bituminous	12,814,120	14,, 814,, 886	I. 2,000,276
Coke	5,134,928	5,602,513	I. 467,585
Total	19,575,881	22,765,164	I. 3,189,283

The total increase this year to date has been 16.3 per cent.

New York

Anthracite

June 5—In the anthracite coal market the demand for small sizes has become very sharp, and can be met with difficulty by the producers. The demand for all other sizes is also very good. The car supply while not adequate is improving slowly.

On June 1 prices advanced 10c. per ton on all sizes and quotations are: broken, $4.45; egg, stove and chestnut, $4.70. Quotations on small sizes are merely nominal, being about as follows: pea, $3.10; buckwheat, $2.60; rice, $1.95; barley, $1.60. All f.o.b. New York harbor.

Bituminous

The Atlantic Seaboard soft-coal trade shows improvement, there being greater demand and somewhat higher prices. This condition has been developed to a great extent by the continuous shortage of transportation facilities on land and water. Vessels are being chartered from two to three weeks in advance "to arrive" in order to secure them. Additional factors are the adverse weather recently experienced and the considerable number of vessels formerly in the coal trade which have taken outside freights.

Trade in the far East is calling for considerable quantities of coal which producers are not able to ship in the volume demanded and accumulations are piling up in shippers' hands. Eastern consumers are paying winter ocean rates to secure vessels.

Trade along the Sound is showing a disposition to take on large quantities of coal, and this tendency is increasing as anthracite prices go up each month. Sound barge rates continue high. New York harbor trade shows signs of improving, there being a steady demand for higher grades of coal. Good grades of steam coal are now selling around $2.70@2.75 per ton f.o.b. New York harbor ports.

Transportation from mines to tide is fairly up to schedule and more regular. Car supply is up to demand generally.

In the Coastwise trade vessels continue to be scarce and in great demand and this condition is apparently growing more severe. Current rates are as follows: Philadelphia to Boston, Salem and Portland, $1.05@1.10; Providence, New Bedford and the Sound, $1; Lynn and Bangor, $1.30; Portsmouth, Gardiner and Saco, $1.15, Bath, $1.10; with towages where usual.

Chicago

June 3—The coal market is in strong condition, generally, for the beginning of summer. Both steam and domestic coals have sold well in the last week, the activity in domestic grades being chiefly due to cool weather. There is no great accumulation of any coal on tracks, and prices are fairly firm, while sales are good for nearly all coals. Anthracite sales in the last week of May were comparatively heavy, the discount for the month proving attractive. Buying was well distributed, both city and country sales being increased.

In Western coals, screenings are increasing in strength and prepared sizes are weakening, though slowly. Lump and egg from Illinois and Indiana mines sell for $1.80@2.55; run-of-mine for $1.60@2.25, and screenings for $1.45@1.75. Brazil block brings $2.65.

Eastern coals are generally in good condition. Smokeless holds up to $3.35 for run-of-mine, the list price; Hocking is reported selling well at $3.15; Youghiogheny is apparently hard to get, and sells at $3.20 for ¾-in.; Pittsburg No. 8 also is scarce, bringing the same as Youghiogheny. The absence of demurrage coal is a gratifying feature of the market.

Indianapolis

June 3—The chief [illegible] ture of the coal-mining industry in this State is the steady and continuous demand for domestic use coal. Never before were furnaces and heaters kept running from October until June. Of course, this demand has not been heavy, but the operators and shippers say it has been steady and not only from the cities, but from the country towns as well. The operators say that coal is going forward also for the stocking up for another season, consequently, the mines are now being operated to their fair capacity.

The joint conference of the executive boards of the Indiana Operators' Association and the United Mine Workers was held in Terre Haute, May 31 and June 1. After two days' consideration of a number of disputes which could not be settled by the local committees, nor the State officials of the two organizations, the joint conference adjourned without agreement, and without date for another conference. Ordinarily, the situation might be considered strained, but both sides say the disputes will yet be settled. In all cases the grievances were presented by the men.

The Brotherhood of Coal-Hoisting Engineers has served notice on a number of operators that they must cease to employ non-licensed engineers if they wish to avoid trouble.

The Indiana Railroad Commission has been notified that the Vandalia Railroad

has ceased adding a switching charge on coal consigned to Indianapolis, from the southern Indiana coalfields. Hitherto the Vandalia has made a switching charge of 7c. a ton on Indiana coal delivered off its own tracks in Indianapolis.

The new Indiana State law, taking effect June 1, provides that in ordering empty cars all coal operators must make such orders in writing to the railroad companies on all cars to be loaded within the State. Written orders must be filed with the local agent in order to keep a complete record and the time such cars are furnished by the railroad company. Orders can no longer be taken over the telephone, telegraph or orally as heretofore.

Hartshorne, Ind. Ter.

May 30—Work for the mines along the Rock Island promises to be very good the coming summer; the railroad as well as the coal dealers are storing large quantities of coal. At present there are plenty of cars to run all the mines full time, the only thing that is holding back an increased tonnage being the scarcity of miners.

Pittsburg

June 4—A strike of coal miners that threatened to tie up the entire Pittsburg district was scheduled for yesterday, but was averted. The trouble was due to dissatisfaction over the installation of the Pate dump at a number of the mines. The miners contend that the shaking of the coal means a decrease in earnings and is a violation of the agreement. A conference was held on Friday after the strike order had been issued and it was agreed to submit the question to arbitration. The mines will continue in operation pending the result.

The demand continues good and prices are firm and unchanged on a basis of $1.20 a ton for mine-run coal at mine. For the first time in the recollection of the oldest river coal operator a "June rise" came without any coal of any consequence to go out. The rivers have been navigable almost constantly since the opening of the year and the coal has been sent to the lower ports as rapidly as it was loaded. A heavy shipment was made a week ago and this week there was scarcely enough ready to make two fairly good tows.

Connellsville Coke—There is no material change in the coke market and prices for prompt shipment remain low. Spot furnace coke has sold as low as $2 a ton but quotations this week for June range from $2.15 to $2.25 and for last half $2.50 seems to be the minimum. Foundry coke for prompt delivery remains around $3. The *Courier* in its summary for the week gives the production in both fields of the Connellsville region at 421,278 tons and the shipments aggregated 12,217 cars distributed as follows: To Pittsburg, 4,892 cars; to points west of Connellsville, 6,596 cars; to points east of Connellsville, 729 cars.

Foreign Coal Trade

Exports of coal and coke from the United States for the four months ending April 30, are reported as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
Anthracite	493,721	687,539	I. 193,818
Bituminous	2,116,007	2,842,383	I. 426,386
Total coal	2,609,728	3,229,932	I. 620,204
Coke	245,792	285,985	I. 40,193
Total	2,855,520	3,515,917	I. 660,397

These figures do not include coal bunkered, or sold to steamships engaged in foreign trade. The coke exported went chiefly to Mexico and eastern Canada; the distribution of the coal was as follows:

	1906.	1907.	Changes.
Canada	1,773,497	2,197,356	I. 423,859
Mexico	357,490	398,708	I. 41,678
Cuba	248,326	287,488	I. 39,162
Other W. Indies	125,351	166,383	I. 41,032
Europe	30,852	22,728	D. 8,124
Other countries	74,612	157,209	I. 82,597
Total	2,609,728	3,229,932	I. 620,204

The exports to Europe were chiefly to Italy; those to other countries, to South America. The exports to Canada—68 per cent. of the total in 1907—were, in detail, as follows:

	1906.	1907.	Changes.
Anthracite	478,361	673,119	I. 194,758
Bituminous	1,295,136	1,524,237	I. 229,101
Total	1,773,497	2,197,356	I. 423,859

There was a considerable increase this year, in both anthracite and bituminous coals.

Imports of coal and coke into the United States for the four months ending April 30, were as follows:

	1906.	1907.	Changes.
Great Britain	60,665	20,004	D. 40,661
Canada	573,232	463,352	D. 109,880
Japan	5,972	54,899	I. 48,927
Australia	69,205	115,654	I. 46,449
Other countries	4,100	503	D. 3,597
Total coal	713,174	654,412	D. 58,762
Coke	36,825	54,342	I. 17,517
Total	749,999	708,754	D. 41,245

Some Nova Scotia coal comes to New England ports, but the bulk of the imports of coal is on the Pacific coast. The coke is chiefly from British Columbia, though a little comes from Germany.

Sydney, Cape Breton

May 31—The backward season and the delay in the opening of navigation is having a disastrous effect upon the Nova Scotia coal trade. Sydney harbor continues blocked with ice, the fleets of both the Dominion Coal Company and the Nova Scotia Steel and Coal Company being tied up. These companies control the greater portion of the Cape Breton output and the supply of the St. Lawrence river trade. The delay will prevent the anticipations of a record output from being realized, as it will be impossible to make up the shortage during the season. The Dominion Coal Company is about 200,000 tons behind last year in its shipments to date. The inability of vessels to make a clearance has rendered it necessary to curtail the output at the mines, owing to a want of further storage facilities. It will be necessary to readjust contracts made previous to the new year for summer delivery, reducing the orders by about 7 per cent.

Iron Trade Review

New York, June 5—There is still a good deal of buying of pig iron and the market is active. The present business, however, is chiefly in bessemer and basic iron, the foundry demand being less in evidence.

In finished material the prevailing activity is chiefly in structural material, for which a good demand is reported. A large part of this is for buildings in the East.

Reports have been current that the United States Steel Corporation is negotiating with W. P. Snyder & Co. for the purchase of their extensive furnace interests in the Mahoning and Shenango valleys. Such an addition would help the Steel Corporation on its weak side.

Iron and Steel Exports—Exports of iron and steel, including machinery, from the United States for April, and the four months ended April 30, are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1906.	1907.	Changes.
April	$14,933,495	$17,684,863	I. $2,751,368
Four months	54,953,041	62,371,457	I. 7,418,416

The total increase for the four months was 13.5 per cent. The leading items of export for the four months were, in long tons:

	1906.	1907.	Changes.
Pig iron	27,850	28 346	I. 496
Billets, ingots & blooms	89,199	39,593	D. 49,606
Bars	27,251	30,187	I. 2,936
Rails	115,941	112,724	D. 3,217
Sheets and plates	32,183	45,279	I. 13,096
Structural steel	33,425	43,990	I. 10,565
Wire	54,856	52,881	D. 1,965
Nails and spikes	23,276	19,392	D. 3,884

Decreases are shown in nails, in wire, in rails, and in billets, ingots and blooms; the latter loss was the only large one.

Iron and Steel Imports—Imports of iron and steel, including machinery, in the United States for April and the four months ending April 30 are valued by the Bureau of Statistics as follows:

	1906.	1907.	Changes.
April	$2,547,199	$3,723,176	I. $1,175,977
Four months	9,875,981	13,742,284	I. 3,866,303

The increase for the four months was 39.1 per cent. The chief items of the iron and steel imports for the four months were, in long tons:

	1906.	1907.	Changes.
Pig iron	95,079	215,983	I. 120,900
Scrap	7,950	5,461	D. 2,474
Ingots, blooms, etc	6,739	5,427	D. 1,318
Bars	10,959	9,601	D. 1,352
Wire-rods	5,886	5,666	D. 228
Tin-plates	14,807	19,117	I. 4,310

There were large proportional increases in pig iron and in tin-plates.

Iron Ore Movement—Exports and imports of iron ore in the United States for the four months ended April 30 are reported as follows, in long tons:

	1906.	1907.	Changes.
Exports	17,440	1,352	16,088
Imports	588,156	602,501	14,345

Most of the exports were to Canada. Imports were from Cuba, Spain and Algeria.

Imports of manganese ore for the four months ended April 30 were 62,515 tons in 1906, and 59,345 tons in 1907; a decrease of 3170 tons this year. Most of the ore this year was from India and Brazil.

Baltimore

June 4—Imports of spiegeleisen for the week were 1250 tons; of ferromanganese, 3514 tons. Receipts of iron ore were 5350 tons from Cuba and 4800 tons from Spain; a total of 10,150 tons for the week

Chicago

June 3—Sales of pig iron have not been heavy in the last week, but signs indicate continued strength. The scarcity of iron is generally commented on as one of the causes of the lull. Among melters the feeling seems to be that it is a good plan to buy as little as is needed, in the hope that things will be easier in a little while. Sellers of iron assert that the market is bound to grow stronger with furnaces generally well sold up and much tonnage yet unplaced.

The local demand is chiefly for small lots on quick delivery conditions. Sales for the third and fourth quarters are not for large amounts, though fair in number. Northern furnaces have little quick-delivery iron to sell at any price; Southern obtains on such sales premiums of 50c. to $1 over quotations for the fourth quarter. For fourth-quarter delivery quotations are as follows: Lake Superior charcoal, $27.50; Northern foundry No. 2, $24.50@25; Southern foundry No. 2, $21@21.50 Birmingham, or $25.35@25.85 Chicago.

Coke is easy, with no oversupply. Connellsville 72-hour brings $5.85 per ton.

Cleveland

June 4—The chief object of interest in the local situation during the week just passed has been the strike of 2000 machinists in the city shops. The strikers walked out on June 3 in all shops where the nine-hour schedule would not be granted. It is expected that 2500 will be out before the week is out. The strike is to be deplored at this time as every one of the plants is swamped with orders for quick delivery. Efforts will be made to bring the strikers back, but they declare that they will not go back on any other terms than those demanded.

The iron-ore market has been active during the week at steady prices. A number of large cargoes was received which build up stocks on the docks. Lake rates remain firm. Local foundries are fairly well supplied with pig iron. Prices remain as follows for last half delivery; No. 1 Foundry $24.50; No. 2 $24; No. 3 $23.50; bessemer $23.90; No. 2 Southern $24.35; gray forge $22.50.

Scrap dealers report a big demand for old materials and prices have jumped around during the week with pronounced gains in old iron and steel rails.

Philadelphia

June 5—The large amount of business that has been done during the past two or three weeks by engineering plants and foundries accounts for the reviving interest in pig for next year's delivery which is at present stirring the market. The furnaces in this territory are not in the market for this year's business, but whatever capacity is unsold will be reserved for the accommodation of regular customers and such outsiders as it may be possible to accommodate. Some additional business has been done with Virginia and Alabama furnaces. Local supplies of English and Scotch iron are practically non-existent. The demonstrated inability of furnace people to take care of summer or early fall needs has led to some additional business in foreign material. Quotations on basic for third quarter are $24; low phosphorus, $28; forge, $22.50; No. 2 foundry, $24.50.

Steel Billets—Consumers believe the mills are getting into shape where they can deliver strictly according to agreement. There is less feverishness as to obtaining supplies for future delivery. While new orders are fewer options to take larger quantities on old contracts are being used. A fair quotation is $33 for rolling billets.

Bars—Capacity continues to be oversold. The tone of the market is strong, particularly for steel bars. Retail distribution from city and country stores is very satisfactory.

Sheets—The feature of the week is a more urgent demand for small lots for quickest possible delivery. Mills are not anxious for the business and offer no inducements.

Pipes and Tubes—A slight advance has been made to cover higher freight rates on merchant pipe. The tube situation is worse as regards deliveries. The larger consumers in our territory are pretty well covered by contracts.

Plates—The mills are gaining a little in point of making early deliveries. This easing up is only temporary.

Structural Material—Deliveries on old contracts are being hastened. Quite a good business has been done this week in small work for office buildings and city work.

Steel [illegible] the market is the rush of small orders for late summer delivery.

Scrap—The steel scrap scarcity is more pronounced. In other kinds a moderate business is being done.

Pittsburg

June 4—The iron and steel markets have been decidedly quiet for over a week, new business being extremely light and only for prompt shipment. For the first time since the opening of the year there appears to be a feeling of unrest in the trade. General conditions, however, do not warrant any alarm for the rest of the year, when the tonnage booked is considered. When there was a slight murmur of probable cancellations yesterday it was promptly hushed. Prices, except for some lines of finished material, are much higher than a year ago. Bessemer pig iron is $7 a ton, and No. 2 foundry $9 a ton, higher than on June 1, 1906. Bessemer billets are $4 a ton higher and steel bars, $2; iron bars, $5, and plates, $2.

In merchant pipe and plates the mills seem to be more congested than in any other line. An independent pipe interest reluctantly accepted a large order for pipe for California, deliveries to be made within four months, the buyer paying a premium of $4 a ton over the established price. This contract practically puts the concern out of the market for the remainder of the year. The National Tube Company is still taking on some new business, but is not guaranteeing delivery. A number of inquiries for steel cars have been received, and if the contracts are closed it will be impossible for the plate mills to get out the tonnage necessary to complete them before next year. The pressure on the sheet mills has fallen off and deliveries are being promised before Oct. 1. For prompt shipment, premiums of about $2 a ton are paid. Demand for tin plate is not as heavy, and the leading producer is not taking on any business for last quarter delivery.

The wage question is now up and until the scales have been arranged for the year beginning July 1 it is not likely that much new business will be booked at current prices. The representatives of the Amalgamated Association of Iron, Steel and Tin Workers and the Western Bar Iron Association are meeting today in Toledo, O. A conference with the Republic Iron and Steel Company has been arranged for June 10. The conference with the American Sheet and Tin Plate Company likely will be held on Tuesday, June 18. A disagreement is certain to result unless the workers' representatives withdraw their demands for an advance. They have already received increases in wages this year under the existing scale amounting to 6 per cent., despite the stiff advance in the price of tin.

[illegible]

[illegible] $24.50@25, and a few small sales of No. 2 foundry were made at $25.50@26, Valley furnaces. There is a heavy demand for prompt bessemer iron, but there is none to be had. The Carnegie Steel Company, which was running short of iron on account of the idleness of Furnace C of the Edgar Thomson group for repairs, will be in better shape this week, as one of the new Carrie furnaces was blown in last night. Repairs to the idle furnace will be completed next week, when it will again be a producer at the rate of 600 tons daily.

Steel—The supply of crude steel shows some improvement, and bessemer billets are quoted at $31, Pittsburg. Open-hearth billets cannot be had, and are quoted nominally at about $33. Plates remain at 1.70c., and merchant steel bars at 1.60c.

Sheets—The mills are catching up on deliveries, as there is no new business being placed. Black sheets are strong at 2.60c., and galvanized at 3.75c. for No. 28 [illegible].

Ferro-Manganese—There has been a decline in ferro, which it is believed will be only temporary. One lot for prompt shipment sold at $66, and for last quarter a sale was made at $65 per ton.

Cartagena, Spain

May 18—Messrs. Barrington & Holt report shipments of iron ore for the week: Great Britain, 13,750 tons. The market continues active and prices are firm. During the past fortnight tonnage has been somewhat scarce for prompt loading and for this reason the stocks of iron ore on the wharves and at the railway stations have increased.

Quotations for iron ores are: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; low phosphorus, 10s. 9d.; specular ore, 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganiferous ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 14s. 6d. No higher grades on the market.

Pyrites—Iron pyrites, basis 40 per cent. iron and 43 sulphur, is quoted 11s. 9d. per ton, f.o.b. shipping port.

Dusseldorf, Germany

May 15—Imports of iron and steel, and of machinery, into Germany for the three months ended March 31 were, in metric [illegible]

	[illegible]	[illegible]	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Exports for the three months were as follows, in metric tons:

	[illegible]	[illegible]	Changes
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Imports of iron ore for the three months were 1,465,358 tons, and exports were 1,017,486 tons; showing net imports of 447,872 tons. Imports of slag and slag products were 146,989 tons; exports being 8082 tons.

London

April 15—Exports of iron and steel, and of machinery, from Great Britain for the four months ended April 30 are valued by the Board of Trade returns as follows:

	1906.	1907.	Changes
Iron and Steel..	£12,151,182	£15,461,711	I. £3,310,529
Machinery	8,346,398	9,626,688	I. 1,280,290
New Ships	1,816,130	3,032,801	I. 1,216,671
Total.....	£22,313,710	£28,121,200	I. £5,807,490

The total increase was 26 per cent. The leading items of the iron and steel exports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	600,041	670,340	I. 270,299
Wrought iron.....	60,813	72,299	I. 11,486
Rails	133,760	141,562	I. 7,802
Plates.....	77,508	121,457	I. 43,949
Sheets.....	149,998	167,825	I. 17,827
Steel shapes, etc.....	67,615	79,920	I. 22,305
Tin-plates.....	123,151	137,208	I. 14,057

The total quantities of iron and steel were 1,333,359 long tons in 1906, and 1,742,789 tons in 1907; an increase of 409,430 tons. Exports of pig iron to the United States in 1907 were 231,948 tons, an increase of 161,319 tons over 1906; of tin-plates, 22,210 tons, an increase of 7151 tons.

Imports of iron and steel and of machinery into Great Britain for the four months were valued as follows:

	1906.	1907.	Changes.
Iron and steel...	£3,216,219	£2,126,984	D. £1,089,235
Machinery.....	1,669,072	1,767,894	I. 98,822
Total.....	£4,885,291	£3,894,878	D. £ 990,413

The total decrease was 20.2 per cent. The chief items of the imports were, in long tons:

	1906.	1907.	Changes.
Pig iron.....	24,248	24,245	D. 3
Wrought iron.....	45,058	20,323	D. 24,735
Steel billets, etc.....	213,419	92,837	D. 120,582
Bars and shapes.....	22,237	3,936	D. 18,301
Structural steel	56,371	28,192	D. 28,179

The total quantities of iron and steel were 495,034 tons in 1906, and 269,475 tons in 1907; a decrease of 225,559 tons this year.

Imports of iron ores into Great Britain for the four months were, in long tons:

	1906.	1907.	Changes.
Manganiferous ores.	135,514	128,509	D. 7,005
Iron ores.....	2,670,561	2,642,953	D. 27,608
Total.	2,706,075	2,671,462	D. 34,613

Of the ores imported this year 92,333 tons of manganiferous and 1,983,373 tons of iron ores came from Spain.

Johannesburg

April 29—The problem of the unemployed grows worse every day. For a long time many of the unfortunates have been living in a camp near Johannesburg, sustained from a donation of £500, given by a Rand philanthropist. This fund will not last forever, and the men are beginning to get restless. To provide employment the Government has started relief work, offering the men 2s. per day and rations, for road building. The aristocrats of labor have indignantly refused such a humiliating proposition, which they declare is an insult. They consider that their services are worth at least 10s. per day, if not more.

As a protest, and to sufficiently impress the Government, mass meetings are being held, and a great march of the unemployed on Pretoria is being organized, to interview the acting prime minister.

The price of coal on the Rand has been brought down to such a low point by fierce competition, that scarcely any of the companies are making a decent profit. There seems to be a movement on foot for the different companies to come to an agreement as to price, so that in future the price of coal on the gold mines will probably be somewhat higher.

There is a considerable difference in the grades of coal being supplied to the gold mines. Some of it is rather inferior stuff, while the coal from other collieries is of excellent quality. Hand sorting is adopted on those mines where slate is prevalent.

The cost of coal per ton crushed on the gold mines has been greatly reduced in the past few years. On some mines it is now as low as 9d. while on other mines where the conditions are unfavorable, the cost per ton crushed is nearly 60 cents.

The Boer government is continuously maintaining that there are any number of Kafirs waiting to work in the mines. The conditions are exceptional. The terrible scourge of locusts that has swept over South Africa this year is still with us, and many of the crops of the Kafirs and the white farmers have been ruined. The black men are forced to come to the mines for work. But they will only sign on for a few months.

There have been many ghastly mining swindles and failures on the Transvaal of late, but it is satisfactory to note the success of some of the new ventures. The Robert's Victor diamond mine is doing very well, and expects to pay regular dividends before long. This mine is in the Orange River Colony, about 49 miles from Kimberley. Another success seems to be the Voorspoed diamond mine, also in the Orange River Colony about 20 miles west of Kroonstad. The prospects of this proposition are encouraging.

On the other hand, Lion Hill diamond mine, which was such a favorite counter on the stock exchange a few weeks ago has fallen in the public estimation. The shares mounted from £1 to nearly £20. Today they are being offered at £2 15s. per share, but there are no buyers. Then again we have Barberton Coppers, which are still being heavily gambled in. A report by a distinguished geologist shows that no mine is yet proved and that the prospects for copper are by no means favorable.

All these symptoms show that every effort is being made to explore and prospect the country. As far as the base metals are concerned the results have been disappointing. There is no question in copper syndicates and glowing reports, but after all this activity there does not yet seem to be a copper mine worth mentioning.

Metal Market

NEW YORK, June 7.

Gold and Silver Exports and Imports

At all United States Ports in April and year

Metal.	Exports.	Imports.	Ex'cess.
Gold			
Apr. 1907..	$2,201,650	$ 4,728,130	Imp. $2,526,481
" 1906 .	2,485,552	14,941,583	Imp. 12,456,031
Year 1907..	7,864,365	16,575,105	Imp. 8,710,742
" 1906..	22,682,174	25,257,670	Imp. 2,625,496
Silver			
Apr. 1907..	4,862,998	3,921,484	Exp. 941,514
" 1906..	4,213,687	2,833,859	" 1,379,828
Year 1907..	19,592,394	15,367,010	" 4,225,384
" 1906..	23,379,205	15,510,857	" 7,868,438

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending June 1 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 2,813,838	$ 40,543	$ 1,089,142	$ 27,025
1907.....	4,696,534	5,570,147	16,145,198	772,298
1906	5,468,121	44,120,908	26,959,940	885,479
1905.....	32,080,546	5,169,142	18,493,018	1,654,482

Exports of gold for the week were chiefly to Paris; of silver to London. Imports, both gold and silver, were from the West Indies and Central America.

The shipment of $5,400,000 gold to Paris this week looks as if it might be the beginning of a considerable movement. Paris has been accumulating gold lately, with a view to possible requirements later.

The joint statement of all the banks in the New York Clearing House for the week ending June 5, shows loans $1,139,931,000, an increase of $13,541,600; deposits, $1,128,194,600, an increase of $15,554,100 as compared with the previous week. Reserve accounts show:

	1906.	1907.
Specie.....	$185,100,600	$221,928,000
Legal tenders.....	82,888,200	72,891,100
Total cash	$266,988,800	$294,891,100
Surplus.....	$ 6,816,025	$ 12,792,440

The surplus over legal requirements shows a decrease of $2,906,425, as compared with the previous week this year.

Specie holdings of the leading banks of the world, June 1, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'd New York	.....	.....	$221,928,000
England.....	$156,185,550	.....	156,185,550
France	529,824,285	$197,765,995	727,590,280
Germany	184,650,000	61,550,000	246,200,000
Spain.....	77,495,000	127,640,000	205,135,000
Netherlands....	26,649,000	27,996,000	54,645,000
Belgium.....	16,270,000	8,135,000	24,405,000
Italy.....	161,895,000	24,737,000	186,632,000
Russia	580,455,000	31,475,000	611,930,000
Aust.-Hungary.	228,220,000	63,660,000	291,880,000
Sweden.....	20,725,000	.....	20,725,000

The bank of England and Canada report gold only. The New York banks do not separate gold and silver in their reports. The European estimates are those of gold in the *Commercial and Financial Chronicle* of New York.

Shipments of silver from London to the East are reported by Pixley, Abell & Abell, as follows, for the year to May 23:

	1906.	1907.	Changes.
India.....	£ 5,252,000	£5,082,034	D. £ 2,197,659
China	.....	.....	.....
Straits..	1,750	426,062	I. 424,312
Total.....	£ 7,281,103	£5,508,096	D £ 1,773,007

Imports for the week were £4000 from Brazil, and £91,000 from New York; £95,000 in all. Exports were £76,000, all to India.

Indian exchange has been stronger, and all the Council bills offered in London were taken at an average of 16.06d. per rupee. There has also been some buying of silver in London on Indian account.

The Treasury Department estimate of the money in the United States on June 1 is as follows:

	In Treasury.	In Circul'n.
Gold coin (inc. bullion in Treasury)	$ 242,209,761	$ [illegible]
Gold certificates.	50,614,460	[illegible]
Silver dollars.....	1,[illegible],388	82,083,942
Silver certificates...	5,274,748	470,459,252
Subsidiary silver.....	9,052,491	121,726,527
Treasury notes of 1890...	11,220	6,066,780
U. S. notes	3,580,820	343,100,193
Nat. Bank notes	11,910,342	[illegible]
Total	$327,006,440	$2,[illegible]

Population of the United States, June 4, 1907, estimated at 85,956,000; circulation per capita, $34.20. For redemption of outstanding certificates an exact equivalent in amount of the appropriate kinds of money is held in the treasury, and is not included in the account of money held as assets of the Government. This statement of money held in the treasury as assets of the Government does not include deposits of public money in national-bank depositaries to the credit of the treasurer of the United States, amounting to $172,831,241. The total in circulation showed increases of $7,176,544 over May 1, and $196,101,449 over June 1 last year.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars.....	$0.52	$0.54
Peruvian soles and Chilean	0.47	0.50
Victoria sovereigns.....	4.85	4.87
Twenty francs.....	3.86	3.89
Spanish 25 pesetas...	4.78½	4.80

SILVER AND STERLING EXCHANGE

May-June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
30	.....	.....	31	3	4.8675	67⅛	31
31	4.8675	67	30¾	4	4.8675	67⅛	31
1	4.8675	67⅛	31⅛	5	4.8675	67¼	31

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

	Copper.			Tin.	Lead.	Spelter.	
May-June.	Lake, cts. per lb.	Electrolytic, cts. per lb.	Casting, cts. per lb.	cts. per lb.	cts. per lb.	New York, cts. per lb.	St. Louis, cts. per lb.
30	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
31	24¼	24	23½	[illegible]	[illegible]	[illegible]	6.20
1	@25	@24¼	23¾	43	6.00	[illegible]	@6.30
3	24¼	24	23½	[illegible]	[illegible]	[illegible]	6.20
4	@25	@24¼	23¾	42	5.90	@6.45	@6.30
5	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
6	@25	@24¼	23¾	43	5.90	@6.45	@6.30
7	24¼	24	23½	[illegible]	[illegible]	[illegible]	6.25
8	@25	@24¼	23¾	43	5.90	@6.45	@6.30
10	24	23¾	23½	[illegible]	[illegible]	[illegible]	[illegible]
11	@25	@24¼	23¾	43	5.90	@6.45	@6.30
12	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
13	@25	@24¼	23¾	43	5.90	@6.45	@6.30
14	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
15	@25	@24¼	23¾	43	5.90	@6.45	@6.30
17	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
18	@25	@24¼	23¾	43	5.90	@6.45	@6.30
19	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
20	@25	@24¼	23¾	43	5.90	@6.45	@6.30
21	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
22	@25	@24¼	23¾	43	5.90	@6.45	@6.30
24	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
25	@25	@24¼	23¾	43	5.90	@6.45	@6.30
26	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
27	@25	@24¼	23¾	43	5.90	@6.45	@6.30
28	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
29	@25	@24¼	23¾	43	5.90	@6.45	@6.30
31	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
1	@25	@24¼	23¾	43	5.90	@6.45	@6.30
3	24¼	24	23½	[illegible]	[illegible]	[illegible]	6.20
4	@25	@24¼	23¾	43	6.00	@6.45	@6.30
5	24¼	24	23½	[illegible]	[illegible]	[illegible]	6.20
6	@25	@24¼	23¾	42	5.90	@6.45	@6.30
7	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25
8	@25	@24¼	23¾	43	5.90	@6.45	@6.30
10	24	23¾	23½	[illegible]	[illegible]	[illegible]	6.25

copper. The exports from Baltimore also included 41,005 lb. copper sulphate.

per sheets is 32c. per pound.

per pound.

Tin—The increase in the visible supplies of 1900 tons as cabled from London resulted in a very sharp break early in the week, but at the lower level there has been a better demand and the market

The foreign market also sustained a sharp decline, but the close is steady at £187 for spot, and £184 for three months'.

It is stated that at the Banka sales in Holland last week about 600 tons of tin were bought for account of the United States Steel Corporation.

Shipments of tin from the Straits in May were 5130 tons, a decrease of 260 tons from May of last year.

Lead—The American Smelting and Refining Company reduced its price $5 per ton on Monday, and the market is now quoted at 5.75c. New York.

The market in London shows continued strength, and closes firm at £20 for Spanish and £20 2s. 6d. for English lead.

Spelter—There has been a very good business doing, which has resulted in the absorption of whatever quantities were offered for near-by shipment, bringing about an advance at the close to 6.45 New York, and 6.30 St. Louis.

The weakness in the European market ntinues, and the close is cabled at £24 os. for good ordinaries, and £24 15s. for specials.

The Bartlesville Zinc Company is erecting a six-block smelting works at Bartlesville, Indian Territory, which it is expected will be ready for operation next October.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 60-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The market has experienced a further decline and is weak. Reports of lower quotations come from abroad also. The market here is 18½c. for Cookson's; 17@17½c for Hallett's; and 15½@16½c. for other brands.

other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum—The market has declined and is in weak condition. Consumption remains normal, apparently not having been

quotations are: Ordinary metal, $27 per oz.; hard metal, $29.50 per oz. Scrap is $19@20, with light demand.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Imports and Exports of Metals

Copper — Exports of copper from the United States for the four months ended April 30 are reported as below by the Bureau of Statistics of the Department of Commerce and Labor, in long tons, of 2240 lb. each:

	1906.	1907.	Changes.
Great Britain	6,815	6,081	D. 734
Belgium	712	409	D. 303
France	12,267	10,042	D. 2,225
Italy	2,369	2,824	I. 455
Germany and Holland	34,609	28,612	D. 5,997
Russia	762	1,160	I. 398
Other Europe	3,806	3,208	D. 688
Canada	391	434	I. 43
China	800	. ..	D. 800
Other countries	45	74	I. 29
Total metal	62,666	52,844	D. 9,822
In ores and matte	2,528	1,483	D. 1,045
Total	65,194	54,327	D. 10,867

The total decrease was 16.7 per cent. The actual quantity of ore and matte exported this year was 25,907 tons, of which 22,705 tons went to Canada, 3022 tons to Mexico, and the balance to Germany and Great Britain.

Imports into the United States of copper and copper material for the four months ended April 30, with re-exports of foreign metal, are reported as follows; the figures give the contents of all material in long tons of fine copper:

	Metal.	In ore, etc.	Total.
Mexico	13,344	5,597	18,941
Canada	4,268	1,899	6,167
Great Britain	7,223	.....	7,223
Japan	957	.....	957
South America	.....	1,364	1,364
Other countries	7,329	608	7,937
Total imports	33,121	9,468	42,589
Re-exports	178	....	178
Net imports	32,943	9,468	42,411
Net imports, 1906	24,830	7,975	32,805

The total increase in the net imports was 9606 tons, or 29.3 per cent. The actual tonnage of ores and matte imported from Mexico this year was 31,792 tons; from Canada and Newfoundland, 42,866 tons; from South America, 11,105 tons.

The exports and net imports compare as follows for the four months:

	1906.	1907.	Changes.
Exports	65,194	54,327	D. 10,867
Net imports	32,805	42,411	I. 9,606
Excess, exports	32,389	11,916	D. 20,473

This shows a decrease this year of 63.2 per cent. in the excess of exports.

Tin—Imports of tin into the United States for the four months ending April 30 were as follows, in long tons:

	1906.	1907.	Changes.
Straits	6,056	5,422	D. 634
Australia	366	304	D. 62
Great Britain	8,278	7,928	D. 350
Holland	152	532	I. 380
Other Europe	586	423	D. 163
Other countries	23	14	D. 9
Total	15,461	14,623	D. 838

There was a decrease of 5.4 per cent. in the imports of this year.

Lead—Imports of lead into the United States in all forms, with re-exports of imported metal, are reported as below for the four months ended April 30, in short tons, of 2000 lb. each:

	1906.	1907.	Changes.
Lead, metallic	3,161	6,914	I. 3,753
Lead in ores and base bullion	26,434	18,665	D. 7,769
Total imports	29,595	25,579	I. 4,016
Re-exports	16,956	8,171	D. 8,785
Net imports	12,639	17,408	I. 4,769

Of the imports this year 16,294 tons were from Mexico and 2227 tons from Canada. Exports of domestic lead were 83 tons in 1906 and 176 tons in 1907, an increase of 93 tons.

Spelter — Exports of spelter from the United States for the four months ended April 30 were 1718 short tons in 1906 and 250 tons in 1907, a decrease of 1468 tons. Exports of zinc dross were 4082 short tons in 1906 and 4363 tons in 1907, an increase of 281 tons. Exports of zinc ore were 10,270 long tons in 1906 and 8070 tons in 1907, a decrease of 2200 tons.

Imports of spelter for the four months were 1417 short tons in 1906 and 414 tons in 1907, a decrease of 1013 tons.

Antimony — Imports of antimony into the United States for the four months ended April 30 were as follows, in pounds:

	1906.	1907.	Changes.
Metal and regulus	2,656,999	3,671,297	I. 1,014,298
Antimony ore	538,985	913,693	I. 374,708

There was a large increase this year, both in metal and in ore.

Nickel—Imports of nickel ore and matte into the United States for the four months ended April 30 were 4246 tons in 1906, and 5200 tons, containing 6,590,579 lb. of metal, in 1907. The metal contents were not reported last year.

Exports of nickel, nickel oxide and nickel matte for the four months were 4,117,285 lb. in 1906, and 3,901,489 lb. in 1907; a decrease of 215,796 lb. this year.

Platinum—Imports of platinum into the United States for the four months ended April 30 were 3966 lb. in 1906, and 2817 lb. in 1907; a decrease of 1149 lb. this year.

Quicksilver — Exports of quicksilver from the United States for the four months ending April 30 were 233,641 lb. in 1906, and 183,562 lb. in 1907; a decrease of 50,079 lb. this year.

Aluminum—Exports of aluminum from the United States for the four months ended April 30 were valued at $39,210 in 1906 and $112,514 in 1907, an increase of $73,304 this year.

Missouri Ore Market

Joplin, Mo., June 1—The highest price paid for zinc concentrates was $51 per ton, on an assay basis of $47 per ton for 60 per cent. zinc. One bin of ore, settled for at $50 per ton, was sold on a base price of $47.50. The base price on medium and under-grade concentrate was generally advanced, no offering under $46 being reported. The average price was $45.22, lowered on account of heavier silicate sales. The highest price for lead was $83.50 per ton, medium grades bringing $80@82, increasing the average to $80.78 per ton.

Activity the first of the week gave place to a lessened demand toward the close, when it became apparent that the new mills recently started would offset the reduction in output occasioned by the inundation of the Badger mines on May 13. The output and shipment of the week was approximately balanced, and was practically at a stage normal to the inflow of water.

Following are the shipments of zinc and lead from the various camps of the district for the week ending June 1:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	3,[illegible],480	1,004,510	$128,537
Joplin	2,[illegible],580	[illegible],[illegible]	[illegible],[illegible]
Duenweg	1,[illegible],[illegible]	307,940	[illegible],[illegible]
Alba-Neck City	1,[illegible],[illegible]	[illegible]	32,595
Oronogo	[illegible],[illegible]	[illegible],[illegible]	21,735
Galena-Empire	[illegible],[illegible]	[illegible],[illegible]	19,703
Aurora	[illegible],[illegible]	22,190	[illegible],[illegible]
Prosperity	[illegible],[illegible]	179,990	14,043
Granby	[illegible],[illegible]	[illegible],[illegible]	11,300
Spurgeon	[illegible],[illegible]	43,870	6,155
Sherwood	110,[illegible]	7,500	3,115
Baxter Springs	[illegible],[illegible]	[illegible]	2,473
Carthage	[illegible],[illegible]	[illegible]	1,604
Carl Junction	44,[illegible]	10,400	1,[illegible]
Sarcoxie	[illegible],[illegible]	[illegible]	1,199
Totals	12,185,120	2,150,990	$362,71[illegible]
22 weeks	[illegible],[illegible],[illegible]	[illegible],[illegible],[illegible]	$7,[illegible],[illegible]
Zinc value, the week, $[illegible],[illegible]; 22 weeks, $6,[illegible],[illegible]			
Lead value, the week, $[illegible],[illegible]; 22 weeks, 1,[illegible],[illegible]			

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.26	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	74.78	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51	45.48	May	78.40	[illegible]
June	43.83	[illegible]	June	80.96	[illegible]
July	44.25	[illegible]	July	74.31	[illegible]
August	43.56	[illegible]	August	75.46	[illegible]
September	42.58	[illegible]	September	79.64	[illegible]
October	41.55	[illegible]	October	79.84	[illegible]
November	44.13	[illegible]	November	81.98	[illegible]
December	43.68	[illegible]	December	81.89	[illegible]
Year	43.24	[illegible]	Year	77.40	[illegible]

Wisconsin Ore Market

Platteville, Wis., June 1—The interest shown by the ore buyers did not let up during the week, in consequence of which, there was no change in the price of zinc ore. All the 60 per cent. ore in the district was cleaned up at $47@48 per ton. One lot was reported sold at $50. The lower grades brought high prices, as compared with former years. The transactions reported bear out the prophecy made in a previous issue of the JOURNAL, and it now seems that even the most optimistic may be surprised during the coming summer. Every energy is being used to complete the plants, and before winter sets in the Wisconsin district should be shipping double what it is now. Inquiries from outside buyers show that the eyes of the smelters are on the district.

The smelter bins are well filled, but in spite of this fact buying continues by all the regular buyers. Lead price dropped off a little and all that was reported sold at $81.50@82 per ton. Sulphur and dry-bone suffered no material change.

Shipments of the district were as follows, by camps, for the week ending June 1:

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
[illegible]	[illegible],[illegible]	[illegible]	[illegible]
Buncombe-Hazel	[illegible],[illegible]	[illegible]	[illegible]
[illegible]	[illegible],[illegible]	[illegible]	[illegible]
[illegible]	[illegible],[illegible]	[illegible]	[illegible]
[illegible]	[illegible],[illegible]	[illegible]	[illegible]
[illegible]	[illegible],[illegible]	[illegible]	[illegible]
[illegible]	[illegible],[illegible]	[illegible]	[illegible]
Linden City	[illegible],[illegible]	[illegible]	[illegible]
Highland	66,000	[illegible]	[illegible]
Harker	[illegible],[illegible]	[illegible]	[illegible]
Total for week	[illegible],[illegible]	[illegible],[illegible]	[illegible]
Year to June 1	39,381,260	1,782,150	189,160

Taken as a whole, the zinc market is firmer at the present writing than it has been for several weeks. The rainy weather and continued car shortage has had a little to do with loading.

Chemicals

New York, June 5—Imports of heavy chemicals into the United States for the four months ended April 30 are reported as follows, in pounds:

	1906.	1907.	Changes.
Bleaching powder	[illegible],[illegible],[illegible]	[illegible],[illegible],[illegible]	[illegible],[illegible],[illegible]
Potash salts	57,168,413	73,800,427	I. 16,632,014
Soda salts	[illegible],[illegible],[illegible]	[illegible],[illegible],[illegible]	[illegible],[illegible],[illegible]

Exports of acetate of lime for the four months were 21,742,251 lb. in 1906, and 32,637,887 lb. in 1907; an increase of 10,895,636 lb. this year.

Copper Sulphate—The market continues strong, and quotations are unchanged at $7.50 per 100 lb. for carload or larger lots; $7.75 per 100 lb. for smaller parcels.

Exports of copper sulphate from the United States for the four months ended April 30 were 10,081,956 lb. in 1906, and 5,413,387 lb. in 1906; a decrease of 4,668,569 lb. The exports this year contained the equivalent of about 604 tons of fine copper.

Phosphates—Exports of phosphates from the United States for the four months ended April 30 were, in long tons:

	1906.	1907.	Changes.
[illegible]	[illegible]	[illegible]	[illegible]
All other	5,[illegible]	[illegible]	[illegible]
Total	354,645	324,823	D. 29,822

The chief exports this year were 102,030 tons to Germany; 47,396 to Great Britain; 52,780 to France; 27,242 to Italy.

[illegible] rites into the United States for the four months ended April 30 were, in long tons:

	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

The decrease in brimstone imports was due to the displacement of Sicilian sulphur by the Louisiana product. Estimating sulphur contents of pyrites, the total imports of sulphur were 100,182 tons in 1906 and 94,001 tons in 1907; a decrease of 6001 tons.

Nitrate of Soda—Messrs. Mortimer & Wisner, of New York, report the position of nitrate in the United States on June 1 as follows, in long tons:

	[illegible]	[illegible]	[illegible]
Stocks, Jan. 1	13,100	13,050	D. 50
Imports	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Deliveries [illegible]	[illegible]	[illegible]	[illegible]
Stocks, [illegible]	[illegible]	[illegible]	[illegible]
Afloat for U. S.	[illegible]	[illegible]	[illegible]

The quantity afloat includes all cargoes due to arrive at United States ports before Sept. 15 next.

Mining Stocks

New York, June 5—The general market is still depressed and uncertain. The taking of a large amount of gold for shipment to France—indicating that foreign loans are being called in—had an unfavorable effect.

The curb market has been dull and weak. Sales have been small and buying orders little in evidence. It has been almost a dead week, in fact.

Boston

[illegible] the mining stock market has been in the doldrums the past week and price changes, as a rule, have been unimportant. They showed a mending tendency for a while, but there is no stability to the market and buyers are lacking. Much depends upon the course of the metal market.

Amalgamated stiffened over $3 during the week, touching $87.12½, but in the meantime fell back to $83.75 today. The annual report, issued Monday, had no effect on the stock. Calumet & Hecla has declared another $20 dividend, making a total of $103,350,000 distributed to date. The stock is off $12 to $798, ex-dividend. Quincy is off $3 to $112 on light trading. Another Boston director has been added to the Quincy board, making four in all.

Old Dominion fell $3 to $44. Of the 12,000 shares of new stock offered about two-thirds was taken by stockholders at par, $50. Calumet & Arizona went off to $150, ex-dividend, recovering to $154. Copper Range has fluctuated within narrow limits and closes within a fraction of a week back at $79. Franklin is off $1.50 to $13.50 and Isle Royale went off $2 to $14, recovering $1.

strength in the curb market.

Colorado Springs

smelter returns for the month ending today show nearly $1,250,000 output from the mines of the Cripple Creek district. The mines are producing and paying regular dividends, but the stocks seem to be gradually declining in price. The principal reason of this decline is that the investing public has grown tired of the manipulation of various stocks, both listed and unlisted.

STOCK QUOTATIONS

NEW YORK	June 4
Name of Comp.	Clg.
Amalgamated	1
Am. Nev. M. & M. Co.	
Am. Zinc	84
Arcadian	8
Atlantic	11
Bingham	16
Boston Con.	24⅜
Calumet & Ariz.*	154
Calumet & Hecla*	798
Centennial	
Con. Mercur	
Copper Range	70¾
Daly-West	16
Franklin	13
Greene Cananea	14⅝
Isle Royal	14⅞
La Salle	
Mass	4⅛
Michigan	12½
Mohawk	84
Mont. C. & C.(new)	2⅝
Nevada	14½
North Butte	82
Old Colony	
Old Dominion	45¾
Osceola	
Parrot	19½
Phoenix	
Quincy	112
Rhode Island	1⅞
Santa Fe	2½
Shannon	17
Tamarack*	104
Trinity	19
Utah Con.	57½
U. S. Oil	9⅜
U. S. Smg. & Ref.	49
U.S.Sm. & Re.,pd.*	43⅜
Utah Copper	58
Victoria	6⅝
Washington	
Winona	3⅞
Wolverine	153
Wyandotte	1

BOSTON	June 4
Name of Comp.	Clg.
Adventure	2
Allouez	45
Am. Zinc	8⅛
Arcadian	8
Atlantic	11⅞
Bingham	16
Boston Con.	24⅜
Calumet & Ariz.*	154
Calumet & Hecla*	798
Centennial	
Con. Mercur	
Copper Range	70¾
Daly-West	16
Franklin	13
Greene Cananea	14⅝
Isle Royal	14⅞
La Salle	
Mass	4⅛
Michigan	12½
Mohawk	84
Mont. C. & C.(new)	2⅝
Nevada	14½
North Butte	82
Old Colony	
Old Dominion	45¾
Osceola	
Parrot	19½
Phoenix	
Quincy	112
Rhode Island	1⅞
Santa Fe	2½
Shannon	17
Tamarack*	104
Trinity	19
Utah Con.	57½
U. S. Oil	9⅜
U. S. Smg. & Ref.	49
U.S.Sm. & Re.,pd.*	43⅜
Utah Copper	58
Victoria	6⅝
Washington	
Winona	3⅞
Wolverine	153
Wyandotte	1

N. Y. INDUSTRIAL	
Am. Agri. Chem.	
Am. Smelt. & Ref.	119
Am. Sm. & Ref., pf.	108
Bethlehem Steel	
Colo. Fuel & Iron	29½
Federal M. & S., pf.	
Inter. Salt	15
National Lead	69⅝
National Lead, pf.	98⅛
Pittsburg Coal	
Republic I. & S.	24⅜
Republic I. & S., pf.	
Sloss-Sheffield	55⅜
Standard Oil	510
Tenn. C. & I.	
U. S. Red. & Ref.	17
U. S. Steel	31⅛
U. S. Steel, pf.	95⅜
Va. Car. Chem.	
Va. I. Coal & Coke	

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Alumeck	
Ariz. Com.	
Black Mt.	5
Cananea Cent.	
East Butte	10
Hancock Con.	
Keweenaw	9
Majestic	2⅝
Raven	1½
Shawmut	72
Superior	
Superior & Pitts	
Troy Man.	1½

LONDON	June 5
Name of Com.	Clg.
Dolores	£1 -s -d
Stratton's Ind.	0 3 9
Camp Bird	1 2 3
Esperanza	1 18 9
Tomboy	1 0 0
El Oro	1 7 6
Greenville	0 17 6
Nipissing	1 1 3
Utah Apex	1 6 11
Ariz. Cop., pfd.	3 0 6
Ariz. Cop., def.	3 7 6

Cables through Hayden, Stone & Co., N. Y.

ST. LOUIS	June 1
Name of Comp.	High.	Low.
Adams	40	36
Am. Nettie	05	04
Center Creek	2 50	2 —
Comb. & C.	26	25
Con. M. pf.	77	70
Doe Run	120	0	115	00
Columbia	5	4 50
Ex.	25	24 00
Iron	15	00	14	00
Ira Mines	2	17
St. Joe	18	00	17	00

SAN FRANCISCO	May 29
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.28
Best & Belcher	.75
Caledonia	.18
Challenge	.11
Con. Cal. & Va.	.92
Crown Point	.19
Exchequer	.37
Gould & Curry	.18
Hale & Norcross	.65
Mexican	.52
Ophir	1.85
Overman	.10
Potosi	.10
Savage	.47
Sierra Nevada	.36
Union	.34
Utah	.05
Yellow Jacket	.75
TONOPAH STOCKS	
Golden Anchor	.21
McNamara	.27
Montana-Pitts. ex.	.11
North Star	.25
Rescue	.17
GOLDFI'D STOCKS	
Black Ants	.05
Blue Bull	.25
Columbia Mt.	.18
Comb. Frac.	2.50
Conqueror	.12
Daisy	1.12
Florence	3.95
Frances-Mohawk	.98
Goldfield Con.	5.12
Grandma	.16
Great Bend	.60
Red Hills	.37
St. Ives	.96
BULLFROG STOCKS	
Amethyst	.27
Bonnie Claire	.43
Mayflower Con.	.32
Montgomery Mt.	.17
Original	.11
MANHAT'N STOCKS	
Gold Wedge	.05
Manhattan Mg.	.12
Pine Nut	.09
Ruby Wonder	.18
Stray Dog	.12
Yellow Horse	.04

NEVADA (Weir Bros. & Co., New York)	June 5
TONOPAH STOCKS	Clg.
Tono'h Mines of N.	14.87½
Tonopah Exten.	1.87½
Montana Tonop'h	2.70
Belmont	3.12½
Tonopah Midway	1.20
West End Con.	.85
Jim Butler	.80
GOLDFI'D STOCKS	
Sandstorm	.54
Kendall	.25
Red Top	2.00
Jumbo	2.00
Goldfield Mining	1.10
Dia'dfield B. B. C.	.18
Atlanta	.42
Mohawk	9.00
Silver Pick	.46
Laguna	1.10
BULLFROG STOCKS	
Mont. Shoshone C.	7.50
Tramps Con.	.42
Gold Bar	.60
Bullfrog Mining	.14
Bullfrog Nat. B.	.20
Homestake Con.	
MANHAT'N STOCKS	
Manhattan Con.	.50
Manhat'n Dexter	.12
Jumping Jack	.10
Stray Dog	.13
Indian Camp	.04

COLO. SPRINGS	June 5
Name of Comp.	Clg.
Acacia	9⅛
Black Bell	
C. C. Con.	4½
Dante	5
Doctor Jack Pot	7
Elkton	55
El Paso	43
Findlay	62
Gold Dollar	7
Gold Sovereign	47⅛
Isabella	23
Index	
Jennie Sample	58⅛
Jerry Johnson	85¼
Mary McKinney	53
Pharmacist	
Portland	1.19
Un. Gold Mines	84⅛
Vindicator	85
Work	18⅝

New Dividends

Company.	Payable.	Rate.	Amt.
Amalgamated Copper	May 27	$2.00	$3,961,758
Am. Smelters Sec., pf., B	June 1	1.25	375,000
Beck Tunnel Con.		0.10	10,000
Butte Coalition	June 26	0.50	500,000
Calumet & Arizona	June 20	5.00	1,000,000
Col. & Hocking C. & I., pf.	July 1	1.50	3,000
Federal M. & S.	June 15	5.00	300,000
Federal M. & S., pf.	June 15	1.75	210,000
Iron Silver, Colo.	July 1	0.10	50,000
Lehigh Coal & Nav.	May 27	2.00	395,110
Mexico Con. Mg. & Sm.	May 25	0.50	120,000
National Lead	July 1	1.25	186,318
National Lead, pfd.	June 15	1.75	261,820
North Butte	June 10	2.00	800,000
N. Y. & Hon. Rosario	May 25	0.10	15,000
Quincy, Mich.	June 10	4.50	93,750
Sloss-Sheffield S. & I.		1.25	5,750,000
Standard Oil	June 15	9.00	495,000
U.S. Cast Iron Pipe & Fdy.	June 1	1.00	160,000
U.S. C. I. Pipe & Fdy, pfd.	June 1	1.75	262,500
U. S. Steel Corp.	July 1	0.50	2,541,518
U. S. Steel Corp., pf.	May 31	1.75	6,304,919
U. S. Reduction & Ref., pfd.	July 1	1.50	59,187
Utah (Fish Springs)		0.03	3,000

Assessments

Company.	Delinq.	Sale.	Amt.
Benson, Cal.	June 9	June 29	$0.10
Bullion, Nev.	June 10	July 2	0.05
Ena King, Cal.	June 8	July 1	0.03
Jenny Lind, Cal.	June 8	June 25	0.03
Lyon, Utah	May 13	June 3	0.02
Mabel Graves, Cal.	June 3	June 25	0.10
New Red Wing, Utah	June 11	June 29	0.02
Nev. Superior, Utah	June 17	July 5	0.10
Overman, Nev.	May 17	June 7	0.10
Potosi, Nev.	May 13	June 5	0.10
St. Joe, Utah	June 13	July 3	0.02
Sierra Nevada	May 28	June 18	0.10
Utah, Nev.	May 27	June 17	0.05
Wabash, Utah	May 11	June 3	0.05
Wasatch Utah	June 17	July 2	1.25

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	66.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.862
March	64.593	67.519	29.854	31.325
April	64.765	65.462	29.994	30.253
May	66.976	65.981	30.968	30.471
June	65.394		30.185	
July	65.105		30.113	
August	65.949		30.529	
September	67.927		31.483	
October	69.593		32.148	
November	70.813		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.825	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.356
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	24.224	18.688	25.260	84.793	98.625
May	18.475	24.048	18.724	25.072	84.867	102.375
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.850		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.606	
March	36.662	41.013	September	40.516	
April	38.900	40.938	October	42.852	
May	43.313	43.149	November	42.994	
June	39.260		December	42.760	
			Av. year.	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.031	19.531
March	5.750	6.000	15.922	19.703
April	5.404	6.000	15.959	19.975
May	5.685	6.000	16.725	19.688
June	5.750		16.813	
July	5.750		16.625	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.281	
December	5.900		19.609	
Year	5.657		17.370	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.195
February	6.075	6.814	5.924	6.664	25.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.078	6.685	5.931	6.535	25.781	25.900
May	5.997	6.441	5.846	6.291	27.000	25.563
June	6.096		5.948		27.728	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.056		27.563	
October	6.222		6.070		28.076	
November	6.375		6.225		27.781	
December	6.593		6.443		27.938	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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Iron Mining Practice on the Marquette Range

The Caving System Predominates but Milling and the Inverted Cone Methods Are Also Used When Conditions Require

BY REGINALD MEEKS

The Marquette range extends from a point about a mile east of Negaunee, Mich., westward a few miles from Michigamme. The range consists of many low diorite hills between which are found deposits of soft and hard hematite. These orebodies vary in size and shape, but for the most part they conform to lenses between hanging and foot walls of diorite. In some cases the ore was found close to the surface, but frequently the deposits were covered with many feet of overburden. Both bessemer and non-bessemer ores occur.

Operating Companies

The mines of the Marquette range are worked principally by three concerns. These are the Oliver Iron Company, a subsidiary company of the United States Steel Corporation; the Cleveland Cliffs Iron Company, and the Inter-State Iron Company, the operating concern of the Jones & Laughlin Steel Company. The Cleveland Cliffs Company operates several charcoal blast furnaces at Marquette and at Gladstone, Mich., but these furnaces are not able to handle the output of the mines; the surplus ore is sold in [illegible] are also mining on the other ranges of the Lake Superior district.

The various systems of mining hard and soft ore have been brought to a high state of efficiency and practically all of the ore is extracted. This is especially true of the caving system, which permits of an extraction, in some cases, of more than 95 per cent.

OPEN PIT IN BED OF LAKE ANGELINE, LAKE MINE OF CLEVELAND CLIFFS IRON COMPANY

The Swanzy District

Twenty-five miles south of Negaunee, on a branch line known as the Munising

LAKE SUPERIOR NO. 1 SHAFT, OLIVER IRON COMPANY, ISHPEMING

CLIFF SHAFT MINE, ISHPEMING, CLEVELAND CLIFFS IRON COMPANY

AUSTIN MINE, CLEVELAND CLIFFS IRON COMPANY, PRINCETON, ON THE NEW RANGE BEING OPENED

Railway, which connects with the Northwestern system at Little Lake, is the Swanzy district. Although ore was carted to Marquette, 25 or 30 years ago, from the old Swanzy pit, little mining was done until about 1900, when the Cleveland Cliffs Iron Company started the mines at Princeton and Austin. This company operates four mines and is opening a fifth. The Oliver Iron Company owns one mine in the district, the Stegmiller, but the former company has the most important and extensive holdings. The four mines are Princeton Nos. 1 and 2, the Austin and the Stephenson. The new mine is to be known as the Smith, but so far no ground has been broken. The orebody has been proved by diamond drilling and the first section of the shaft, known as the "shoe," is in place ready for the excavation.

The location chosen for the shaft is close to a branch of a river and it is believed that serious trouble will be experienced with water and quicksand when sinking begins. Perforated pipes have been sunk all around the shaft site, and it is hoped that the water level may be lowered in this way. Another alternative is to deflect the direction of the stream, and this method will probably be adopted.

The Austin and Stephenson mines are more than a mile away from the two Princeton mines, but each pair of mines lies close together; a central power plant, which is now being built, will furnish power for drills, pumps, lights, etc., and later for electric haulage, where underground locomotives are installed.

The Stephenson mine is equipped with a steel head-frame, which has just been completed. This head-frame represents the more modern ideas of construction, and new shaft-houses will probably conform to this type, because it is strong, safe and efficient. The other mines at Princeton use the older wooden construction.

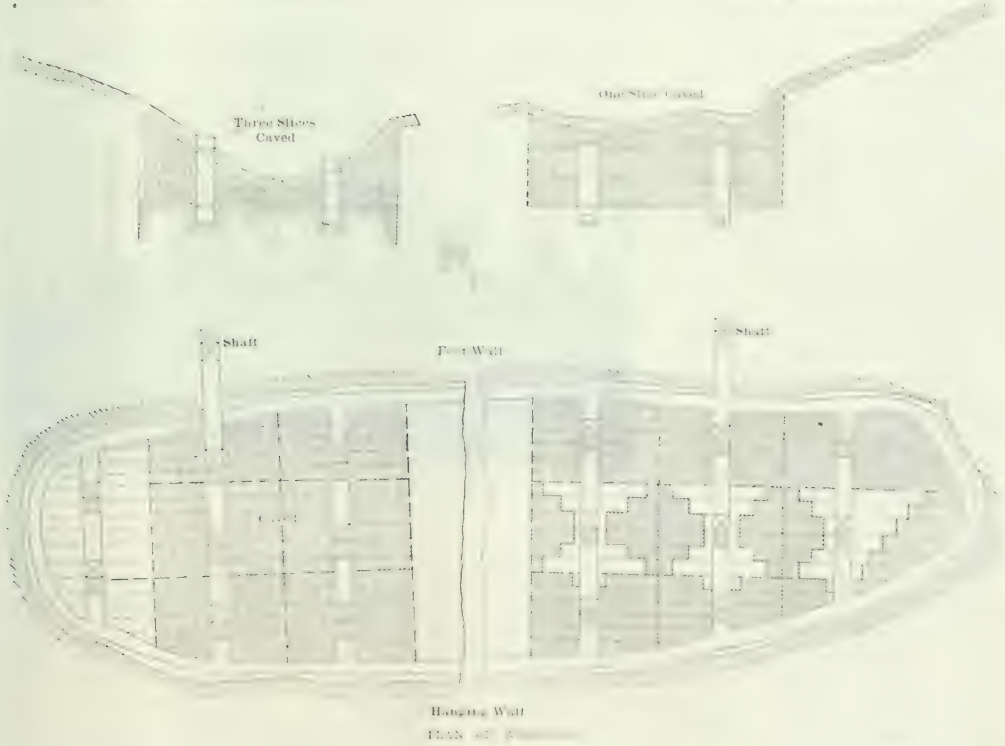
METHOD OF OVERHAND STOPING.

The Caving System.

Along all the iron ranges in general where the ore is comparatively soft, and where there is a roof or cap, the caving system is adopted. If the deposit comes down chutes to the lower levels and then hoisted to the surface. This method resembles the caving system to a certain degree.

The mines in the Lake Superior district have developed and perfected the caving system to a marvelous degree, and it has been brought to a state of great elasticity.

METHOD OF UNDERHAND STOPING.



In the hands of experienced engineers a mine can be worked in many stages of development, and caving may be done at several different points at the same time, and from various depths. To the uninitiated the method appears dangerous and uncertain, to say nothing of seeming chaotic. But the system has proved itself to be safe, rapid and economical.

The orebodies are usually about four times as long as they are wide and lie between walls of diorite. The method of attack consists in sinking one or more two-compartment shafts, usually situated near the ends of the deposit, in the solid foot wall and cross-cutting to the formation. A level is then driven around the entire bed close to the foot, and at points, approximately 40 ft. apart, cross-cuts are run through to the hanging wall. Three raises—sometimes only two—are then cut up to the roof, and the portions of the mine between the cross-cuts are let on contract to the miners in groups of two each. It is usual to take three slices between levels. If the formation is regular and sufficiently extensive the mine is divided into 40-ft. squares, but conditions frequently interfere with this arrangement.

Removing the Ore

The miners work out, from the top of the raise, to the limit of their boundary line, and then start to mine at right angles to the cross-cut. As the ore is removed timber is set in place; this consists of ordinary round caps, and posts, with lagging placed on roof and floor. When the contractors have advanced 20 ft., and have met the men on the opposite breast, they work back, toward the raise, to the next breast. In no case is it permitted to start a second breast until the first has been completed. The ore taken out is trammed to the raise, and sent down the chute to a car on the level below. These cars are collected and hauled to the shaft by electric locomotives.

In the illustration it appears as though several consecutive breasts were being worked at the same time. The sketch was made this way to show the progress of the work from the boundary line back to the raise. The bottom slice is never started until the upper two have been taken out.

Supporting the Roof

The whole upper slice is removed in this manner and the roof is temporarily supported by the timber. In time the weight of the roof crushes the supports and this causes a cave filling the whole upper slice. Usually the caving of the roof follows the advance of the men. Frequently it is necessary to blast the timbers away, but the natural caving of the roof is the desideratum.

When the whole upper slice has been removed and the roof has caved, work is [illegible] in the same manner and finally the third slice is taken out. In the meantime on the level below, the cross-cuts and raises have been completed and this work is always well in advance of the slicing of the level next above.

The breasts are usually 5x7 ft. and the men are paid by the linear foot advance, in some cases, but usually by the load of ore. The price includes setting the timber; supplies are paid for by the contractors.

Hard-ore Mining

The orebodies of hard hematite are usually 40 to 60 ft. thick although a thickness of 125 ft. or more is met with. The method of extraction in general is to sink a shaft, in the formation and close to the foot wall. Cross-cuts are then driven to the hanging wall about 60 ft. apart. The method of attack will be decided by the character of the orebody and the position of the walls. One method is to cut a raise up to the roof from the first level and then break the ore down by underhand stoping. In wide deposits more than one raise may be necessary. The ore is sent down the raises to the level below and trammed to the shaft. Pillars are left to support the roof and when these are ready to be robbed the stopes are filled, either from outside or from the hanging wall, and the pillars are taken out from below.

Another method is to raise up from the level, keeping one set of raises sloping from the hanging wall over toward the foot wall and the other raises slope in the opposite direction. These raises intersect and continue on to the roof, walls or, if lower down in the mine, to the level above. The ore is broken down by overhand stoping and sent down the raises.

The Milling Method

Where the ore comes to the surface and is soft, the deposit is worked by open pit; but the ore, instead of being taken out from the pit, is milled down chutes which have been raised from the level below. The pit gradually becomes deeper as the ore is taken out and level after level is brought into service. This system is clearly shown in the illustration. This pit is being worked by the Cleveland Cliffs Iron Company at its Lake Angeline mine.

STEVENSON SHAFT, CLEVELAND CLIFFS IRON COMPANY, SWANZY DISTRICT

Mining methods at various mines differ but slightly, because conditions are nearly alike. All soft orebodies are mined by the caving system which is practically the same as that in use in northern England for many years.

The production of the three copper smelting works in the Urals in 1906 was 258,793 poods, against 223,883 poods in 1905. The increase was due to the Bogoslovsk works, the Nigni-Tagilsk and Verch-Izetsk works having made decreased outputs. A new smeltery, with capacity of 30,000 to 40,000 poods, is to be erected at the Blagodat mine, Peklevsk Kossel.

Temporary Whim for Hoisting

By Guy C. Stoltz*

The accompanying drawing shows a whim which has been built for temporary hoisting, in sinking the Clonan shaft, on the Port Henry Iron Ore Company's property at Mineville, N. Y., of which E. P. Clonan is superintendent.

Some advantages of this style of whim are noteworthy. The rope winds on the drum at the same elevation as the head frame sheave. This obviates the loss of power attended, when the rope is lowered to the whim drum. The horse is not hindered underfoot by the sweep, and should the rope or the horse's hitching break, instead of depending upon a dog to catch, the driver would apply the hand brake. The driver and horse are in little danger of being thrown to the ground by this overhead sweep.

The site chosen for the drum foundation was on a side hill, at a point about 15 ft. higher than the collar of the shaft. The foundation *a* is built up in log-cabin fashion to a hight of 6 ft. with rough cedar sticks, 8 ft. long and 10 to 14 in. in diameter. The sticks are all drift-spiked, and further anchored by a filling of lean ore and stone. Two 10x12 in. by 8-ft. sticks bolted securely together and again to the crib work offer a foot-step bearing *b* for the center post of the drum. This center post, a 12x12-in. stick, is cut down at the ends, forming a tenon 6 in. in diameter and 6 in. long, *c* and *c'*. The tenons at the ends, fitted with 6-in. pipe couplings, rest in mortises 6 in. in diameter and 6 in. deep cut into the foot-step timber and again into the cross-piece stick.

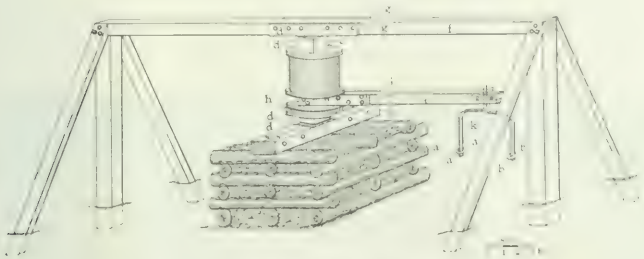
Steel plates ⅜ in. thick, *d*, *d'*, *d''*, *d'''*, are lag screwed to the shoulders of the center post and to the collars of the foot-step and cross-piece bearing.

The drum, 3 ft. 6 in. in diameter and 2½ ft. high, is built of segments of plank 3 in. thick bolted together, and fitted horizontally around the center post *c*. The drum is then faced with vertical strips of hard wood 1 in. thick, on which winds a ¾-in. steel rope. Attached to the center post and below the drum, a hand brake 2½ in. wide works by means of a lever arm on a 3½-ft. diameter disk of 3-in. plank *h*.

The sweep *i*, which is a stick of yellow pine, mortised and tenoned into the center post, between the drum and the brake disk, is further fastened to the center post by bolting on either side 5-ft. lengths of 3-in. plank *j* and *j*.

The cross piece, a 10x10-in. by 30-ft. stick *f* resting on 12x12-in. posts, is reinforced at the center of the space, where the mortises for center-post tenon have naturally weakened it, by bolting 3x12-in. planks ft. long, *g* and *g'*, on each side of the timber.

The horse is hitched under an inverted V-shaped yoke *k*, made from two 6-ft. lengths of 3x¾-in. flat steel; these are welded at the middle of the V and swedged to 2 in. in diameter, in order to act as a hanger for the yoke which turns freely in the end of the sweep. The method of fastening the horse to the sweep allows him to be hitched once for all throughout a shift. When the bucket is raised the tugs pull on hooks *a'* and *b'*, and when lowered the horse makes a half turn in the whim round, and holds the load by hold-backs fastened to hooks *a''* and *b''*.



TEMPORARY WHIM FOR HOISTING

The load handled by a horse weighing 1100 lb. when the steel bucket is filled with its usual load of drift and water amounts to about 2½ tons. The average speed of hoisting is 27 ft. per minute. The cost of a whim of this kind, including labor and material, amounted to $70.

*Mining engineer, Port Henry Iron Ore Company, Mineville, N. Y.

After describing the various processes to prepare metallic uranium, pure or cast, I. Escard, in *Rev. de Chim. Ind.*, April, 1907, remarks that no very important application has yet been made of this metal, though it appears that Messrs. Krupp, of Essen, have tried uranium steel for ships' steel plates. The French navy has tried it for other purposes. The chief quality of uranium is to give steel great hardness and raise the annealing temperature.

Legal Rights of the "Grub Stake"

The United States Circuit Court of Appeals in San Francisco has decided an important "grub-stake" case in affirming the decree of the lower court dismissing the suit of Isaac L. Marks against William C. Gates, alias Swiftwater Bill, and Howard Turner, holding that the contract between the parties was unjust, oppressive and iniquitous. On April 27, 1903, Gates contracted with Marks in this city to convey to Marks a 20 per cent. interest in any and all property which Gates might, either by location, purchase or otherwise, acquire in the Territory of Alaska. Marks claimed in the suit that the real consideration of the contract was the cancellation of a prior indebtedness of $11,225 due to him from Gates and the payment by the appellant to Gates of $1000 cash, and that in pursuance of the agreement Gates went to Alaska and acquired mining claims in the Fairbanks mining district, the value of which is more than $750,000.

Circuit Judge William B. Gilbert, in delivering the opinion of the court, said: "For aught that appears in the complaint to the contrary, Gates purchased this property and paid full value for it. If the appellant now has the right to such belief, it follows that he may hereafter sustain suits to acquire a life interest in all property of every nature and description which Gates may obtain at any time in Alaska, and that such life will end only with the life of Gates. But where the consideration is grossly inadequate, as it is in the present case, and the contract is made without any knowledge at the time of its making on the part of either of the parties thereto of the nature of the property to be affected thereby, or of its value, no equitable principle is violated if specific performance is denied and the parties are left to their legal remedies, if any they have."

Mineral Production of Russia

Statistics published in the *Gornui Journal*, St. Petersburg, recently, show that in 1905 Russia produced 19,167,399 short tons of coal. Of this total the Donetz basin furnished 14,355,540 tons or 74.9 per cent.; the Dombrowski basin, 3,939,840 tons, or 20.6 per cent.; the Ural district, 582,482 tons, or 3 per cent.; the Samoskowskaja mining district, 257,936 tons, or 1.4 per cent.; and the Kaukas, 31,600 short tons, equal to 1.6 per cent. of the whole.

In the same year 4009 short tons of copper were produced in Ural smelting works from local ores, which shows a decrease of 1034 tons since 1902.

The production of manganese ore in 1905 in the same district, was 5090 short tons, 2070 tons more than in 1904, and 1671 tons less than in 1902.

The production of oil in Russia in 1905 amounted to 7,254,000 short tons, 24.2 per cent. of the world's production.

The Smelter Fume Question in Great Britain

Until the beginning of the present year the smelting works in Great Britain have been free to discharge their fumes into the air as long as their neighbors have not objected, and they have been entirely free from government control. With the beginning of 1907, this state of things was altered by the inclusion of all smelting works in the new alkali works regulation act. There was one curious exception to the former freedom of smelters from government interference. Zinc appears to be the scapegoat of all governments, and for a somewhat odd reason the works where zinc ores are smelted were included in the Alkali Act of 1881. In one of the districts in England where zinc dross from galvanizing works is smelted, a good deal of local discomfort had been occasioned by the sal-ammoniac fumes and hydrochloric acid fumes given off, so that special representations were made to Parliament. The act, as passed, was made to include all zinc works, not only galvanizers' waste works, so that the zinc smelter was saddled with government control, while the copper smelter who gave off far more sulphuric fumes, was not.

As already mentioned, until recently the copper and lead smelters have been governed in the fume question entirely by the common law. Their neighbors, either as corporations or as individuals, could sue for damages and obtain injunctions. Consequently, smelting works have always been erected in districts where population was scarce, and where a sufficient tract of land could be bought to isolate effectively the plant from the property of other people. If, after the works were started, the district became a center of population, nothing could be done in any way to restrain the gaseous output. The history of Swansea exemplifies this fact. The town became the center of copper smelting over a hundred years ago when the Cornish output of copper was of importance. The smelting of the ores was more conveniently done on the coast of Wales, in close proximity to the source of fuel, than at the mines. Until thirty years ago the sulphurous fumes in Swansea district, due to the roasting of the ores, were prodigious. That the nuisance was mitigated was due not to the pressure of public opinion, but to the establishment of sulphuric acid works by some of the smelters, and by the gradual decay of the district as a center for the smelting of copper ores. At the Vivians' works, roasting furnaces were introduced, for the manufacture of sulphuric acid, and a good deal of the copper output is now disposed of as sulphate. At the present time the valley behind Swansea, for two or three miles in the districts of Landore, Llansamlet and Morriston, is moderately smoky, but the smelters are not the special offenders.

A notable case of the stoppage of a smelter by injunction obtained by a neighbor was that of the Smelting Corporation some six years ago. The works were erected at Ellesmere Port, on the River Mersey some 10 miles away from the South Lancashire chemical and smelting centers, to work the Fry process for treating zinc lead sulphides. No negotiations were entered into with adjoining landowners, and the consequence was that directly the roasting of the sulphides was commenced an injunction was obtained, and the works rendered useless. It happened also that the process itself was a failure, so that the fact of the suppression of the works as a nuisance was lost sight of by the public in the general confusion.

The new law of 1907 is not exactly an absolute one, and leaves the method of dealing with existing smelting works somewhat elastic. It says: "An inspector may inquire whether in any smelting works means can be adopted at a reasonable expense for preventing the discharge of any offensive gas; where it appears that such means can be adopted at a reasonable expense, the owners may be required to adopt the best practicable means for the purpose."

This is a reasonable enough requirement, and if carried out in a fair and equitable manner by the government departments no smelter will have any fault to find. There is only one smelter in South Wales that will be very much affected, and as it is situated a good distance from any center of population it may escape from the serious attention of the inspectors. In South Lancashire and on the Tyne some alterations may be necessary. It will be interesting to see how this new law is carried out in practice.

It is not probable that any damage is done by the escape of flue-dust from any of the British smelters, for they work on such a small margin of profit nowadays that they cannot afford to waste anything. The only noxious emanations that will have to be dealt with are the sulphuric fumes. The maximum amount allowed by the act is the equivalent of 1½ grains of sulphuric anhydride per cubic foot of gas discharged from the chimney.

The new act does not say anything about works established in the future. As there is not much prospect of any such extension of smelting operations in Great Britain, it is hardly necessary to enlarge on this side of the question. The only new works at present contemplated are those of the Central Zinc Company, which are now being built near West Hartlepool. These are located on a low-lying tongue of land at the mouth of the river Tees, and they are hardly likely to do any damage to property or life in the neighborhood. There is some prospect of the Zinc Corporation establishing its zinc reduction plant in South Wales, but the scheme is only in nebulous form at present. There is no possibility of any new lead or copper reduction works ever being established in Great Britain. It is more probable that the few survivors will experience a gradual thinning out process.

The Deacon Zinc Mine

The Trinity Zinc, Lead and Smelting Company, of which J. P. Newell, of Carthage, is manager, operating in Richland valley, Duenweg district, Missouri, is erecting, with the exception of the Yellow Dog, the largest mill in the Missouri Kansas district; it will be known as the Deacon. The capacity will be 700 tons of dirt per 10 hours; it is the intention to run the mill two shifts per day, three shafts having been sunk from which to hoist the dirt to keep the mill in steady operation. All hoisting is to be done with double engine hoists. The mill is to be equipped with three 150-h.p. boilers, two compressors with a capacity of 1900 ft., a Corliss engine of 200 h.p., a generator for light and motor, drill sharpeners, etc. The mill building is 180 ft. in length, the jig room occupying 130 ft. The hight of the derrick is 78 ft. The hopper has a storage capacity of 1100 tons. There are two other 300-ton mills operating on this tract.

Canadian Mining and Metallurgy

Hon. Wm. Templeman, Canadian minister of mines, has authorized the collection of authentic information for a detailed report on the mining and metallurgical industries of Canada covering the entire country. It will deal only with producing mines, mines under development and metallurgical plants, and will give in each case the names and full information concerning the companies engaged, number of men employed, wages, markets, etc. As regards the mining industry, information will also be afforded as to the land owned or controlled by each concern, the character of the ore and average quality as shown by analysis, and the method and cost of mining and treatment. The returns concerning the metallurgical industries will show the location of the plant, the ore treated and the quality of the product, method of treatment, description of machinery, source of supply and composition of raw material, and cost of production.

It is reported that promising deposits of graphite, of steely and metallic appearance, have been discovered on the banks of the Gamboa river, in the department of Castro, in the eastern part of the Chiloe island, at latitude 42 deg. 28 min., in Chile.

The Stassano Thermo-Electric Furnace

With Rotary Agitation and a Closed Melting Chamber It Produces Malleable Steel with a Thermal Efficiency of More Than 50 Per Cent.

BY ERNEST STASSANO*

In order to utilize the heat generated by transforming electric into thermic energy with advantage for industrial purposes, and especially in the metallurgy of iron, the apparatus must meet the following conditions:

(1) The chamber in which the transformation of electric energy into heat takes place, and in which the metallurgical operations are effected, should not be subjected to the immediate action of air, but should, chemically considered, be absolutely neutral.

(2) The heat generated by the repeated transformation should be utilized at the highest possible temperature.

(3) The materials to be treated should not have direct contact with foreign bodies capable of unfavorably affecting their composition.

(4) All of the apparatus in which the various metallurgical operations are performed should be so constructed as to be capable of always working under full load.

In an article published in the *Rivista di Artiglieria e Genio*, of 1902, I gave the details of my experiments, and I therefore limit myself to a short description of the two furnace types which in my opinion meet the conditions.

The Rotary Electric Furnace

The rotary electric furnace comprises a metal shell of cylindrical shape, terminating at the top in a truncated cone. The shell is lined with refractory material, which incloses the cylindrical melting chamber, terminating at the top in an arch. Suitable openings in the refractory wall admit the electrodes which extend into the melting chamber and meet in the center. The current which operates the furnace generates an arc at the point of contact at a convenient hight above the bottom of the furnace. Double-walled metal cylinders provided with guide rods support and protect the carbon electrodes, which are connected by means of suitable metal sleeves, metallic rods and flexible cables with the current collector at the lower part of the furnace.

A current of water between the double walls of the cylinders maintains a comparatively low temperature at the coupling between the metallic part of the carbon holder and the electrode.

Each of the cylinders is provided with a hydraulic cylinder and piston, which controls the position of the electrodes.

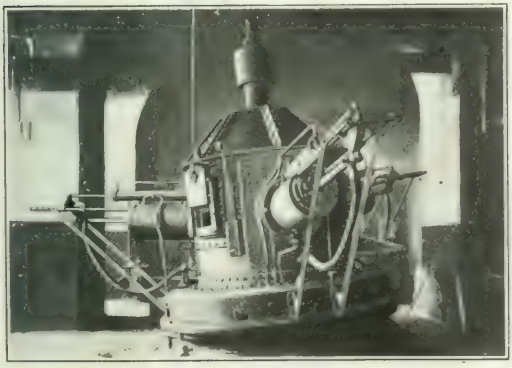
Water and Current Connections

The furnace has a ring support surrounding the shell which bears upon a metal crown provided with truncate conic rollers. The rollers travel on a circular cast-iron rail the upper face of which is in the shape of a truncated cone. The rail is not placed horizontally but is fixed on an inclined floor.

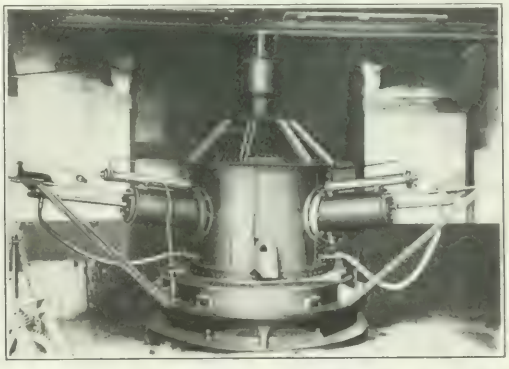
Below the base of the shell is a gear which by means of a shaft and bevel gears serves to rotate the furnace on its inclined axis. Suitable copper rings insulated from the furnace proper, iron bars, and flexible cables serve to connect the ends of the iron rods which support the electrodes with the current generator. Groups of brushes on the metallic support below the furnace maintain a contact with the copper, both when the furnace is at rest and when it rotates about its axis.

A valve attached to the supporting mechanism distributes water under pressure to the hydraulic cylinders and the jackets of the electrode holders. Rotation of the furnace does not interrupt the free circulation of water.

Besides the openings in the refractory walls of the melting chamber to admit the electrodes, there is a tap pole on the extension of the bottom, a charging door and an outlet at the top of the vault for volatile products. This outlet opens into a pipe extension of the furnace shell, the connection being sealed by a sand valve and the end of the tube dipping into a tank of water.



TAP-HOLE SIDE, STASSANO FURNACE



STASSANO ELECTRIC FURNACE

The circulation of air is thus prevented. When the feed door is closed, the gases in the interior of the furnace are above atmospherical pressure; and when the door is opened there are no currents because the upper outlet of the vault is closed.

Advantages of the Furnace

The furnace therefore meets, within the limits of practice, all the requirements named in the beginning of this article. The atmosphere in the melting chamber is chemically neutral. The transformation of electric into thermic energy is effected by the electric arc, which is known to produce the highest temperatures practically obtainable. The materials to be treated are not in contact with the elec-

Note—From a paper published by the International Congress of Applied Chemistry, Rome.

*Major of artillery, director of the Stassano Thermo-Electric Furnace Company, Turin, Italy.

alteration by absorption of foreign substances.

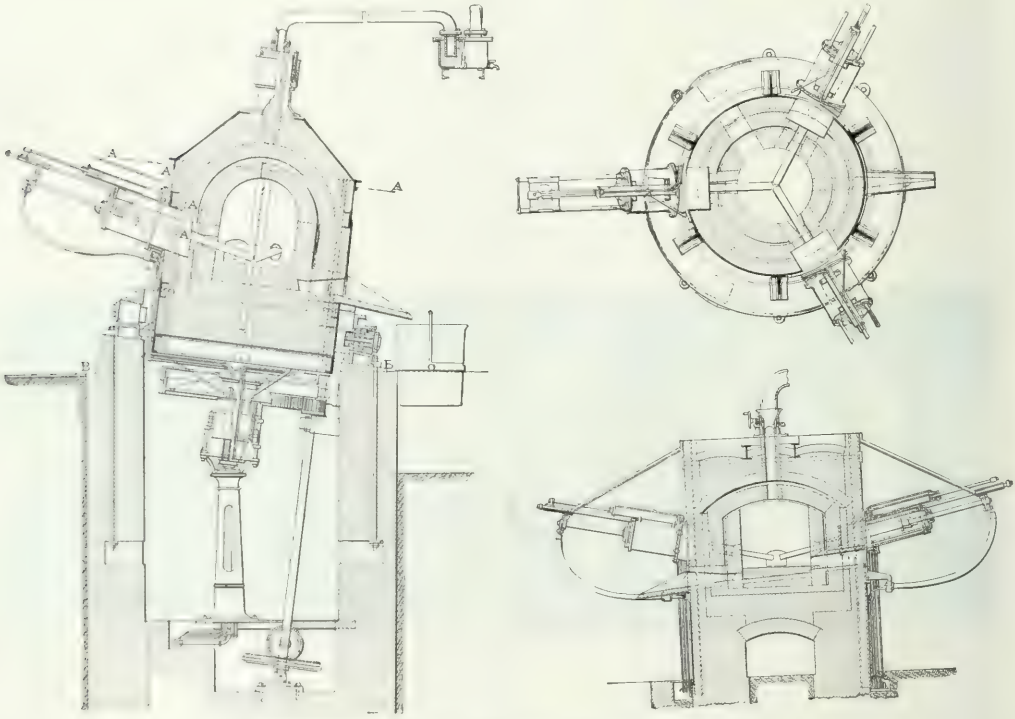
Active agitation of the molten material obtained by the rotation of the furnace facilitates chemical reaction, and reduces the time necessary for the operation to a minimum, so that the furnace may always be worked under full load, thus obtaining the highest utilization of the energy.

Reducing the furnace to its simplest expression, it appears to comprise a closed chamber in the center of which a thermic source, independent from combustion, radiates heat at a very high temperature.

It is obvious that under these conditions the temperature of the chamber tends to increase gradually and uniformly until it reaches that of the source of heat. Owing to radiation from the walls the temperature of the melting chamber, although approaching that of the thermic source, will never equal it. Thus by proportioning the capacity of the melting chamber to the quantity of heat which it is proposed to generate, and suitably regulating the charges, we may maintain the temperature necessary for the operation without overheating the molten mass.

It is not always necessary in practice to agitate the mass in order to accelerate the reactions. In this case the furnace, while keeping its special features, may be simplified by omitting the rotating mechanism. The bottom of the fixed furnace becomes rectangular, the charging doors are placed at the ends, while the tap-hole is on one side, and the slag discharge on the other. The uniform distribution of heat throughout the melting chamber is obtained by multiplying the radiation centers. This type of furnace is especially adapted for reducing fusion operations, and has the advantage of being more economical and more easily manipulated.

In practice it may sometimes be found necessary, as in the treatment of certain copper ores, to keep the materials for a long time in a molten condition in order to permit the metallic part, spread through the molten mass, to separate by gravity from the slag. In these cases a furnace of the fixed type, modified in a suitable manner, will permit the material to remain for a long time in a special chamber. It is obvious that in apparatus of this kind, modifications and adaptations for special requirements are easily effected.



STASSANO ELECTRIC FURNACE, REVOLVING AND STATIONARY FORMS

Thermal Efficiency

As I have stated elsewhere the utilization of the heat of fuels varies and is very low in the furnaces now used in the industries, except in large blast furnaces where it may reach 70 per cent. and perhaps more. Upon closer examination, however, this relatively high utilization is found to be more apparent than real. If we consider that in the blast furnace besides the reduction of iron ore that of silica, manganese oxide and other substances is also obtained, and that such bodies deprive the iron of its characteristic malleability and ductility, so that the cast iron obtained must be subjected to long and troublesome refining operations, the advantages of this high rate of heat utilization disappear. It is true that cast iron, as it comes from the blast furnace, is largely used in practice, but the increasing use of soft-iron and steel castings in the industries shows that if malleable iron products could be obtained directly from the furnace, many articles which are now, for the sake of economy and convenience, made of cast iron, would certainly be constructed of the purer metal.

Since all other types of furnaces used in metallurgy generally and the production of iron especially have an output inferior to that of the blast furnace, generally not exceeding 20 per cent., I may say without fear of being contradicted that, if it is possible to obtain in thermo-

electric furnaces a rate of utilization equal or superior to 50 per cent. of the heat provided by transformation of electric into thermic energy, the new process may support a metallurgical industry where natural fuels are lacking. Where water power is available at a cost of about 40 lires ($7.72) per electric h.p. year, electric smelting is not out of the question. It may also be used in special appliances even where water power is not available, when fossil fuel is abundant, or when other cheap combustibles, such as blast-furnace gases, may be utilized.

Experimental Data.

Lunge's tables, completed by Juptner V. Jonstorff,[1] give the quantity of heat necessary to heat 1 kg. of iron to 1200 deg. With the aid of this we are enabled to determine approximately, by prolonging the curve constructed on these data, the quantity of heat necessary to heat iron to the melting temperature, and beyond, while with the aid of the data given by Grüner, Ledebur and other prominent metallurgists we can ascertain the quantity of

Electric Furnace

	Per cent.
Fe	99.764
Mn	0.092
Si	trace
S	0.020
P	0.060
C	0.092

He further reported that a consumption of about 5 h.p.-hours of current was necessary for each kilogram of metal produced, thus obtaining a thermic efficiency of about 60 per cent.

After the tests performed at Darfo I erected on behalf of the War Office in the Artillery Construction Works of Turin a furnace of the rotary type, in order to produce the steel needed for the production of artillery shots by using iron and steel turnings.

we are able to ascertain the average thermic output of the new furnace.

As the average quantity of energy absorbed by the furnace in every operation was 772 kw.-hours, equal to 667,256 cal., the thermic output of the furnace was:

This result, which apparently differs from that obtained by Dr. Goldschmidt at Darfo, in reality agrees perfectly, the difference being due to a greater absorption of heat by the water of the coolers of a three-electrode furnace.

These results show that with this furnace it is possible to obtain: (1) A thermic output above of 50 per cent. of the electric energy used, even with installations of low power, involving greater losses; (2) Malleable iron products di-

Diagrams showing the number of calories required to heat iron to different temperatures.

heat necessary to melt slags. We may assume 510 to be the number of calories necessary for melting and heating 1 kg. of iron to a temperature of 1900 deg., at which iron and steel are generally taken out from the furnace, and 600 to be the number of calories necessary to melt and heat 1 kg. of basic cinder to the same temperature.

In the congress of Berlin, 1903, Dr. Hans Goldschmidt reported on the results of experiments in which in his quality of delegate of the Imperial Patent Office he had assisted at Darfo, in order to ascertain whether it was possible to obtain malleable iron products in one operation by means of my furnaces, directly from the ore. On that occasion he stated that starting with an ore of the composition shown in the accompanying table it was possible to obtain in a single operation a soft iron of a composition also shown in a table.

[1]Die *Untersuchung von Feuerungsanlagen*. Hartleben, Vienna, 1891.

From the certificate granted to me by the Army Board, and from the data of 39 successive operations of cast-iron fining and scrap melting with this furnace from May 15 to 27 1905, it appears that:

(1) The furnace normally produced 2500 kg. of steel a day from cast iron, melting scrap and steel, with a loss of material not exceeding 2 per cent., even if 75 per cent. of the charge were turnings.

(2) Of each charge of 600 kg. at least 150 kg. was cast iron for the refinement of which 29 kg. iron ore and 6 kg. lime were used.

(3) For every charge about 850 kw.-hours of energy were needed. As, however, the latter was measured on the primary transformer supplying the furnace, the actual quantity of energy expended was about 92 per cent. of the above figure, or 772 kw.-hours, taking into account the losses of the transformer and secondary conductors.

From these data and those of the heat necessary to melt and heat 1 kg. of iron rectly from ore in a single operation as well as certain steel types with predetermined composition; (3) The highest possible utilization of the treated material, for the reason that the operation takes place without contact with air.

It is not unreasonable to assume that analogous results may be obtained in the treatment of other ores and with metals other than iron.

In a magnetic separating mill of 50 tons daily capacity, for the treatment of mixed sulphide ore by concentration on Wilfley tables, and magnetic separation of the zinky product by Wetherill machines, the cost per ton of crude ore, under the conditions existing in Colorado is about $1.25 @1.50 per ton, exclusive of interest and amortization. The cost of plant will be about $45,000, or $3 per ton of annual capacity. Interest (at 6 per cent.) and amortization (at 10 per cent.) will amount therefore to about 50c. per ton, making the total cost $1.75@2 per ton.

Expenses of Development in Sonora

By F. J. H. Merrill*

In a region of new mines the cost of development is an important topic and with the present flow of American capital into Sonora development expenses are of interest at more points than are the expenses of mining.

The so called successful promotor often seems to find it to his interest after raising some ready money, to rush a large shipment of machinery into the field and raise additional funds by selling stock on the show of machinery at the surface, the average small investor being more impressed by the array of machinery which he can see, than by underground details which he cannot understand.

There are, however, many who are anxious to do as much work as possible on a limited supply of funds and to such the following notes may be of interest.

Contract Work

It is in general much cheaper to work by contract than by day's labor, because the miner is stimulated by the gambling chance of increasing his earnings by meeting easy ground. Prices of labor vary from $2 to $3 (man) per day away from the larger mining camps where rates are higher, and the scale for contract work should be adjusted so far as possible to give the workman the daily wage which he may fairly earn. This requires experience on the part of the employer.

The following is a scale in actual use on the western edge of the Magdalena district: Sinking shaft 5x7 ft. three men with windlass—first 10 ft., $5 per ft.; second 10 ft., $6 per ft.; third 10 ft., $7 per ft.; fourth 10 ft., $7 per ft.; fifth 10 ft., $10 per ft., Mexican currency. Below 50 ft. the employer furnishes a whim, a gasoline hoist or a steam hoist. With the whim he furnishes two mules and their feed. With the gasoline or steam hoist he furnishes fuel and an engineer for each shift. The whim is most effective up to about 150 ft. Below 50 ft. the rate for sinking is $10 per foot. Drifting or crosscutting 5x7 ft. at all levels is $7 per foot. This scale would be increased 50 per cent. in some places and under some conditions of hard rock or otherwise. Also if the employer is inexperienced he may have to pay much higher prices. A whim costs at Nogales, Arizona, $125 gold, timber for bed and head-frame all fitted, $50. A steam hoist, smallest size, costs about $600. Buckets and steel cable are, of course, extra.

The labor and expense of erecting the whim and head-frame or installing the hoist must of course be considered. It varies with the character of the surface and involves the time of two or three men from two or three days to a week.

Supplies

In general the employer furnishes all tools and timber, the contractor paying for everything except wood and steel. Powder, caps and fuse are sold to the contractor at cost. Labor in timbering is paid for by the employer at the prevailing rate per day. In the present case the rate is 25c. per hour. Tools are sharpened by the contractor in his own time. Charcoal for the forge is supplied by the employer, costing $1 per sack.

If the mine is at a distance from a source of supply, a mine store must be opened. This is subject to a government tax of 0.5 per cent on the sales. A permit is issued from the district capital. Permits to sell cigarettes and cigars are also necessary.

The stock of the store need not be very varied. Flour, coffee, beans, sugar, potatoes, and cheese are the staples. A few canned meats, and a supply of cheap cigarettes make up the stock. A few articles of clothing are from time to time called for and it is safest to produce these on special order so as not to have much money locked up in uncertain stock.

This of course refers to a store for development work which may turn out unsatisfactorily and from which it may be desirable to break away at short notice.

The Sonoran mine laborer is generally of a happy, indolent type with undeveloped intellect. Usually he is able to do only one thing, is easily managed with kindness and quickly discouraged by harsh treatment.

Some camps make a pretense of high wages and charge 75 to 100 per cent. profit at the store thus seeking to recover a large part of the money earned.

It seems, however, wiser to pay a reasonable wage and charge only about 20 per cent. profit.

Mineral Production of Great Britain

Reports have now been received from the quarries, or open workings, as well as from the mines, and the total mineral output of the United Kingdom in 1906 is now stated as follows, in long tons:

SUMMARY OF OUTPUT OF MINERALS FROM MINES, QUARRIES, AND BRINE WELLS IN 1906.

Mineral.	Coal Mines Acts.	Metalliferous Mines Acts.	Quarries.	Total.
	Tons.	Tons.	Tons.	Tons.
Alum Shale	9,454	.....	.....	9,454
Arsenic	.....	1,599	.....	1,599
Arsenical Pyrites	.....	640	.....	640
Barytes	7,199	27,827	719	35,745
Bauxite	.....	6,654	.....	6,654
Bog ore	.....	.....	5,425	5,425
Chalk	.....	2,902	4,746,408	4,749,310
Chert and Flint	.....	4,912	.....	4,912
China Clay	.....	.....	656,017	656,017
China Stone	.....	.....	57,174	57,174
Clays and Shale	242,821	118,521	11,245,646	11,606,988
Coal	251,050,809	.....	16,819	251,067,628
Copper Ore and Precipitate	.....	7,758	.....	7,758
Fire Clay	2,971,173	.....	.....	2,971,173
Fluor Spar	.....	36,280	5,569	41,849
Gold Ore	.....	17,384	.....	17,384
Gravel and Sand	.....	.....	2,354,343	2,354,343
Gypsum	.....	196,143	28,884	225,027
Igneous Rocks	424	72,722	6,092,604	6,165,750
Iron Ore	8,209,880	1,824,415	5,466,111	15,500,406
Iron Pyrites	7,342	3,798	.....	11,140
Lead Ore	.....	30,226	569	30,795
Limestone	32,816	765,718	11,960,054	12,758,588
Manganese Ore	22,762	.....	.....	22,762
Mica	.....	.....	11,384	11,384
Ochre, Umber, etc	.....	4,415	9,795	14,210
Oil Shale	2,546,113	409	.....	2,546,522
Petroleum	10	.....	.....	10
Rock Salt	.....	230,558	.....	230,558
Salt from Brine	.....	.....	1,734,593	1,734,593
Sand	.....	12,642	.....	12,642
Sandstone, etc	126,675	168,077	4,966,398	5,261,150
Silver Ore	.....	1	.....	1
Slate	.....	126,699	365,964	492,663
Sulphate of Strontia	.....	.....	14,112	14,112
Tin Ore	.....	6,276	877	7,153
Uranium Ore	.....	11	.....	11
Wolfram	.....	263	8	271
Zinc Ore	.....	22,824	.....	22,824

Coal and iron ore both showed increases in 1906, as compared with the previous year. The gain in coal was 14,938,692 tons, or 6.3 per cent.; that in iron ore was 909,703 tons, or 6.2 per cent.

An Odd Effect of Unwatering

An odd thing recently happened to dredge No. 2 of the Folsom Development Company while at work in its pond or pit below Folsom, Sacramento county, California. A tunnel, a part of some old mining works, was struck, and within three minutes all the water had been drained from the dredger pond, although at the time water was being piped at the rate of 300 in. per minute. The dredge was not injured to any great extent, although it will be a week probably before operations can be resumed. It will be a difficult matter to make the pond hold enough water to again float the boat.

* New York.

Tool Room Care and Economy

By F. G. De Sanctis.

Good tools are as essential to an organization as is good material. The tool room is the very heart of the modern shop. Much attention has been given to material, but the care of tools is woefully lacking in most of our large plants and systems, and yet a saving of expenses in this department is easily accomplished.

The Four Essentials

For the tool-room foreman to care for the tools, it is necessary for him to know at all times the location of any particular tool, whether in service, under repairs or on the rack, and to gain this information a checking system must be installed—one that will cover at least four points: (1) Tools in service; (2) tools under repair; (3) tools ordered; (4) tools to be

[illegible] the painter is obtained.

Laying Out the Tins

An easy method of laying out the tins is as follows: Take a roll of ordinary wrapping paper and saw 2 in. off the end, thus giving a slip of paper 2 in. wide and several hundred feet in length. Stretch these slips across the facing pieces of the rack and mark in lead pencil the size of the tool and space required. It is now easy for the painter to duplicate this upon the tin strips, and allows him to paint with them as a pattern upon a table, insuring a quicker and better job than if he had to do the work with the tins previously nailed upon the racks.

After all tools are thus taken care of, the rules to keep them in their proper places cannot be too strict. The shop management has a choice in the checking system of whether the men shall carry their own checks or have them taken

[illegible]

The continual shift of men in larger [illegible] ing the names from time to time, and, that the [illegible] posted and have his rack up-to-date, it would be well to adopt a form similar to the following for the men employed:

TO THE TOOL ROOM FOREMAN—The bearer, Mr. [illegible] has been employed in the [illegible] place and him a tool check number.

.....
Gen'l Foreman.

.....
(Typewrite here name of men employed)

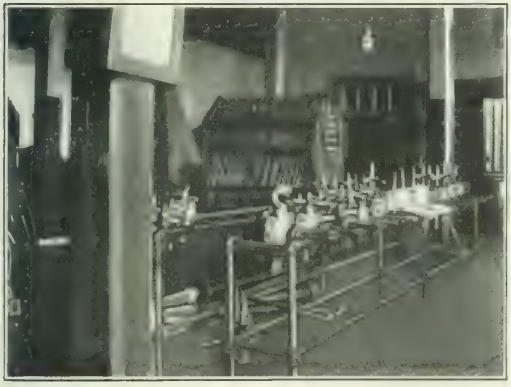
and for men leaving the service:

TO THE TOOL ROOM FOREMAN—The bearer..... is this day leaving the [illegible] employ; kindly O. K. [illegible] checks and return.

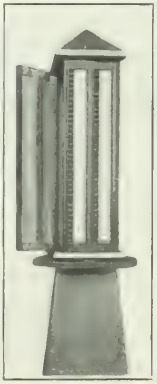
.....
Gen'l Foreman.

.....
Tool Room Foreman.

The object of repeating the name of the man employed is that in the tool room this lower name may be cut out and placed in the rack.



TOOL RACK.



CHECK RACK.

AIR-MOTOR RACK.

ordered. But, to have a checking system it stands to reason that each tool belonging to the shop must have a separate and distinct place in the tool room and that its name, size or number be clearly stenciled under its place in the rack. There are numerous forms of racks, upon which the smaller tools, such as drills, taps, etc., may be kept, some conical in form, flat shelves or pigeon holes; but, for economy of space and simplicity, the slanting rack, as shown in Fig. 1, is probably the best. These racks are cheap in construction, durable and clean, and can be placed wherever most convenient.

Upon the facing strips of these racks the name and size of the tool should be clearly stenciled, yellow cromine letters upon a black background making a good combination, and to do this, strips of bright tin cut 2 in. wide are lampblacked, and the letter then stenciled upon them. The reason for using tin instead of painting upon the board itself care of in the tool room. Experience compels me to say that, where the checks are carried by the men many complications will arise—checks left at home, lost, borrowed, stolen, and the interchange of check for tool other than at the tool room window. The first cost of taking care of the checks in the tool room is probably a little greater than when every man is given his bunch of checks, but its simplicity and accuracy soon pays for the cost of construction of a check rack. In the check rack illustrated in Fig. 2, the name of every employee is placed opposite a small pigeonhole containing twelve tin checks, say $\frac{5}{8}$x1$\frac{1}{4}$ in. Each check (Fig. 3) has a small hole punched in one end, so that it may be hung upon a brad driven opposite the stenciled size of each tool. The employee's name is typewritten upon heavy paper, and this paper then cut into strips $\frac{3}{4}$x2 in. and the pieces placed between the edges of the folded tin receivers that are fastened to the name panel.

The racks themselves may be square, hexagonal or octagonal, according to the number of men employed, they should be made of light material and have one side, or face, hinged to act as a door. To remove or replace a name, open the door, turn the thumb catches down, remove panel to the inside of the rack and take out or slip in the name between the edges of the folded tin.

Let us now illustrate the system by following a tool. The employee, John Smith, No. 98, comes to the delivery window and wishes $\frac{3}{4}$-in. standard taps. The tool boy takes check No. 98 from the pigeon hole as he passes toward the tap rack, hangs it on the brad opposite $\frac{3}{4}$-in. "Standard Taps" and delivers the tools to Smith at the window. When the tools are returned the check is again placed in the pigeon hole opposite Smith's name, or No. 98, and the tools placed on the rack in their allotted space.

Special Checks

[illegible] enumerated above [illegible] essential to a good checking system, the foreman should have on hand, say, 50 checks of the ordinary size painted blue, 50 red, and 50 painted yellow. A small blue print, framed and hung in the tool room, will explain the use of these colored checks. Thus: John Smith brings back the ¾-in. standard taps, and one of them is broken. It cannot be used again, and so its place is vacant. If it can be repaired, hang a yellow check in the place of Smith's, again placing his in the pigeon hole, and place the tool under repairs as soon as practicable.

If it cannot be repaired, place a red check and replace the broken taps with a new set from stock, thus keeping the rack full, and check out when called for, just as if the red check were not there. When ordered on either special or regular requisition, place the blue check on the brad. The difference between the "To be Replaced" and the "On Requisition," is readily seen to prevent the same tool being ordered on two requisitions. This method of checking enables the foreman to tell at a glance just where all tools are and what should be ordered to replace those broken or lost.

Special Tools

The tool room foreman should number all air hammers, air motors, jacks and tools of that kind and a board (Fig. 4) should be placed near the delivery window, and the hammers, motors, etc., checked out in the usual manner, only the check being hung upon the board, since the hammers are kept in an oil bath and the motors on a rack made of [illegible] it would be difficult to [illegible] upon the tool.

It often is the case, especially in the larger plants, that more than one tool room is required. Take, for instance, a manufacturing concern in which the boiler shop is located some distance from the machine department. It would be an utter waste of time for a boiler-maker to be compelled to go to the machine department tool room for every tool that he might require, and it would surely be economy to have a small tool room in the boiler shop and equip it with such tools as are most used in boiler making. But it would be impracticable to give both shops an elaborate equipment, and for this reason some means of interchange between the two places must be established which will avoid the error of having an undue number of toolmakers, and yet provide ample facilities for the proper care of all tools and not complicate matters so that it is hard for the workman to secure whatever tool he may desire.

The Main Tool Room

To reduce the number of toolmakers, establish one place as the main tool room and have all tools in need of repairs, or to be made, brought to the foreman of that place, and give that foreman charge over both tool rooms, so that there may be a clearly defined head, and someone to whom all business pertaining to that department may be referred. To prevent the carrying of the boiler-makers' names in the machine department tool room, and the consequently large rack, an exchange check should be used. Thus a boiler-maker desiring a tool not kept in his department goes to the delivery window, and his check is taken from the pigeon hole and placed on a board in the place of a similar check marked "Boiler Shop Exchange," or simply "B. S. Exc.," and with this exchange check he is entitled to any tool from the main tool room. When he has finished using the tool, he takes it back to the main tool room, receives the exchange check back, which, when taken to the boiler-shop delivery window, will be again changed for his check, which is now replaced in the pigeon hole. This has the double advantage of keeping the men under their own departments, and at the same time protects the main tool room.

Broken Tools

Although many tools are broken through no fault of the operator, still it is safe to say that there are quite a number damaged through carelessness, and it is another case of the innocent suffering with the guilty. There should be a record kept of broken tools, and this record should be forwarded to the shop foreman and a careful investigation made, for it is only through some such system that the condition of the machine, as well as the carelessness of the employee, may be checked.

NAME OF SYSTEM.

Report of Broken Tools.

Date .....
Tool Broken .....
Broken By .....
Remarks .....
.....
.....

Approved.

T. R. F'man. Gen'l F'man. Mast. Mech.

On some of the larger railroad systems there are many special tools made at the different shops and used locally, but these tools are a long time finding their way into more distant shops, and for the purpose of having them in general service a "Book of Special Devices" should be made up at the head office. Each master mechanic should be fur-

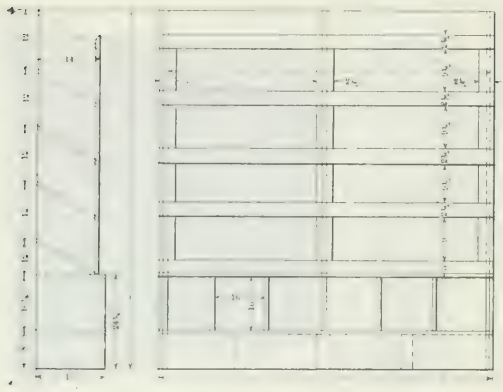


FIG. 1. DETAILS OF TOOL RACK

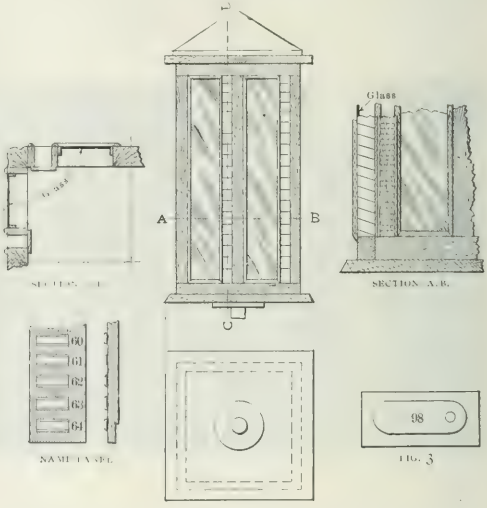


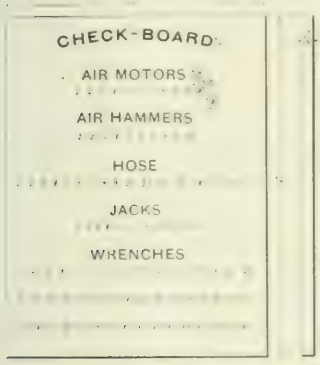
FIG. 2. DETAILS OF CHECK RACK

FIG. 3

mished with one of these books, and as a special tool is made, a drawing of it should be made and blue prints from the drawing sent to the master mechanic for their books, and the tool-room foreman should be at once authorized to construct these tools and place them in service.

MATERIALS STORAGE.

But above all is the question of a standard, and the reader will pardon a rather bold statement when I say that there should be no special tools, or, more correctly, no odd thread taps; no taps ranging in sixty-fourths or even thirty-seconds. If it is found that a certain class of engine needs a certain tap for its grease cup or crank-pin nut, then make that into a special device and have it a standard for the entire system. If a hole needs to be tapped in thirty seconds, a shim of tin placed by the tap will answer all purposes. This thing of every shop having its own ideas as to what thread a certain nut should have, and no other shop having the same thread tap, is entirely wrong and very expensive. All taps of a size should have the same size heads (as large as the stock will permit). All reamers of the same



class should have the same taper per inch, the double- and single-end wrenches should fit the squares; "Morse tapers" should not be ground by hand on an emery wheel, and many other things too numerous to mention, which, if permitted, will make a waste that would bankrupt the best of firms.

The questions of light, heat and size of shop make it impossible to give any definite statements or drawings as regards the tool-room layout; that part of the matter must be governed by local conditions. One thing, however, should always be remembered, and that is that cleanliness is of the greatest importance, and, with this end in view, do not make your tool room into a storehouse nor yet into a junk pile.

"At the Works"

I borrow the title of this article from a book which has recently appeared in England and to which, in view of [illegible] its individual merit and its representative character I desire to call the attention of students of the "labor question." The literature of this subject, voluminous as it is, still fails to furnish the body of clearly observed and accurately recorded data which is necessary to safe inductions of general value. Magazine writers, bound to make impressive, picturesque and readable articles; partisans, seeking to advance their own theories or interests; sentimental philanthropists, to whom every hardship is a wrong, and every radical change of the social order is a remedy; politicians, regarding every wave of popular unrest as an aid to their own private navigation—until the tide changes; governmental committees of inquiry, tabulating assertions as if they were facts, and seeking to draw conclusions which will offend nobody; boards of arbitration, whose object is peace through compromise, rather than justice at any cost—these are too often the sources of our knowledge of the labor-problem. Assuming them all to be sincere and honest (which certainly not all of them always are) they are still affected by the lack of quantitative measurements and the substitution of emphasis for weight in their statements of the fundamental elements of the problem. As a result, we are distracted by the advocacy of impracticable or ruinous remedies for non-existent, unavoidable, transitory or self-correcting features of the industrial situation.

What we want above all is *facts*. Are the poor really growing poorer, while the rich grow ever richer? Is the freedom of individual contract, protected and enforced by law, achieved by so many centuries of [illegible] and [illegible] cialism our only refuge from anarchy? These profound questions are daily treated as if they could be settled by eloquence, enthusiasm, or even brute force, without any thorough preliminary inquiry into the facts.

In this hasty and hysterical condition of public opinion, every calm and just, as well as sympathetic, report of the simple facts is most welcome; and to this class belongs the little book to which I have referred. Lady Bell, the author (already known in literature through several works of fancy and criticism, quite unlike this one), is the wife of Sir Hugh Bell, the son of Sir Lowthian Bell, and now the president of the Iron and Steel Institute, as well as lord lieutenant of the North Riding of Yorkshire. Those who know [illegible] need not be told how warmly the

At the Works. A Study of a Manufacturing Town. By Lady [illegible]. 8vo. 320 pp. London, 1907.

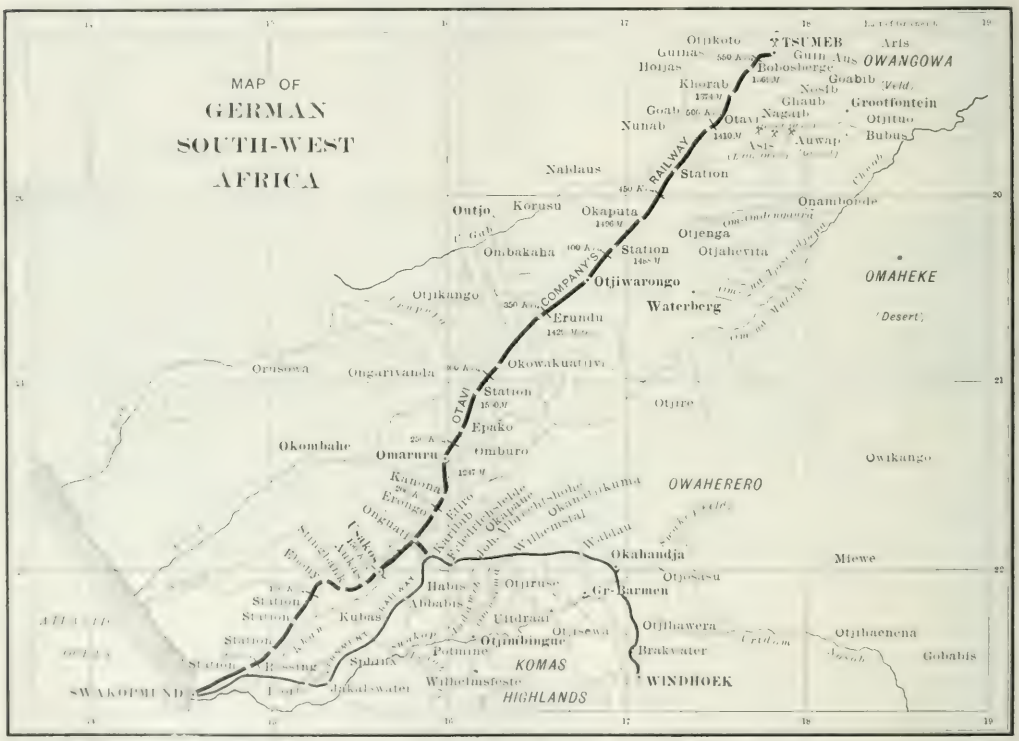
Let us fervently give thanks for a piece of work so modest, yet so thorough and sincere. However tempted, I shall not, on this occasion, at least, mar my praise of it by using it in support of any views—even my own!—on the "labor question." All I would do now is to recommend the perusal of it to all honest students of the subject.

In successive chapters, the book treats of the Genesis of the Town; the Process of Iron-making; the Expenditure of the Workman; Illness and Accidents; Old Age, Joint Households, and Benefit Societies; Recreation; Reading; the Wives and Daughters of the Ironworkers; Drink, Betting and Gambling. These topics are treated with keen perception and practical wisdom, as well as graphic descriptive power. Lady Bell must be recognized as one of the select company who set forth

The Otavi Copper and Lead Mines

By J. Hartley Knight*

Until recently the man in the street knew little and cared less about Otavi and its potentialities as a mining area. The existence of base metal in this region in southwest Africa has been known for a considerable time and it must be quite 15 years since the richness of the Tsumeb mine in especial was proved and steps were taken to properly exploit the property. It was early seen that the distance of the mine from the coast was a serious drawback to its profitable development, but when once the extent and richness of the copper veins was determined the parties interested decided that it would pay them to build a railway to the coast, and



MAP SHOWING THE LOCATION OF THE OTAVI MINES AND MEANS OF COMMUNICATION

concluded, there is every reason to suppose that operations at the mine will be pushed forward with speed. Labor is plentiful, water fairly abundant and smelting works have already been erected at Tsumeb, and other works are contemplated at Swakopmund. The Otavi Railway, between Swakopmund and Tsumeb, is 351 miles long; it constitutes a record for a 2-ft. gage railway. From Swakopmund the line runs practically parallel to the Swakopmund-Windhoek Government Railway as far as Roessing, after which it diverges somewhat to the northwest.

Nature of the Deposits

The ore deposits of Tsumeb are designated as elongated replacement deposits, the data for this classification being based upon information obtained by present developments within the mine. In the Otavi region, and stretching away to the north and west, there are limestone strata which presumably belong to the oldest primary formation, and which are not related to the orebody. Granite is found in many cases within this zone and doubtless it forms the core of the mountains of Otavi. The usual strike of the deposit, as well as of the limestone, is east and west, while the associated igneous intrusions bear about 60 deg. south.

Along the outcrop the ore deposits are about 180 meters wide, while at the third level, 70 meters deep, they have a much greater development toward the west than is the case on the surface. It appears, therefore, that an extension of the deposit is to be expected. The thickness varies between 10 and 17 meters, and this does not include the clay seams which are impregnated with ore and mixed with boulders, and which are prominent in the upper levels. In the undisturbed part of the deposit, the hanging as well as the foot wall occurs in conjunction with a clay seam.

In 1899 there were four shafts. Two of these were 76 m. apart, and were down to

crosscuts led out from the shaft. From these developments, it was learned that there were two thick high-grade seams, and between these a somewhat thinner deposit of low-grade ore. But with increased depth this low-grade deposit grows smaller in size while the richer deposits increase considerably. There is therefore a possibility that at lower levels this poor deposit will disappear altogether.

The minerals in the formation consist of copper glance, malachite, azurite, galena, cerusite, a little zinc blende, calamine, clay and quartz. Analyses show also small amounts of antimony and arsenic compounds.

The distribution of the ore in the deposit is very irregular as is shown by the mine development. On account of the varying ratios of the sulphides and carbonates of lead and copper, an accurate estimate of the average metal contents is not possible. C. James, who opened the mine as far as the 50-meter level, estimated that there are about 293,000 tons of high-grade ore averaging about 12 per cent. copper, 25.3 per cent. lead, and about 191,000 tons of low-grade ore running 2.9 per cent. copper and 4.4 per cent. lead. Recent development work in the western part of the orebody, especially in the extension of the second level at a depth of 70 m., has shown an increase in value of the ore.

Mining and Smelting.

Repeated experiments have shown that a separation and concentration of the lead and copper ores cannot be made by mechanical or wet means, and a complete separation of these ores is out of the question on account of the amount of carbonates present, which are too near each other in specific gravity to allow proper concentration. But the massive character of the ore allows a hand separation and all low-grade material is eliminated, and direct smelting of the concentrate can be carried out. The massive replacement character of the deposit permits a very complete winning of the mineral without loss.

In order to win the high-grade outcrop mineral without excessive underground development there is installed a mechanical equipment for hauling from open cuts along an inclined way. In addition to this system, there is a main hoisting shaft sunk in the hanging wall of the deposit and connected with the surface work by an inclined crosscut and through this shaft a part of the ore is hoisted. By this means, it will later be possible to attain the maximum daily production of 400 to 500 tons.

It is proposed to smelt the ores after sorting and to produce work lead and copper matte containing 40 to 50 per cent. copper, and to refine these products [illegible] to Europe. Smelting operations are expected to be under way by the middle of [illegible]

Genesis of the Copper Deposits of Yerington, Nev.*

By [illegible]

The [illegible] county, Nevada, 40 miles southeast of the [illegible] interesting features. The Mason Valley mountains in which the mines are located are a small north-south range about 25 miles long and three to six miles wide with a maximum elevation of 6500 ft. above sea level and 2000 ft. above the valley of the Walker river.

The core of this range is intrusive granite, exposed in the higher peaks and in the deeper cañons where the erosion has been greatest, but covered by metamorphosed sedimentary strata on both the eastern and western slopes. Late rhyolite flows occur along the eastern base of the mountain. The intrusive granite is a coarse-grained mixture of feldspar, quartz, hornblende and biotite, becoming porphyritic in structure near the contacts.

Resting on this granite are beds of rock several hundred feet in thickness composed of the lime-alumina garnet, grossularite, graduating into andradite by the partial replacement of the alumina and lime by iron. This rock varies in texture from a compact mass to a coarse crystalline aggregate of a cinnamon-brown color.

Thick beds of white to gray crystalline limestones cover portions of the garnet rock, but their original area has been greatly reduced by erosion.

An extensive series of metamorphic rocks also occurs, greatest development being on the west side of the range where the strata have a nearly vertical dip and a thickness of 3000 ft. This series is unconformable with the garnet and limestone on the western slope and separated from them by a fault which has dropped this later series into its present position. These rocks are not as well developed on the eastern side and their relation to the [illegible] sition they range from silicified limes to microscopic aggregates of tremolite, lime-silicates and biotite, and probably were lime shales and slates originally.

The eastern foot hills are covered by late flows of rhyolite that have no connection with the [illegible] The structure is complicated by a system of folding and faulting older than the granite [illegible] mineralization.

[illegible] MIN. ENG. Vol. X. [illegible]

[illegible] in fractures and shear zones, also as [illegible] stones. The effect of the [illegible] [illegible] on the [illegible] [illegible] [illegible]

to the action of intrusive rock masses, the magmatic waters of which have mineralized certain preexisting fissures, and, together with the heat derived from the molten magna, has converted certain sedimentary beds into garnet rock containing more or less disseminated ore and other beds, in a higher horizon, into marble, and also filling fractures parallel to the bedding of this marbleized limestone with copper ore.

It is not possible at the present time to determine how much of the rock metamorphism is due to the heating effects of the intrusive and how much to the introduction of new compounds by the waters of the molten magna, but we can assume that the ore is due to these waters and that the rock metamorphism was largely caused by the action of heat, supplemented by the chemical action of the water, as the garnet is more or less impregnated with ore, showing its permeability to these solutions which undoubtedly contained other mineralizers that contributed to the formation of the garnet.

The limestones, which occur at a higher horizon, have probably been altered by the action of heat alone, as they contain no ore, except in the fissures.

The district is being developed rapidly and in two years' time it is expected to become a copper producer on a large [illegible]

New Silver District in the Temagami Reserve

By L. H. Maltair*

What bids fair to be a new Cobalt has been discovered up the Montreal river, 45 miles north of Latchford, a town on the Timiskaming & Northern Ontario Railroad. The first finds were made in August, 1906, followed immediately afterward by others in September and October. Few prospectors got into the territory until after navigation closed, but all through January, February and March they have gone in, in great numbers. There are about 2500 there at the present time, most of whom will remain until the ice goes. The matter of transportation is a serious one, and while the best time to move supplies is in the winter, still this spring and summer immense quantities will be required; for as the new finds are reported, more and more prospectors will go in. Plans are on foot to provide naphtha launches for the Montreal river traffic, both above [illegible] around Park rapids. This will solve the question unless the rush is phenomenal. [illegible] near Mountain lake, about where the prospector and develop the section much more quickly.

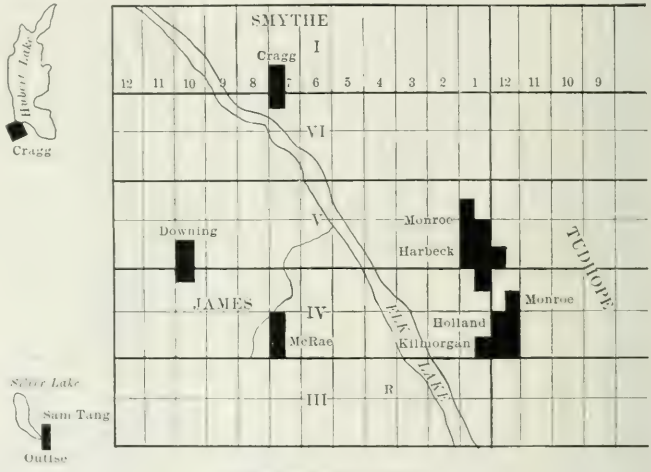
Claims Located

The country in James township is, practically, all staked now, on both sides of the river, west of the river being in the Temagami forest reserve. The township of Smythe, in the first and second concessions, is also staked; while the tier of lots in the western part of the Tudhope township is staked, the only territory at this writing near James which is not staked is in Truax and Barber townships, lying northeast and southeast, respectively.

The unsurveyed portion of the Temagami reserve, lying adjacent to James and for three miles back, is staked. The finds of native silver have not been confined to any small area, but are widely scattered. The area so far reported is about six miles wide, north and south, by twelve miles long, east and west. The strike of the formations carrying the veins is, approximately, parallel to the river.

The high ground in James and Tudhope townships, east of the river, is back about one mile, while on the west the high ground of James terminates at the water edge. The veins strike here generally northeast and southwest. The country rock is diabase, gabbro and slate, with diabase predominating.

The country has been well shaken up, the slate dikes intruding from the east. The calcite carrying the silver is the white crystalline variety; in the veins found in the gabbro rocks a reddish quartz accompanies the calcite. In nearly all cases copper and iron sulphides appear. Cobalt bloom invariably accompanies the calcite and in the diabase smaltite is shown very close to the surface in the veins.



MAP OF TEMAGAMI DISTRICT

Workings

There have been no deep shafts put down as yet, but active development will begin in the early summer. All finds so far made are at or a few feet below the surface. In most cases, a few shots have blown the native silver out with its accompanying calcite.

The deepest shaft I saw was down about 12 ft., and the vein was calcite and smaltite with bloom profusely decorating the rocks, the native silver occurring with the calcite. The formation was diabase. It was a typical Cobalt district vein, the calcite particularly being similar to that in the Timiskaming Mining Company's property in southeast Coleman township.

There is no doubt but that this section will divide laurels with Lorrain township and the Larder Lake district, as far as finds and prospecting are concerned. The accompanying sketch map shows the location of the different finds so far made. The claims are forty acres each.

In a paper by M. Frochot, on the South of Angola (*Comptes Rendus* de la Soc. de l'Industrie Minérale, April, 1907) it is stated that there are some analogies between the formations of this region and South Africa. Three diamonds of the first water were found on the border of the plateau of Huilla. At Cassinga there are numerous quartz veins, some containing gold and the others copper and lead. The nearest port is Mossamedes.—(*Min. Journ.*, May 4, 1907.)

Greater working strains can be secured by the use of steel chains of the same weight than is possible with the malleable chains. The natural defects and flaws to which malleable castings are subject are avoided in the use of steel.

Mutual Displacement by Intersecting Veins

By Waldemar Harold Weed*

Joints, fractures and fault fissures are all the results of the straining and cracking of rocks under pressure, and though of different magnitude, are closely alike in character. If the fractures be mineralized they form so-called fissure veins.

In many regions there are strong veins cut by cross veins, often with displacement. Very generally such displacement is assumed to be due to faulting that has taken place since the formation of the veins, and if the cross fissures carry ore they are taken to represent a later and second period of mineralization. The accompanying illustrations are particularly fine examples on a very small scale of what is sometimes found to exist in workable veins, and show that one set of veins may be displaced by another of exactly the same age.

The illustrations are photographs of specimens of black argillite from the shore of Lake Champlain, near Burlington, Vt. The rock is cut by small fractures filled by white calcite that contains silica in the center of the seams. It is the peculiar relations of these seams to one another that make the specimens of interest, as they represent on a small scale, so that it can be comprehended at a glance, features

FIG. 1

FIG. 2

which are hard to trace out when they prevail in large veins whose outcrops are partially concealed.

Fig. 1 shows a [illegible] stringers corresponding to those which make up the gold veins of Grass Valley and the Mother lode regions, California. Fig. 2 shows the same block tilted to expose [illegible] the other figures, but they are relatively obscure. The appearance is typical of the ordinary type of vein formation in many [illegible]

*Mining geologist, 42 Broadway, New York.

the mass presented infinite resistance to deformation. If this resistance is not infinite, they will stand at greater angles to the line of force. There will generally be more than one direction of rupture and in masses the thickness of which in the direction of pressure is considerably smaller than the lateral extension there will often be four systems of parallel fissures, two systems answering to each of the two equal shears arising from simple pressure. In most cases there is an inequality of resistance and rupture will take place in the greatest and the least of the three axes of the strain ellipsoid. If the pressure continues after rupture, the blocks

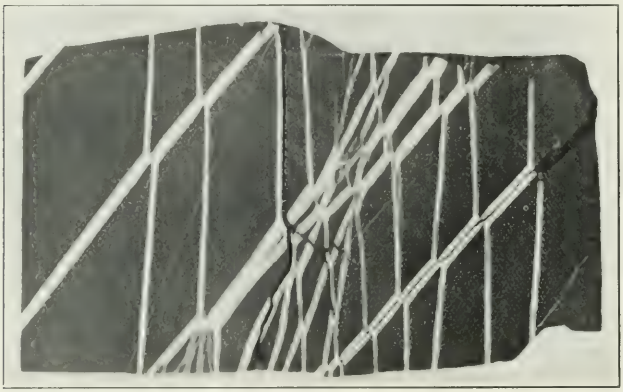


FIG. 3.

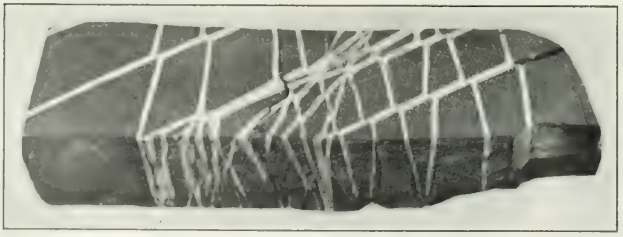


FIG. 4.

will grind against each other and produce

In nature many rocks under the action of direct pressure rapidly applied behave as highly elastic brittle masses of great rigidity. The range of the planes of maximum strain is practically nil and the systems of fissures are at right angles to one another, and it is not unusual to find

the first

It is reported that sulphur mining has been commenced in the north of Peru at a place where brimstone mixed with about 50 per cent. of sand occurs as a surface

The Brennan Mono-rail System

At the last meeting of the Royal Society, at London, one of the most interesting exhibits was a model of a mono-railway by Louis Brennan, the inventor of the Brennan torpedo. The following account is taken from *Engineering* of May 10, 1907.

The car or locomotive is wholly above the rail level, and yet evinces no inclination to overturn. This result is obtained by the use of two gyroscopes with horizontal axes mounted in the car and rotated at high velocities in opposite directions. When these are running at the required speed their influence is such that the car remains upright, either when at a standstill or when moving along its rail, notwithstanding the fact that its center of gravity is high above the latter. The gyroscope wheels are mounted in special bearings and are rotated by means of electric motors in a vacuum, so that both the bearing and air friction are very small. The energy stored up in the flywheels is sufficient to keep them revolving at the velocity necessary to impart stability to the vehicle for a considerable time after the current is cut off.

The model exhibited, which measures about 6 ft. long, is supported on four small wheels, all power driven, arranged in two groups, one at each end of the vehicle. Each group is a mono-rail bogie pivoted both vertically and horizontally, the car being thus able to take very small curves, and to travel over uneven ground without fear of derailment. The motive power in the model is derived from accumulators carried by the vehicle itself, current also being drawn from these to keep the gyroscope wheels rotating while the vehicle is standing. While loaded, and with a man on board, this model has been put to many tests. It is calculated that the weight of the gyroscope wheels should be 5 per cent. of the total weight of the loaded vehicle.

The model which Mr. Brennan showed in motion is large enough to carry a man, but was sent round the meeting room at Burlington House unattended. It was made to travel at considerable speed on a track about 8 ft. from the ground, and negotiated sharp curves with the greatest ease. It was also run upon a tight wire rope fixed to a stout timber frame, and the whole frame was turned down through 90 deg. from the vertical to the horizontal position. During this performance the vehicle, unaided, remained upright on the rope, and maintained its upright position till the gyroscope frames were locked, when legs were put out to support it. A wire rope was also coiled about on the platform, and the machine ran over this, taking sharp curves without difficulty.

A New Fery Pyrometer

Among the exhibits at the last meeting of the Royal Society, at London, was a self-contained Féry radiation pyrometer shown by the Cambridge Scientific Instrument Company, which marks a noteworthy advance in Féry pyrometers. The instrument, which resembles in outer appearance the usual Féry pyrometer, permits of direct reading without the aid of any galvanometer. The total radiation of a furnace is focused by a concave gilt mirror (the gold baked into the glass) on a Breguet spiral—a little spiral, 1.5 mm. in diameter, built up of three metals, gold between platinum and silver. As the temperature rises the spiral uncoils, and the pointer of the spiral travels over the dial next to the eye-piece of the short telescope tube, which contains the whole apparatus. The furnace used in the exhibition was a Féry electric furnace, consisting of a tube of Marquardt porcelain, surrounded by a helix of carbon. When the hand was held between the hole of the furnace and the pyrometer, the pointer at once receded. As the whole pyrometer is heated by the radiation from the furnace, the instrument would record too high temperatures; the pyrometer case can therefore be closed by a double shutter, when the pointer will go back to zero.

Progress in the Use of Aluminium in 1906

Improved Methods of Working the Metal Have Extended Its Use as a Light, Durable Material and as a Deoxidizing Agent

BY JOSEPH W. RICHARDS*

Pin Holes in Aluminium Castings

E. S. Sperry[1] gives some valuable observations on this subject. These annoying defects are usually just under the surface of a casting, and are in evidence as soon as the casting is machined. They are due to the metal absorbing gases while in the furnace and giving them out as it sets. No harm is done by the material of a graphite crucible, which may be used with safety; but to get absence of gas in the metal, the top of the crucible should project out of the fire and above the top of the furnace, like a zinc-melting pot. The metal absorbs gases in the furnace rapidly if exposed to them, and much faster as the temperature becomes high. Overheating must in all cases be avoided. Mr. Sperry formulates the following general rules:

(1) Use only ingot metal, and put the largest pieces in the bottom of the crucible. (2) Do not allow the ingots or any scrap metal to project above the top of the crucible. (3) Do not fill up with coke around the crucible up to the top. (4) Take the crucible from the fire before the metal gets too hot. (5) The metal must never be heated above the correct temperature for pouring. (6) Have the molds ready before the metal is put into the crucible, so that any possible delays are avoided after the metal is melted. (7) Do not pour too cold, since air may be entangled in the pasty metal and form large blow-holes. Wet sand may also cause similar blow-holes.

For casting plates for rolling Mr. Sperry recommends using a mold having a side runner connected with the mold proper throughout its hight by a 3/16-in. slot. Dross remains in the runner, and only clean metal enters the mold. Runners and gates are best cut off by band saws.

Amos Brown[2] recommends using chills at such parts of an aluminium casting as are ordinarily provided with risers. The latter are often a detriment to a fine casting, causing shrinkage cracks and being difficult to cut off. Pieces of sheet copper or brass, rather thick and flat, about 1/16 in. thick, may be used as effective substitutes, being placed so as to cover the part of the casting which it is intended to chill cause heavy portions of the casting to cool off as quickly as the lighter parts which are not chilled, and thus preserve the shape of the heavier parts, avoid unequal cooling and shrinkage strains. The chill should be cleaned from scale or grease by emery cloth. The proper heat for casting the aluminium is a very low red.

Plating

A. Giroux claims to have obtained satisfactory results principally by giving great attention to the preliminary preparation. The articles are first cleaned in potassium cyanide solution until the greasy spots are loosened; then cleaned by brushing with powdered pumice until a clean surface is obtained. They are then to be well washed and dipped into caustic potash solution until gas bubbles are evolved, and are then immersed in cold water. They are then dipped into a solution containing 0.2 per cent. of corrosive sublimate and 2 per cent. of potassium cyanide. They are then dipped once into the caustic potash solution and placed at once in the plating bath. The plating must be done slowly and evenly, not at any time showing evolution of gas; only in this way can an adherent plating be obtained

Soldering

A. W. [illegible] U. S. pat. [illegible] Feb. 6, 1906, coats the surfaces of aluminium to be soldered with an alloy containing 3 tin, 7 lead, 5 zinc, and 5 to 8 aluminium. The surfaces are cleaned, scraped and heated, then the solder rubbed in until the surfaces are coated. The surfaces thus prepared can then be soldered with ordinary half-tin, half-lead solder.

B. C. Senton (U. S. pat. 809,472, Jan. 9, 1906) patents the solder containing 12 parts tin, 2 zinc and 1 aluminium, which ingredients are melted together, using 1 per cent. of common salt as a flux. Antimony may be added to make it harder.

Of the hundred (more or less) solders [illegible] patented since Mourey first essayed the problem in 1855 none has entered into commercial use or justified the award of the [illegible] July 3, 1905, [illegible] and 1 of aluminium [illegible] the last 12 years the value of [illegible] being larger than that of any preceding year. Its use is described in Aluminium," p. [illegible]

[illegible] nium in the United States. M. U. Schoop [illegible] ated the United States early in 1907 for the purpose of introducing his latest improvements. He uses an hydrogen air blowpipe and a flux, the composition of which is kept secret, which is said to dissolve all grease, oxide, alumina, etc., and enable perfect welds to be easily made. Tests made at the Conservatoire des Arts et Metiers have shown the welds to be equal in strength to pure aluminium. Tubes of any size can be made by spiral welding of sheet

M. Posno, of Paris, has also made advances in this art, and has founded the Société Française de Brasure [illegible] nium to operate his methods

Uses

[illegible] dizer in brass and bronze, in which it acts by reducing the oxides of copper, zinc or tin with which the metal may be contaminated. A small excess of aluminium does not injure the metal so much as a small excess of phosphorus. Care must be [illegible] mediately after using the deoxidizer, since the alumina formed must be [illegible] enter the slag. If this is not done, the [illegible] copper used for electrical purposes, silicon [illegible] less infusible, tends to unite with [illegible] completely, leaving it with higher electric conductivity

Dr. Hans Goldschmidt, the inventor of [illegible]

Note.—From advance [illegible] of *The Mineral Industry* Vol. XV. In [illegible] of the writers of Professor Richards' [illegible] aluminium has been [illegible] although the [illegible] of the [illegible] aluminium. [illegible]

*Professor of Metallurgy, Lehigh University, Bethlehem, Penn.

[1] *Brass World*, January, 1906.

[2] *Brass World*, December, 1906.

higher even than aluminium alone, while the heat of formation of the aluminate of lime slag is also utilized, and the slag is much more fusible than alumina alone.

Supposing the alloy of calcium and aluminium to contain 42.5 per cent. of calcium, corresponding to $CaAl_2$, the reaction on Fe_2O_3 would probably be:

[illegible]

In this reaction 70 per cent. of the iron in the oxide used would be reduced to the metallic state, while the resulting slag would be very fluid, and 1.4 parts of fluid iron at high temperature would be obtained per one part of calcium-aluminium alloy used.

Coinage—It is again rumored that the United States mint will again try the suitability of aluminium for coinage of cents—a subject which I strongly advocated in 1895.[1]

Electrical Conductors — The Niagara, Lockport & Ontario Power Company now transmits power 160 miles to Syracuse and 200 miles to Cleveland. The equipment to Syracuse contains 12,000 miles of heavy wire, in three cables of 19 strands each. The voltage is 60,000.[2]

Paint

The metallic paint of silver-white color made of powdered aluminium has deservedly become quite popular for outdoor work. The analysis of a European paint powder, made by Kohn Abrest, showed: metallic aluminium (trace of iron) 91.20 per cent.; aluminium oxide (alumina) 5.80 per cent.; silica, 1.30 per cent.; insoluble silicon, 0.40 per cent.; carbon, 0.23 per cent.; moisture, 1.07 per cent.; total, 100. The large amount of alumina is due to the incipient oxidation of the powder. These powders are often adulterated by zinc and tin dust; mica and similar "fillers" may be likewise present, distinguishable by the large residue insoluble in acid. The powder is manufactured by forcing gas or air into the melted metal while it is setting, accompanied by vigorous mechanical stirring. This granulates the metal, forming a film of crystalline metal partly oxidized, which is easily pulverized. The powdering of this spongy or granulated metal is done in stamp mills or disintegrators, afterward sieving to different sizes and finally polishing in polishing mills.

The powder was orignally suspended in various forms of spirit varnish, but it is now used in thin oil varnishes, such as would be made by warming, mixing and stirring well together the following: turpentine 1.5 gal.; palest copal varnish, 0.5 gal.; palest terebine, 4 oz.; magnesium carbonate, 4 oz. The magnesia is allowed to settle and the clear liquid is drawn off. The metallic powder is stirred into this [illegible]

[illegible]

of liquid. The paint shows up better if applied to a warm surface, and a colorless lacquer on interior work or white copal varnish on outside work, protects it well.

Racing Shoes—The Bryden Horse Shoe Company of Catasauqua, Penn., makes aluminum racing shoes weighing 2 oz. each and selling for $1.25 the set.[1] They have a rim of steel set in edgewise, being cold rolled, slotted, and the steel strip inserted by machinery. Racing men say that, "An ounce off a horse's foot is equal to a pound off his back."

Miscellaneous

G. R. Gibbons[2] classifies the various uses of aluminium as those based on its low specific gravity, its chemical characteristics, its color, its electric conductivity, and those based on combinations of these properties. He catalogs the new uses, as follows. *Light durable plates*—sticking up or transfer plates in lithography, for spreading gelatine in collotype work, die plates for supporting dies of embossing machines, cauls for veneering wood, ivory, etc., press plates for book binders, trays for clipped fur in making hats, shipping receipt binders, stub binders, darbies and hawks for plasterers; *parts of musical instruments*—snare and kettle drum shells, xylophone bars, small bells; in pianos and organs, the molding, tops, bushings, action parts, piano-player fingers, air tubes, organ slides, blowers and valve rings; *machinery*—typewriter and adding machine key levers, platencores, frames, graphophone parts; *miscellaneous*—kodak or camera cases, frames for dress-suit cases, traveling bags, trunks and sample cases, eye-glass cases, cost ledger backs, spirit level frames, pans for stearin manufacture, parts of scales, mailing tubes, fishing reels, blocks for forming hats, artificial limbs, gold-washing pans, bowling balls, bench marks, saddle trees, embalming table covers, dowels for stone work, refrigerator linings, beer coolers, dipping baskets (especially for use in nitric acid), aniline evaporating pans, apparatus used in manufacture of gun-cotton, cream of tartar, rubber (mandrels, forms, labels, pans in vulcanizing process), lasts for rubber boots, engine lagging, show-case molding, buckles, telephone diaphragms, mouthpieces and receiver caps, sounding bars of telephone instruments, electrical meter disks, caps, frames and cases; incubator rheostats, shade roller parts, railway car linings and racks.

Alloys

Production — J. N. Pring[3] produces aluminium alloys by reducing metallic oxides by aluminium carbide. The latter is made by heating aluminium in a carbon crucible in a Moissan arc-type furnace. Al_4C_3 results, chiefly from the action of CO on aluminium. This, heated with CuO produces Cu. and CO_2 at low heats:

$$12CuO + Al_4C_3 = 12Cu + 1Al_2O_3 + 3CO_2$$

but at high heats produces:

$$3CuO + Al_4C_3 = Al_4Cu + 3CO$$
$$Fe_2O_3 + Al_4C_3 = Al_4Fe_2 + 3CO.$$

Any excess of oxide present oxidizes aluminium out of the alloy.

Bronzes—The strongest is said to be made[1] of 89 parts copper, 10.5 parts aluminium and 0.5 parts silicon, the latter added as silicon copper for the purpose of hardening the alloy. This alloy is not ductile or workable, but must be cast into shape.

According to E. S. Sperry[2] the strongest bronze for bolts, such as are used for anchoring gun carriages, is 9 per cent. aluminium to 91 copper, containing no zinc, tin, or other metal, melted with common salt as flux, cast in a 4x4 in. billet, 40 in. long, and rolled in one heat to 2 in. diameter. Such a bolt will show 60,000 lb. tensile strength per square inch, with 20 per cent. elongation in 8 in. and 20 per cent. reduction of area. Its chief advantage over steel is its non-rusting quality.

E. S. Sperry[3] states that 8 per cent. aluminium bronze will not stand high reductions in rolling. If not frequently annealed it may actually split in rolling into tranverse sections. Even if annealed, but reduced too strongly at one pass, it is apt to become overstrained and fatigued, and in course of time, say a year, is apt to develop very pronounced season-cracks. A 4 per cent. bronze is extremely ductile, and draws out splendidly into tubes which develop no season-cracks.

German-Silver—E. S. Sperry recommends[4] as a very white alloy, and the stiffest in common use, the mixture of 57 parts copper, 20 nickel, 20 zinc and 3 aluminium. The copper and nickel are first melted together under (borax 2 lb. to 100 lb.), the aluminium then added, the metal cooled considerably by gates, etc., until the zinc can be added without loss. If the ingots thus made are remelted, very sound castings may be obtained. Only the best metals should be put into this alloy, viz., Bertha zinc, Lake copper, best grain nickel and No. 1 aluminium. The castings should have large gates, to prevent cracking in the mold, and the alloy poured at a low heat.

Silver—G. I. Petrenko has made a complete fusion-point diagram of the alloys of aluminium and silver.[5] He finds the two compounds $Al\,Ag_2$ and $Al\,Ag_3$, occupying maxima on the fusing-point curve. Adding aluminium to silver, the melting point falls to a eutectic (minimum) at 567 deg.

[illegible]

[1] *Metal Industry*, August, 1906.
[2] *Metal Industry*, January and February, 1906.
[3] *Trans.* Chemical Society, LXXXVII, 8530 to *Electrochem. and Met. Ind.* January 1906, p. 27.

[1] *Metal Industry*, May, 1906.
[2] *Brass World*, August, 1906.
[3] *Brass World*, February, 1906; April, 1906.
[4] *Brass World*, March, 1906.
[5] *Zeit. anorg. Chem.*, 1905. *Electrochem. and Met. Ind.*, February, 1906, p. 73.

C., then rises with two breaks at 771 and 721 deg. corresponding respectively to Al Ag, 7.72 per cent. Al, and Al Ag, 11.15 per cent. Al.) Between these two proportions, the alloys take a good polish. With less than 7.72 per cent. aluminium they show great stability and resistance to atmospheric influences.

Magnesium—Barnett describes[1] light alloys in which the aluminium is stiffened and hardened by small amounts of magnesium and other metals. A casting alloy is described containing 1.76 per cent. copper, 1.60 magnesium, 1.16 nickel and smaller quantities of antimony and iron; a soft alloy for rolling into sheet contains 0.21 per cent. copper, 1.58 magnesium, 0.72 lead, 3.15 tin and 0.3 iron. These alloys show 8.5 to 10 tons tensile strength in ordinary castings and turn up well. The description lacks definiteness, contains some improbable statements, and does not offer alloys of very good mechanical qualities, after all.

Silicon—E. Vigouroux states that pure silicon and pure aluminium refuse to combine,[2] but in the presence of a third metal double silicides or alumino-silicides are formed. These are definite crystalline substances with metallic luster, dense, hard and brittle; some are attacked by dilute acids, but most of them resist all acids save hydrofluoric; none is affected by caustic alkali solutions. They may be formed either by heating the three substances together, or by the thermite method of reduction, using mixtures of silica, metallic oxide and an excess of aluminium; or by acting on aluminium by a mixture of the metal, its oxide or its sulphide, and potassium silico-fluoride. Clay vessels must be avoided in handling metals which can form alumino-silicides.

Tellurium—Cabell Whitehead[3] prepares aluminium telluride by melting aluminium and throwing in small pieces of tellurium from time to time. (The powdered metals, heated together, unite with great violence). The melted aluminium telluride separates perfectly from the excess of aluminium in the crucible.

The telluride decomposes water completely, even in the cold, and a constant stream of hydrogen telluride gas may be obtained by regulating the water supply so that it falls upon the telluride a drop at a time:

[illegible]

Tin and Bismuth—A. G. C. Gwyer has studied the alloys of aluminium with these metals.[4] With tin, a cutectic is found at 0.48 per cent. aluminium, melting at 229 deg., i.e., 3 deg. below the melting point of pure tin. With bismuth 3.7 per cent. reduces the melting point of aluminium from 657 down to 650 deg., apparently forming a saturated solution of bismuth in aluminium; at the same temperature, the excess of bismuth contains 8 per cent. of aluminium, which amount reduces to zero as the temperature of the mixture is reduced toward the melting point of bismuth. There appears to be no chemical combination even at 1200 deg.

Thorium—O. Honigschmid obtains a crystalline alloy of thorium and aluminium by heating the two metals together in a vacuum at about 1000 deg. C., or also by reducing thorium oxide or potassium-thorium fluoride by aluminium.[5] The alloy crystallizes from the aluminium in which it is dissolved in hexagonal needles. It has the color and appearance of aluminium, but is not attacked by aqueous solutions of the alkalies. Analysis shows it to have the formula Th Al_4.

[1] London *Engineering*, February, 1906.
[2] *Comptes Rendus*, 1905, CXLI, 951.
[3] *Journ. Frank. Inst.*, April, 1906, 238.
[4] *Bull.* George Washington University, V, No. 4, (1906).
[5] *Zeit. anorg. Chem.*, 1906, XLIX, 311.

Deep Fissuring at Rico, Colo.

Special Correspondence

Although Rico has been a mining camp for about 27 years, and has produced as many millions of dollars as it is years of age, the first shaft ever sunk here to quartzite formation was put down this spring in the Atlantic Cable mine of the United Rico Mines Company. The sinking of this shaft has proved a theory that has been discussed here for a quarter of a century without any previous attempt to demonstrate it, viz., the theory that the vertical veins which intersect the contact orebodies at distances of 150 to 175 ft. apart extend to and through the quartzite and carry values at depth.

The developed mines at Rico are all on the east side of the Dolores river, and are located on Newman hill, Dolores mountain, Nigger Baby hill and C. H. C. hill. Practically all of Rico's production has come from this area. None of the vertical veins in this area has been explored above the contact, while the exploration below the contact only extends for distances varying from 75 to 225 ft. On the opposite side of the river, on Expectation mountain, where there has been some prospecting ore has been found in the verticals both above and below contact.

On Dolores mountain, Newman, Nigger Baby and C. H. C. hills, there is not a shaft that has been sunk on a vein. They have all been sunk through barren ground to the contact, from where drifts have been run to strike the verticals. The reason why these verticals in the developed section were never prospected above the contact, or explored for any great depth below, is apparent at a glance to anyone informed as to the history of mining in this camp. The first body of pay ore was found at the intersection of a vertical vein with the contact. Later it was found that the orebody [illegible] was by the

[1] *Metallurgie*, 1905, II, 737.
[2] *Journ. Soc. Chem. Ind.*, May 30, 1906.

vertical, but always at or near the point of [illegible]. When found in the [illegible] the high-grade shipping ore would extend to a depth ranging from [illegible] feet, the maximum depth having been attained in the Jumbo No. 3 vertical, which was the deepest vertical in the camp until the Atlantic Cable shaft was sunk and vertical veins carrying gold were cut in east and south drifts at quartzite.

As high grade ore was [illegible] to exist at or near the [illegible] there and nowhere else for it. It never seems to have occurred to anyone on the east side of the river, and only lately to a few on the west side, to prospect the verticals above the contact or continue to sink to the quartzite and ascertain if they made values at that depth.

Of the $27,000,000 produced from Rico mines, practically all of it came from the contact and the verticals at or near the place of intersection. The verticals cut by drifts on the third level of the Atlantic Cable at the quartzite, which is 700 ft. geologically below the deepest workings on the hills, are strong veins—3, 5 and 7 ft. in width, of a silicious white quartz, carrying their highest value in gold, together with some silver and highly impregnated with copper. In the strata above the quartzite occur numerous hori[illegible] quartzite bed itself is thickly shotted with the latter mineral at points of contact.

It is [illegible] predictions are of little value) the average grade of these veins, as they have been but recently cut and remain unexploited. The drifts were run for the purpose of catch[illegible] and the discovery of the vertical [illegible] was incidental; hence the original work has been prosecuted, and the verticals passed by for future exploration. Grab samples, however, have shown gold from $8 to $41 per ton.

It seems possible that Rico may re[illegible] deep mining. If the verticals at quartzite prove up according to present indications, past experience warrants the belief that [illegible] values have been extracted [illegible] contact.

The [illegible] Mountain [illegible] the Yale [illegible] Company [illegible] the industry.

Operation and Equipment of the St. Clair Colliery

Outside Machinery Is Driven by Steam While Underground Equipment Is Electrically Driven. Unique Devices at Power House

BY FLOYD W. PARSONS

The St. Clair colliery is one of the oldest operations in the Pottsville region, Pennsylvania, and has passed under the management of several different companies. At one time this mine was practically abandoned, as it was thought unprofitable to continue operations. At present, however, it is being worked with as much success as during any previous period. The Buck Mountain seam is the only bed worked, and from this vein alone there is an output of about 500,000 tons per year. The most striking impression upon a visitor is the simplicity and magnitude of the operation, and the fact that although the conditions are highly diversified, the management has succeeded in adapting methods of mining that are particularly successful.

Haulage

The mine workings are reached by a 24-deg. slope, 3500 ft. long. A steam hoist is used for bringing the two-car trips up this incline, the general plan being to hoist the cars about 100 ft. from the mouth of the slope on a continuation of the incline. When the cars have reached a certain point, after passing through a spring-latch switch, they are dropped back by gravity to a sliding from which point they are hauled to the breaker by Vulcan locomotives. The hoisting rope is 1⅛ in. in diameter, while 60-lb. rails are used on the slope.

Practically the entire outside arrangement is driven by steam, while the underground operations are electrically driven The present management claims that the use of electricity underground saves 50 per cent. power, as compared with steam. This immense saving is principally due to the fact that the steam had to be carried 3500 ft. to the bottom of the first slope, and 1500 ft. further to the bottom of the second slope.

Ventilation

[illegible] ventilation have not involved any serious difficulty; although parts of the mine are gaseous, the outflows have been successfully removed. On most of the main [illegible] cu ft. of air passing per minute. This current is [illegible] exhaust fans. Each miner employed underground has a safety light, which is used only to test with, and not for illum[illegible]

Electric Hoist

One of the most interesting installations at the St. Clair colliery is the electric hoist, specially designed by the S. Flory Manufacturing Company, of Bangor, Penn. Fig. 1 shows the construction of this duplex motor hoist. It is of the single-band friction type, equipped with two 100-h.p. motors. The drum is made of cast-iron, turned off smooth and balanced, and revolves freely at high speed. It is loose on the drum shaft and fitted with an improved band friction, and two brake bands of the differntial type. The main brake is made of long-fiber asbestos, secured between special flanges on the drum, over which is fitted a very strong and powerful steel band. The other brake is of the usual type, lined with hardwood blocks and is used as an auxiliary. The advantage of the asbestos brake is obvious from its non-combustible qualities.

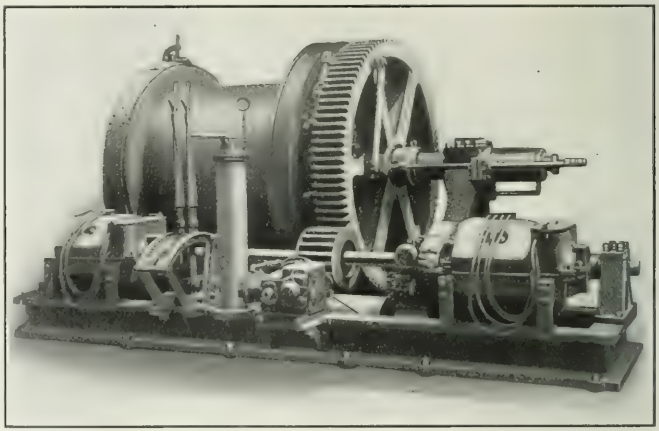


FIG. 1. FLORY ELECTRIC HOIST

The improved band friction, as snown in Fig. 1, has many admirable features. The coggle arrangement is of such form as to produce a vise-like grip on the special rim on the drum flange, and the tests to which this arrangement has been subjected have demonstrated its efficiency and durability.

The hoist here installed is equipped with a Westinghouse airbrake compressor outfit. This arrangement is simple and easy to operate; the air cylinder is secured to the housing, as shown, and the [illegible] of the lever on the compressor is sufficient to throw the friction into or out of contact. The two motors are mounted to admit the compressor equipment to be placed centrally. The two levers shown in the battery operate the brake bands, and the controller, which is not shown, is placed to the left centrally.

Power-house Equipment

The power-house equipment, shown in Figs. 2 and 3, consists of a Fort Wayne Electric Company's 290-volt dynamo; a McEwen engine, 430-h.p., 22-in. stroke; a 185-h.p. McEwen engine, with a 15-in. stroke, driving a direct-current generator of the class 6-110-280, General Electric Company. There is also a Hamilton-Corliss engine, 36-in. stroke, running 125 r.p.m., and driving a Westinghouse direct-current generator, 450 kw. The fly-wheel is 12½ ft. in diameter with a 16-in. face and weighs 20 tons.

The Lighting Unit

The unit used for lighting the entire outside colliery plant is an 85-h.p. McEwen engine, running 250 r.p.m., with a 12-in. stroke and a 12-in. bore. This machine carries a 22 per cent. overload when all the lights are on. There are more than 500 16-c.p. equivalents and 25 arc lights; some of the latter are run off the 250-volt haulage system. Lighting by electricity is depended on entirely, and for this reason it is so arranged at the

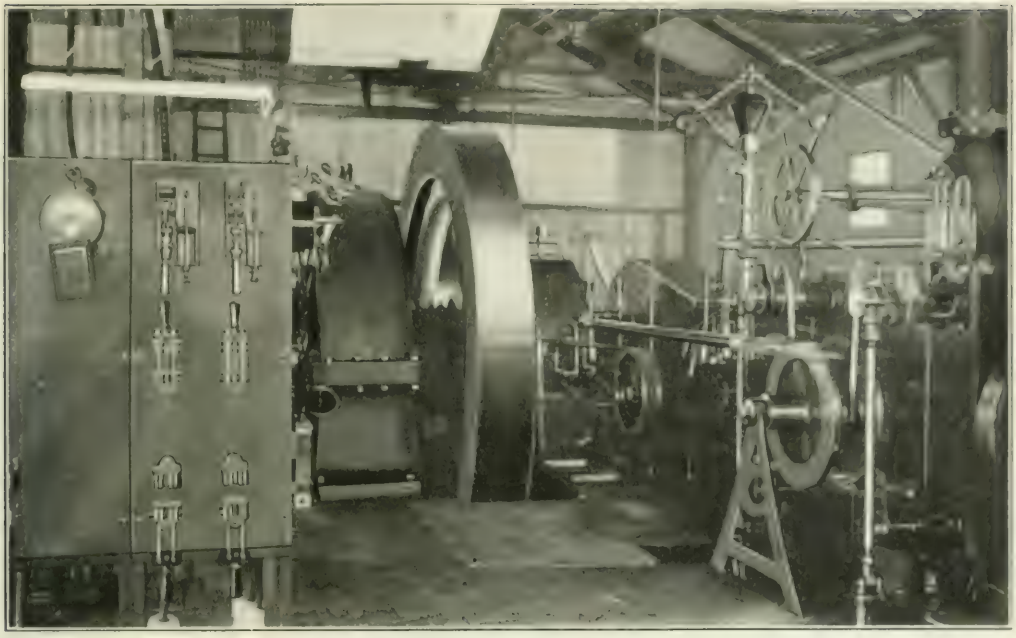


FIG. 2. THE GALVANOMETER HANDS ARE VISIBLE ON THE CABLES ABOVE THE SWITCHBOARD; THE HANDS ARE [illegible] THE RIGHT SHOWING THAT CONSIDERABLE CURRENT IS [illegible]

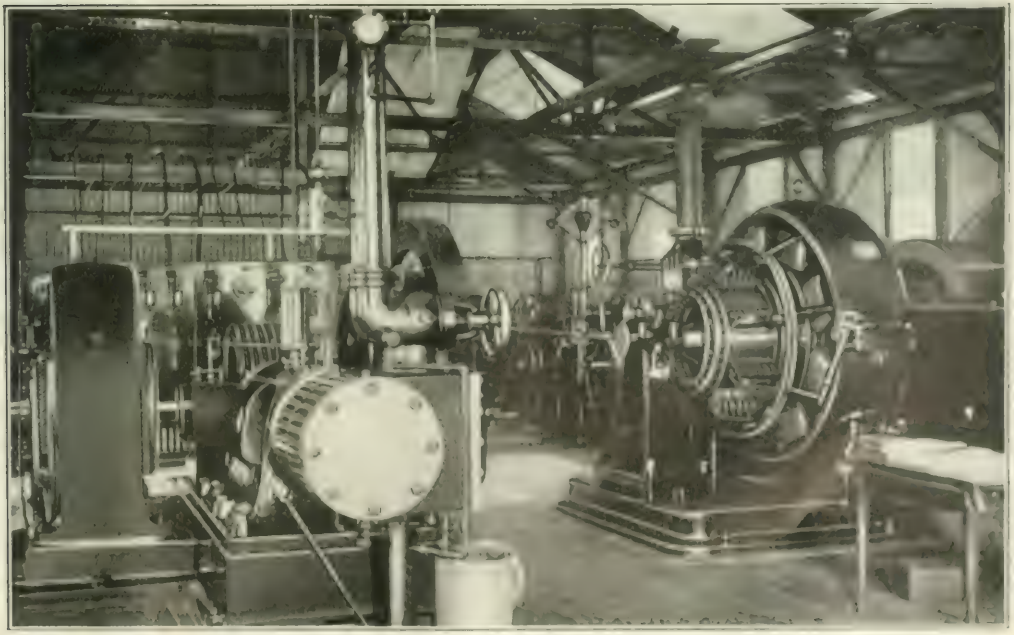


FIG. 3. [illegible]

power [illegible] to the lighting unit it is possible to change the 110-kw. 250-volt haulage unit into a 110-volt machine by short-circuiting the series winding on the machine, and then using an intermediary switch between the 250-volt switch and the 110-volt switch; fuses are placed on the underside of the switch which is connected to the underside of the 250-volt switch, while the top of the intermediary switch is connected to the top of the 110-volt switch.

If the lighting unit is put out of service a jumper is put across the series winding, and with the machine generating (having both 250-volt and 110-volt switches open) and closing the intermediary switch, the lighting circuits are gradually thrown on. It has only been necessary to do this twice in four years, but in both instances the scheme worked satisfactorily.

Signal Arrangements

A simple but rather unique arrangement is an improvised galvanometer on each circuit of the haulage system, which enables the man in charge at the power house to tell how each circuit is being used. This device consists of a piece of No. 8 bare copper, bent like an L (see *A* and *B*, Fig. 4). The long end of this copper is taped vertically on the feed wire in sight above the switchboard; a piece of thin steel ½ in. wide and 5 in. long, with a hole in the center and large enough to slip on the No. 8 wire, is also used. For this purpose corset steel or hack-saw blades can be utilized. A piece of No. 20 copper is bent so as to grip squarely the steel at points 1½ in. each side of the center hole (see *C* and *D*, Fig. 4). The steel is then magnetized on one of the poles of a dynamo and put on the copper wire about ½ in. away from the feed wire; if no current is flowing, the hand should be vertical; if the current is being used, the hand will point to the right or left, depending on which field magnetized the hand; the more current flowing through the wire, the more the hand inclines. By using this device the attendant is able to tell if one or both locomotives on one circuit are working, or if any [illegible]

Another unique and convenient arrangement is that of having the eight automatic circuit breakers connected to a large electric bell, having a constant-ring [illegible] of the circuit breaker is thrown out, the bell rings until the attendant stops it, thereby avoiding many telephone calls as to "What is the matter with the power?" for many times a circuit breaker sneaks open. The arrangement is shown in Fig. 5 and consists of having button-head bolts ½ in. in diameter on the face of the switchboard just under each breaker and 1½ in. apart. The upper button has a short lip. A piece of brass 1/16x¼x6 in. long has one end bent over for a heel to rest on the lip of the button; on the other end is riveted a piece of ¼-in. fiber with a hole in it, which the hand release of the breaker goes through. The hand release is visible on the switchboard, Fig. 2. There is a piece of 1/32x¼x3-in. copper soldered on the brass and bent to come in contact with the lower button head, when the armature of the magnet is down; this closes the bell circuit, causing the bell to ring and the circuit to open. On the back of the board a circuit of No. 16 wire is run from button to button, connected with the bell, the constant ring and the battery.

The Cable Conductors

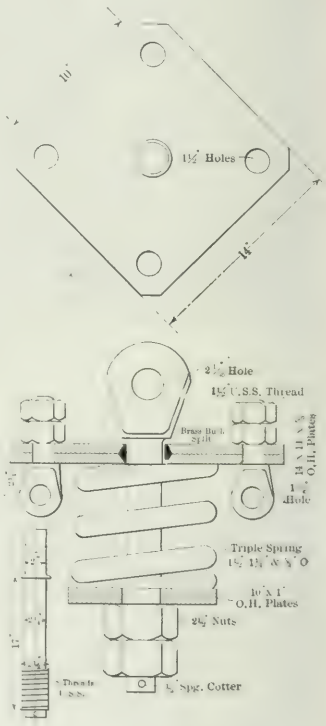
There are five circuits of different areas that go out from the power house. One cable of 400,000 circ. mils. runs 2700 ft. to the bottom of the first slope and supplies a 90-h.p. motor on an electric pump. Another cable of 900,000 circ. mils. runs 1500 ft. and branches into two 500,000 and 550,000 circ. mils. conductors, which run 3350 ft. to the bottom of an inside slope and supply a 90-h.p. electric pump and an 85-h.p. centrifugal pump. Another 900,000 circ. mils. cable runs 3400 ft. to supply the large electric hoist.

Another circuit runs 2700 ft. and supplies two 8-ton electric mine locomotives, each having trolley lines 7200 ft. and 7800 ft. long respectively. Another circuit of bare wires is run on poles 11,000 ft. from where it feeds into a trolley line 6000 ft. long, from which two feeders are run, supplying two 40-h.p. electric hoists, and an 8-ton locomotive. The further of these two hoists is 15,000 ft. from the power house. Rail return is used and at the electric pump the column pipe is used for a return. There are five return wires coming from the rails into the power house; 4/0 grooved trolley wire is used altogether.

In connection with the operation of this plant A. R. Stetler, chief electrician, to whom I am indebted for much information here given, has made a number of duty tests. One of these tests on an Aldrich electric pump is given in Table 1.

TABLE 1. DUTY TEST ON 14x12 IN. ALDRICH HORIZONTAL TRIPLEX ELECTRIC PUMP GEARED TO A C. L. 6'90-470-220 VOLT SHUNT MOTOR

Volts at Motor	Amp.	Speed of Motor	Speed of Pump, R. P. M.	Horse-Power	Area Displaced, Cu. Ft.	Gallons Displaced.	Gage Pressure Lb.	Feet in Vertical Height.	Lift of Pump. Feet.
240	30	445	40½	11.5					
244	256	567	49½	69.9	80.0	600	156	377	12
240	250	558	42½	70.1	82.1	615	156	377	12
240	245	550	42½	72.7	84.1	630	156	377	12
238	247	545	47	82.6	94.0	704	156	377	12
[illegible]	[illegible]	535	45½	80.6	100.0	750	156	377	12
229	250	397	44	75.7	85.0	637			



KING BOLT AND SADDLE PLATE FOR A 12-TON LOAD

New King-bolt and Saddle-plate

A. H. Halladay, of Spring Valley, Illinois, has designed an improved king-bolt and saddle-plate, which is now in use at five mines of the Spring Valley Coal Company. The bottom threads are the strongest part of the bolt. This is accomplished by having the area at the bottom of threads slightly larger than the body of the bolt. There are four chains fastened by clevises to each corner of the plate ready for attachment to the cage. The accompanying drawings show the details of a bolt and saddle-plate adapted for a 12-ton load.

In operating an engine plane it is important that a trip should consist of a reasonable number of cars. In practice, it rarely exceeds 30 cars, and the least grade should be 3 per cent., so as to have an average speed of about 10 miles an hour. On a good track, with empty cars in fairly good condition, the minimum grade the empty trip will run on is found to be 2¼ per cent.

Slope Sinking and Timbering

By M. S. Hawley*

Having decided upon a projected slope, the first thing to be done is to build a temporary sinking plant; this usually consists of an old engine and drum placed upon a temporary foundation of crib work loaded with rock. A rough plain house should be built over the engine and one or two tubular boilers are necessary.

The sinking must be carried on as an open cut, and the earth and stone shoveled out by hand, until the roof becomes self supporting and timber can be used to hold up the rock, which by this time has been considerably weakened from weathering. The width of sinking depends first; on the tracking plan; second, on the manner in which the slope is to be ventilated; third, on the size of cars to be handled. If the slope has a pitch less than 18 deg., a traveling-way is necessary; if the pitch is greater than 30 deg., the cars must be specially designed, so that while hoisting, the material in the cars will not be spilled. In case the slope is to have three compartments, the width should be from 16 to 24 ft., and the hight at least 7 ft. clear.

While sinking is carried on, the bottom of the slope should be kept in advance of the top, and one corner in advance of the main face to collect the water and give a loose end in blasting. The timbering and track laying are carried down with the sinking, and kept within a few feet of the face.

Timbering

Timbering a slope is in many respects similar to gangway timbering, but the joints are cut with greater care and square timber is more frequently used. On steep dips a heavy foot sill is let into the rib on each side to prevent the roadbed from slipping down the pitch. The distance between each two sets of timber depends upon the character and nature of the roof; it usually varies from 3 to 8 ft., although in some cases it is necessary to place them almost in contact with each other. The manway is often brattieed off and used as an upcast; a small fan being erected near the mouth of the slope and connecting with this by a frame airway. When the slope is driven to open up a coal seam, an independent air-way is necessary. The ventilation is maintained by cross headings connecting the slope and the air-way. Small movable pumps are used to keep the face free from water until the depth is reached at which the first lift is to be turned off. A sump is then excavated below the level of the gangway, and to one side of this, a permanent pumping plant is erected.

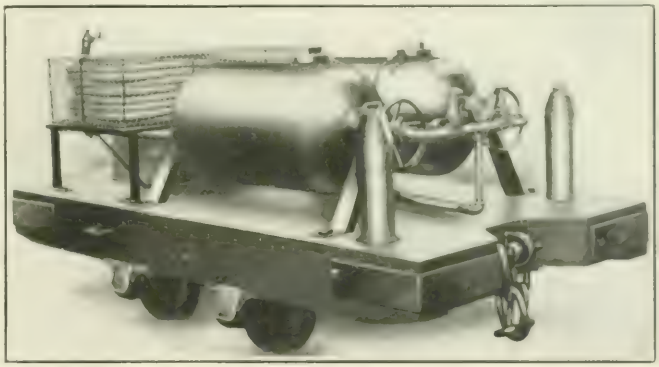
*District engineer Lehigh Coal Company, Wilkes Barre, Penn.

Costs

The cost of sinking a slope depends upon the dip, thickness and character of the seam; upon the size of the slope and the character of the roof. Under ordinary conditions, a slope 8x12 ft., including timbering, track, etc., will cost from $35 to $50 per linear yard.

Chemical Engines for Mine Fires

A number of the coal companies in the Northern basin of the Pennsylvania anthracite field have been testing the practicability and efficiency of a chemical fire engine which has been devised by A. G. Morse, of Scranton, and built specially for fighting mine fires. After completing his design Mr. Morse submitted it to the La France Engine Company, of Elmira, N. Y., who built a demonstrating engine, which has answered the test satisfactorily and will no doubt become generally popular. The apparatus as now



and practical application of the old principle of the action of chemicals upon fire as already used by the fire departments in various cities.

Two large tanks of chemicals are mounted on a mine car; the tanks are connected and work through a one-service pipe, while a hose of any required length may be attached. It is so arranged that one tank can be refilled while the other is in use, thereby giving a continuous service [illegible] a fire in this way. Moreover, it is well known that it can at least be held in check by a liberal application of chemicals. This system of fighting mine fires has a decided advantage over the use of water for the reason that when the latter is applied much steam is generated, which retards the work of the fire fighters, while with chemicals but little steam is generated and the heat readily converts the carbonic acid in the solution into gas [illegible]

Canadian Coal Lands

[illegible] of coal mining rights still vested in the [illegible] rental of $1 per acre, no applicant being allowed to lease more than 2560 acres. The leases will include mining rights only, but [illegible] at $10 per acre. Lessees must begin operations [illegible] to do so, and must produce the amount [illegible] they shall be so required to produce being [illegible] subject to cancellation in case of default. Actual settlers are entitled to [illegible] over coal they may require for their own use at the pit's mouth at a price not to exceed $1.75 per ton, and a royalty of 5c per ton is to be paid on the output in addition to the rent.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

An English authority asserts that all coal dust is explosive if pulverized enough. In this same connection it is stated that coal with conchoidal fracture is more liable to pulverization than coals with rectangular cleavage.

Good lime should slake completely in 48 hours; there are, however, some limes which contain particles that will not slake with the bulk, but will continue to absorb water after a long period, sometimes as much as two years. When lime of this sort is used on a wall or ceiling, the plaster is likely to fall off.

As a general rule where conditions are normal, it is advisable in using compressed air for haulage, pumps, drills, coal-cutting machines, etc., to have the air under high pressure. Air under low pressure requires larger pipes for its conveyance, while repairs are more difficult and expensive. Air under high pressure can be used more expansively.

Many practical mine managers claim that the plungers of mine pumps should be externally packed, giving an easy access to the stuffing boxes. This arrangement is said to be most desirable on account of the short life of the packing in such service. The water valves should be of the ball type, which gives clean waterways and insures longer life, because they continually present a different wearing surface.

When deciding on what system of haulage to use underground, it is necessary, first of all, to consider whether the workings are at all gaseous. If such is the case, the use of electricity is likely to be accompanied by considerable danger. Experience has shown that in some cases moisture and dust have penetrated through the insulator surrounding a conductor, and thus caused the wire to become alive. When this condition is true, a fall of roof is likely to cause a flash at any time.

Pumps for sinking shafts and recovering old workings which have been drowned out should be designed to be operated vertically as well as horizontally or at an angle, and should be light, portable and efficient. They should be easily handled, provided with an eye-bolt, to which can be attached a hoist for lowering them as the water is pumped and quickly raising when blasts are fired. The water end should be provided with a removable composition lining which can be replaced

In England, coal was first used in the twelfth century and was then known as sea-coal, to distinguish it from char-coal. The name was given it from the fact that most people believed coal to be a marine product, since it was gathered from the seaweed and wreckage cast up by the waves on the Northumbrian coast. Later the name was given to coal brought from over the sea. About the year 1200, the English began to dig coal for the use of smiths and lime burners. In 1281 the entire coal trade of Newcastle was about $500 per year.

In the bituminous coalfields, as a general case, the hight of the head-frame above the ground, measuring to the center of the sheave wheel, is from 34 to 50 ft. where the shaft has but one landing; the hight varies from 50 to 90 ft. for shafts landing on a trestle or bridge. If the coal is loaded on the railroad cars as run-of-mine, the hight of the tipple landing need not be more than 25 ft. If three or four sizes of coal are produced, the landing should be about 30 ft. above the ground. When coke ovens are supplied, the hight should be from 35 to 40 feet.

In the operation of compressed-air locomotives, it is best to run the compressor at uniform speed, pumping continuously into the reservoir from which the locomotive is charged. If the compressor is run only while the locomotive is being charged, an unnecessarily large compressor is required, while the wear and tear are greater and more steam and fuel are wasted. In building an air reservoir, pipe lines are preferable to stationary tanks, as the former give more charging stations at different points, besides permitting two or more locomotives to be charged at the same time in different localities.

As a general rule for the construction of tall brick chimneys, it may be stated that the thickness of the outer wall of the chimney for the first 25 ft. from the top should be one brick (8 or 9 in.); for the second 25 ft., it should be 1½ brick and so on, increasing one-half brick for each 25 ft. from the top downward. If the inside chimney diameter exceeds 5 ft., the thickness of the first 25 ft. should be 1½ brick, and the thickness of the next 25 ft. should be two bricks. If the inside diameter is under 3 ft., the first 10 ft. may be ½ brick thick. The batter should not be less than 1:36 to give stability. The inside core may be 4 in. thick for 25 ft. from the top, then 8 in. for 50 ft.

The capacity of belting to transmit power depends upon the width and thickness of the belt, the arc contact with the pulley, whether the belt is horizontal, vertical, or at an angle, and upon the speed. The greater the velocity and the thicker the belt, the more power transmitted. An inclined or vertical belt will not transmit as much power as when running horizontally, although in figuring the horse-power capacity of a belt it is usually the custom to consider only the velocity, width and thickness. For single belts, multiply the width in inches of the belt by the speed in feet per minute, and divide this result by 1000; the quotient will be the horse-power. For double belts, multiply the width by the speed and divide by 700 to get the horse-power.

The advantages of oil over coal, coke or wood as a fuel, may be summarized as follows: A petroleum fire can be controlled by one man of ordinary intelligence by the mere turning of a valve, the fire can be increased or decreased at will, and steam can be maintained at any desired pressure. The heat generated by a petroleum fire is much more uniform than that produced by coal or wood. Roughly speaking, 1 lb. of oil evaporates about 18 lb. of water at 212 deg. Fahr. as against 7.5 lb. of water for average quality of coal. Economy in labor, cleanliness, and a complete combustion of oil are secured. The absence of sulphur in the oil makes its effect on the flues less destructive than coal; the flues remain cleaner and in better condition to absorb heat. Oil has no ash or refuse and requires less space than coal for combustion.

The amount of foreign matter brought into steam boilers is considerable. A 100-h.p. boiler uses on an average, about 1.5 tons of water per hour, or about 400 tons per month, steaming 10 hours per day. With water as pure as that from the Croton dam near New York, the boiler receives 90 lb. of mineral matter per month. In many instances where spring water is used, a ton of mineral matter is deposited per month. It has been estimated that hard scale, 1/16 of an inch in thickness, on the heating surface of a boiler, will cause a loss of about one-eighth of the boiler efficiency; the waste increases with the square of the thickness of the scale. Water containing more than five parts in 100,000 of free sulphuric or nitric acid is liable to cause serious corrosion of the boiler, as well as the pipes, cylinders, piston, and valves of engines and pumps.

A Move against the Anthracite Coal Roads

A [illegible] in the United States Circuit Court in [illegible] certain railroads in New York and Pennsylvania and the leading anthracite coal companies.

An official statement given out by the Department of Justice says that the petition is "aimed at the anthracite coal monopoly," and goes on as follows:

"The Reading Company, a holding corporation; the Philadelphia and Reading Company, the Lehigh Valley Railroad Company, the Delaware, Lackawanna and Western Railroad Company, the Central Railroad of New Jersey, the Erie Company, and the New York, Susquehanna & Western Railroad Company, comprising all the railroads that tap the anthracite regions, save the Pennsylvania, the New York, Ontario & Western and the Delaware & Hudson (which last does not extend to tidewater), are made defendants, together with their subsidiary coal mining companies. As yet no evidence of sufficient probative force to connect the three last named railroads with the alleged unlawful combination and monopoly has been found. Should such evidence be forthcoming in the progress of the trial they may and of course will be joined with the other defendants.

"In brief, the petition recites that the defendant railroads control all the means of transportation between the anthracite mines and tidewater, except the lines of the Pennsylvania Railroad and the New York, Ontario & Western Railroad, which have only a limited number of collieries; that they transport annually at least 78 per cent. of the total anthracite tonnage; that in their own name or through coal companies whose capital stock they own they control about 90 per cent. of all the anthracite deposits and produce about 75 per cent. of the annual supply; that independent operators, although owning probably little more than 5 per cent. of the anthracite deposits, yet produce about 20 per cent. of the annual supply, which would be sold in competition with the output of the defendants were it not for the restraints imposed by the latter.

"The petition then charges that the defendants have conspired to silence competition among themselves in the transportation and sale of coal and to prevent the sale of the independent output in competition with their own, thereby establishing a monopoly, and in support of this general allegation it specifies:

"(*a*) That the defendant railroads agreed among themselves upon a uniform contract to be entered into by them or their coal companies with the independent operators along their respective lines under which the railroads would be able to control the sale of the independent output, and that by virtue of their control of all [illegible] of the Pennsylvania company and the New York, Ontario & Western Railway Company [illegible] force and practically did force the independent operators along their lines into making these contracts.

"(*b*) That the Erie Railroad Company has exchanged shares of its own capital stock for a majority of the shares of the New York, Susquehanna & Western Railroad Company, a competing line, thereby uniting under a common source of control the two competing railroad companies and their subsidiary coal companies.

"(*c*) That the Reading company, which already held all the shares of the Philadelphia & Reading Company, has exchanged its own shares and bonds for a majority of the shares of the Central Railroad Company of New Jersey, a competing line, thereby uniting under a common source of control the two competing railroads, and their subsidiary coal companies, which together transport about 35 per cent. of the annual anthracite tonnage and control about 60 per cent. of the anthracite deposits.

"(*d*) That twice in recent years the defendants have defeated the construction of projected independent railroads from the mines to tidewater which would not only have introduced competition into the transportation of anthracite coal but would have permitted the output of the independent operators to be sold in the markets in competition with that of the defendants.

"The petition prays generally that the defendants be enjoined from further carrying out their combination, and specifically that the above described contracts be canceled and that the mergers between the Erie Railroad Company and the New York, Susquehanna & Western Railroad Company and their coal companies and between the Philadelphia & Reading Railroad Company, and the Central Railroad Company of New Jersey and their coal companies be dissolved."

A deposit of glass sand of remarkable purity is reported from the Arbuckle mountains, Oklahoma, by Prof. C. N. Gould, the geologist of the State University at Norman. The material which was analyzed in the university laboratories [illegible] in southern Kansas obtained the greater part of their sand from Illinois. The deposit [illegible] miles of the recently developed gas fields of Oklahoma. This fact is of more economic importance [illegible] should become one of the [illegible]

Aerial Tramway of the Famatina Mines, Argentine

[illegible] the most elevated railway plant of the [illegible] has a steam engine ever been erected at [illegible] sented unusual difficulties.

[illegible] terial, but must deal with general traffic. Not only is the ore brought down from the hights to the railway and the smelting works, but all building material for the mines and the necessaries of life for the workmen must also be carried up. It is also employed for carrying the mails and the officials even use it for passenger traffic.

The introduction of this plant, with a capacity of 40 tons down traffic and about 20 tons up traffic, reduced the cost of transport from about 50s. per ton to about a tenth of this sum. Other Bleichert ropeways have been erected at neighboring mines in Argentina and also in Chile. Similar conditions prevail in Japan, where the same firm has also built [illegible] in mountainous regions. These are several kilometres long, with considerable differences in level, and have spans of [illegible]

The Price of Cadmium

The world's supply of cadmium is de[illegible] smelters produce it as a by-product. The [illegible] which are guaranteed to be 99.5 per cent. [illegible] to the [illegible]

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The Haywood Trial

Public attention is centered upon the trial which is now going on at Boise, Idaho. It is not merely, Moyer, Haywood and Pettibone who are at the bar, but also the Western Federation of Miners as an organization. The latter comprises many honest, hard-working miners, to whom assassination is as repulsive as it is to other civilized persons, but they have permitted themselves to be led by men of the type who are now on trial for their lives, and if it be proved that they are guilty of the fearful crimes with which they are charged, not only they but also the whole organization will bear the odium. Orchard's amazing confession discloses a record of cold-blooded crime that is without parallel. It is so extraordinary that the judgment of public opinion is properly reserved until it be supported by satisfactory confirmatory evidence. There is no question as to the fairness with which the trial at Boise is being conducted. That is admitted by the partisans of the labor unions which have united in the defense of the prisoners at the bar.

The Haywood trial is distinctly a mining case, in which the names of important mines and well known mining men figure prominently. It is a matter of history that during the last 20 years there has been a succession of outrages against life and property in many mining districts of the country west of the Rocky mountains. Beginning at Butte, the trail of maltreatment, assassination, and incendiarism led through the Cœur d'Alenes, Cripple Creek, Leadville, Telluride, and finally to Goldfield, which has been the focus of the latest disorder. Whether or not these crimes are due to the direct instigation of the Western Federation of Miners, or have been committed with its connivance, the present trial will serve, as nothing else would, to direct public attention to this festering sore; and if the Western Federation of Miners passes through the present trial with clean skirts, it will nevertheless be compelled to use its influence to quell the turbulence that has existed among its adherents, and render life and property as secure in the mining districts as they are elsewhere.

In the face of the charges that are made by the State of Idaho, which are supported by the appalling testimony of Orchard, it is a great descent from the crucial to the comparatively petty to refer to minor crimes that have been disclosed. However, Orchard's testimony as to the practice of "high grading" throws an interesting side-light upon that evil of mining in the West. If the Western Federation of Miners is ever to regain esteem, it must use its influence to put down that crime against property as well as the crimes of violence.

Some of the Present Problems in Coal Mining

Never in the history of coal mining has there been such earnest endeavor to solve the many difficult problems that confront the operators, managers and engineers of collieries as at the present time, when the demands of great industrial activity strain efforts to the utmost, while competition is still so keen as to keep attention fixed upon all possible improvements and economies. In general, the development and operation of coal mines is the most dangerous branch of the mining industry, this condition being due principally to the inflammability of coal dust, the presence of dangerous gases, and the generally unsafe nature of the overlying strata that act as the supporting roof. In its endeavor to assist the coal-mining industry, the JOURNAL is attempting to secure the coöperation of colliery managers and engineers in an effort to eliminate the ignorance and uncertainty with which so many of the more common phases of mining are attended.

Some of the more important problems whose urgent solution can be furthered by a discussion by those whose practical experience enables them to give evidence and valuable opinion are as follows:

1. What is the cause of the upheaval of bottom in a coal mine? (Some claim occluded gas, some say reservoirs of contained water, other say simply pressure of overlying strata.)

2. Will coal dust cause an explosion in the absence of gas?

3. Is there any definite relationship between atmospheric pressure and outflows of gas into mine workings? If there is, what precautions should be taken to reduce the dangers brought on by atmospheric changes?

4. What is the advisability of having specially appointed shot firers? What has been the result of the legislative action in that direction in certain States?

5. Should there not be laws limiting the

use of explosives [illegible] that have been officially examined and placed on a permitted list?

6. Is it the better plan to have the miners set their own preps, or to employ a corps of experienced men to set props?

7. Why does West Virginia produce more coal per man employed than any other State? Why does Ohio produce the least tonnage per man, while at the same time it produces the largest percentage of machine-mined coal?

8. What is the [illegible] in certain localities, whereby day men (track-layers, drivers, timbermen, etc.) are paid according to the tonnage produced in the district where they work?

9. What connection is there between periods of seismic disturbance and coal-mine explosions?

The above are some of the live questions of the day. They are worthy of careful attention on the part of colliery engineers, and a discussion which will tend to elucidate the points upon which definite conclusions cannot be immediately formulated. Our columns are open to such discussions. We hope that our readers will offer their views.

Prospecting in the Joplin District

The question that is most often asked in the Joplin district (it is not an unusual question in other mining districts) is where may ore be found? There is but one way to answer it. Drill for it. Twenty years ago there was no ore (at least, that was the opinion then) on the Lyon-Dougherty land, in Richland valley, southeast of Webb City. Recent drill prospecting has demonstrated some of the richest deposits found in the valley underlying the lime that in former years was believed to shut out the possibility of ore. In those days there was no ore known to exist under the lime. However, the ore is there today, and must have been there 20 years ago. But even if it had been known to exist under 120 to 140 ft. of lime no one then would have thought of sinking for it. The miner would have been foolish to sink through that much lime when zinc ore was worth only $12 to $16 per ton. It could not have been mined at a profit; so why sink for it, or even drill for it? Only 11 years ago it was thought that if zinc ore ever reached $30 per ton, it would bring an era of great prosperity to the Joplin district, and it did [illegible] point inside of three years, reaching $55 per ton in April, 1899, receding again to $35 the following year. Since then zinc ore advanced by easy stages to the present high plane, and today it is conceded that ore cannot be mined at a profit for less than $40 per ton in the "sheet ground" section of the district. Actual mining confined to the "sheet ground" alone is of recent origin. The Yellow Dog mine is in reality the first to demonstrate that the sheet vein would produce profits. The question of where ore may be found is answerable at the point of the drill. In the language of the old miner "the ore is where the ore is, and that is where the ore is."

The Price of Antimony

The recent decline in the value of antimony has been as spectacular in its rapidity and extent as was the advance. In January, 1907, ordinary brands were quoted at 24¼c., and a few weeks ago this metal was worth 23c. per pound. Since then there has been a steady decline; this week the price has dropped to 12@13 cents.

The chief reason for this remarkable decline is the increase in the supply, stimulated by the high range of price throughout 1906. For example, the United States, which did not produce any antimony ore at all in 1905, produced about 295 tons in 1906, while New Brunswick also became a producer again. Other countries made far greater increases, particularly China, Chile and Australia. The imports of antimony ore into Great Britain in 1906 amounted to 8443 long tons, against only 2482 tons in 1905; while the imports of regulus and crude metal in 1906 were 5153 tons, against 3481 tons in 1905. It is needless to look further to account for the recent decline in the value of the metal. However, it may be remarked that some dealers apparently misunderstood the condition of the market and accumulated rather large stocks of material, which recently have not been easily salable. It is an interesting feature that during the recent great demand for antimonial lead the shortage in the supply of that product was such that one concern, at least, bought antimony ore and smelted it with lead ore in order to produce antimonial lead [illegible]

Mining in the Philippines

[illegible] rule, it was said, had revealed promising [illegible] the large unexplored areas of the islands [illegible] a mining department was organized and [illegible] as the limited means assigned to it permitted. [illegible] the results have been creditable to those in charge. So far it has revealed the existence of coal and iron ore in considerable quantities, but the copper deposits of Luzon have not yet been reached. Some work has been done in the districts where gold was said to exist, and this work has been supplemented, in Masbate and elsewhere, by a number of American prospectors, who have engaged in the search for the precious metals.

It cannot be said, as yet, that the indications point to the Philippines as a great mining country of the future. Enough has been found, however, to show that further explorations are warranted, and that it is quite possible that a mining industry of respectable proportions may grow up in the future. For this purpose capital and intelligent direction will be needed. The former supplied, the latter can be found without difficulty. So far, however, American capital has been very slow in finding its way to the East, and little has been done to overcome the general ignorance of the possibilities there [illegible]

[illegible] which caused much unfavorable anticipa- [illegible] mines of the district are now working on [illegible] be the result, and it is gratifying to note [illegible]

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Utilization of Black Sand

I have read the editorial on the "Utilization of Black Sands," which appeared in the JOURNAL of April 13, 1907. This editorial contains matter which is news to us on the Pacific coast, and who claim to know something of conditions as they exist. You state that "there are many places on the Pacific coast where black sand exists in large quantities." I should be pleased to have one of the places indicated, that is, where the black sand is found in large concentrated bodies. Your correspondent also states that "one place is so attractive that I have located two miles of it. In another place I found a six-inch streak for two miles which averages 13 oz. of gold per ton, together with some platinum."

However, I am open to conviction and will make a personal examination of any large deposits of concentrated sand that may be specifically mentioned. It is to the interest of the Pacific coast to develop our mineral deposits, and I for one would be glad to assist in their development by giving proper publicity, etc.; but there has been so much misrepresentation on the black-sand subject by companies organized for the purpose of fleecing the public, and as this department has thoroughly investigated the subject in California, and I have made personal investigation outside of this State and could find no workable deposits, I thought best to call the matter to your attention.

I desire to call your attention to Bulletin No. 45 of the California State Mining Bureau on "Auriferous Black Sands of California," in which will be found matter pertaining to this subject which I trust will prove satisfactory.

[illegible]
State Mineralogist.

[illegible] Mar. 15, 1907.

Our statement as to the existence of black sand in large quantity on the Pacific Coast was based partly on information that has been published by the U. S. Geological Survey, and partly on private information that we consider equally authoritative. We have already published [illegible] paper, and if Mr. Aubury will refer to previous issues of the JOURNAL he will [illegible] various misrepresentations that have been [illegible] and have corrected them by statements of the facts and conservative opinions. On the other hand we have warmly recognized the promise of valuable commercial results from the investigation inaugurated by the Geological Survey, which is evidenced by the fact of an already increased production of platinum from this source. Our information on this point is based on reports of persons who are producing the platinum—not as companies which have stock to sell, but as private producers for the sake of the profit in securing and selling platinum. It is well-known that the Geological Survey considers that the black sands of the Pacific Coast are of promise not merely as sources of platinum, but also as sources of iron ore, which of course is evidence as to its opinion as to the quantity available. However, we have several times called attention to the diffuseness of many of the beach deposits and the engineering problems involved in the collection of the sand, a subject not entered into in the report of the commission of the Geological Survey, on which there have been several interesting communications published recently in the JOURNAL. With respect to occurrences of black sand on the Pacific Coast, we are permitted to quote from a recent letter from Dr. David T. Day, as follows:

"In regard to the location of gravels particularly rich in black sand, there is a long continuous range of low mountains extending from the southern end of Trinity county up through Del Norte and taking in part of Siskiyou, California, and on into Coos and Curry, Josephine and Jackson counties, Oregon. This ridge is made up largely of serpentine. The Pacific beaches which are made from the wash from this serpentine are very heavy and black, contain much chrome iron ore (as shown usually in the wash from such serpentine ridges), much magnetite, and some gold and platinum. The Coos and Curry county beaches have been good hunting grounds for platinum. These beach sands are black sands straight. Frequently the beach has been elevated; frequently 50 or 60 ft, occasionally several hundred feet, and sections of these hills show alternating layers of black and light sand. In addition to the mining on the present beach itself, the Sixes mine, in Curry county, Oregon, near Denmark, and various other placer mines, have been worked in these old elevated beaches. The elevated beach on Leonard's place, at Aptos, Monterey bay, is another good example of a solid black sand layer.

"Away from the beach, black sands are simply accumulations of placer mining, usually small in amount, except where the wash comes from such serpentine ridges as the one spoken of, or from the serpentine ridge in Butte and Plumas counties, where the proportion of black sand leads to an inordinate amount, and discourages placer mining. No one therefore, looks for black sands occurring naturally, away from the beaches, but considers simply what percentage of black sand a given gravel will yield. Where the black sands reach a considerable proportion mining has been abandoned in a great many places. This is true of the Trinity and Klamath rivers, and Old Cherokee, Butte county, Cal., and particularly in Josephine and Jackson counties, Oregon. Here there are many placer properties in a rather wild, undeveloped country, which have been neglected because of the considerable amount of black sand which they contain. Before any one is going to develop these formerly objectionable placers, they must be encouraged by the successful use of such concentrating machinery as we have recommended in utilizing the black sands thrown away by the present miners.

"The important future of this work seems to be that companies (one or two now operating) will buy up the small batches of black sand, and as the saving of black sand thus gradually becomes an object to the placer miner, the extension of placer mining to the gravels where the black sand was formerly a nuisance, will become an important feature in placer mining in California. If you will take up tables on pp. 6 to 48 and figure the amount of black sand which can be obtained by dredging and hydraulicking on many of the samples there mentioned, you will see that the aggregate is very great, although widely scattered."

Among the places we had in mind in making the statement in our editorial of April 13, to which Mr. Aubury refers, was the mouths of certain rivers, including the Columbia, as to which we have had affirmative reports from several sources. Referring to this, we may quote from another letter from Dr. Day, as follows:

"It is well to insist upon the very evident distinction between the *small* batches of heavy sands obtained in placer-mining operations in the interior regions of California, Oregon and Idaho, as contrasted with the low-grade black sands in *very large* quantities constituting great patches on the Pacific sea beaches. These patches are particularly large, and the sands particularly rich in magnetic iron ore at the

[illegible] Gray Harbor, both on the north and south shores, the proportion of magnetic iron ore is high—on the north shore frequently [illegible] large scale. At the mouth of the Columbia river we examined five carloads, all of which showed over 30 per cent. magnetite. Equally high [illegible] various points on the Coos and Curry county beaches of Oregon, and a particularly inviting deposit is characteristic of an elevated beach some 60 ft. above tide in the outskirts of the village of Aptos, on Monterey bay, Cal. This elevated beach is of very great extent. Naturally the sands which we selected from these beaches were most frequently concentrates and containing more magnetite than the average beach sand, a selection which it is perfectly legitimate for the operator to carry out. Nevertheless, taking into consideration these concentrates and all others examined by us on the reach to the extent of more than 60 samples altogether, the average of those examined (not the average of the beach for the reason above stated) from Cape Flattery to San Diego, showed 12 per cent. magnetic iron. The large amount of material thus represented (and considering the fact that these iron ores characterize repeated strata to a depth of 400 ft. at least in one locality), cannot be overlooked as a supply of iron for the Pacific Coast, provided the *quality* of the magnetite is favorable. In determining this it should be noted that at the mouth of the Columbia river (where 33 per cent. of magnetite was found at Hammond for example) we also found 17 per cent. of ilmenite (titanic iron ore). This was easily separable by ordinary magnetic concentration, but the examination of the grains of magnetite as separated by a magnetic separator also usually showed titanium. In fact, at this locality, after passing the magnetite repeatedly over the magnetic separator, the magnetite still contained 5 per cent. of titanium. . . . The press comments made previous to our report, have extended far beyond any intention of ours, but in so far as they have awakened interest on the Pacific coast to supplies of iron which Birkinbine and others have already predicted, they must be taken into consideration in the future, and these newspaper reports also must be looked upon as helpful rather than detrimental to the interests of the West."

The Cost of Oil Burned in Wolf Safety Lamp

On page 960 of May 18, 1907, issue of the JOURNAL there is an article on the Wolf safety lamp by L. H. Hodgson. Near the end of the article is an evident error. The article states that a 5/8-in flat wick while burning nine hours will consume 1088 drams [illegible] with naphtha at 14c. per gal., it states that of five shifts, and that with a round wick this cost is reduced to 74c per lamp for five shifts.

I do not understand how 1088 drams [illegible] only 14c. S. J. OETTINGER.

New York, May 16, 1907.

The omission of decimal points before the figures 92 and 72 is the cause of this apparent rise in the cost of naphtha. The figures should have read 0.92c. and 0.74c., respectively.

Iron and Steel in Great Britain

The British production of [illegible] steel has been heretofore reported. The production of wrought or puddled iron is now given by the British Iron Trade Association at 938,558 long tons in 1905 and [illegible] tons. The number of puddling furnaces in existence in 1906 was 1536, of which about 1275 were in operation.

The estimated consumption of iron ore in Great Britain for the year was as follows, in long tons:

	[illegible]	[illegible]	[illegible]
British production	[illegible]	[illegible]	[illegible]
Iron ore imported	[illegible]	[illegible]	[illegible]
Pyrites refuse	[illegible]	[illegible]	[illegible]
Total supplies	[illegible]	[illegible]	[illegible]
Exports	[illegible]	[illegible]	[illegible]
Ore used	[illegible]	[illegible]	[illegible]
Ave. per ton of pig	[illegible]	[illegible]	[illegible]

The exports are insignificant. The chief source of imports is Spain, which furnished 5,949,361 tons in 1906, or 76 per cent. of the total.

Imports of manganese ore were 238,700 tons in 1905 and 338,423 tons in 1906, an [illegible]

Unusual Feat in Transportation

The Elwood Tinworkers Gold Mining Company, of Elwood, Indiana, a few months ago contracted for the construction of an aërial tramway from Camborne, Fish River camp, northern Lardeau, B. C., to its Silver Dollar mining property, situated six miles from Camborne. The construction of this ropeway involved considerable difficulty, since the only way of communication between town and mine was by packhorse up a mountain trail, in places rough and steep. Much trouble had already been experienced in getting up to the mine an air compressor and machinery for a stamp mill. However, E. J. Branford & Co., a local freighting firm, undertook to deliver the tramway cables at their respective destinations, the lower and upper terminals. The following will give an idea of the undertaking.

This firm first conveyed on nine packhorses about six miles up the trail to the site of the upper terminal, the altitude of [illegible] on 20 horses, also to the [illegible] taken to the upper [illegible] The sixth day's work was the delivery at the lower terminal of 3400 ft. of 1¼-in [illegible] horses. On the last day a pack train [illegible] cable, weighing 7600 lb., to the upper terminal. All these cables were delivered in [illegible]

The Geological Survey's Confidential Information

The employees of the United States Geological Survey are apt, in the course of their work, to become possessed of [illegible] have been acquired had they not been engaged in such work. This is particularly true of geologists who make investigations [illegible] Property owners usually communicate freely all the geological facts in their possession to the engineering geologist, [illegible] will not be published by the geologist without the consent of the proper parties, except as a basis for conclusions and generalizations.

Those who have their property examined by officers of the Geological Survey will be interested to know that all scientific employees of the Geological Survey are requested to sign an agreement, in which the geologist pledges himself to bear in mind the fact that his position may enable him to learn facts that are not known to the general public, and that when such facts are of a confidential nature he will refrain from any mention of them that would tend to violate such confidence. He further pledges himself not to testify in any [illegible] the United States [illegible] expert in [illegible] with respect to the United States [illegible]

New Publications

The Cornish Tin-mining Manual. By H. A. H. Russell. Pp. 65, with map. 3¼x7 in.; cloth, 1 shilling. London, 1907: Effingham Wilson.

[illegible] By Bernhard Neumann. Pp. 176; illustrated. 6½x9½ in.; paper, 7 marks. Halle a. S., Wilhelm Knapp.

Design of a Railway Bridge Pier. By Charles Derleth. Pp. 24; illustrated. 7x10 in.; paper, 50 cents. New York, 1907: Engineering News Publishing Company.

Annual Report of the Department of Mines, New South Wales for the Year 1906. Pp. 195; illustrated. 8x13 in.; paper. Sydney, N. S. W., 1907: William A. Gullick, Government Printer.

The Underground Water Resources of Alabama. By Eugene A. Smith. Prepared in coöperation with the United States Geological Survey. Pp. 388; illustrated. 6x9 in.; cloth. Montgomery, Ala., 1907: Geological Survey of Alabama.

Investigations of Kerosene Oils and Gasolenes. By E. J. Babcock. School of Mines Bulletin, University of North Dakota. Pp. 15. 6x9 in.; paper. Grand Forks, N. D., 1907; School of Mines, University of North Dakota.

Census of Manufactures: 1905. Electrical Machinery, Apparatus and Supplies. Bulletin 73, Dept. of Commerce and Labor, Bureau of the Census. Pp. 73; illustrated. 9x12 in.; paper. Washington, 1907: Government Printing Office.

Report on the Experiments Made at Sault Ste. Marie, Ont., Under Government Auspices, in the Smelting of Canadian Iron Ores by the Electro-thermic Process. By Eugene Haanel, Superintendent of Mines. Pp. 149; illustrated. 6½x10 in.; paper. Ottawa, Ont., 1907: Mines Branch, Department of the Interior.

Maryland Geological Survey. Report on the Physical Features of St. Mary's County. By G. B. Shattuck, B. L. Miller, J. A. Bonsteel, C. F. Von Hermann, N. C. Grover and L. A. Bauer and C. D Mell. Accompanied by large scale topographical and geological maps. Pp 209; illustrated. 6½x10 in.; cloth. Baltimore, 1907: [illegible]

Power Transmitting Machinery. Catalog B of the Geo. V. Cresson Company. Pp. 340; 8x9½ in.; cloth. Geo. V. Cresson Company, Philadelphia [illegible]

This volume is the regular descriptive catalog of this manufacturer of transmission of reference, for it contains quantities of standard information of value to the engineer and millman.

Annual Report of the Department of Mines, New South Wales, for the Year 1906. Pp. 195; 8x13 in.; paper. Sydney, N. S. W., 1907. William Applegate Gulick, Government Printer.

This is more than the conventional annual collection of statistics. It contains in addition to full data concerning production and the state of the industry, a mass of information valuable to those interested in mining. Notes and matters of use to the practical miner range in character from instructions for prospecting and acquiring titles to an explanation of the rules for the installation and use of electric current underground.

Message of the President on the Panama Canal, communicated to the two Houses of Congress December 17, 1906. Pp. 29; 9½x11½ in., with map, and ornamental binding. With compliments of The Bucyrus Company, South Milwaukee, Wis.

This beautifully printed and illustrated publication is issued by the company which has furnished all the steam shovels ordered by the Isthmian Canal Commission up to the date of issue, May 1, 1907. It contains the text of the President's message in full, and the only advertising matter is found in the full-page illustrations of scenes along the canal, in which Bucyrus machinery figures naturally and properly. As an example of art in advertising it has seldom been surpassed.

Open-hearth Steel Castings. By W. M. Carr Pp 118; illustrated 5¼x7½ in.; cloth, $1.50. Cleveland, Ohio, 1907: Penton Publishing Company.

Contents. Melting stock for acid practice. Fuels and alloys. Molding materials. Materials for basic practice. Open-hearth furnace construction. Fuels and accessories. Manipulation of heats in acid practice. Manipulation of heats in basic practice. Order of charging. Melting. Charging cold stock. Chemical analyses and physical tests. Relation between composition and physical properties. Blow holes in steel castings. Discussion of the causes of cracks in steel castings. Heat treatment and annealing. Repair of steel castings with thermit. Cost of equipment for open-hearth steel foundries.

Arrangements are reported to have been made for working the deposit of asbestos in the Minusisk district, near the village of Battenei, Siberia. The deposit is reported to be rich, and all the local conditions favor its development. It lies in the midst of a populous district about 10 to 15 versts from the Yenissei river. This will be the first asbestos enterprise established in Siberia, although Russia proper has been a producer of asbestos for

Carbonado in Brazil

Albert R. Morawetz, American consul at Bahia, Brazil, reports that the firms engaged in the business of purchasing carbons at that place either are branches of French houses or they ship to firms in London and Paris on joint account. Carbons are not brought to Bahia for sale, but are bought in the interior of Brazil by agents of the dealers, the latter advancing to the former large amounts of money at the several places in the producing districts.

There are no companies engaged in mining or searching for carbons, that work being done by the natives, individually or in small parties working together. Prices are not controlled by any trust, but are governed by supply and demand and are subject to frequent changes. The carbon region begins about 2½ miles from Bahia and can be reached in four days, viz: Bahia to Cachoera, 45 miles by water, one day; Cachoera to Bandeira de Mello, 158 miles by rail, one day; thence to Andarahy, 64 miles, on mule back, two days.

Owing to the facilities with which carbons can be smuggled out of the country, exporters are compelled to pay a tax for doing business, as follows: Firms exporting up to $150,000 annually, $1500; exporting above $150,000, $3000 In addition to this tax there is an export duty of 7 per cent. ad valorem.

Mining Stock "Sucker Lists"

The Journal recently called attention to the fact that the sellers of fake mining stock make use of lists of names similar to the "sucker lists" used in the patent medicine business. A law suit tried in New York recently brought out the fact that the collection of these names of the gullible has grown to be a well defined industry.

The method of the collection of names is to buy a small block of stock in a mining company, legitimate or otherwise, and then, being a shareholder, to demand the right to examine the stock books and obtain extracts under section 53 of the New York corporation law. This section provides that the books of all foreign stock corporation doing business in the State shall be open to the inspection of stockholders. The law also provides a penalty of $250 against the corporation and another against the officer making the denial, in case the right to examine the books is denied.

The right to make extracts gives an opportunity to copy the list of names. The law sets the limit of three hours for the examination of the books, but in that time it is possible to copy a list of names that, it is said, will bring $100 or more in the market.

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

J. H. Williams, of Oaxaca, Mexico, is visiting New York.

Allen H. Rogers has returned to New York from a six months trip to South America.

J. P. Hutchins, mining engineer, of New York, has been visiting Washington on professional business.

H. F. Fay, president of the Centennial and the Allouez mines, is at Lake, inspecting the properties.

W. H. Horton, of Providence, R. I., has been looking after mining interests near Central City, Colo.

Albert Fries, of New York, president of the Richmond-Eureka Mining Company, sailed June 1 for Europe.

William Busby, president of the Great Western Coal Company, McAlester, I. T., is in the East on business.

C. S. Desch, operator in the Silver Plume, Colo., district, has gone to Baltimore, Md., on mining business.

Horace V. Winchell, chief geologist for the Great Northern Railroad Company, is spending a few days in Butte, Mont.

Frederick Hobart, associate editor of the JOURNAL, was married June 12 to Miss Charlotte A. Clarke, of Brooklyn.

W. E. Thorne, mining engineer, East Auburn, Cal., has been appointed field assistant to the State mineralogist of California.

R. H. Allen, engineer for the Sierra Plata Mining Company, Parral, Mexico, passed through New York on his way to Boston.

Sewell Truax is now manager and consulting engineer for the Granadena Mining Company, Santa Barbara, Chihuahua, Mexico.

Dwight E. Woodbridge, mining engineer, of Duluth, Minn., is visiting the west coast of Mexico on professional business.

Carl Scholz, president of the Rock Island Coal Company, Chicago, is inspecting the mines of the company in Indian Territory.

W. Loach, manager of the Boulder County mine, Cardinal, Colo., has returned from an extended trip to Nevada and California points.

Dr. Franklin R. Carpenter, of Denver, returned there from Copper Mountain district, Wyoming, and is at present in southern Mexico on professional business.

R. H. Channing, general manager of the Cerro de Pasco Mining Company, of Peru, returned to New York this week on business in connection with his company.

Dr. J. Bonsall Porter, professor of mining at McGill University, Montreal, spent two or three days at Victoria, B. C., toward the end of May, before returning East.

A. A. Hassan, consulting engineer of New York, has gone to examine the mines at Cobalt and will embody the result of his researches in a book.

Hudson H. Nicholson passed through Denver on his way from Chicago to Goldfield, Nevada, after making a short professional trip to Boulder county.

H. E. Collbran, of Seoul, Korea, a graduate of the Colorado School of Mines, is in Colorado for the summer months, being in charge of valuable mining interests in Korea for Americans.

Frank Klepetko, consulting mining engineer, of New York, has opened an office at Lima, Peru, which will be his headquarters for some time to come. He expects to visit New York about Sept. 1.

Professors L. C. Hodson and T. A. Williams, of the Iowa State College, with about 15 students, are spending a couple of weeks at Idaho Springs, and will thence proceed to Pueblo, Cripple Creek, and Leadville.

William S. Mann, formerly cyanide manager for the Montezuma Mines, Inc., at Miramar, Costa Rica, Central America, has resigned to accept the management of the Boston & Oaxaca mines, Tlacolulu, Oaxaca, Mexico.

F. F. Sharpless, mining engineer, of New York, is examining mines near Silver City, Idaho. After the completion of this work he will go to Denver, and probably will return to New York in the course of four or five weeks.

R. A. Wood and T. M. Thackwaite, mining engineers, of London, England, are in Cobalt, inspecting the property of England's Premier Cobalt Mining Company and the Badger location, recently acquired by British capitalists.

John C. Brydon, who recently resigned as general manager of the Davis Coal and Coke Company, has been appointed vice-president of the West Kentucky Company, an affiliated corporation of the North American Coal Company.

Dr. Alfred Stansfield, professor of metallurgy at McGill University, Montreal, after accompanying the McGill Summer Mining School, on its western itinerary, visited the Tyee Copper Company's smelting works at Ladysmith, Vancouver island, B. C.

George B. Dorr, formerly in charge of the Western Electric sales agency in Chicago and recently sales manager of the Allis-Chalmers Company, is now connected with the Chicago office of the Fairy Improvement Company, Limited.

W. C. Thomas, resident general manager of the Dominion Coal Company, Limited, operating mines and steel plants at Sydney, Glace Bay, and New Waterford, Nova Scotia, has been elected president of the Dominion Iron & Steel Company, Limited, succeeding Graham Fraser, who has resigned the presidency of that company, but will remain a director.

Dr. G. C. Hoffmann, of Ottawa, Ontario, has resigned the position of assistant director, chemist, and mineralogist to the Geological Survey of Canada. He has been in charge of the work of the Survey in connection with the mineral industry of the province, but now relinquishes.

T. J. Vaughan-Rhys, formerly in charge of the Van Anda Copper and Gold Mines, Limited, operating mines in Mexico, lately visited British Columbia, in which province he is also mining, on Valdez island.

J. W. Campbell, of Toronto, Ontario, manager of contract sales for the Canadian General Electric Company, has resigned to accept the position of managing director for the Alberta Portland Cement Company, of Calgary, Alberta, Canada. He assumed his new duties on May 15.

Robert R. Hedley, late manager of the Hall Mining and Smelting Company's lead-silver smelter at Nelson, B. C., has been appointed to collect data in British Columbia, Alberta, Saskatchewan, and Manitoba, relating to mines, reduction works, etc., for a full report on the mining industry of Canada.

L. J. Le Duc, for some time engineer in charge of construction of the Cerro de Pasco mines in Peru, arrived in New York last week. He sailed from New York, June 6, and will spend two months in Europe. On his return to New York in August, he will enter into practice as consulting engineer, taking the [illegible] formerly occupied by Thomas Hancock.

J. Ayer Bonsall, assistant to Dr. Frank D. Adams, professor of geology at McGill University, Montreal, has been granted by the Dominion government exclusive rights to explore the coal area of the British Columbia government has kept for [illegible] Lake. The Dominion will be represented, R. Graham, is now on the [illegible] Powell river.

Obituary

William Ball, for several years [illegible] of the Grand Monadnock [illegible] in the Tyler [illegible] Lead, was killed [illegible] an electric [illegible] Hill on which [illegible] candlestick.

George L. Morey, manager of the [illegible] Mining and Smelting Company, [illegible] on the Tyee Copper Company, [illegible]

trict, was killed May 29 in the Four Metals mine, in the Deep Creek, Utah, district. A ladder gave way precipitating him to the bottom of the shaft, a distance [illegible].

Industrial

[illegible] Dutton Iron Works, of Dallas, Penn., has established agencies at Baltimore, Reading, Scranton, Pittsburg and Buffalo, where a line of its engines will be carried for exhibition and demonstration purposes.

At the recent annual meeting of the Ridgway Dynamo & Engine Company, Ridgway, Penn., the sales department was reorganized. H. A. Otterson, formerly assistant superintendent, has been appointed sales manager with R. C. Eccleston as his assistant.

At a special meeting of the directors of the Joseph Dixon Crucible Company, held May 31, to take action on the death of Vice-president and Treasurer John A. Walker, Geo. T. Smith was elected vice-president, Geo. E. Long treasurer, and Harry Dailey was elected director and secretary.

The Chrome Steel Works, Chrome, N. J., is distributing circulars describing [illegible] parts of crushers, rolls, mills, pulverizers and other crushing and grinding machinery made of "Canda" tempered and "Adamantine" chrome steel. The steel is rolled, cast or forged, according to the requirements of the parts designed to re-[illegible]

The Sprague Electric Company, New York, has opened a district office in the Hennen Building, New Orleans. This office is under the management of F. V. L. Smith, and will cover the territory included in the States of South Carolina, Florida, Alabama, Georgia, Tennessee, Mississippi, Louisiana, Arkansas, Texas, Oklahoma and Indian Territory.

The Boston branch of the American Manufacturing Company, makers of American transmission rope and manila, sisal and jute cordage of all sizes and for all purposes, has outgrown its original quarters in the Postoffice Square building [illegible] building. W. F. Morgan, previously engineer of the transmission-rope department of the company, is manager of the Boston office.

F. E. Butcher, until recently manager of foreign sales for the K. & J. Company, becomes general manager for the American Concentrator Company, June 1. In his new position he will have to do with the [illegible] of the American Concentrator Company.

The H. W. Johns-Manville Company is planning to make an interesting exhibit at the International Electric Light Association convention, which will be held in Washington during June. Among other interesting features, it will exhibit a "transite" asbestos fire-proof door for high-tension transformers and switches. These doors, which are fire proof and excellent insulators as well, are designed for the protection of apparatus from short circuiting; also to prevent persons coming into contact with the live parts.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

W. L. Beel, Elyria, Ohio. The Beel Prospecting Core Drill. Pp. 24, illustrated, paper, 6x9 in.; 1907.

Charles E. Sholes Company, New York. "Things Chemical." Pp. 20, illustrated, paper, 7x9½ in.; April, 1907.

Sullivan Machinery Company, Chicago, Ill. Coal Mining by Machinery. Pp. 17, illustrated, paper, 3½x6 in. 1907.

Hendrie & Bolthoff Manufacturing and Supply Company, Denver, Colo. The King Screen. Pp. 19, illustrated, paper, 5x7 in. 1907.

Adam Cook's Sons, New York. "Lighten Your Machinery Loads with Albany Grease." Pp. 10, illustrated, paper, 3½x6 in. 1907.

Brown & Sharpe Manufacturing Company, Providence, R. I. Machinery and Tools. Pp. 499, indexed, illustrated, cloth, 3½x6 in.; 1907.

Mussens, Ltd., Montreal, Canada. Bulletin No. 12. Double Cylinder, Single Drum Mine Hoists. Pp. 4, illustrated, paper, 5½x9 in.

Sullivan Machinery Company, Chicago, Ill. Catalog No. 58. Modern Practice in Air Compression. Pp. 112, indexed, illustrated, paper, 6x9 in.

Pratt & Whitney Company, Hartford, Conn. Catalog No. 4. Small Tools. Standards and Gages. Pp. 215, indexed, illustrated, paper, 4½x7 in.; 1907.

Allis-Chalmers Company, Milwaukee, Wis. Instruction Book No. 5009 for Direct Current Motors and Generators. Pp. 16, illustrated, paper, 6x9 in.; Jan., 1907.

Geo. E. Woodbury, 238 Townsend street, San Francisco, Cal. Bulletin No. 1. The New Woodbury Concentrator. Pp. 19, illustrated, paper, 7x10 in.; May, 1907.

Jeffrey Manufacturing Company, Columbus, Ohio. Bulletin No. 12. The Care of Electric Mine Locomotives in Service. Pp. 89, illustrated, paper, 8x10 in.; March, [illegible]

Wagner Electric Manufacturing Company, St. Louis, Ill. Bulletin No. 76. Single Phase Variable Speed Ventilating Fan Outfits. Pp. 4, illustrated, paper, 6x9 [illegible]

Indestructible Fibre Company, 26 Cortlandt street, New York. Car Headlinings and Steamboat Panels made of Fibrite, Durite and Kantlite. Pp. 4, illustrated, paper, 4x9 in.

Golden-Anderson Valve Specialty Company, Fulton building, Pittsburg, Penn. Catalog No. 8. Steam and Water Specialties. Pp. 56, ilustrated, paper, 5½x8 in.; May, 1907.

Ph. Bonvillain & E. Ronceray, 9 & 11 Rue des Envierges, 17 & 19 Vills Faucheur, Paris, France. The Universal System of Machine Moulding. Pp. 96, illustrated, paper, 6x10 in.; 1907.

Chrome Steel Works, Chrome, N. J. Chrome Steel Wearing Parts for Cement Grinding Mills. Pp. 13. A Tempered Steel Jaw Plate for Blake Type Crushers. Pp. 8. All illustrated, paper, 5x7½ in.; April, 1907.

Monongahela Manufacturing Company and the Hoshor-Platt Company, 10 Liberty street, New York City. Hoisting Engines, Mine Haulage, Gravity Railways, Industrial Railways, Steel Cars, Wood Cars, Revolving Screens and General Coal Handling Machinery. Pp. 119, illustrated, 9x1 in.; 1907.

Allis-Chalmers Company, Milwaukee, Wis. Bulletin No. 1059. Allis-Chalmers Engine Type Generators for Direct Current Type "I." Pp. 12, illustrated, paper, 8x10½ in.; February, 1907. Bulletin No. 1060. Allis-Chalmers Belted Alternators Type "AB." Pp. 12, illustrated, paper, 8x10½ in.; February, 1907.

Fort Wayne Electric Works, Fort Wayne, Ind. Bulletin No. 1091. Direct-Current Motors—Type Ef. Pp. 8. Feb. 15, 1907. Bulletin No. 1092. Type S Single Phase Motors. Pp. 4. Mar. 15, 1907. Bulletin No. 1093. Small Power Motors—Types GA and GD. Pp. 8. Mar. 15, 1907. All illustrated, paper, 8x10½ in.

Construction News

Rollinsville, Colorado.—The Opa Mining Company will install a plant of steam machinery on its mine near Perigo. J. W. Koons, Rollinsville, is manager.

Wall Street, Colorado.—The Gold Run Mining and Milling Company, it is reported, will build a cyanide mill on its Tambourine property near Wall Street. E. A. Austin is president and general manager.

Bald Mountain, Colorado.—The Uranus Mining Company contemplates installing a heavier gasolene plant of machinery for the Kirk mine, Gilpin county, Colo. L. G. Nesmith, Bald Mountain, Colo., is manager.

Isaac's Harbor, Nova Scotia.—The Beaver Hat Gold Mining Company is preparing to build a 10-stamp mill and amalgamating plant, to replace its old mill. S. C McLean, Isaac's Harbor, N. S., [illegible] manager.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 5. The committee of the Grass Valley Miners Union, which has had the matter of an advance in wages under consideration for some weeks, has issued a statement that all trouble over the matter is past; an amicable agreement having been reached with the Mine Operators' Association. There will therefore be no strike. The basis of agreement has not yet been made public. This camp is the most important gold-mining one in the State, and two of the most productive gold mines of California are located there. Those two mines, the North Star and Empire, might have stood the proposed advance in wages, but some dozens of other mines nearby could not have done so. The members of the Mine Operators' Association seem to have stood together in the matter so that an amicable adjustment has resulted.

The desert camps of Daggett and Vanderbilt, once prosperous, are both being revived. At the former place the Daggett-Belleville Mining Association has been formed to engage in spreading the fame of the Daggett and Belleville mineral section, which only needs capital to become again productive. Daggett was formerly a very important silver-producing region. It is on the line of two great transcontinental roads—the Salt Lake and Santa Fe—but for some years has been neglected. The Belleville region near by has also been overlooked by capital. An advertising committee has been appointed which will soon begin operations. G. B. Myers is president and Irving Garringer, secretary.

The old town of Vanderbilt, near Leastalk, which has been virtually dead since the shutdown of the mines, about 10 years ago, owing to litigation, is again coming to life. Where two watchmen employed to guard property [illegible] the only inhabitants, numbers of people have arrived within the last thirty days, in consequence of the reopening of the Hale mines, acquired by the Big Five Mining Company, a company recently organized. Ore is being shipped from time to time from this district to the Keswick smelter. From the old Copper World property, at Ivanpah, three cars a week are being shipped.

Now that the [illegible] railroad to the Hornet mine, Shasta county, are completed, it is expected that this mine of the Mountain Copper Company will be in operation a matter of regular ore for the Keswick smelters, as was the Iron Mountain mine of the same company in years past. The new [illegible] is rapidly as possible.

Numerous strikes in the mining counties are responsible for a lower tax rate this year. Members of the State board of equalization have been through the northern counties investigating the tax rolls of the assessors. No increase in valuation will be reported. The dropping of the valuation in several counties necessitates a higher assessment. In the case of small prospects, undeveloped, and only held by annual assessment work, the tax is already excessive. Upon a small prospect in Calaveras county, entirely undeveloped, the valuation was placed at $800, when nothing at all was known as yet of the actual value of the claim.

The transfer of the Orleans Bar Gold Mining Company's property to the California Mining and Dredging Syndicate, in Humboldt county, is notable, in that it is expected that the new company will probably do some dredging in the bed of the Klamath river, at that point. The Klamath has for over half a century been receiving the accumulated tailings from hundreds of mines, and as they have now been concentrated it would seem reasonable to expect that profits could be secured from dredging. The river has paid well at many points where river-bed mining has been carried on by means of wing-dam and Chinese pumps, but this class of work has been mainly confined to bars. There are many stretches of the river which have never yet been mined.

The old, and once highly prosperous hydraulic mining camp of You Bet, in Nevada county, which has been virtually left to itself since the legal edict against unrestricted hydraulic mining, is being revived. This time the gravel, which is [illegible] and then crushed in a mill which is being built. Of course, a much smaller quantity can be worked daily than when whole banks were washed away by the stream from the nozzle; but on the other hand the drifting system contemplates only handling the lowest and richest portion of the deposit.

The law passed recently fixing a license [illegible] works something of a hardship in the small [illegible] which are not productive. The tax for [illegible] $10 for each mill, $100 for each [illegible] and $200 for each [illegible] Stamps and $300 for each [illegible] and upward. Stamps will [illegible] $50 per [illegible] The [illegible] the assessment work, and it is the opinion [illegible] operations will take [illegible] This [illegible] is in addition to the annual [illegible] required by the Federal laws.

Salt Lake City

[illegible] Articles of Incorporation of the Iron King Consolidated Mining Company have been filed, and the company will operate in the East Tintic mining district. The [illegible] are at Provo, and the officers are: [illegible] Loose, of Provo, president; Reed Smoot, vice-president; these, with O. J. Salisbury, Frank Knox, and A. A. Noon are directors.

The Markham Gulch mill, in Bingham, [illegible] commenced, and is treating ore from the Flagg Apex mine. The initial dividend of the Lower Mammoth Mining Company has been paid to shareholders, the amount being $9500.

More than two-thirds of the members of the Salt Lake Stock and Mining Exchange have agreed to discontinue that organization, and to form an association believed to be more advantageous to the members of the organization. The price of seats on the exchange is now about $1000.

According to a statement from the management of the Utah Copper Company, the month of May was the banner one of its career. An average of a little more than 5000 tons per day was treated at the Copperton plant, in lower Bingham canyon, which is handled by [illegible] tons during the greater number. A portion of the new Garfield plant has been in operation, and [illegible] expected that by the middle of the month [illegible] will be in commission. Parties [illegible] are negotiating for the purchase of the mine owned by the Bingham Mining Company, at Bingham. Development work [illegible] is being pushed in the Bingham district.

[illegible] Of the properties of the Bingham Standard Mining Company, [illegible] Bingham Central Standard Mining Company, Bingham Central Consolidated, have not been as prompt in [illegible] and the [illegible] the assessment work. This [illegible] is in addition to the annual [illegible] required by the Federal laws.

[illegible] consolidate the two mines has been somewhat delayed.

The filing of deeds of conveyance to the Silver King Coalition Mines Company, was the closing chapter in the deals whereby the Silver King, Keith-Kearns and a number of other contiguous mining properties are to be operated under one management. The new corporation will have more than 2000 acres of ground in the best portion of the mineralized section of Park City.

Denver

June 7—It having become apparent that the evidence in the case of the Portland Gold Mining Company against the Stratton Independence Company, Limited, in which the charge was made that the latter had crossed the Portland line and extracted a large amount of valuable ore, was not sufficient to support a charge of trespass, the Portland attorneys introduced evidence under grounds of conversion, which was objected to by the other side, and Judge Lewis, of the Federal court, directed a verdict for the defense. The case will be appealed to the higher court. About half a million is involved.

The Union Pacific Coal Company and the Central Coal Company, operating at Rock Springs, Wyoming, whose mines have been idle for several days on account of labor troubles, posted notices a few days ago to the effect that an advance of 10 per cent. in wages would be paid to all who reported for duty at a certain time. The companies are determined to work the mines, but do not propose to recognize any organization. A large number of non-union men have arrived there.

The Consolidated Mines Selection Company, Limited, of London, has purchased the Japan group of mines, near Telluride, which has produced in the neighborhood of a million dollars' worth of ore, although until now only operated in a small way. During the past year a large amount of development work has been done.

President Richards, of the American Mining Congress, has appointed a committee to draft a vertical side-line law, doing away with extra lateral rights. The committee consists of Charles J. Hughes, Jr., of this city; Curtis Lindley, of San Francisco; John A. Church, and James D. [illegible] of New York, and P. A. B. Penrose, of Philadelphia.

Toronto, Ont.

[illegible] The Provincial Bureau of Mines has completed arrangements for exploration work in northern Ontario during the summer. Three parties will be sent into the field, one in charge of Prof. Willet G. Miller, provincial geologist. C. W. Knight, of Kingston, will go up the Montreal river, and make a geological and [illegible] survey of the adjacent [illegible] Dr. A. P. W. Bruce is assigned the Lake Abitibi district, and will make in charge of A. Niven and A. L. Parsons, of Toronto University, will explore and mark out the boundary between the Algoma and Thunder Bay districts, north of the Canadian Pacific Railway, a country concerning which very little is known. The parties will start from Toronto about the end of June.

The Ontario Government has decided to construct a wagon road to afford access to the Larder Lake district, running from Boston on the Temiskaming & Northern Ontario Railway, situated 153 miles, north of North bay, to the lake, a distance of 14 miles. The difficulties in the transportation of supplies and machinery for want of a road have been so great that development has been much retarded. A preliminary examination of the ground has been made.

London

May 25—About a year ago I gave some particulars of the flotation of the Great Cobar copper mine in London. The doings of the London company have been followed with keen interest, and the circular just issued to shareholders has received special attention. The company was formed in May, 1906, but it was not until September that the working of the properties was entirely taken over. Since that time until the beginning of May, 119,287 tons have been smelted, producing 3217 tons copper, 7595 oz. gold and 47,300 oz. silver. This is an average monthly output greater than that estimated in the prospectus.

Developments at the mine during this time have increased the ore ready for stoping, which now represents eight years' supply at the present rate of extraction. In one part of the mine opened up during the past few months a strong body of copper ore averaging 2 oz. gold per ton has been found. The new main shaft has been sunk 500 ft. and, at the rate of 140 ft. a month, the thousand feet should be reached in about four months from now.

Considerable difficulty has been met with in erecting the new smelter plant. Six months ago a contract for its supply was entered into with the Allis-Chalmers Company, but for some unexplained reason the latter company did not go on with the contract, so the plant has been bought from other makers, some in the United States, and some in England. Some of the plant has already been shipped and the remainder is practically ready for despatch, so that by the end of the year the plant should be nearing completion.

Johannesburg

May 13—We are in the midst of the most serious strike known on the Rand. The trouble broke out on the Knights' Deep last week. At this mine the wages earned by the miners working on contract were high, the average being over $9.60 per 8-hr. shift. Some men were actually earning $19.20 per shift in stopes.

The management proposed another arrangement. The price paid per fathom was reduced from $16.80 to $14.40, and instead of running two machines in a stope the contractors were asked to take on another machine. In this way it was hoped to increase the efficiency of the men, without reducing their income. But the men took up the cry of three machines. The miners' union plus a few labor agitators, came to their assistance, and the fight commenced in earnest.

The men were not quite clear why they struck, but in a general way the trouble is about the idea of one white man superintending three rock drills. The men declare that this is only the beginning, that the scheme of the capitalists is to do with less white labor, by compelling each white man to "boss" more Chinese and Kafirs.

The strikers have carried the fire brand to other mines, so that today there are nine or ten mines officially on strike. Some of these properties have been held up by the strikers marching *en masse* to the shafts, and employing more than moral suasion to prevent the men from going underground. The three-machine idea is not enforced on most of the mines, but the men declare they are striking in sympathy. Several mines are still undecided.

The men claim that by running three machines fewer white men will be required. The demand to run three machines is not universal; on some mines it is not practicable for a miner to look after more than two machines. In some mines, however, like the Knights Deep, there are some large open flat stopes, where three machines can be worked to advantage. The action of the miners in the past is contrary to their present avowed solicitude to protect and increase the white skilled labor employed on the mines.

Their next cry is that to run three machines will shorten their lives. This question of health has appealed to the general public, but the three machines will only be placed in large open stopes, and if the operator will take sufficient pains there need be no more dust than with two machines. There is a law that machine men must use sprays to lay the dust, but the men as a class will not use the appliances provided for them.

Although the outlook is not bright, the general feeling is that the strike cannot last long. Great inconvenience is being experienced on the mines where the strike is in force to keep the mills running, but the managers and their staffs, together with a few loyal workmen, are doing all in their power to keep their flags flying. Police are located on all the mines where the strike is on. It is not anticipated that the trouble will affect the May output to any great extent.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

CLAY COUNTY

Southern Mineral Development Company—This new company has been organized by Robert R. Zell, N. H. Sewall, Wm. H. Thorpe and J. Rosenbaum, with offices at Birmingham. The Chambers property, located one-half mile west of the Standard mine, has been purchased, and the company has begun work upon two openings, one on each 40 acres. The property contains 80 acres carrying the Chalcopyrite lead, and has been thoroughly prospected with the diamond drill. The property had been tied up in litigation for years and was recently sold by decree of the United States District Court of Appeals. The ore will be hauled by tram to the Standard tipple to be prepared for shipment.

Standard—The slope reached the 200-ft. level on June 1. During May, 40 ft. was made in the opening 10x12 ft., showing an orebody 8 ft. wide and having a dip of 42 deg. Drifting has been begun on the 200-ft. level.

Arizona

YAVAPAI COUNTY

Knight Copper Company—It is reported that this company has made a discovery of good ore, the deepest workings being only 40 feet. The properties are in the Big Bug mining district, about one mile from the Humboldt smelting works.

Marschall Group—J. K. Miller, the new owner of this group of mines, states that with every foot of work more ore is exposed, and that he is considering placing a small reduction plant on the property. This group is in the Eureka district about 60 miles southwest of Prescott, and on the Santa Maria river, the nearest railway station is Hillside, distant 14 miles.

Mount Tritle Copper Company—This company has made a new strike of 18 ft. of ore carrying silver and gold and copper. The management states that more machinery will be installed.

New England and Arizona—This company has been pushing development work at its mines in the north end of the Big Bug district, and has constructed one of the best plants in the county. The engine room is equipped with a [illegible] and a 9x10-in. Hendrie & Bolthoff geared hoist, capable of a depth of 500 ft. The shaft is on a incline to a point of 38 deg. As it progressed will be installed in a short time. A one-ton skip is used for hoisting both the ore and water. Numerous holes and shafts have been sunk on the property, all of which show ore.

California

CALAVERAS COUNTY

Chapman—Exceedingly rich ground has been struck in this mine at San Andreas.

Smelter—The smelter of the Union copper mine has been started up at Copperopolis, and more men are being added to the force of miners as fast as they can be secured.

EL DORADO COUNTY

Gold Bug—S. G. Sturman has leased a portion of this mine and will commence operations at once.

Josephine—C. B. Cleveland, superintendent, expects to reopen this mine shortly.

Pilot Knob—This mine, near Shingle Springs, has been sold to Goldfield, Nevada, men. There is a small mill on the property. The vein is small, but of high grade. The mine will now be extensively developed.

HUMBOLDT COUNTY

Orleans Bar Mining Company—This company at Orleans has a large force of men running a pipe line through the property, where a new cut is to be put.

INYO COUNTY

[illegible] About 25 [illegible] are now lifting ore. Several mines have reached depths of 500 ft. and crosscuts are being made. More miners are at work than heretofore.

Willow Creek—At this new camp, five miles southwest of Greenwater, high-grade ore has been found in the Baltic. The hills are full of prospectors.

LOS ANGELES COUNTY

San Gabriel Mines—[illegible] company at San Gabriel cañon has leased the north half of its 160 acres to D. D. Nice & Co., of Bowen, Ill. The property extends along the San Gabriel river bed for about two miles.

MARIPOSA COUNTY

Incorporated Copper—This company, 16 miles from Le Grand, J. G. Roberts, superintendent, has opened [illegible] copper [illegible]. Only the [illegible] The property shows a large ledge of ore.

MONO COUNTY

Fort Bidwell Group—The gold mines 10 miles south of Fort Bidwell, recently discovered, are attracting numbers of prospectors. The ledges are large and of a fair grade.

NEVADA COUNTY

California Copper—This mine, near Spenceville, is taking out high-grade ore and shipping it to smelters in Shasta county. The mine has recently been reopened.

Gold Mesa Mining Company—This property, near Grass Valley, owned by Spokane men—H. B. Dennis, superintendent—has its double-compartment shaft down to the depth of the old one. Quartz has been found of high value.

Richland Gold Mining Company—This old hydraulic mine, now operated as a drift mine, is approaching the old Manzanita channel at the end of its 1900-ft. tunnel.

PLACER COUNTY

Asbestos—W. S. Haworth and T. E. Morgan, Alta, have filed several deposits of asbestos near Green Valley. On one of these considerable work has been done and a good quality of the mineral has been found.

Herman—This mine is pushing the work of grading for its 40-stamp mill and has contracted for 3000 cords of wood. The orebody is large.

PLUMAS COUNTY

Plumas-Mohawk Gold Mining Company—[illegible] ground.

[illegible]

San Diego County

Argonaut Mine—At this mine, Grapevine district, [illegible] miles southwest of Warner Springs, a contract has been let to drive 1000 ft. of tunnel.

Shasta County

Midas Mining Company—The machinery for the new hoisting plant of this mine, Knob, has arrived, and will soon be put in operation. Fifty men are now employed at the mine.

Sierra County

Bonanza King—This mine in Alleghany district has been bonded by C. L. Crane and the lower tunnel will be extended.

Dead River Mining Company—Work is to be resumed on this gravel mine in the famous Blue Lead of the county.

Siskiyou County

Cyanide Plant—Gillett & Sons have secured the Lewis mill in Oro Fino for crushing ore from their claim, and are making preparations to install a cyanide plant.

Highland—This mine, 18 miles from Etna, L. H. Cory, superintendent, is being equipped for summer work. Rich ore has been taken out.

Yuba County

Marysville Gold Dredging Company—A. B. Strock, superintendent of this company, is preparing to build one more gold dredge. The company already has two in operation.

Colorado

Clear Creek County

Buffalo-Colorado Mining Company—The Fraction mine in Spring gulch has been sold for $35,000 to Buffalo and Colorado parties. New machinery is to be installed and George A. Sanborn, Jr., Idaho Springs, is to have charge of the [illegible].

Coulter—Denver and Idaho Springs people have purchased this group, situated on Leavenworth mountain, near Georgetown, for a consideration of $25,000, and a company is to be formed for its operation.

Diamond Tunnel—This group in Griffith district has been sold to C. S. Desch, representing Eastern people, for a consideration of $32,400, and a new company is to be formed. C. S. Desch, of Silver Plume, will be manager.

Humboldt—It is reported that a controlling interest in this mine, near Idaho Springs, has been sold to W. F. Wallace, and A. R. Wells, of Grand Junction, Colo., and that a reorganization will take place at the next stockholders' meeting in Denver.

Lee—It is reported that the property of this company, [illegible] at Georgetown, has been sold to the Eastern Colorado Power Company, which is an auxiliary of the Central Colorado Power Company recently organized, and that the consideration is $750,000.

Gilpin County

Clifton Bell—Southern capitalists have become interested in the King Bee G. M. & M. Company, operating in Russell district, and A. H. Heller, formerly of Cripple Creek, is manager, with headquarters at Central City. New machinery is being installed.

Gower Mines Syndicate, Ltd.—A good strike is reported in the 14th level at a depth of 1250 ft. on the east side of the shaft in the Running Lode mine, near Black Hawk. The exploration work on the east side shows that the orebody is a good one. T. Dunstone, Black Hawk, Colo., is superintendent, and British capital is interested.

Guardian Mining Company—Articles of incorporation have been filed, showing capital stock of $10,000, with Denver people interested, they having secured a lease and bond on the East Pewahie property in Russell district. Heavy developments are planned as soon as the new machinery is installed. C. T. Austin, Russell Gulch, Colo., is manager.

Naragansett Mining and Milling Company—A deed has been recorded showing consideration of $50,000, conveying from G. P. Goodier, of Denver, to this company the Carr group on Bobtail hill, the Randolph mill, aërial tramway and improvements. Rhode Island capitalists are interested and they will install an air-compressor plant and carry on increased operations.

Lake County—Leadville

Bartlett Tunnel—Since the Halycon Mining Company took hold of this property, Sugar Loaf, in the spring it has begun to pay. The original owners sank a shaft 280 ft. and were driven out by water; a tunnel was then driven 1300 ft. Some ore was shipped when work was stopped. This spring the Halycon Mining Company took possession, deepened the shaft and is now shipping regularly from a well defined body, about 25 tons daily of ore carrying both gold and silver. The shaft will be sunk another lift of 80 feet.

Boston-Arizona Mill—This plant at the foot of Harrison avenue treating lead-zinc-iron sulphide ores will be enlarged to increase the capacity to 200 tons daily. At present 150 is the daily tonnage. The plant recently made a successful run on the Iron Mask zinc ore from Gilman.

Boulder Shaft—This shaft, Little Evelyn Mining Company, South Evans gulch, is down 425 ft. and the streak of gold ore found at the 400-ft. mark continues. Drifting will probably be begun north and south on this vein to catch the main ore-[illegible].

Buckeye—The body of lead carbonate ore recently opened in this property, Fryer hill, holds good and is widening with development work. The ore shoot continues to the north, which proves that the orebodies extend north across Big Evans gulch and into Cumberland mountain. The Buckeye shoot is on the edge of Big Evans gulch.

Hoffer Shaft—Work on this property, lower Big Evans gulch, is still being carried on at the 300-ft. level. The work is at present in the blue lime, but a shaft will be sunk to the white lime where it is believed the main orebodies lie.

Ibex Mining Company—At present about 450 men are employed by the different sets of lessees and the ore shipments amount to 8000 tons per month. Some of the ore shipped is of high grade, the principal shippers of this class of ore from No. 4 shaft are the Hahnewald brothers shipping an average of 25 tons weekly of ore that nets $1000 per ton. The lessees in the copper belt are also shipping a good grade of ore.

Long & Derry—Operations have been resumed on this property by the Anona Mining Company and a tunnel is being driven into the hill. A portion of the ground has been leased and this will be worked for the iron. This property in the early days was a large producer of gold and silver. The tunnel will be driven past the old workings and into new territory.

Parenolos—This property adjoining the Mammoth, Big Evans gulch, will resume operations in a few days.

Louisiana

Calcasieu County

Union Sulphur—The mines of this company, 12 miles west of Lake Charles, on May 30 suffered considerable damage from the season's floods, which were more than usually severe this year.

Michigan

Houghton County—Copper

Calumet & Hecla—Work on the foundations of the recrushing mill and boiler house is progressing rapidly. The recrushing mill will be approximately 340x125 ft. and will contain 48 Chilean mills and Wilfley tables, all to be operated electrically. This mill is to treat the tailings from the other mills and to work over portions of the present stamp sands. The boiler house is to contain 20 Babcock & Wilcox water-tube boilers of 510-h.p. capacity each and the building is to be equipped with stoker, coal and ash conveyers and all modern facilities. The company is also changing the gage of the railroad track to the standard gage, necessitating the change of about 20 miles of track and the rebuilding of 14 locomotives.

[illegible] The [illegible] gallery on the third [illegible] level has been cut to the Centennial-Allouez mill. At the present time there are three heads operating, one [illegible] Centennial rock, and the other two during the day and one at night on Allouez rock.

Tamarack A record of 30 inches of ore has been struck at the thirteenth level.

Osceola—Work has been resumed at No. 1 North Kearsarge shaft, after a shutdown of several months on account of fire.

Missouri

[illegible]

Doe Run Lead Company—Grading for the new 1200-ton mill has begun at Elvins. It is to be built on strictly modern lines and with the latest improvements; the old 900-ton mill at Doe Run will also be operated, so that the output of this company will be doubled in about a year. The new shaft at Mitchel is completed at a depth of 460 ft. and the railroad has been extended to it. The option on the 590 acres of the Columbia lands at $600,000 has been exercised, so that with the earlier acquisition of the Union Lead Company's lands nearly 1500 acres additional land have been secured and their position greatly strengthened. The old No. 1 mine at Flat river, which was drowned out about 15 years ago, is being reopened. It was found to have been drained by the neighboring mines; it is one of the richest mines in the district.

Federal Lead Company—The new 2500-ton mill on the Central land is about finished and two sections are now in successful operation. This is the largest and finest mill west of the Mississippi river and cost about $1,250,000. John Hays Hammond, Chester A. Beatty and Pope Yeatman have been making their annual inspection of the Federal properties.

Herculaneum—At the St. Joe smelter the Savalberg pot-roasting method of desulphurizing the galena concentrates has been under experiment for several months; it has proved so satisfactory that three more pots are being installed.

St. Joe Lead Company—The labor situation is quieting down and all danger of a general strike seems to be over. The men were given a sweeping advance of 10 to 12½ per cent. on the first of the year and the house rents were reduced 50 per cent., yet they demanded another advance of 10 per cent. [illegible] This was refused, the 20 diamond drills were called in and laid up, and other preparations made for shutting down. This had the desired effect and the men abandoned all further talk of a strike.

[illegible]

St. Joe Lead Company—This company has six diamond drills in operation near Big river, where it has about 2000 acres under option.

Montana

[illegible]

Anaconda—The shaft on the High Ore is down 2800 ft. and will have 50 or 75 ft. added for sump purposes. The sump finished, an immense station will be cut at the 2800. Crosscutting from the 2400 of the Neversweat to catch the south vein is still in progress. All mines of the company, with the exception of the Gallatin and J. I. C., are in operation. The two latter yield about 300 tons of ore a day when running and were closed down on account of a strike of teamsters. Anaconda is not feeling the loss of ore from this source.

Boston & Montana—The ore reserves are now greater than ever before and are becoming more extensive each week. The daily yield is about 3300 tons, which is the capacity for the smelter. Sinking continues in the West Colusa, now about 1800 ft. deep. The Badger State opening is 370 ft. deep and that on the Greenleaf 750 feet.

Copper Exploration — This company, which began developing the Six O'clock group on the east side about a year ago, has suspended operations temporarily at least. It deepened the old shaft to 1000 ft. and crosscut and drifted on veins, but failed to find commercial ore. The company worked under lease and bonds, which will expire in August, and was backed financially by Paine, Webber & Co., Hayden, Stone & Co., and Richardson, Hill & Co., Boston, with the Leopolds, of Chicago.

Parrot — The company is sinking its main shaft from the 1800-ft. level to an indefinite point, possibly only the 1900-ft. line for the present. The lifts in this mine are only 100 ft. apart. The yield is about 300 tons a day, but the company also hoists ore from the Nipper vein for the Coalition Company.

Raven Mining Company—Development work has been resumed on this property, consisting of the Raven and Snoozer claims. The old incline shaft on the former, now 700 ft. deep, will be taken to the 1000-ft. mark. The capitalization has been increased from $500,000 to $1,000,000. The directors have authorized [illegible] mine.

[illegible]

Washoe Smelter—About one-[illegible] of the [illegible] of the Washoe smelter fell in on June 5, suspending operations in all departments except the [illegible] This was a [illegible] days. According to the engineers in charge, [illegible] and [illegible] of the roof supporting beams [illegible] bolts holding them in place.

Nevada

[illegible]

Jumbo Extension—The Extension Mining Company, Tybo, Nev., has purchased the Mammoth group of claims, lying to the west of the Jumbo Extension, and is opening a tunnel to cut a vein, which, on the north, bears with the general trend of the Jumbo Extension. [illegible] to the north. The Jumbo Extension is on the north end of the Tybo district, and is [illegible] The vein is known to be [illegible] month two carloads were sent to Salt Lake. During May the production of the property amounted to $150,000.

Mammoth Extension—The company is shipping 60 tons of high-grade ore to the smelters daily. Arrangements have been completed for shipping several hundred tons daily. Increased shipments will be made next week. Several of the recent shipments averaged $300 per ton. The shaft is down 250 ft., and the workings are being developed rapidly.

Mohawk Consolidated—The [illegible] on the 200-ft. level is now over 300 ft. out from the shaft, and has encountered a change of country with every indication of the proximity of the orebody. This portion of the mine is being worked by the Mohawk Consolidated Leasing Company, of San Francisco.

St. Ives—Drifting has been started at the 300-ft. level. Some trouble is being experienced with water, but this will soon be remedied and ore-breaking will be started in the course of a few days. The vein is from 3 to 7 ft. in width, and carries high-grade shipping ore.

[illegible]

sumed on this property, and work is being carried on in the tunnel which has [illegible] the vein in the tunnel face.

[illegible] the Thanksgiving vein.

[illegible] times to look well.

Manhattan—The [illegible] in the [illegible] and [illegible] [illegible] and [illegible] [illegible] [illegible]

as the mills now in course of erection are in operation.

Mustang Extension—The Thangsgiving and Brey-fogle veins both strike into this property, and a shaft has been started to cut them at depth. As the surface prospecting work resulted in exposing a number of ledges which are being profitably developed in adjoining mines, the management has determined to make the shaft of large dimensions.

Verde—The shaft has been sunk to the 160-ft. level, and has struck water. The north cross-cut at the 150-ft. level has cut a 12-ft. vein carrying free gold and assaying well.

White Pine County—Ely

Boston Ely Development Company—This company has taken up its options on several promising groups of properties in this district, the final payments having been made within the last two weeks. It now has title to the Bon Ton, Sunset, Imperial, Fairbanks-Morse, Sevastopol, Emma No. 2, Standard, Mineral Chief, Ivanhoe, Thelma, Bellevue, Julian and Victor Hugo mines.

Ely Consolidated—The rich strike of copper on the Rising Sun claim two weeks ago, continues to develop well and shipments will soon be made.

Ely Witch—The shaft is down 230 ft., and a body of ore averaging well has been uncovered at the 210-ft. point. Sinking is progressing at the rate of 5 ft. a day.

Giroux Consolidated — The workings continue to develop well, and regular shipments of ore are being made from the Alpha shaft.

Wide West—Operations will be resumed at once. Foundation for a new power plant is being laid and machinery

[illegible]

[illegible]—Ruse[illegible]

[illegible] progressing rapidly. Tunnel No. 1 is in about 190 ft., and the big ledge will probably be cut in about 60 ft. Tunnel No. 2 is also going ahead rapidly and a number of rich stringers have been encountered.

Dreamland—The old shaft is down 58 ft. and a drift was run from the 140-ft. level for 68 ft. Shipping ore is being sacked from the drift.

Golden Anchor—The tunnel is in about 275 ft., and will be driven 75 ft. further, at which point it is expected to cut the main ledge. From the lower shaft drifts have been started each way to catch the

[illegible]

has been uncovered in trenching on claim No. 7.

Battler—Work is progressing satisfac[illegible]

[illegible]

Eureka County

Richmond-Eureka—About 150 tons of ore daily are now being produced at the Eureka Consolidated mine, and the Richmond mine has also been reopened, and will likewise become a steady producer. Over $500,000 has been expended during the last year and a half in reopening these mines. The company still has over $100,000 cash available, besides 49,500 shares in the treasury. The total capitalization is $3,600,000, divided into 360,000 shares. In a report made on the property in 1905 it was recommended that the main shaft be sunk 400 ft. deeper. It was also stated that several hundred thousand tons of ore, formerly regarded as too low grade for treatment, were available and can now be treated at a good profit.

New Mexico

Socorro County

Mistletoe Mining Company—This company, at its mine in the Magdalena district, entered the ore chute June 4. The tunnel is 1100 ft. long. The ore is a good grade of galena and blende.

Oregon

Baker County

Eagle Mountain Mining Copper Company—This company, George E. Alexander, superintendent, on Goose creek, about 25 miles east of Baker City, is driving two tunnels.

Power Plant—T. R. Berry, of the Eagle River Electric Power Company, and crew of men are at work at the power-house site on Main Eagle to the Virtue mine for the transmission line.

Sawmill Gulch—J. T. Miller will begin sinking on his claims on Goose creek.

Sovereign Group—The control of this group of copper claims on Goose creek and the Poorman group, 25 miles east of Baker City, including 18 claims on Goose, Coin and Balm creeks, has been acquired by an Eastern syndicate for $250,000, through its representative, W. B. Gledding. Development work will begin at once under the direction of C. H. Knight.

Trade Dollar — This company, Dewey, Idaho, has placed an order for a new power plant at Swan Falls with the Baker Iron and Supply Company. This local house is also supplying the machinery for the large water wheel on Snake river, which is to generate power for Nampa and Caldwell, and also for the Boise Interurban.

[illegible] group—A shaft is being sunk on this group which shows good ore.

Pennsylvania

Anthracite Coal

[illegible] & Reading Coal and Iron Co.—This company's statement for April and the 10 months of its fiscal year from July 1 to April 30 is as follows:

	April.	Ten Mos.
Earnings	$4,121,378	$32,010,461
Expenses	3,901,151	30,319,880
Net earnings	$ 220,227	$ 1,690,581

For the 10 months there was an increase of $4,014,939 in earnings; an increase of $3,876,937 in expenses, and a resulting gain of $138,002 in net earnings.

Bituminous Coal

Pittsburg Coal Company — This company's financial statement for the four months ended April 30 is as follows:

	1906.	1907.	Changes.
Earnings	$1,398,427	$1,522,832	I. $124,405
Depreciation, etc.	$ 604,885	$ 560,045	D. $ 44,840
Interest	393,778	372,426	D. 21,352
Total charges	$ 998,663	$ 932,471	D. $ 66,192
Net balance	$ 399,764	$ 590,361	I. $190,597

Depreciation charges in 1907 were $223,718 for decrease in value of coal lands, and $336,327 for depreciation of plant and equipment.

Utah

Box Elder County

Lakeside Copper Company—Churn drills are used for prospecting on the property of this company on Promontory point, near the north end of Great Salt lake.

Juab County

North Scranton — This new company will shortly begin the development of mining property adjoining the Scranton lead-zinc mine in the North Tintic district.

Tintic Ore Shipments — The mines of the Tintic mining district were the last week of May represented by 130 carloads of ore, the contributing mines and amounts being: Ajax, 2; Bullion-Beck, 9; Beck Tunnel, 12; Carisa, 6; Colorado, 10; Centennial Eureka, 42; Du Pue, 6; Eagle & Blue Bell, 4; Eureka Hill, 2; Grand Central, 2; Lower Mammoth, 7; Godiva (concentrate), 7; Scranton, 6; Swansea, 1; Uncle Sam Con., 8; Yankee Con., 5; Victoria, 2.

Washington

Okanogan County

Olentangy—The vein was encountered in a double-compartment shaft over a year ago, at a depth of about 75 ft. After several months idle, work was resumed about the middle of last February, sinking the shaft on good gold ore. There is a good wagon road to the railway, about three miles distant. This property is owned principally by Ohio people.

Wehe Consolidated—These claims in Golden camp, on Palmer mountain, have been sold to a Milwaukee, Wis., company by the original owners. A. M. Wehe reports having interested some Eastern

people in a plan to build a smelter near Oroville.

Kimberley—The steam hoist, boiler and compressor have been delivered. As soon as they are installed, sinking will be resumed in the shaft from the 100-ft. level.

[illegible] County

Green—The main vein, 20 ft. wide, has been intersected in the lower tunnel, 345 ft. from the portal, at a depth on the pitch of about 500 ft., the vertical depth being about 300 feet.

Meteor—The tunnel, now in 630 ft., will be driven about 40 ft. farther. The company will also drift each way on the ore vein already cut in the tunnel. A new ore house has been built for sorting.

San Poil Mining and Exploration Company—This company has been incorporated under the laws of Washington with $1,500,000 capital, divided into 1,500,000 shares. The directors are Chas. E. Skiles, John W. Mickle and Mr. Hannaford, of Philadelphia; Caspar Howarth, of Chester, Penn.; A. L. Wright and S. L. Boyer, of Spokane, Wash. Philadelphia will be the principal place of business. This company has purchased three groups of claims, which will be known as the Philadelphia, Empire and Last Chance groups, the last named consisting of 10 silver-lead claims at the head of Nine Mile and the south fork of Bridge creek. S. L. Boyer is the manager. The ore brought to the surface is gray carbonate of lead. The vein is a contact between porphyry and lime.

Seal Mining Company—The directors of this company are the same as those of the San Poil Mining and Exploration Company. The company has bought six claims 1½ miles north of the Congress mine, on Bridge creek. The vein is a contact between porphyry and diabase. A tunnel 57 ft. long has intersected the vein at a depth of 50 ft. A new tunnel will be driven on the hanging wall.

Slocan County

Nellie S.—A shaft was sunk 200 ft. on a 4-ft. vein. Recently an 8-ft. vein was uncovered in a shaft 15 ft. deep, about 200 ft. west of the main shaft and dipping toward it. A crosscut will be driven from the bottom of the working shaft to intersect the newly discovered vein.

[illegible] district, 320 ft. from the portal, a vein of silver-lead and copper ore was cut at a depth of 175 ft. Drifts will be driven on it and the tunnel will be continued about 100 ft. to intersect another vein which was opened at the surface.

Trojan—Work has been resumed.

Trojan Gold Mining and Milling Company—This company has been organized to operate the Wild Rose and Rockwell claims on First Thought hill.

[illegible] Mining Company—The [illegible] P. Milkaik, G. H. Walters and J. A. Maicil, of Spokane, Wash., to operate a gold copper [illegible]

West Virginia

Kanawha County

Cardiff Coal Company—The lands and operations of this company on Armstrong creek in the lower edge of Fayette and the upper edge of Kanawha counties, have been sold to the Tyree interests. The company purchasing was the M. B. Coal and Coke Company, composed of the same persons as those composing the Black Betsy Coal Company, of which Frank L. Tyree is general manager. The transfer covers several thousand acres of land and four plants in operation.

Canada

Alberta

The provincial government has appointed a commission to investigate and report on all phases of the coal-mining industry. The members are: Chief Justice Sifton, chairman; Lewis Stockett, general manager of the Pacific Coal Company, Bankhead, representing the coal-mine operators; and William Hasom, president of the Coleman Miners' Union, representing the coal miners.

British Columbia—Boundary District

The output of ore from Boundary district mines during the first four months of 1907 was as follows: January, 60,003 tons; February, 53,965; March, 100,219; April, 117,907; total, 332,094 tons.

The April tonnage was made up as follows: The Granby Company's mines, 70,518 tons; British Columbia Copper Company, 22,830; Dominion Copper Company, 13,289; Snowshoe mine, 11,030; sundry small mines, 180; total, 117,907 tons.

British [illegible]—A new record of ore treated in one month at this company's smelter was made in April, 34,230 tons being smelted in two blast furnaces. The [illegible] is 48x240 in.

[illegible]

Ore Shipments—Shipments of ore from the Cobalt camp during the week ending June 1 were made by the following mines: Coniagas, 170,300 lb.; Nipissing, 185,670; O'Brien, 65,200; Trethewey, 63,200; Timiskaming, 55,500; total, 548,870 pounds.

[illegible] Road [illegible] 80 h.p. boiler has been installed, and is in [illegible] will be put down to the 125-ft. level, where drifting will be undertaken, as well as [illegible] was struck about 300 ft. from the main shaft.

[illegible] at the 115-ft. level, Cobalt, [illegible] at the higher level.

[illegible] 25 men in charge of Consulting Engineer [illegible] the company's claims at Larder [illegible] Larder Lake area. Some samples of milling quartz have been obtained. Native silver has been found on an island in the lake owned by the company.

Nipissing—A big chute of high-grade ore has been struck in vein No. 49, Cobalt, by a cross-cut, driven south, 200 ft. from shaft 25. The strike was made at a point 250 ft. southwest of the original strike of high value in the vein, and at a depth of 30 ft. The vein is 3 ft. wide, with a streak of native silver ore 18 in. in width, and is in the Huronian formation, the first discovery in the vein being in the [illegible] stones. A drift is being run to the [illegible] deposit from the foot of the 125-ft. shaft sunk at first on the vein. Additions are being made to the working force which now numbers 350. A subsidiary camp is to be established on the Nipissing property, north of Cobalt.

[illegible] initial shipment of ore amounting to 27 tons less a fraction have been received, the sum being about $90,000. The main shaft, Cobalt, is down 82 ft., and will be sunk [illegible] drifting has been done for over 250 ft. [illegible] shaft a winze has been sunk for 35 ft. [illegible] vein for the greater part of this distance [illegible] silver, with [illegible] per cent. [illegible] lb., and carrying over 18,000 [illegible] native silver [illegible]

South America

[illegible] their transportation

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

The western coal trade is steady, with no special incident. Warmer weather seems slow in coming, and the demand for domestic coal keeps up to an unprecedented degree for the season. Steam coal continues in steady demand. The trouble in the Pittsburg district is to be settled by arbitration after all, as briefly noted last week. Some minor troubles in Indiana have been settled by a conference. The lake trade is not specially active, though shipments from Lake Erie ports exceed those of last

The eastern bituminous trade is rather active, demand for steam coal showing up well. The coastwise trade is hampered by a shortage of vessels available, and consequent high freight rates.

The anthracite trade is steady, May shipments, as given elsewhere, being close to 6,000,000 tons. There is still a strong demand for small or steam sizes, which is most apparent in the city trades.

The New York, New Haven & Hartford Company has given to the New York Central & Hudson River Company an option on the controlling interest which it holds in the New York, Ontario and Western Railroad, and its coal proper-

property, which it bought over a year ago, in return for certain traffic arrangements, and in consideration of the withdrawal of opposition to its purchase of the Boston & Maine system. The option will doubtless be exercised, and will bring into the anthracite combination the only independent company having its own line to tidewater.

Coal-Traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to

	1906.	1907.	Changes.

per cent

the three months ended March 31, in short tons:

	1906.	1907.	Changes.
Missouri	1,026,221	784,480	D. 241,741
Kansas	1,898,078	1,620,399	D. 277,679
Arkansas	619,438	563,345	D. 56,093
Indian Territory	1,001,553	685,325	D. 316,228
Total	4,545,290	3,653,549	D. 891,741

This shows a total decrease of 19.6 per cent. this year.

Shipments of anthracite coal by Lake from Buffalo for the season to June 1 were 770,430 tons.

Shipments of coal and coke over the Chesapeake & Ohio Railway for the 10 months of the fiscal year from July 1 to April 30 were as follows, in short tons:

	Coal.	Coke.	Total.
New River	4,600,564	183,257	4,783,821
Kanawha	3,013,515	84,022	3,097,537
Kentucky	150,372	.....	150,372
Connecting lines	346,625	104,695	451,320
Total	8,111,076	371,974	8,483,050
Total, 1906	7,595,273	408,643	8,003,916

The total increase was 479,134 tons, or 6 per cent. Deliveries of tonnage originating on the road this year were: Points west of mines, 3,536,117 tons coal and 198,728 tons coke; points east, 1,487,560 tons coal and 68,551 tons coke; tidewater, 2,740,774 tons coal.

Shipments of anthracite coal in May were 5,994,272 long tons, an increase of 2,740,042 tons over May, 1906. For the five months ended May 31 the shipments, by companies were, in long tons:

	1906 Tons.	1906 Per Ct.	1907 Tons.	1907 Per Ct.
Reading	3,959,424	20.0	5,451,068	20.2
Lehigh Valley	3,327,306	16.9	4,551,318	16.9
N. J. Central	2,461,274	12.5	3,503,635	13.0
Lackawanna	3,375,058	17.1	4,303,237	16.0
Del. & Hudson	2,019,960	10.2	2,664,918	9.9
Pennsylvania	1,725,523	8.8	2,498,216	9.2
Erie	1,906,082	10.1	2,859,568	10.6
N. Y., Ont. & W.	854,656	4.4	1,128,475	4.7
Total	19,709,783	100.0	26,960,435	100.0

The total increase this year was 7,250,552 tons, or 36.8 per cent. The light tonnage in 1906 was due to the suspension of mining in April and a part of May.

New York

Anthracite

June 12—There is very little change to report in the anthracite-coal market. The demand for small sizes continues to be sharp, with a fair demand for other sizes. The backward season has had a small effect in stimulating demand. The slow improvement in the car supply continues, but conditions are not yet normal. We quote prices as follows: Broken, $4.45; egg, stove and chestnut, $4.70. Quotations on small sies are as follows: Pea, $3.10; buckwheat, $2.60; rice, $1.95; barley, $1.60; all f.o.b. New York harbor.

Bituminous

The improvement in the Atlantic seaboard soft-coal trade continues, and there seems to be a fairly general demand for coal, which transportation facilities, especially by water, are not large enough at this time to take care of. Producers, however, are careful not to send coal to tide in quantities sufficient to produce blockades, as the lesson of a few weeks ago in that direction had a good effect.

Throughout the trade there has been a general complaint that the main-line railroad transportation superintendents have been over-zealous in their efforts to discharge cars at tide promptly, the complaints being that it interferes with the transaction of business in a legitimate manner.

Trade in the far East is still demanding considerable amounts of coal and orders from this territory seem to be accumulating in the hands of shippers. The great scarcity of vessels does not permit the coal to go forward as promptly as desired.

Trade along the Sound is quiet, probably because consumers have fair stocks of coal on hand. New York harbor trade seems to be taking care of all of the coal which is offered. Prices are somewhat lower, and good grades of steam coal are now selling around $2.60 f.o.b. New York harbor shipping ports.

All-rail trade appears to be pretty well supplied with coal, and there are a good many suspensions of shipments to avoid congestion; this will probably continue until stocks are reduced. Transportation from mines to tide is up to schedule. The car supply is fairly good, although the quick action of main-line transportation superintendents in shutting off mine-car supply on the slightest appearance of accumulations at tide interferes greatly with the proper handling of business.

Coastwise vessels are scarce, and in great demand, and quotations are unchanged from last week as follows: Philadelphia to Boston, Salem and Portland, $1.05@1.10; Providence, New Bedford and the Sound, $1; Lynn and Bangor, $1.30; Portsmouth, Gardiner and Saco, $1.15; Bath, $1.10; with towages where usual.

Birmingham

June 10—Coal operations in Alabama show no change. The miners are getting out a large quantity of coal and there is a demand for every ton. No apprehension is felt as to the outcome of the

annual meeting of the district organization of the coal miners which began today and is to continue for a week. The iron and steel companies do not deal with the union miners except the Alabama Consolidated. The commercial coal companies in Jefferson, Shelby and St. Clair counties sign contracts with the union men. It is hardly believed there will be any change made in the contract which has been in effect for the past three years, in which case the operators will sign willingly. Almost all of the miners are doing well and very little trouble is heard of in this State. New men are being brought into the State right along and are being given employment. The operators report that there will be no need for cutting off any of the work at the mines this summer and a steady output is looked for through the entire year.

The coke situation is a little better. The demand is picking up. Prices are inclined to be weak. The production is being held up, the operators declaring that it will be a profitable move when the demand is again normal.

Chicago

June 10—The wholesale coal market continues strong for both Western and Eastern coals. It is probably the best market, for early summer, that the trade has seen for several years. All kinds of coal are in good demand, prices are fair though not high, and there is not the usual summer accumulation of coal on tracks to be sold at a sacrifice because of demurrage.

Of Illinois and Indiana bituminous, which constitutes the bulk of the local supply, this is especially true. Fine coals are increasing in demand and value; lump coal is being sold at the low prices usually prevailing at the beginning of summer. June business, both in city and country, promises to average well, as the railroads are laying in stocks of storage coal.

Quotations on Illinois and Indiana coals remain practically unchanged; lump and egg sell for $1.00@2.55, run-of-mine for $1.50@2.25, and screenings for $1.55@1.75.

Anthracite is in good demand for immediate and future deliveries, the demand for immediate deliveries being larger than usual on account of the continued cool weather. Smokeless is a trifle weak; the supply is large and the demand, while good, does not increase so fast; run-of-mine listed at $3.35 sells for $3.15 in some cases. Hocking is in steady demand and firm condition at $3.15 for lump. Youghiogheny and Pittsburg are a little more plentiful and bring $3.15@3.25 for $3 lump.

Cleveland

June 11—The Cleveland Chamber of Commerce issued the following report of receipts and shipments through Cleveland for May:

Receipts: Anthracite coal, 14,340 tons; bituminous coal, 422,750 tons; [illegible] tons; pig bloom and railroad iron, 68,805 tons; [illegible] tons, by lake, 87 tons. Shipments: Bituminous coal, [illegible] tons; [illegible] tons; [illegible] tons;

son Company is negotiating for the sale of the stock of the Chateaugay Ore and Iron Company which it owns—carrying the control of the company—to the United States Steel Corporation. The property is in the Adirondack region in northern New York, including a blast furnace and appurtenances. The chief value of the property, however, is in the extensive body of iron ore owned by the company. This is rather low grade, requiring concentration, but the quantity of ore known to exist is large.

Lake Superior Ore Shipments—Shipments of Lake iron ore reported for the season to June 1, by ports, were as follows, in long tons:

	1906.	1907.	Changes.	
Escanaba	923,744	1,014,339	I.	90,595
Marquette	404,497	376,873	D.	27,524
Ashland	632,092	495,194	D.	136,898
Superior	868,187	1,101,183	I.	232,996
Duluth	1,524,404	1,947,830	I.	413,426
Two Harbors	1,499,546	1,326,842	D.	72,704
Total	5,792,340	6,252,261	I.	499,921

The increase this year was 8.7 per cent. The gain was all made in May, the shipments up to May 1 having been considerably behind those of last year.

Baltimore

June 11—Imports of spiegeleisen for the week were 100 tons; of ferromanganese, 1539 tons; of ferrosilicon, 200 casks. Receipts of iron ore were 11,100 tons, from Cuba. Other arrivals included 3954 tons iron pyrites from Spain and 772 tons chrome ore from London.

Birmingham

June 10—While the iron market in this section has been a little quiet recently it has lost none of its strength, and what selling is going on is at a higher quotation than has prevailed. Southern furnace companies have been selling some iron for delivery during the fourth quarter of this year at $21.50 per ton, while a few sales are still being booked for delivery during the first three months of 1908 at $18.50 per ton. The production in Alabama has been increased recently and during the present month further improvement will be noted. The new furnace of the Alabama Consolidated Coal and Iron Company at Gadsden and one of the Tennessee Coal, Iron and Railroad Company at Ensley were blown in during the last few days. The Sloss-Sheffield Steel and Iron Company will blow in their two furnaces now under repairs by July 10. Every ton of iron is in demand.

Some complaint is heard as to ore supplies from a few companies. Others report supplies sufficient for all needs. The Sloss Sheffield has completed a large ore-washer in the Russellville field.

No change in conditions is reported on steel, finished iron and steel, steel products and cast-iron pipe. All plants are in full operation and the transportation

Chicago

June 10—There is a livelier tone to the iron market, but sales are not large and indications are for a quiet, firm market indefinitely. The melters are well supplied for the year up to the end of the third quarter, except for the emergencies arising out of larger business than had been contracted for in supplies of raw material. These emergencies have made the dealing in quick-delivery lots of pig iron somewhat larger in the last week than in previous weeks, and maintain the tone of spot deliveries firmly.

Sales continue to be chiefly quick delivery, with a sprinkling of orders for delivery in the last quarter of 1907 and the first quarter of 1908. Quotations for the fourth and first quarters are variable, beyond the usual figures for a corresponding time, but may be averaged at $21@21.50 Birmingham for Southern ($25.35@25.85 Chicago), and $25@25.50 for Northern, the quotations being for No. 2 iron. There are reports of lower prices on Southern, and for the first quarter of 1908 prices are 50c.@$1 lower in some cases, depending on the conditions of delivery and the size of the order.

Quick-delivery business is more active with Northern than Southern furnaces. This business, as heretofore, is in small lots, chiefly for piecing out requirements.

Coke is fairly firm, the local supply being well regulated to the demand, and escaping demurrage charges. Connellsville 72-hour sells for $5.85 and other cokes for 25@50c. less. The demand for contract coke is increasing, but is not heavy.

Cleveland

June 11—The strike of Cleveland's machinist trades union for the nine-hour day and advance in wages has not assumed a serious aspect during the week. The strikers were but half organized, and in consequence have not made much of an impression, all of the shops affected operating with reduced help. In consequence a number of the men have become discouraged and returned to work, and it is expected that the end of the week will see the strike broken up.

The coal and iron markets are reported at the same prices as last week. There is a slight tone of betterment noticeable in the pig-iron market. Orders do not appear heavy, but furnaces are reporting a good demand for last-half delivery, with some orders from Lorain mills and the valley for delivery during the first part of 1908. The movement of pig iron, as well as all other ores, has been exceptionally heavy during May. Prices are quoted as follows for last-half delivery: No. 1 foundry Northern, $24.50; No. 2, $24; No. 3, $23.50; bessemer, $23.90; No. 2 Southern, $24.35; Gray Forge, $22.50.

The coke market is quoted quiet with no change in the following prices: Furnace—$2.15 to $2.25 last half, foundry, $3.15 to $3.25 same; spot furnace coke is bringing $2.10@2.15.

Philadelphia

June 13—The pig-iron market appears to have finally entered upon a dull period which some makers believe will continue into mid-summer. The suspension of demand in a large way is welcomed. Buyers who have purchased heavily for forward requirements incline to the opinion that the incoming capacity in the Central West will indirectly bring about easier prices. The opinion of pig-iron makers is exactly the reverse. They believe, that while prices may not advance, the largest production will be anticipated by demand. The fact that foreign stocks have declined over one-half is also kept in sight. A good many small consumers in this territory have decided to do nothing more at present with reference to fourth-quarter requirements. The bar mills are well supplied with forge for this summer but not beyond. Special foundry grades in small lots have been under negotiation this past week. Low phosphorus is quoted $28, mill irons, $23@23.50. English No. 3, $22.50 and Scotch, $25. Basic, $24 autumn delivery.

Steel—A large volume of business has been done in extension of old contracts and the making of new ones. Purchasers keep themselves well provided and as the mills are taxed, prices keep at the highest point. Just as fast as business comes in, contracts for material to cover are placed. Quotations continued at $32.50@33.

Sheet Iron—Contracts are renewed as old ones are filled and at the same figures. Consumers of sheet are crowded with work and some of the larger concerns have understandings with manufacturers that amount to a continuous supply. Light sheets are just now particularly active.

Bar Iron—A number of renewals of contracts will be made this week and next on the old basis. Early deliveries are still at a premium. All bar-iron users show anxiety to keep contracts going. The store demand all over this territory is even stronger than in May.

Pipes and Tubes—Merchant pipe is not quoted higher in this market but early deliveries are at a premium. The heavy western demand is reflected here. The tube situation is about the same, and deliveries are insisted upon according to terms of contract. All work calling for tubes is abundant. The boiler plants are extremely busy.

Plates—The announcements of the purpose of some railroad companies to largely increase their steel-constructed rolling stock has not taken our plate-mill interests with surprise. Parties representing railroad interests have been personally conferring with plate-mill interests at both ends of the State, and it is believed that

capacity will be engaged in the early summer on some of the new steel mills. Small early-delivery orders are being taken care of.

Structural Material—Small, urgent orders are more numerous. Prices for such business are on a premium basis. The local and near-by building demands are quite a feature. Officials say that the requirements for large bridge building will be heavy during the summer. Special efforts are made to accommodate the small builders.

Steel Rails—Negotiations are hanging fire for large lots of rails, but no immediate action is probable. A few weeks of comparative quiet are expected. Makers admit railroad managers are looking into the open-hearth rail subject with serious intent.

Scrap—The corner in steel scrap still continues and every prospective source of supply is picketed by dealers. Consumers want scrap due them and are not getting it promptly. Other kinds of scrap are moving slowly.

Pittsburg

June 11—One of the largest producers was forced to admit today that there is a decided falling off in new business in all lines of finished iron and steel. Orders for small lots which have been unusually heavy since the opening of the year have been remarkably light during the past few days. Specifications have also fallen off, but despite the dullness all the mills are busy and there are enough orders on the books to keep them running for several months. The railroads are not canceling contracts and it is believed they will take all the steel ordered. No new business in steel rails has been recorded for two weeks by the Carnegie Steel Company, but there are a number of inquiries for 1908 delivery which may result in contracts later. The Union Railroad of the Carnegie Company has placed a contract with the Pressed Steel Car Company for 1500 steel gondolas which are to be delivered by October. This company also booked during the week orders for 100 steel gondolas and 200 steel underframe box cars for the Richmond, Fredericksburg & Potomac Railroad. Early in the year it was announced that the steel car concerns had enough business to keep their plants going steadily all year. The fact that the leading producer can take on a big order for October delivery would indicate that delivery on some of the business has been postponed.

The market for crude steel shows some improvement as deliveries are better. This is accounted for by the fact that the Lackawanna Steel Company and the Cambria Steel Company [illegible] from their structural mills and putting it into billets. This indicates a slight lull in demand for shapes and there is therefore more profit in billets. There has been an abatement in the demand for steel bars as most of the agricultural implement makers have covered for their requirements for the year beginning July 1. These interests usually take about 200,000 tons of steel bars annually and so far, it is estimated, contracts have been placed for fully 75 per cent. of the material needed. The large plate mills are filled up for the year and the demand has fallen off, but for prompt shipment no [illegible] premium.

Interest is centered in the wage conferences this week. The Amalgamated Association representatives met the Western Bar Iron Association in Toledo last week and after a session lasting four days adjourned without having reached an agreement. The conference with the Republic Iron and Steel Company opened in Pittsburg yesterday. It is not likely a settlement will be made unless the workers recede from their demands for an advance. The conference with the American Sheet and Tin Plate Company will be held here next Tuesday and it is also certain that the demands of the workers will be refused.

Pig Iron—The pig-iron market shows some evidence of weakness, as sales of bessemer iron for spot shipment in small lots were made at the maximum price of $24, Valley furnaces, and a number were at 50c. a ton less. About 7000 tons of bessemer iron for June shipment are recorded at $23.50, Valley furnaces. This may be regarded as a low price when it is known that some sales have been made at that figure for fourth-quarter delivery. The most important transaction of the week was the sale of between 3000 and 4000 tons of No. 2 foundry iron for equal deliveries through the first half of 1908 at $20.75, Valley furnaces. This price is considered low from the fact that sales have been made at $22 to $22.50 for deliveries in the last half of this year. An offer of $23.75 was made today for 200 tons of bessemer for June and the deal may be closed this week. W. P. Snyder & Co. have closed a deal with the Republic Iron and Steel Company for 5000 tons of bessemer for June delivery, payment to be made in ore. Spot bessemer [illegible] at $[illegible] to $30.50. Open-hearth billets are still [illegible] $31. Bessemer billets [illegible] and closed at [illegible].

Sheets—Deliveries have improved but [illegible] Black [illegible] 3 [illegible] Galvanized [illegible] 4 [illegible]

Tin Plate—[illegible] 100 boxes [illegible] $[illegible] to $[illegible]

Dusseldorf, Germany

June 1—The [illegible] iron and steel [illegible] the production of pig iron [illegible] April, 1907, 1,[illegible] metric tons [illegible] same time last year, and April, 1906, [illegible] March, and April, 1905, [illegible] April, 1907, [illegible] metric tons.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]

Increases were, in foundry iron, 38,741 tons; in steel pig—which includes spiegel [illegible] 43,[illegible] Thomas, or basic pig, 130,067. There was a decrease of 19,371 tons in forge iron, leaving the total gain this year 200,526 tons, or 5 per cent.

Metal Market

[illegible] York, June 13.

Gold and Silver Exports and Imports

Metal	Exports	Imports	Excess
Gold			
Apr., 1907..	$[illegible]	$[illegible]	$[illegible]
" 1906	[illegible]	[illegible]	[illegible]
Year 1907	[illegible]	[illegible]	[illegible]
" 1906	[illegible]	[illegible]	[illegible]
Silver			
Apr., 1907	[illegible]	[illegible]	[illegible]
" 1906	[illegible]	[illegible]	[illegible]
Year 1907	[illegible]	[illegible]	[illegible]
" 1906	[illegible]	[illegible]	[illegible]

[illegible] [illegible] [illegible] [

Specie holdings of the leading banks of the world, June 8, are reported as below, in dollars:

	Gold.	Silver.	Total.
Ass'n N. York	.....	.....	$211,571,200
France	$174,570,800	....	173,876,815
Germany	567,500,000	$198,100,485	765,752,510
Germany b	129,750,000	58,750,000	188,250,000
Spain	77,745,000	128,250,000	205,815,000
Netherlands	29,100,000	25,194,500	54,757,500
Belgium	15,000,000	7,916,665	24,550,000
Italy	161,595,000	24,737,000	186,332,000
Sweden	580,000,000	31,479,000	611,859,000
Aust.-Hungary	227,615,000	63,605,000	291,220,000
Sweden	20,720,000	.....	20,720,000

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from the cables to the *Commercial and Financial Chronicle* of New York.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell, as follows, for the year to May 30:

	1906.	1907.	Changes.
India	£ 7,614,213	£5,257,534	D. £ 2,356,679
China	.....	.....	.....
Straits	1,750	491,862	I. 490,112
Total	£ 7,914,963	£5,749,396	D. £ 1,865,567

Imports for the week were £2000 from China, £5000 from the West Indies, £5000 in Mexican dollars from Vera Cruz, £7000 in Mexican dollars and £127,000 in bars from New York; a total of £146,000. Exports were £15,000 coin to Australia, £65,800 coin to the straits, £85,000 in bars and £90,500 in Mexican dollars to India; £256,300 in all.

Indian exchange has been firmer, and the Council bills offered in London brought an average of 16.09d. per rupee. The demand for money in India is strong. Buying of silver for India was only moderate.

Other Metals

June	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. Cts. per lb.	Spelter. New York, Cts. per lb.	Spelter. St. Louis, Cts. per lb.
	24	23					
6	@25	@24¾	97½	41½	5.75	6.45	6.30
	24	23					
7	@25	@24	97½	41	5.75	6.45	6.30
	24	23½					
8	@25	@24		41	5.75	6.45	6.30
	24	23½					
10	@25	@24	97	40¾	5.75	6.45	6.30
	24	23½					
11	@25	@24	97	41	5.75	6.45	6.30
	24	23½					
12	@25	@24	96½	41	5.75	6.45	6.30

[illegible] the decline in London has made further progress, and even at the lower prices reached, the market is but barely steady. The close is cabled at £185 10s. per ton for spot, £186 10s. for three months.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.51⅛	$0.53½
Peruvian soles and Chilean	0.47	0.50
Victoria sovereigns	4.85	4.87
Twenty francs	3.85	3.89
Spanish 25 pesetas	4.78½	4.80

SILVER AND STERLING EXCHANGE

June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.	June.	Sterling Exchange.	Silver. New York, Cents.	Silver. London, Pence.
6	4.8680	66⅞	30 1/16	10	4.8700	66⅝	30 1/16
7	4.8710	66⅝	30 1/16	11	4.8700	66⅝	30⅛
8	4.8700	66⅜	30⅛	12	4.8700	66⅞	30 1/16

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Copper—The market this week is substantially a repetition of last week. Some sporadic sales of near-by electrolytic have been made for export at a slight concession in price, but there has been no business with domestic consumers, who are still conspicuous by their absence and are evidently determined to use up their present supplies before entering into further contracts. No business in Lake copper was reported during the week, and quotations for that grade are entirely nominal. As for a number of weeks previous, the total amount of business done last week was small in comparison with the transactions under ordinary conditions. The large selling interests, which have been holding out of the market, continue to maintain their position. Everything apparently depends upon how soon the large consumers will come into the market prepared to place orders. In the meanwhile some producers appear to be tired of waiting for the situation to clear up and are disposed to accept lower prices. The market closes at 24@25c. for Lake, 22¾@23c. for electrolytic, and 21½@21¾c. for casting.

The market for g.m.b.'s in London has been steadily declining, and supporting orders have so far made no impression. The close is lower and easy at £96 5s. for spot, £93 5s. for three months. Refined and manufactured sorts we quote: English tough, £102; best selected, £106; strong sheets, £113.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Exports of copper from New York for the week were 2443 long tons. Our special correspondent reports exports for the week from Baltimore at 1525 long tons copper.

The decline in London has made further progress, and even at the lower prices reached, the market is but barely steady. The close is cabled at £185 10s. per ton for spot, £186 10s. for three months.

The New York market is without special feature, excepting that there is again a scarcity of spot supplies, which has resulted in a premium for immediate shipment, in which business is being done at 40¾c.

Lead—The price for desilverized remains steady at 5.75c., New York, and 5.67½c., St. Louis. Corroding brands are 0.1c. higher.

Owing to a decided falling off in shipments from Australia, the London market is very firm and heavy premiums are being paid for immediate shipment. Prices at the close are strong and advancing at £20 7s. 6d. for Spanish lead, and £20 10s. for English.

St. Louis Lead Market—The John Wahl Commission Company reports from St. Louis that lead is firm but quiet. There have been fairly liberal sales of Missouri brands at 5.67½c., both for prompt and forward delivery.

Spanish Lead Market—Messrs. Barrington & Holt report from Cartagena, Spain, under date of May 18, that the price of pig lead has been 92 reales per quintal; silver, 13.25 reales per ounce. Exchange 27.84 pesetas to £1. The price of lead, on current exchange, is equal to £18 10s. per long ton, f.o.b. Cartagena. Shipments have been 470 tons argentiferous and 100 tons desilverized to Marseilles; 471 tons argentiferous and 200 tons desilverized to Great Britain; 200 tons desilverized to Hamburg; a total of 1441 tons.

Spelter—The market is rather quieter and business has been of reduced volume. The close is unchanged at 6.45c. New York, 6.30c. St. Louis.

Advices from London indicate a singularly weak spelter market, due to production overlapping consumption. The close is cabled at £24 7s. 6d. for good ordinaries, £24 12s. 6d. for specials.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 60-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.5c. per 100 pounds.

Antimony—The market is extremely weak and prices have suffered a heavy decline, which has been due to the pressure of holders who have been forcing sales. There appears to be a considerable stock of metal in some hands. Quotations at the close are 12@13c. for ordinary brands, while for Hallett's and Cookson's there is at present no sale. A range of 12 to 16c. probably represents the whole market.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Platinum.—A slight further decline has taken place in the market and there appears to be a disposition to await further developments rather than to take advantage of the present lower prices, which are quoted as follows: Ordinary metal, $26 per oz.; hard metal, $28 to $30. Scrap is worth $20@21.

Quicksilver.—Current prices in New York are $41 per flask for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 10s. per flask, but 6d. to 3d. is quoted by jobbers.

Wisconsin Ore Market

Platteville, Wis., June 8.—While the price of 60 per cent. zinc ore remained the same as last week, lead was off considerably, selling at $74@75 for the best grades. One of the most prominent ore buyers states that the smelters have a surplus, but his instructions to buy all ore in sight still hold good. This statement was substantiated by the action of all buyers. The buying movement was well defined all throughout the week for immediate loading, and the tonnage purchased totals up to a respectable size though all was not loaded. Toward the latter part of the week some interest was shown in purchasing for next week, but no sales for future delivery were reported. The large amount of ore in the bins at the smelter, and the active buying this week are significant that, at least for the present, there will be no material change in the price of zinc ore. Nearly all of the larger producers contemplate changes and improvements of some sort, that will tend to increase the output.

Shipments of the district, by camps for the week ending June 8 were as follows:

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	259,400		
Buncombe-Hazel Green	772,900		
Benton	455,340		
Cuba City	210,280		
Highland	138,000		
Linden	182,340		
Galena	70,000		
Livingston	60,000	.....	.....
Mineral Point	44,000		
Rewey		44,280	
Total for week	2,387,340	44,280	
Year to June 8	41,057,200	1,852,410	189,160

The lead output for this camp should increase materially. The producers claim that they have sold all their ore produced, consequently the ore in the bins at the mines cannot be called a surplus. A slight improvement in the car supply is looked for in the near future.

Missouri Ore Market

Joplin, Mo., June 8.—The highest price paid for zinc ore was $51 per ton, on an assay base of 60 per cent. zinc, averaging $45.42. The highest price paid for lead was $75.50, medium grades commanding from $74 to $74.50. Although the high price of the week was $75.50, numerous settlements were made on purchases of the previous week, according to the agreement of the producers' meeting, which gave higher than the high price.

Within three weeks there has been a total increase in the production of zinc concentrates of 600 to 700 tons per week, by the opening of new mines and starting of new mills. Deducting the loss by the inundation of the Badger mines the net increase is 500 tons per week. During these three weeks the demand has grown stronger each week, until considerable ore is being contracted ahead of its production.

Following are the shipments of zinc and lead from the various camps of the district for the week ending June 8:

	Zinc, lb.	Lead, lb.	Value
Webb City-Carterville	1,444,[illegible]	[illegible]	$[illegible]
Joplin	2,[illegible]	[illegible]	[illegible]
Duenweg	[illegible]	[illegible]	8,622
Galena-Empire	[illegible]	[illegible]	6,[illegible]
Alba-Neck City	[illegible]	[illegible]	4,[illegible]
Prosperity	[illegible]	[illegible]	[illegible]
Aurora	[illegible]	[illegible]	[illegible]
Granby	[illegible]	[illegible]	[illegible]
Oronogo	[illegible]		[illegible]
Spurgeon	[illegible]	[illegible]	7,845
Baxter Springs	[illegible]	[illegible]	5,829
Zincite	[illegible]	[illegible]	5,534
Sarcoxie	[illegible]		[illegible]
Carthage	[illegible]		1,486
Sherwood	44,[illegible]	11,[illegible]	1,468
Badger	42,[illegible]	2,[illegible]	1,[illegible]
Reeds	41,[illegible]		947
Totals	11,[illegible]	2,[illegible]	$[illegible]
23 weeks	271,[illegible]	[illegible]	$[illegible]
Zinc value, the week, $261,[illegible]			
Lead value, the week, $[illegible]			

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907	Month.	1906.	1907
January	47.38	45.84	January	75.20	80.53
February	47.37	47.11	February	72.80	81.78
March	42.68	48.66	March	73.73	82.75
April	44.62	48.24	April	76.13	79.76
May	40.51	[illegible]	May	78.40	[illegible]
June	43.88		June	80.96	
July	45.26		July	74.51	
August	46.56		August	76.46	
September	42.58		September	79.64	.....
October	41.55		October	78.84	
November	44.13		November	81.98	
December	43.68		December	81.89	
Year	43.24		Year	77.40	.....

Chemicals

[illegible] chemical trade is without special incident. Business has been rather quiet, with no new developments.

Mining Stocks

[illegible] market continues irregular and depressed, [illegible] pressing feature, and others were not wanting.

[illegible] price of $55.50 per share.

[illegible] curb, but they did not amount to much, and the market was generally dull and [illegible] active stocks.

Boston

[illegible] continues without animation except occasionally where some special cause creates a temporary advance, only to be lost the following day or so. Buoyancy in the stock market is followed by depression and as a result little change is to be noted in market prices for the week ended today. Amalgamated is off slightly [illegible] according to reports filed in Butte, Mont., for taxation purposes, six of the Amalgamated subsidiary companies, together with North Butte, Butte Coalition and Alice companies, net earnings for the [illegible] 1905, an increase of over $6,300,000 over the preceding year.

The real feature of the week was the break today of $5.75 over night in the price of Utah Consolidated to $53. Un[illegible] were responsible for this. Mohawk had [illegible] $1 [illegible] Boston [illegible] $13. [illegible] $100. The latter company is selling off a

few of the untaken shares offered shareholders last fall. Boston and Corbin has been the curb feature, advancing $2.37½ to $11.37½. There are but 80,000 shares of this stock.

Utah has acquired additional adjoining properties. The price on the curb is around $5.

Colorado Springs

The trading during the past week was better than in the previous week. The prices in general are about the same, but the volume of business has been greater. Mary McKinney advanced from 55 to 60, and dropped back to 58c. Work showed greater activity than it has for some time, recording sales to the extent of 20,000 shares the past week.

STOCK QUOTATIONS

NEW YORK June 11	
Name of Comp.	Clg.
Alaska Mine	1
Am. New M. & P. Co.	
Amalgamated	84½
Anaconda	45⅜
Balaklala	
British Col. Cop.	8
Buffalo Cobalt	
Butte & Boston	1¼
Butte Coalition*	24
Butte Cop. & Zinc	
Cobalt Contact	45
Colonial Silver	2
Cum. Ely Mining	8½
Davis Daly	11½
Detroit Cop.	6¾
El Rayo	5¾
Foster Cobalt	85
Furnace Creek	½
Giroux Mine	9¾
Gold Hill	1¾
Granby, New	
Greene Gold	13
Greene C. & S.	1½
Greene C. & I. Val	75
Guanajuato	30½
Guggenh. Exp.	245
Hancock	90
McKinley Dar.	1
Miami	
Mines Co. of Am.	1½
Mitchell Mining	
Nevada Hills	8½
New Idea M. & S.	1¾
Newhouse M. & S.	
Nipissing Mines	11
Ohio Copper	3
Silver Queen	1½
Stewart	2
Tennessee Copper	
Union Copper	
Utah Apex	6
Wood Consol'd	1

N. Y. INDUSTRIAL	
Am. Agri. Chem.	60½
Am. Smelt. & Ref.	111
Am. Sm. & Ref. pf.	105¾
Bethlehem Steel	
Colo. Fuel & Iron	36
Federal M. & S., pf.	
Inter. Salt	17
National Lead	69
National Lead, pf.	
Pittsburg Coal	
Republic I. & S.	28
Republic I. & S. pf.	86
Sloss-Sheffield	44½
Tennessee Coal	80
Tenn. C. & I.	
U. S. Red. & Ref.	
U. S. Steel	33½
U. S. Steel, pf.	92
Va.-Car. Chem.	37½
Va.-Car. Chem., pf.	71½

[illegible] June 12		
[illegible]		
[illegible]	91	8
[illegible]	0	1
[illegible]	1	2
[illegible]	11	
[illegible]	14	
[illegible]	1	
[illegible]	1	
[illegible]	1	1
[illegible]	1	1
[illegible]	1	1
[illegible]	1	1
[illegible]	3	6
[illegible]	3	6
[illegible]	3	6

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Medical Department of the Colorado F. & I. Co.

Employees Contribute $1 Per Month Each and Receive Medical Attendance and Care in Hospital in Case of Injury or Illness

BY LAWRENCE LEWIS*

Company and its predecessors have maintained through the cooperation of their employees a highly successful medical department. Not counting several years of unorganized effort, it has also carried on since 1901, through its sociological department, welfare work unequaled by any other corporation in America and exceeded in the whole world, perhaps, only by that of the Krupps at Essen, Prussia. This Colorado corporation, which also carries on operations in Wyoming, New Mexico and Utah, besides following some well-worn paths, improved methods of housing employees for example, has also been the pioneer for industrial betterment in a number of other directions, having, for instance, established and fostered the only system of free kindergartens in coal-mining camps in the world.

Polyglot Communities

On the company's payrolls are represented representatives of 32 nationalities, including [illegible] a term which as used in Colorado is roughly synonymous with "Huns" as used in Pennsylvania and includes all Slavs of Central Europe, but especially those of Austria-Hungary—Mexicans, Italians, [illegible]ese, Welshmen, Scotchmen, Germans, Swedes, Poles, Greeks, Frenchmen, Swiss, Belgians, Finns, Hollanders, Russians, [illegible] wegians, Indians, Spaniards, Danes and a few other nationalities.

The various communities scattered over a region larger than Germany differ radically in topography and climate, both of and social conditions. Some, at an altitude of four or five thousand feet, amid the sage brush, cactus and yucca of the plains and scrubby piñon of the foothills, are parched by hot winds and chafed by sand storms. Others, clinging to mountain sides, eight to ten thousand feet above the sea, or sunk deep in lonely valleys and cañons, amid the columbines, silver-tipped firs and stately pines, are drenched with torrential rains and chilled by 20-ft. snows. Some camps are completely isolated; others are near towns like Walsenburg, Trinidad, Cañon City, Florence and Pueblo, with their temptations to dissipation and vice.

The variety of local conditions, the wide separation of the various camps and plants, the magnitude of the field, the diversity of nationality and language among employees, with the accompanying suspicion and hostility, combine to make the task of medical and welfare work exceedingly difficult.

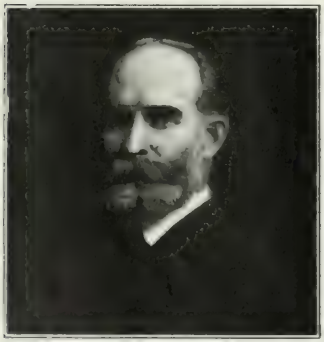
Dr. Richard Warren Corwin, of Pueblo, Colorado, is both chief surgeon of the medical department and superintendent of the sociological department. His principal assistants in these departments are respectively Dr. W. T. H. Baker, assistant chief surgeon and superintendent of the Minnequa Hospital; Dr. C. V. Marmaduke, superintendent of the steel-works dispensary; and Dr. Walter Morritt, assistant superintendent of the [illegible] and formerly of the South End settlement in Boston.

[illegible] til at present it employs 42 resident camp surgeons, hospital surgeons, specialists and consultants besides a full corps of trained nurses, attendants and specially

*[illegible]

[illegible] EMPLOYEES.

The medical department is supported by the employees. One dollar is deducted from the monthly pay of each person on the rolls, from the heads of departments to the humblest laborer. However, if a man works for less than three days he makes no contribution; if he works for more than three days and less than seven he contributes only 50c. Nevertheless, if an employee is hurt after working for but 10 minutes, as has sometimes happened, or if he falls sick after only a day's labor, he is entitled to and receives the best of experienced surgical and medical treatment, nursing and board at the hospital until he completely recovers. An Italian has been in the hospital and about the grounds in a wheeled chair for 13 years. He had worked only 14 days in one of the mines when he sustained an incurable injury of the spine. He will be cared for at the hospital for the remainder of his life. Another Italian with a similar injury, who



RICHARD WARREN CORWIN, M. D.

had worked for only a few months, was cared for during five years until his death.

In a large number of cases persons afflicted with incurable diseases have applied to the company for work, evidently with the intention of insuring their care after they should become helpless. In all such cases when they had actually been employed before final incapacity, they have been cared for. In order to obviate this as far as possible, however, and to reduce the danger of infection of their [illegible] a system of physical examination of all persons applying for clerical positions in the general offices and about the mines has been put in effect. In hiring miners and common laborers, also, superintendents and foremen have been cautioned to employ only those who seem to be in good health, although it has not been found practicable to have all these given a rigid physical examination.

In the camps where no other doctors are available, but not at the steel works, the dollar a month contributed to the hospital fund by employees covers medical and surgical attention for their families also, except in cases of diseases which are the results of dissipation. Under the rules employees are not entitled to receive funeral benefits; but in many cases a certain amount is often contributed by the company when an employee dies. Absolutely every cent of the hospital fees is expended by the company for the purposes of the medical department; and any deficits, such as rarely occur, are made up from other funds. The money for the construction and equipment of the Minnequa hospital, more than $300,000, and that for the new steel-works dispensary was thus advanced.

Organization of the Department

The work of the department may be classed under four heads: (a) general practice at the mines; (b) first aid to the injured and preventive work at the steel-works dispensary; (c) effecting cures at the hospital; and (d) general sanitary betterment and education of the men and their families in the elements of hygiene.

Each of the coal- and iron-mining and coking camps has a company surgeon who is either resident in the camp or makes daily visits thereto. In consideration of a fixed salary paid by the department, he treats all classes of cases except diseases due to dissipation and injuries from violations of laws or ordinances. Sometimes these company doctors have two, in a few cases three, adjoining camps to look after. Besides their regular daily visits they make emergency calls at all hours of the day and night in heavy rains and through snows such as only those who have seen a winter in the hills can appreciate.

The Steel-works Dispensary

At the steel works dispensary, situated about 100 ft. from the main entrance to the Minnequa works, where nearly 5,000 men are employed, 26,043 cases were treated during the year ended June 30, 1905. Less than half of these were injuries; most of the cases were of minor affections. As the function of the hospital proper is the care of serious cases of disease and injury, so the function of the dispensaries is the prevention of sickness and the prompt treatment of minor injuries which, if neglected, might prove serious. Accordingly the men are encouraged to consult the physicians in charge about even trifling aches and pains. Indeed one of the great advantages of the medical department, as conducted by Dr. Corwin, is that each employee makes a fixed monthly contribution which covers all attention. Consequently the employee does not hesitate, on account of expense, to consult a physician in the early stages of an ailment, when it can best be combatted.

By night as well as by day a physician is constantly in attendance at the steel-works dispensary, between which and all parts of the plant there is telephone communication. Stretchers are in accessible and well known places in all parts of the works so that an injured man can be carried at once by his comrades to the dispensary where emergency treatment can be given and where in cases of extreme necessity even amputations can be made. The ambulance can be summoned from the hospital so as to reach the dispensary in ten minutes after an accident to an employee.

The Central Hospital

The Minnequa hospital at Pueblo, the headquarters of the department, is situated about three-quarters of a mile from the steel works in the midst of an elevated tract of 20 acres adjacent to Lake Minnequa. It was occupied in August, 1902, but in the summer of 1906 consid-

JULIAN ABBOT KEBLER

erable enlargements and improvements were made. This hospital embodies the results of 20 years' experience in this field and of a careful personal inspection by the chief surgeon of all the leading hospitals in America and Europe. No expense was spared in providing all the latest improvements and inventions and every facility for the treatment of employees. Dr. Adolf Lorenz, the celebrated orthopedic surgeon of Vienna, after a careful examination, declared this hospital was equal in equipment and management to any in Europe or to those in America he had visited and, for its purpose, was the finest he had ever seen. During the year ended June 30, 1905, 1,160 patients were treated in the Minnequa hospital proper. This does not include the 805 cases treated at the hospital dispensary nor the 26,043 at the steel-works dispensary. Emergency hospitals are also maintained at Fierro, New Mexico, and Sunrise, Wyoming, respectively the extreme southern and northern camps.

Sanitary Work and Education in Hygiene

Extensive sanitary betterments at the various camps and plants as well as education of the people in matters of hygiene are accomplished by the medical in cooperation with the sociological department. Many unsanitary outbuildings have been removed and others destroyed, cess-pools are cleaned and filled; dwellings in some of the company's camps are screened to exclude disease-disseminating insects; wells and cisterns are frequently cleaned and inspected; dumping of filth and refuse into streams is prevented and the water supply improved and protected from contamination; garbage and litter are collected regularly, from receptacles conveniently located about the camps, and burned; and the camps are regularly policed.

By means of placards posted conspicuously and printed in English, German, Spanish and Italian; and by monthly lectures by the company doctors often illustrated by stereopticon views, the two departments impress upon employees the necessity of keeping their bodies, dwellings, food and clothing clean and call attention to the causes of disease and how they can be avoided. One surgeon recently reported: "Persistent instruction regarding the benefits derived from boiling drinking water has had its effect. A few years ago people did not appear to understand what was meant and were indifferent when they were asked to sterilize water; now when we are called to visit a case, whether in an American or foreign family, an apology is rendered and excuses made for the oversight or neglect of giving, to sick or well, water that has not been properly purified."

In connection with the sociological department, sanitary regulations have been put in effect in many camp barber shops which have also in many cases been induced to put in baths for the workmen. At Redstone a wash and changing house has been erected near the coke-ovens by the company. It contains a shower bath and two closets besides 24 white enameled cast-iron wash basins supplied with both hot and cold water. The cement floor is so laid that it can be flushed daily. Expanded metal lockers are arranged all around the room. Similar places have been installed by the company in other camps, notably at the iron mines at Sunrise, Wyoming, where the changing house and baths were installed under the personal direction of the manager of iron mines, J. D. Gilchrist.

Address to the Workmen

Labor agitators not connected with the company have on various occasions loudly denounced the alleged injustice of the arrangement by which the men, who support the department by their monthly contributions, have no voice as to how the money shall be spent; nor any representative even in an advisory capacity, in the management; and are not informed even by means of general financial statements, as to how, in detail, the funds are expended. But the efficiency of the department and the benefits derived from it are generally recognized by the employees themselves.

As far as I have been able to ascertain by talking with the men, most employees realize that the department affords a cheap although a compulsory form of insurance. For a premium of $12 a year the workman, and in the camps, his wife and children also, has the benefit of medical attention and, in case of sickness or injury, is cared for until complete recovery. Moreover, like the Chinese, he pays his doctor only so long as he is well and able to work—for the contribution of hospital fees stops during his incapacity. I have heard from the employees themselves no serious complaints, but much enthusiastic praise.

Analyses of Pig Lead

The following analyses were made recently by the Technical Analysis Department of Osaka, Japan. The table is almost self-explanatory. It is only necessary to remark that the Selby lead is a well-known American brand, produced at San Francisco, Cal. The identity of analyses Nos. 3 and 4 is not stated. Analysis headed B. H. P. is of Australian lead, made by the Broken Hill Proprietary Company. The lead entitled "Trail" is made by the electrolytic process by the Consolidated Mining and Smelting Company of Canada. This is the only electrolytic lead among the analyses. It is to be remarked that this is the highest grade of lead among the lot, being not only highest in lead, but also free from bismuth

	1. Selby	2. Trail	3. [illegible]	4. [illegible]	B.H.P.	6. [illegible]
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
Lead	99.9579	99.9880	[illegible]	[illegible]	[illegible]	[illegible]
Insolubles	0.0040	trace	trace	[illegible]	trace	[illegible]
Bismuth	0.0300	none	[illegible]	trace	[illegible]	[illegible]
Cadmium	trace	none	[illegible]	[illegible]	trace	[illegible]
Nickel	[illegible]	trace	trace	[illegible]	[illegible]	[illegible]
Cobalt	none	none	trace	trace	trace	[illegible]
Silver	0.0030	[illegible]	trace	[illegible]	[illegible]	[illegible]
Manganese	[illegible]	none	[illegible]	[illegible]	[illegible]	[illegible]
Copper	none	[illegible]	none	[illegible]	[illegible]	[illegible]
Antimony	none	none	[illegible]	[illegible]	[illegible]	[illegible]
Tin	[illegible]	none	[illegible]	[illegible]	[illegible]	[illegible]
Arsenic	0.0024	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Zinc	0.0001	trace	trace	[illegible]	trace	[illegible]
Iron	0.0027	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

brands.

At the Gundling mine, opened in the [illegible] found that a 12-ft. hole can be drilled with a cross-bit (star bit) in the same time as a 10-ft. hole with a chisel bit. [illegible] are broken down per day.

Tin Mining in the Malay States

[illegible] the tin-mining capabilities of the peninsula, even if the rate of Chinese alluvial mining is slackening. And even outside [illegible] provinces on both sides of the peninsula

Copper in the French Congo

[illegible] engineer, last year investigated the copper resources in the Kouilou-Niari basin, French [illegible] can be immediately mined; [illegible] reveals an extraordinary wealth. Prospecting is in its infancy. Results hitherto obtained are not calculated to produce a fever, considering estimates of expenses [illegible] railways [illegible] attention only directed to mines already worked by the natives. All these ores, ex[illegible] construction of a railway to improve [illegible] terfalls which abound.

Consul-General Robert I. [illegible]

Practice at the Osceola Mill, Lake Superior

The Nordberg Steeple-compound Stamp and Improved Methods of Handling Pulp Have Reduced Costs to 16 Cents Per Ton

BY LEE FRASER*

The minimum stamping expense for [illegible] by any practice in the Lake Superior copper district of Michigan is 16.4c., the record for the year 1906 at the mills of the Osceola Consolidated Copper Company. In 1850 and until about 1880 all work was done by gravity stamps at a cost of from $1.50 to $2 per ton, but with the introduction of the Ball steam stamp, about 1881 or 1882, the cost was materially decreased, until it had been lowered to 37c. per ton by the Atlantic company. The stamping expense at present varies anywhere from 17c. to 30 or 35c. per ton.

The three most important alterations and improvements upon the old practice made at the Osceola Consolidated Copper Company's mills are: the compounding of the steam stamps; the introduction of crushing rolls, and in the use of a new classifier or distributer. Besides these, a number of changes of less importance have been made.

THE OSCEOLA MILL

Crushing

The steeple-compound stamp, 15½x32x 24 in., designed by the Nordberg Manufacturing Company, is capable of crushing from 750 to 800 tons of rock per day, an increase over the crushing efficiency of the single stamps of from 200 to 250 tons per day. Steeple-compound stamps have been introduced only within the last two years. In the construction of the heads the low-pressure cylinder is superimposed upon the high-pressure cylinder. Live steam is admitted to both ports of the high-pressure cylinder. The exhaust steam is piped to a nearby reheater where its temperature is increased by about 12 deg. F. It then enters the low-pressure cylinder where the steam acts only on the down stroke of the piston, a constant vacuum being maintained upon the lower side of the head.

The introduction of crushing rolls with a 16-in. face and 36 in. in diameter permitted the use of a screen with ⅝-in. round holes in the mortar box of the stamp. Formerly the holes in the screen were ⅜ and 3/16 in., requiring finer work on the part of the stamp head and decreasing its capacity.

The copper rock is dumped from 40-ton cars into mill bins of 450 tons capacity from which it is fed directly to the stamp. The stamp is fitted with an hydraulic discharge for the removal of lump copper; about 7 per cent. of the total value of the mill product is removed in this way. Everything else passes through the ⅝ screen into two launders provided with two hydraulic discharges removing 14 per cent. of the value. Only coarse copper is extracted, No. 1 size being the minimum. Each launder from the stamp runs to a conical trommel with 3/16-in. round holes, 60 in. long, with the small diameter and large diameter 28 and [illegible] tons goes to the classifiers from which it is distributed to the concentrating apparatus, while about 200 tons of oversize is returned to the crushing rolls.

The product from the rolls first passes through a double trommel, the first screen having ⅜-in. round holes, with diameters 28 and 40½ in., while the inclosing sreen has 3/16-in. round holes and diameters of 38 and 50½ in. The trommels are 60 in. long.

The Jigs

The roll discharge is fed directly to the inner screen; the oversize, 70 tons, is fed to one double 2x3-ft. jig, from which there is a sieve discharge removing 19 per cent. of the value. The hutch product, which is inconsiderable, goes to the finishing jigs, while the tailings go by way of the elevator back to the crushing rolls. The undersize from the ⅜-in. screen goes to the outer 3/16-in. screen, from which 200 tons undersize goes to the classifiers and jigs, the oversize being sent back to the rolls.

The overflow from the distributing boxes runs into settling tanks, while the overflow from the tanks is sent by pump to the slime tanks and the settlings are fed back to the jigs.

No tail jigs are provided in this concentration, as is done in the Tamarack mills where a similar system is used, and although no appreciable loss is now sustained by sending the tailings from the head jigs directly to the dump, in case of accident to the jig the screen might be-

the amygdaloid, making it necessary to use increased precaution. Of the total value, 5 per cent. is removed in skimmings, size Nos. 1 to 4, while the hutch goes to two head and tail finishing jigs, where 8 per cent. of the value is removed. The hutch from the head is size No. 3, while that from the tail jig is No. 4. The tails go to the dump.

Finishing

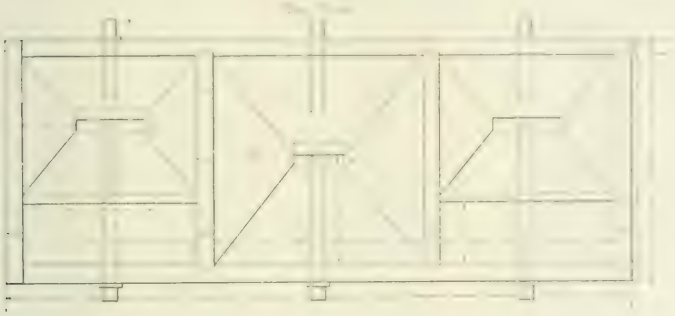
classifying boxes for the roughing jigs,

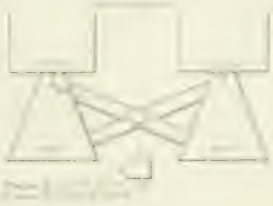
per cent. of the value in No. 4 copper is made by the Willfley, while the tailings are returned to the slime tanks. The

Of the material 440 tons is fed through spigots to eleven 2x3-ft. head jigs from which 7 per cent. of the value is removed by skimming. The tails go to the same number of 2x3-ft. jigs, while the hutch work from both jigs is conducted to the finishing jigs.

Before entering the finishing jigs the hutch product, 22 tons, passes into four

from the other. It was said by engineers to the four jigs, but the copper recovery

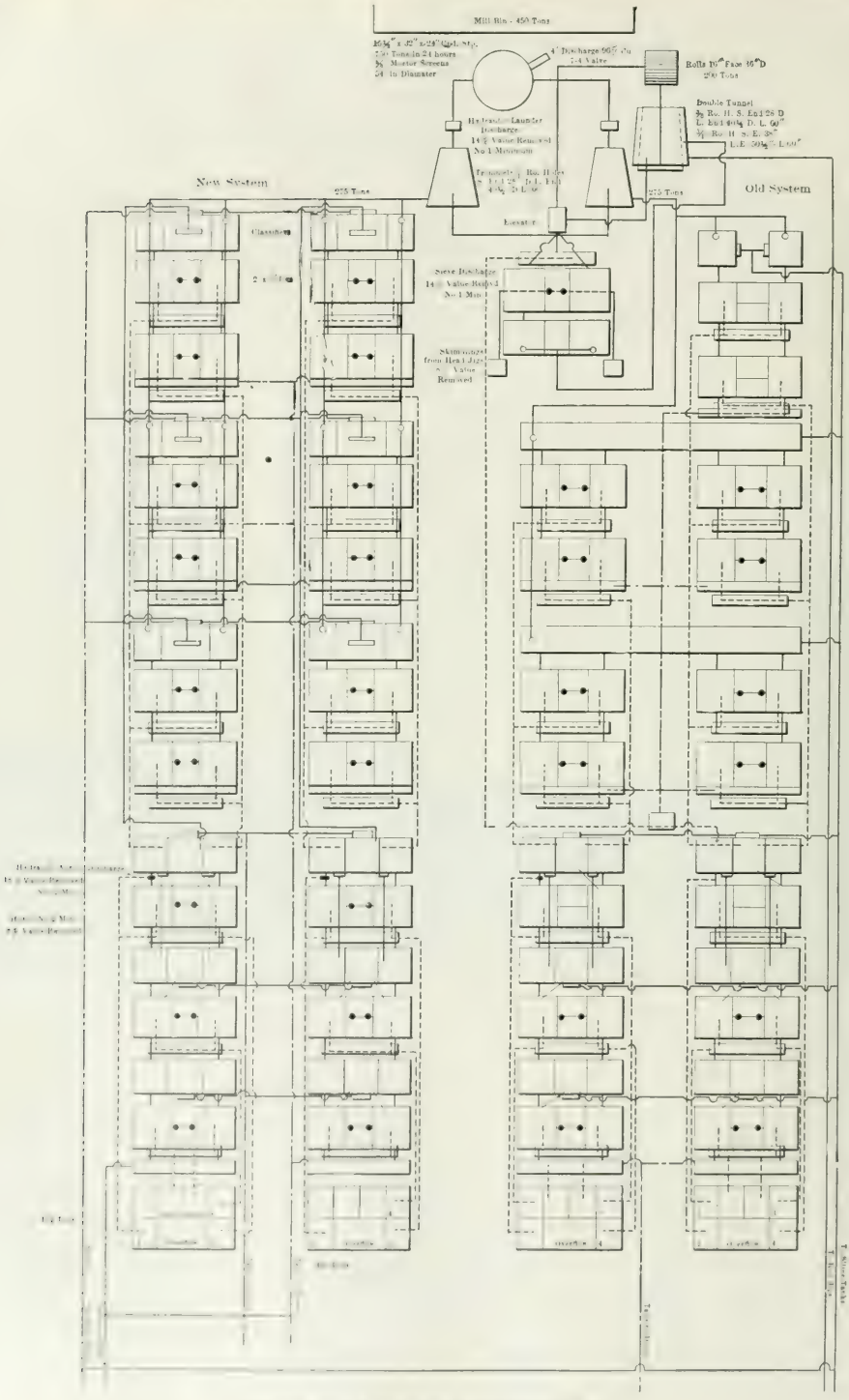




through wooden launders to two slime tanks. Should at any time the amount of overflow become excessive and too great for handling by the usual facilities, an overflow to four unwatering boxes is provided. The slimes are fed by spigots to six Evans round tables, 17 ft. in diameter in decks of two each, while the overflow of 20 tons goes to the dump. The headings from the round tables are pumped to a settling tank, later to be treated on a Willfley, while 120 tons of tailings passes through settling runs to the dump.

unwatering boxes. The overflow is carried down to the four next boxes while the remainder is fed to four hydraulic discharges by which 18 per cent. of the total value is removed. The flow then passes to the jigs, which give a hutch product containing 8 per cent. of the to-

From the tail jigs 395 tons goes to the dump, while 20 tons of hutch goes to un-



FLOW OF MATERIAL IN THE CLIFTON A MILL

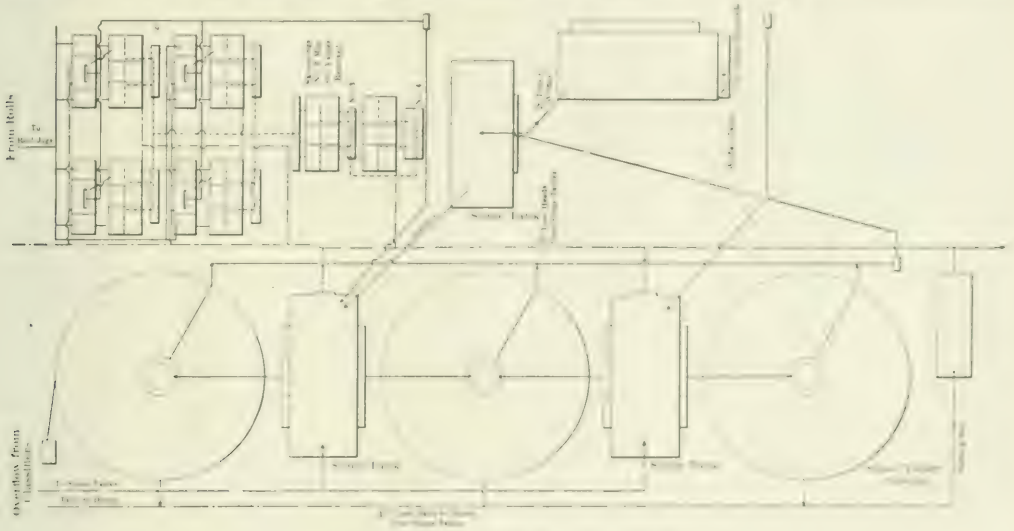
pal chances of loss through carelessness in the spigots has been solved. The discharge from the trommel flows directly into the unwatering boxes, the heavy stuff settling to the bottom immediately and passing out to the jigs, while the fine stuff goes with the overflow to the settling box which is placed between the unwatering boxes to take the overflow from each. The overflow from the settling box goes to the slime tanks, but the heavier particles sink to the bottom and pass through a spigot to the jigs.

Before the settlings can pass through the spigot, however, they undergo hydraulic classification. A jet of water is admitted through a pipe, with its outlet under the slot in the bottom of the box. All settlings must pass through this narrow slot before going to the jigs and must be of sufficient weight to drop through the upward current of water from the pipe. If they are light and fine they will be carried out with the overflow. In this way all loss from the plugging up of the spigots is practically eliminated.

Every precaution has been taken to establish a constant velocity and volume in the flow of water used for concentration. The practice requires 30 tons of water per ton of rock. All water is pumped to a tank from which it is drawn to the mill, thus maintaining a practically constant head. Several devices have been invented to obviate the closing and opening of the valves regulating the flow of water to the boxes and jigs. It is necessary whenever a jig is skimmed to shut off the water and [illegible] a constant changing of the valves and the amount of flow. The regulations must [illegible] will permit the loss of copper. It is essential to have the adjustment of the valves constant to obtain the best results.

Cross boxes have been placed between the two aprons of the head jigs, permitting the discharge to be run upon the other jig. A curved pipe is put over one end of the spigot, while the other enters the box as shown in the sketch.

In draining the hutch box before skimming, it was necessary heretofore to pull out the plug regulating the outlet, but a pipe is now attached to the bottom of the box permitting all hutch and water to be drained back to the slime launders. This obviates the necessity of changing the adjustment of the plug.



[illegible]

These and other minor improvements render the practice of the Osceola mill more successful than that of any other plant in the district.

The Steel-rail Question

[illegible] the United States Steel Corporation, it is probable that in the near future, representatives of the leading railroads and steel manufacturing companies in this country will begin an exhaustive joint examination into the quality of steel rails now being furnished to the railroads. Mr Gary's attention had been called to a report that a committee of prominent rail [illegible] last week.

[illegible] admit that this company has failed to use every reasonable precaution against acci[illegible] company with intentional failure to perform every known duty.

"It should go without saying that every [illegible] rails and the operation of [illegible] any one. [illegible] companies will make it."

Mechanical Production of Low Temperatures

Principles of Refrigerating Processes Which May Be Used for Cooling Deep Workings and in Sinking by Freezing

BY SYDNEY F. WALKER*

The use of the freezing process for sinking shafts is steadily increasing, and the problem of the increased heat at the continually increasing depths to which both coal and metalliferous mines are being sunk is gradually rendering the problem of the mechanical production of low temperatures of increasing interest. Refrigeration and the artificial production of ice have been in vogue for about twenty-five years. Broadly stated, the mechanical production of low temperatures is dependent upon the ability to convert certain substances from the gaseous to the liquid state, and their return to the gaseous state, by the abstraction of heat from the substances to be cooled. The process consists practically in abstracting the heat from the substance that is to be cooled, and transporting it to the cooling water of the condensing plant.

There are three substances now employed that can be converted from the gaseous to the liquid state, and *vice versa*, with comparative ease, viz., ammonia, carbonic acid and sulphurous acid. Other substances have been employed. Ether, for instance, was employed somewhat largely in the early days of mechanical refrigeration, and is still to a certain extent in India, owing principally to the very low pressures required. Compressed air has also been employed, and is still to a certain limited extent, but compressed air is very much less efficient than either of the other refrigerants named, mainly because, owing to the large power required, no attempt is made to liquefy it. It is merely compressed to a certain pressure, dried, and allowed to expand. Probably compressed air will be found to be the readiest agent for dealing with the high temperatures met with at great depths in mines, since the whole apparatus can be installed underground, and run by an electric motor.

In view of the possibility of compressed air being used for lowering the temperature in the workings of deep mines, or for similar purposes about a mine, it may be useful to shortly describe the apparatus. It consists of the usual air-compressing cylinder, with its reciprocating piston, and an expanding cylinder, which also has a reciprocating piston, the two pistons being connected to the same crank shaft, their cranks being usually 90 deg. apart.

Cooling and drying apparatus of various forms completes the plant. One form consists of a cylinder, nearly filled with glass marbles. A fine spray of water is delivered to the top of the mass of marbles, and gradually trickles down over them, passing through the interstices between them, and the air to be cooled enters the cylinders at the bottom, passing up over the surfaces of the marbles, meeting the spray of water, and being cooled and depositing its moisture.

From the cooling cylinder, the air passes into the expanding cylinder, where it works the reciprocating piston, the work performed upon this piston going to assist the work of the engine or motor driving the compressor, the motor thus having only to supply the difference between the two.

In the expanding cylinder the air is cooled to whatever temperature may be desired. It is claimed by makers that it is cooled to as much as 100 deg. below the freezing point. From the expanding cylinder, the cooled and expanded air is driven into the chamber or other place to be cooled, and in regular cold-storage work is usually drawn off again by means of a duct, provided for the purpose, to the compressor, recompressed, recooled, expanded, and so on.

The great source of loss, quite apart from the inefficiency of the method of compressing and expanding air, is that by conduction through the walls of the pipe, or duct, through which the cooled air passes to the chamber or object to be cooled. This duct is made as short as possible, and it is also well insulated thermally, but in spite of that, considerable loss too often results.

Another method is that employed in the Allen dense-air machine, made by H. B. Roelker, of New York. In this apparatus there are two important points of difference from that previously described. The air, after being cooled, is carried in small pipes into the space to be cooled, much in the same way as the ordinary refrigerating agent, ammonia or carbonic acid, is, and it is brought back, after circulating through the grid of pipes, to the compressor, the grid of pipes in which the air circulates corresponding to the expansion coils of the ordinary compression or absorption apparatus.

In addition, the air is cooled on leaving the compressor, by being passed through a coil of copper tube, immersed in a cylinder, through which water is kept circulating. Further, the return air from the chamber that has been cooled is caused to cool the air on its passage from the cooling coil to the expansion cylinder, by circulating in pipes round which the air from the compressor passes, the arrangement being similar to that employed with cooling water and steam in the surface steam condenser. The apparatus has also an auxiliary air compressor, consisting of a small cylinder with piston and auxiliaries, the object of the arrangement being to charge up the system, when it is first put into service. The air, it will be understood, circulates continually round and round, through the compressor, the copper cooling coil, the returning air cooler, the expansion cylinder, the cooling coils, back to the compressor again, any loss being made up, when required, by the auxiliary compressor.

This apparatus appears to be very suitable for cooling the workings of deep mines, since the air-cooling pipes could be carried into the workings, and arranged in any convenient manner. One difficulty that will present itself to mining engineers is the possibility of breakage of the pipes. This could probably be overcome by the employment of flexible metallic tubes, either wholly or for connecting straight lengths of ordinary iron pipe.

The Compression System

The process of producing low temperatures consists in abstracting the heat from the substances to be cooled by the expansion from the liquid to the gaseous state of one of the refrigerants named. With ammonia, there are two systems available, known respectively as the compression and the absorption system. With carbonic and sulphurous acids, only the compression system can be employed.

In the compression system the apparatus consists of a compressor, a condenser, and what are known as expansion coils, or sometimes as the evaporator, or the evaporating coils. The apparatus forms a complete closed circuit, just as an electric circuit, the refrigerant passing continuously from the compressor to the condenser, thence to the evaporator, thence back to the compressor. The compressor consists of a cylinder with a reciprocating piston, much as in an air compressor, except that the fitting of the piston of the compressor is much more carefully carried out, and special arrangements are made in connection with the bearings of the piston rod, that no leakage of the refrigerant shall take place.

Clearance plays an important part in the

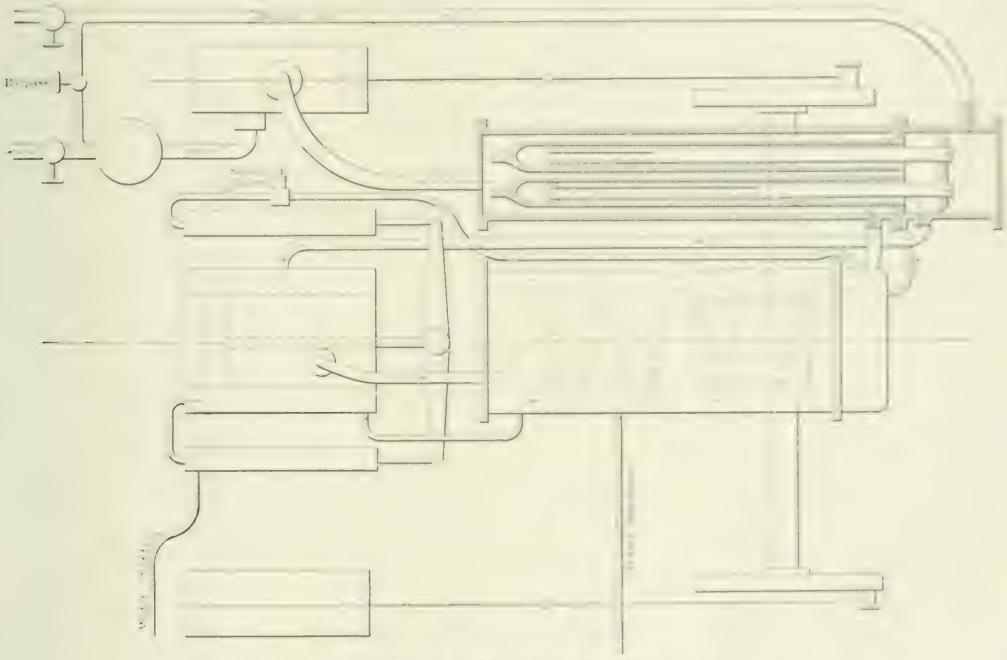
compression system, and consequently it is reduced to the very smallest dimensions. One way in which this is accomplished is: the ends of the compression cylinder are made dome-shaped, and the piston is made in the form of two hemispheres which move closely up to the cylinder ends. Another method employed is: the crosshead of the piston rod is provided with special springs, which enable it to go right up against the cylinder end. The reason for these precautions with regard to piston clearance in the cylinder is, that if a portion of the refrigerant remains in the cylinder, after compression, it immediately commences to expand, when the piston commences its return stroke, and the quantity of refrigerant taken in at the next suction stroke is so much less.

The method employed by the Delaberque company for the purpose is as follows: a quantity of oil is injected into the compression cylinder, at a certain period of the stroke, filling up the clearance place, and this is pumped out of the cylinder, with any refrigerant it may have absorbed, the two being separated in an apparatus provided for the purpose, and the oil used again.

The working of compression plant is as follows: On its suction stroke the compressor draws a certain quantity of the refrigerant, in the gaseous state, from the evaporator coils. On the compression stroke it compresses it to a certain pressure, and it is then passed to the condenser. The condenser consists of a number of pipes, sometimes formed into a coil, inside of a tank, sometimes formed into a grid. In either case, water is continually passing over the surface of the condenser pipes, the refrigerant being gradually cooled as it passes inside of them, and finally becoming liquid.

From the condenser the liquefied refrigerant passes through a valve, sometimes called the regulator, and sometimes the evaporating valve, to the evaporating coils. The passage of the liquid from the condenser to the evaporator is controlled by the regulating valve, which is practically a stop valve of a special construction. A minute turn of the valve handle allows sufficient liquid to pass and a very small difference in its opening or closing is sufficient to control the evaporation in the evaporating coils.

A receiver is sometimes interposed between the condenser and the regulating valve. The evaporating coils also consist of pipes, in which the refrigerant circulates, as a liquid when it first enters, and then as a gas, the pipes being sometimes



liquid which has passed through the remaining coils, and been gradually cooled on its way, the warmest cooling water, that [illegible] gradually warmed by passing over the surface of the condenser pipes on its way, passing out at the top of the tank, and meeting the hottest gas coming over from the compressor.

In the evaporative condenser, the pipes are formed in a grid, a water pipe being placed above the topmost pipe, and a trough usually below the bottom pipe. The water is forced out of perforations in the pipe above the condenser, and is allowed to trickle down over the surfaces of the pipes in which the refrigerant is passing, and is collected in the trough at the bottom.

The cooling effect in the evaporative condenser is partly from the difference of temperature between the water and the gas inside the pipes, but is more from the heat abstracted from the water by the evaporation which goes on, as the water descends, the atmosphere absorbing the vapor that is formed, and the major portion of the heat required to form it into vapor being abstracted from the pipes in which the gas is passing, and thence from the gas itself. It is not possible to apply the counter current system with the evaporative condenser, since the refrigerant must fall to the bottom, from whence it is drawn off by pipes at different parts of the grid.

The Use of Brine

Brine is used for delivering the low temperature created by the evaporation of the refrigerant, for two principal reasons. It is more easily controlled, especially where a certain temperature has to be maintained, and in certain cases it avoids the possibility of damage from the escape of the refrigerant itself. This applies more particularly to ammonia, and especially to where it is employed in the carriage of produce, or in the making of ice.

In the case of freezing for shaft sinking, up to the present time it has not been possible to apply what is known as the direct expansion method, owing to practical difficulties. Cooling by brine has always hitherto been employed. In my opinion, however, it should by no means be impossible to employ direct expansion. By direct expansion is meant the direct application of the cooling influence of the expanding refrigerant in the water to be frozen, or the air to be cooled, as against its indirect application by cooling brine, the cold brine being employed for the purpose. One of the usual engineering controversies has been waged round the question of direct expansion vs. brine cooling. Direct expansion is more efficient, that is to say, it requires less power in the compressor, and it avoids the necessity of a brine pump. On the other hand as ex-

[illegible]

By brine is meant water in which a salt, preferably calcium chloride, has been dissolved. Common salt has been employed, but is now rarely so, because of its chemical action upon the pipes in which it has to circulate. Magnesium chloride is also used. Calcium chloride has practically no action upon iron, providing it be fairly pure; but it has an action upon the zinc covering in galvanized iron, and therefore galvanized-iron pipes should not be employed. Where galvanized-iron pipes are employed, hydrogen gas is generated, which sometimes leads to trouble.

Brine is employed in place of water, because it is necessary that the liquid which is employed to transport the heat from the body to be cooled should not itself freeze at the low temperature which it is necessary for the cooling agent to assume. Whenever a salt is dissolved in water, the freezing temperature of the solution is lowered. Thus, with calcium chloride, a solution containing 5 per cent. by weight reduces the freezing point of the water to 27½ deg. F.; 10 per cent. reduces it to 22 deg., 15 per cent. to 15 deg., 20 per cent. to 5 deg., and 25 per cent. to —8 deg. F. In the freezing process for sinking, the brine has to be carried at a temperature of nearly zero F.

The usual arrangement, where brine circulation is employed, is for the expansion coils to be immersed in a tank, through which the brine is kept circulating, the warmed brine from the substance to be cooled coming continually back to the tank, passing through it, over the surface of the expansion coils, and re-emerging at its low temperature.

Water for Condensing

The provision of water for the condenser of the refrigerating plant is one of the most important points in the apparatus. The lower the temperature of the cooling water, the higher is the efficiency of the plant; that is to say, the smaller is the power required by the compressor. It is usual to deliver the gas from the compressor to the condenser, at a pressure whose temperature corresponds to about 10 deg. above that of the cooling water.

The work the compressor has to perform, and therefore the work the engine driving it has to perform, increases with the pressure. Hence the higher the temperature of the condenser cooling water, the higher the pressure to which the gas must be compressed, and the greater the power required in the driving engine. At the other end of the apparatus it is usual to regulate the quantity of the refrigerant passing into the expansion coils, so that its pressure at the end nearest the suction valve of the compressor is that which corresponds to a temperature 10 deg. below that of the brine it is cooling, or 20 deg. below that of air when it is employed to cool a cold store.

As with steam, each pressure of the [illegible] corresponds to a [illegible] temperature, and it is usual to provide gages, one at the entrance to the condenser, a second at the exit from the expansion coils, which are marked in pressures, and also on another circle, usually in another color, in corresponding temperatures. It will be seen further that the lower the temperature required from the refrigerant, as for cooling the brine in the case of sinking by freezing, the greater the power again that is required from the engine driving the compressor. The power required in the compressor for the sinking by freezing process is much in excess of that usually required for making ice under ordinary conditions, even in hot climates, owing mainly to the very low temperature to which the brine has to be reduced.

Properties of the Different Refrigerants

The three substances that are employed as refrigerants have widely different physical properties. The most important property a refrigerant can possess is the quantity of heat it will absorb in passing from the liquid to the gaseous state, that is to say, its latent heat. Ammonia possesses a latent heat of 555 B.t.u. per lb., carbonic acid 123 and sulphurous acid 171 B.t.u. per lb., these figures being at 0 deg. F.

The latent heat of each of the substances decreases with increasing temperature, and *vice versa*. The relative volumes in cubic feet of a pound of each substance at the same temperature are: ammonia 9.1, carbonic acid 0.277, and sulphurous acid 7.35.

The volumes of the different substances increase with increased temperatures, and *vice versa*. The pressures to which the different refrigerants must be compressed, before delivery to the condenser, also vary considerably. For comparison, the relative pressures are taken at 0 deg. F., the actual pressures of the gases when delivered to the condenser being much higher. At 0 deg. F., ammonia has a pressure of 30 lb. per sq.in., carbonic acid 310 lb., and sulphurous acid 10 lb. The process of the conversion of the gas into liquid is twofold. The molecules of the gas are first brought close together, by compression, heat being liberated in the gas in the process, and secondly, the latent heat due to the gaseous state, and the heat liberated in the gas by compression, are moved by the action of the cooling water. In practical work, with ammonia, condenser pressures range from 120 lb. per sq.in. up to 180 lb., the latter being common. With carbonic acid the pressures range from 800 lb. per sq.in. to 1200 lb. The higher pressures are necessary in hotter climates, with hotter cooling water.

There is the usual rivalry among refrigeration engineers, as to which of the three refrigerants is the most economical. For practical purposes there is really little to

chloride. Though ammonia has a much higher latent heat, the specific gravity of carbonic acid being so much greater, when volumes are taken and volumes are dealt with in the compressor, the advantage is on the side of carbonic acid.

Again, the pressure to which ammonia must be compressed is much less than that to which carbonic acid must be, but on the other hand, the quantity of carbonic acid required is much less than the quantity of ammonia.

It is sometimes supposed that ammonia is the safest of the three refrigerants, because an escape of the gas is supposed not to be harmful, while the escape of carbonic acid is. This is a mistake. A small percentage of ammonia in the atmosphere is distinctly bad, and a comparatively low percentage is poisonous. The pungent odor of ammonia which gives warning of its escape, is a point in its favor.

On the other hand, a small percentage of carbonic acid in the atmosphere is absolutely harmless, and even a comparatively large percentage produces only certain results, to which many of us who work in close offices are only too well accustomed. The fact that the escape of carbonic acid does not declare itself by its smell, is against it, but for another reason. A certain quantity of the refrigerant, whichever may be employed, is necessary for the efficient working of any compression plant. If the refrigerant leaks out, and there is even a small shortage, the efficiency of the system is enormously reduced. It will be understood that the work [illegible] performed by the refrigerant in the operation of passing from the liquid to the gaseous state. If the plant is short of the refrigerant, a certain quantity of the gas passes through the regulating valve with the liquid, and as the gas has practically no cooling properties, one pound of ammonia say, carrying off less than half a heat unit, when passing through the [illegible] as the gaseous condition, while a pound in passing from the liquid to the gaseous carries off 566 units, as mentioned, but in the gas occupies the space that should be occupied by the liquid, the result is a considerable [illegible] of efficiency.

The Absorption System.

The absorption system depends for its work upon the fact that water dissolves ammonia gas. Water, as is well known, dissolves all gases, but ammonia is the only one of the three refrigerants named, to which the absorption system has been applied. According to the modern view of the process of the solution of a gas or a solid in a liquid, the gas or the solid in the process of solution, changes to the liquid state, the gas surrendering its latent heat to the liquid, and the solid taking up from the liquid whatever heat it may require to become liquid.

The quantity of ammonia that water [illegible] roughly in inverse proportion to the temperature. Thus at 32 deg. F., water will take up nearly 90 per cent. of its weight of ammonia, while at 212 deg. it will only take up about 7½ per cent., the quantity falling at first very quickly, the proportion [illegible] and then more slowly. These two properties are taken advantage of in the absorption system, to avoid the necessity for compressing the gas mechanically. Really the gas is compressed on its way to the condenser, by the volume of the gas which is constantly being delivered from what is called the generator.

There are two principal portions of the [illegible] generator and the absorber. In the absorber [illegible] which causes minute globules of water to come away with the gas. A certain quantity of [illegible] accessory apparatus are required to prevent the escape of water and of steam. The accessories consist of a [illegible] changer.

[illegible] the generator.

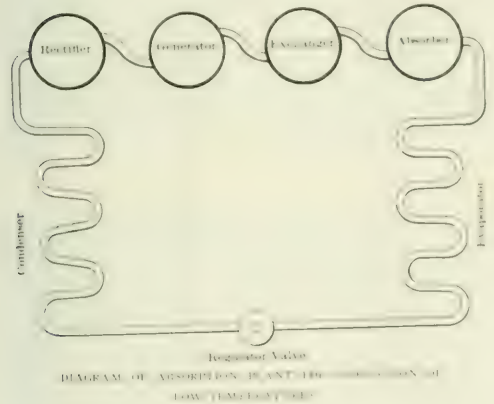
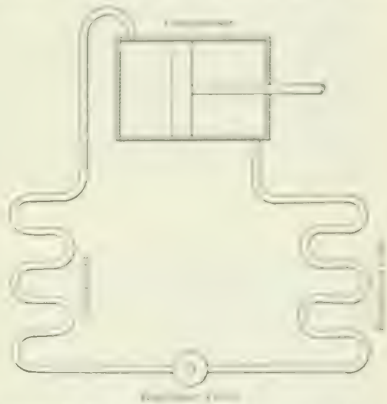


DIAGRAM OF ABSORPTION PLANT [illegible]



The temperature of the absorber must be maintained as low as possible, in order that it may continue to dissolve the gas as it comes over, and this, notwithstanding that the gas is continually delivering heat to the liquid in which it is dissolved. On the other hand, the temperature of the generator is kept as high as possible, so that the gas may continue to come away freely. The exchanger is an apparatus, very much on the lines of a steam surface condenser. The liquid on its way from the absorber to the generator, passes through a set of pipes, and that passing from the generator to the absorber passes around them, the result being that some of the heat from the liquid passing from the generator is delivered to that passing from the absorber, the liquid arriving at the generator at a higher temperature, and that arriving at the absorber being at a lower temperature. Both liquids are usually subject to a further process of cooling, in passing through the exchanger.

There is no practical reason why either of the above systems, the compression system with either of the three refrigerants, or the absorption system with ammonia, should not be employed for generating the low temperature required for freezing the ground for sinking. In both cases, the two important requisites are steam for driving the compressor or for heating the generator in the absorption system and a good supply of cooling water.

Compression plants are made in almost all sizes, and are made to compress in one and two operations, sometimes with compound engines, the two cylinders working the two compression cylinders, sometimes with single cylinders, or as convenient. The compressor also may be driven by an electric motor or by belt from any convenient steam engine, but when made up in one plant with the steam cylinder, especially with carbonic acid, the compression cylinder is usually mounted on the same bed plate as the engine cylinder, and is often driven from the tail rod of the steam piston.

The electric motor has one great advantage over the steam engine for driving the compressor, in that if the steam engine works expansively, the energy delivered to its piston is gradually lessening as the piston moves outward, while the resistance in front of it is gradually

the piston is least when the resistance of the compressor is greatest. With an elec-

delivered to the piston of the compressor would be uniform throughout the stroke.

Diamond Mining in Brazil

Consul-General G. E. Anderson, of Rio de Janeiro, reports that there has been a considerable increase in the movement of diamonds from the Diamantina district of Brazil to the United States, although the bulk of the output continues to go to Paris and London. The establishments of a concern for cutting and finishing the stones at Diamantina has led to a change in the course of export, and the contract of one of the American mining concerns to purchase the output of other concerns at Diamantina is likely to lead to a still further increase in the American imports.

What the output of Brazilian diamond fields at the present time really is cannot be given with any degree of certainty. Owing to the policy of the state government in its attempt to tax the stones on export no records of the finds or of the sales are kept. A private record kept by a diamond mine owner in Diamantina shows that in one district of that field over 4800 carats of stones were bought from the original holders from Sept. 14 to Nov. 14, 1906. This period was probably an average one, and the output of this particular territory therefore will average about 2400 carats of stones per month. There are two other similar mining fields in the same country, and while the output of the two combined will not exceed that of the first-named district, it seems very probable that the total output of the Diamantina country at present is about 5000 carats a month, worth on an average perhaps something over $40 per carat for mine-run stones in the rough. The income of the Diamantina district [illegible] is about $200,000 a month.

Crude Methods to be Supplanted

This output of Diamantina diamonds seems to be altogether the production of mining with native means and methods from the so called "servicoes" which represent no faithful or effective test of the value of the country. These "servicoes" are bands of workmen organized into squads, sometimes by a large number of workmen themselves agreeing to work together for a season and dividing the output and sometimes by men with capital enough to hire men for a season. In the dry season the river beds are worked, in the rainy season the uplands are worked. Rude sluices and wooden pans represent the machinery employed and there is no doubt that a large number of stones are missed in the process. Large numbers of stones are bought from Brazilians inhabiting the surrounding country, and there is no means at present of testing what mining property is worth or how much capital, time, labor, and expenditure the present output represents. Nor is [illegible] people are actually engaged in whole or part time in the work.

The mining companies now installing plants in the Diamantina country are almost altogether American. Practically all of them are engaged in getting in their dredging machinery and preparing for active work on a more or less extensive scale. The trouble, expense, labor, and time necessary to accomplish even the more simple tasks in this line can be fully appreciated only by those who have engaged in the work. Diamantina can now be reached in two days by fast mule back from the end of the railroad, and in the course of a short time a public service of diligences will offer more improved means of making the journey, but the difficulty of transporting heavy machinery in such sections as a mule can carry over mountainous country is apparent.

Stability of Mining Companies

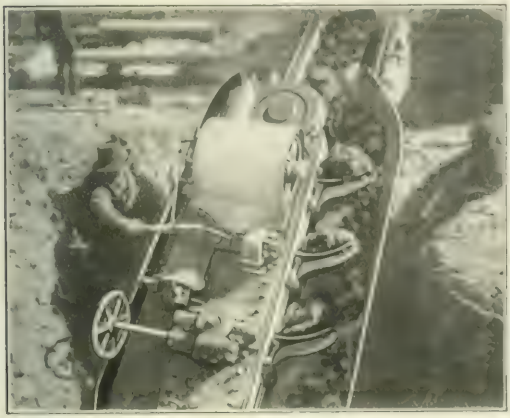
In a report from this consulate-general under date of May 18, 1906, attention was called to the fact that several, if not many, so called Brazilian diamond mining concerns selling stock in the United States were little more than frauds and that there was need of careful scrutiny, on the part of investors, of propositions dealing with gold and diamond mining enterprises in Brazil. The unusually large number of letters received following the publication of that report demonstrated that a good many investors had received the advice too late. It is only fair to the companies now prosecuting work at Diamantina in good faith, however, to call attention to the fact that they are working in good faith, in line with statements made in that report, and that because there have been some frauds in the business all the concerns are not to be included in that category. Companies which before were in more or less questionable position have made some effort and generally succeeded or probably will succeed in ridding themselves of undesirable elements. Without in any way or to any degree passing upon the merits of their property or their prospects it is probably safe to say that the companies now actually at work in the Diamantina country on the whole are going to give investors a fair run for their money. The necessity of investors giving attention to the former report, however, is none the less pressing.

The output of semiprecious stones in Brazil has increased considerably. Contrary to general opinion, these stones do not come, in general, from the diamond country. Of the $90,000 or so of declared exports of semiprecious stones last year about four-fifths came from the port of Rio de Janeiro, coming generally from states farther south. Prices generally here seem to have no advantage for American importers over those for as fine or finer stones in the western United States.

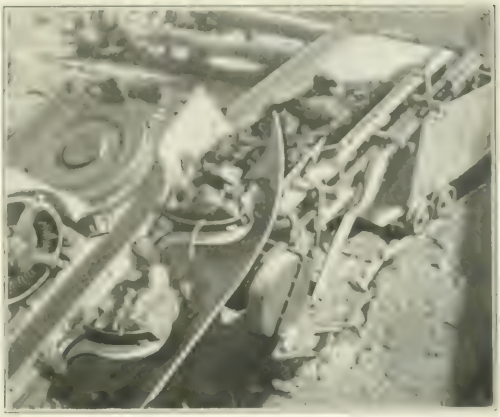
The Park Automatic Loader

The Park [illegible] is a device for transferring loose dirt and broken rock from the ground or tunnel floor to cars by mechanical means. It is manufactured by the Railway Materials Company of Chicago, and has been in use for some time for loading crushed stone, coal, coke, gravel and other loose material on the [illegible] and for [illegible] ing the machine is taken from any convenient electric circuit, and the truck [illegible] and is steered and manipulated in a manner suggesting a steam roller.

The machine, which is the invention of Thos. M. Park, is capable of doing the work of a steam shovel in the narrow space of a tunnel, and is built in two sizes, the larger being 6 ft. 6 in. high and 5 ft. 6 in. wide, while the smaller machine is about [illegible] ft. 6 in. high and 4 ft.



TOP VIEW OF MACHINE IN OPERATION.



[illegible]

[illegible]

[illegible]

ground workings of the Gold Lions Mines Company at Red Mountain, Colo., and other mines it is in successful operation loading muck at the breast after blasting, in a fraction of the time required to clean up by hand.

The essential features of the machine are a heavy steel truck driven by an electric motor, a steel shoe-plate and traveling scraper arms for gathering the material from the ground, and a short and wide [illegible] for transferring the muck to the car. The [illegible] wide. The capacity of the larger machine is from 50 to 120 cu. ft. per minute, according to the material handled; that of the smaller machine is from 30 to 75 cu. ft. per minute. The machine is equipped with a 10-h.p. main motor for operating the shovels and propelling the machine in any desired direction, and with a 3-h.p. motor for driving the conveyer. The [illegible] are constructed of heavy steel construction, the larger size weighing 15,000 lb. and the smaller 12,000 lb. The [illegible]

[illegible] the machine naturally gives the most economical results on a smooth surface.

The machine was originally designed to work on a track without the conveyer-lift [illegible]. In this form it [illegible] the Mount Lyell Mining, Smelting and Refining Company, the average time [illegible]

Manganese in India

United States Consul E. H. Dennison reports that there is a boom in the manganese industry of India. Many discoveries are being made and the ore seems to be pretty well distributed throughout western and southern India. Some rich deposits have been discovered six miles outside the Mysore frontier in the Bellary district, assaying an average of 54 per cent. of manganese. All the ore from Mysore and Goa is shipped from Mormugoa, which possesses facilities for loading direct from the wharves. During 1906 there were 343,340 tons of manganese ore shipped from Bombay, as compared with 213,860 in the previous year. It is expected that 1907 will see a large increase over these figures.

According to one of the largest shippers in Bombay the manganese ore mined in india varies from 40 to 53 per cent. manganese, silica 3 to 12 per cent., and phosphorus from 0.2 down to 0.03 per cent.

The manganese ore industry is at present suffering from lack of proper transportation facilities. The mines are all situated off the lines of railways and the ore is freighted in bullock carts to the nearest station. Owing to the general prosperity of the country there has been a shortage of freight cars on all lines and all industries, including that of manganese ore mining, have suffered thereby. There are thousands of tons of this ore piled up at various railroad points for which no cars can be obtained.

Minerals in Rumania

Minerals and precious metals are said to abound in Rumania, but thus far only salt and petroleum are obtained. According to a recent consular report, the petroleum industry is advancing rapidly and will probably become one of the most important sources of revenue. Large tracts of supposedly petroliferous lands are as yet unexploited, and other sections are only just beginning to be worked. At present the production of petroleum is chiefly from the district of Prahova. There is said to be $30,000,000 capital invested in this industry, mostly by German, Dutch, French, Italian and American interests. An American company has established a plant near Ploesti. The next few years will see a great increase in the capital invested, for the production of oil has greatly increased in recent years.

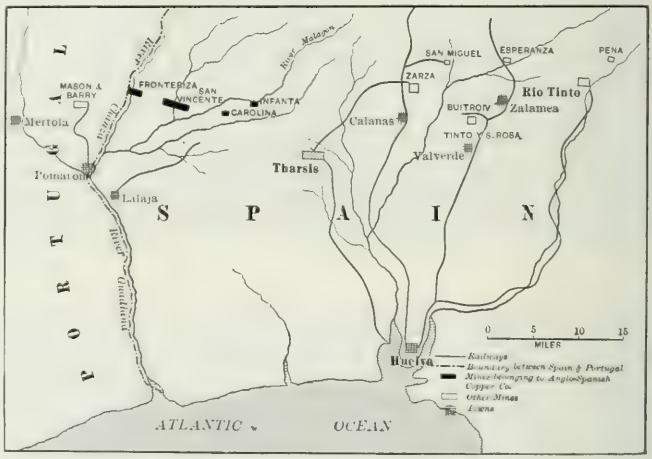
According to a recent British consular report, a British company is developing a mercury mine at Sisme, in Konia, Turkey, and furnaces are soon to be put in operation. Old workings for mercury are reported at several places in this province. According to a recent American consular report mines of mercury are being opened in Algeria and are said to promise well.

The San Vicente Mine, Spain

By Edward Walker

In an article published in the Journal on Dec. 22 last, I gave some account of the new development of copper and sulphur properties in the south of Spain. Since then another mine has been actively reopened by means of English capital. This is the San Vicente, which is situated about half way between the Tharsis mine and the properties over the border in Portugal belonging to Mason & Barry. The accompanying map shows the district between Rio Tinto and Mason & Barry.

For quite a dozen years, it has been difficult to interest English or French investors in Spanish copper properties, for there has been a general inclination to argue that these unworked properties were no good, because Mason & Barry and Tharsis, being in want of new properties would have taken them up readily enough if they were. The Mason & Barry properties have for a long time been known to be of limited extent, and though Tharsis is not so near exhaustion, the company has certainly been examining many new mines in Spain and elsewhere. It is therefore necessary to explain how it comes to pass that no local properties have been taken up by these two big firms. In the first place, the owners of the other properties knowing the need of their big neighbors have attempted to squeeze them and extort a high price, and secondly, the thoughts of Tharsis and Mason & Barry have traveled in a different direction and have deluded them into the idea that they could get new properties as cheaply as they acquired the old ones. Neither side would give way, and consequently no business has been done. The owners of the new properties have gradually managed to come to the front by their own efforts, and to secure the necessary capital to work their deposits on their own account.



MAP SHOWING LOCATION OF SAN VICENTE MINE

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The San Vicente Organization

The San Vicente mine has just been floated in London as the Anglo-Spanish Copper Company. So long ago as 1883, a company was formed in London for the purpose of the flotation by Mr. Yglesias and his fellow owners. In those early days, there were other difficulties in the way of raising the necessary capital, and later on, the before mentioned handicap, played some part in causing delay. The present flotation has been carried through by the instrumentality of Henry Bath & Sons, the metal merchant of London and Liverpool, and several chemical firms in Lancashire are interested in the company.

The new company owns, besides the San Vicente, several other mines and prospects. One is the Fronteriza, which is still under water, but which was reported on very favorably twenty years ago by several eminent engineers. Others are the Valrubio, the Carolina, and the Infanta, which has not so far been developed to any extent.

The Mines

About eighteen months ago, W. B. G. Rivington was sent out to examine the properties, and he spent the greater part of the year doing development work at the San Vicente. The work has been done by Mr. Rivington and his predecessors by means of an adit level about 1500 ft. long and varying from nothing to 100 ft. below the surface. The accompanying section and plan of the workings shows the work done to

outs, and the position of the orebodies so far opened up.

Facts in the last column show that Nos. 1 and 3 are low in copper, and the other two contain copper to warrant their treatment on the spot. The orebodies have been sampled systematically, and typical samples may be given. Sample 1, taken on orebody No. 3, gave ½ per cent. Cu. and 48½ per cent. sulphur, over 3 ft. Sample 2 on orebody No. 3, gave 4 2-3 per cent. copper and 50 per cent. sulphur over 10½ ft. Sample 3 on orebody No. 3, gave 4½ per cent. copper and 47⅓ per cent. sulphur over 25 ft. Samples 4, 5, and 6 on orebody No. 2, gave copper 2½ per cent., and sulphur 49 per cent. over widths varying from 13 to 30 ft. Sample 7 on orebody No. 1, gave less than ½ per cent copper and 45 per cent. sulphur over a width of 11½ ft. All these samples gave small quantities of gold and silver averaging one or two pennyweights of gold and 3 oz. of silver per ton.

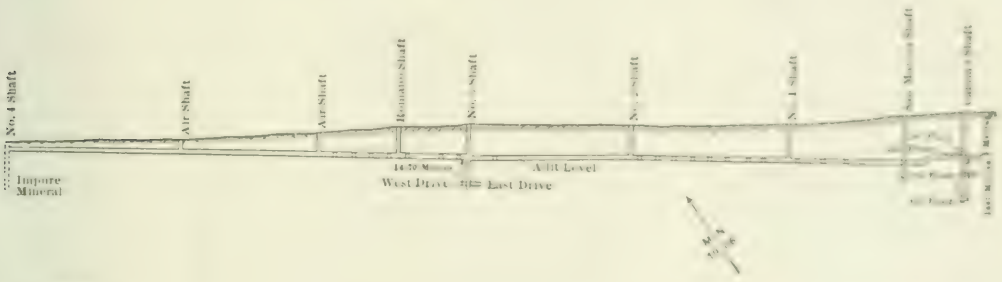
It is estimated that the known and probable ore so far developed at San Vicente amounts to over 200,000 tons, with practical certainty that the bodies continue in depth. It is proposed to erect a smelting works capable of dealing with 200 tons a day, working on ore that will average 3½ per cent. copper. The lower-grade ore averaging 2 per cent. or so will be exported to alkali works, at the rate of 100 tons a day. Whenever possible the sulphur ores of [illegible] will be worked but at the present time they are not likely to be worked, owing to the plentiful supply of better ore. The costs of mining, smelting and handling materials are similar to those ruling at Esperanza given in detail in my previous article.

Phosphate Rock in the West

The discovery of important phosphate deposits over a considerable area in southeastern Idaho, southwestern Wyoming, and [illegible] has opened up a new industry in the West. The future of the industry is, however, shrouded in uncertainty as it is largely dependent on the granting of such rates by the railroads as will enable the manufactured product or raw material to be sold at a profit in Australia, Hawaii, Japan and the Middle States, the home market on the Pacific coast not being at present extensive enough to warrant large development. This phase of the subject is recognized by F. B. Weeks and W. F. Ferrier, of the United States Geological Survey, who have investigated these deposits and reported about them in "Contributions to Economic Geology, 1906."

Prospecting has been carried on at a number of widely separated localities. [illegible] which follows the course of Weber river, [illegible]

The phosphate series consists of alternating layers of black or brown phosphate material, shale, and hard blue or gray compact limestones. The limestones are in the main very fossiliferous. The phosphate series is in places about 90 feet thick. The beds vary in thickness from a few inches to about 10 feet, but wherever they are of this extreme width they are broken by thin layers of shaly material [illegible]



SECTION AND PLAN OF SAN VICENTE MINE

The strike of the beds follows the general northwest-southeast trend of the ranges along which they outcrop. In Idaho the beds outcrop along the Preuss range, extending from the [illegible] and then [illegible] in a southeasterly direction along its west face. A probable southern extension of these beds near the Idaho-Utah line is found on the plateau east of Bear lake, where the overlap of upper Mesozoic sediments has been [illegible] The Sublette range, in Wyoming, are similar beds which follow the southerly trend of this range to Smiths Fork. The deposits are found in oolitic beds of the upper Carboniferous rocks.

This general region is drained by Bear river and its tributaries. The Oregon Short Line Railroad follows the valley of Bear river and affords the only means of [illegible] All the sections that have been examined [illegible] which are of commercial value.

Some New Points in the Geology of Copper Ores*

[illegible]

During the past year or two cobalt and silver have been the metals most prominently in the foreground in Ontario; but south of the national boundary and in other parts of the world, copper has occupied the center of the stage. The growth of electrical applications and the increasing consumption of brass have made the market well-nigh insatiable. Copper mining has greatly increased and with the growth of new districts and with widening experience, we have found it necessary to modify some of our old-time conceptions.

Twenty-five years ago when the classes in the mining schools were taught the mineralogy of the ores of copper, it was chalcopyrite that was esteemed the principal mineral. Of course the importance of the native metal on Keweenaw point was appreciated, but we used to define an ore as "the compound of a metal and a mineralizer such as sulphur or oxygen"—and the native form, even though abundant in one locality, was thus ruled out. Experience with the lenticular beds or veins, in the slates and schists along the Appalachian belt from Sherbrooke, Quebec, to Ducktown, Tennessee, and the historic orebodies of the Rio Tinto district in Spain, whose geological relations are similar, gave good ground for the esteem in which chalcopyrite was held. It was considered, moreover, to be the original mineral from which the others were generally believed to have been derived. Observers of those days were perfectly familiar with the oxidized zone, and with the zone of enrichment, at the level of the ground-water. At the latter horizon the Ducktown mines had taught all of us in America that rich black ores were precipitated, but the dark mineral was for many years believed to be the oxide, tenorite or melaconite, until W. H. Weed proved it to be chalcocite. Chalcocite was esteemed to be rather uncommon and when we students saw it at all, it was chiefly in crystals from the old copper mine at Bristol, Connecticut, an enterprise that had impressed its shareholders rather by the lack of copper than by its abundance.

Lessons from Recent Workings

Today, on the contrary, in the United States and Mexico, chalcocite furnishes much the largest part of the copper produced, and for some years to come its relative importance bids fair to increase rather than diminish. Butte, Morenci, Bis[illegible] their output from it, while Bingham and Ely will soon be concentrating the glance from the porphyries on an enormous scale.

So far is chalcopyrite from being the principal and original mineral at Butte, that on the one hand it is rather uncommon and on the other it is one of the latest of the secondary minerals, since we find it in veinlets cutting covellite. Alike at Butte and in Arizona the original mineral appears to be a lean copper-bearing iron pyrite, which is then, by secondary enrichment, oxidized in one place and deprived of its copper, only to gain the latter elsewhere in the form of chalcocite, which brings the lean original up to grade

In later years, and for a period lasting well up to the present, we have laid great and just emphasis on the processes of secondary enrichment by the descending surface waters. We believed that the new chalcocite and other minerals were deposited at the level of the ground-water and for a limited distance below it. That is, we gradually grew to recognize the necessity of a greater diffusion of the descending copper solution throughout the quiet ground-water than we had at first thought either necessary or probable. But in the issue of the *Mining and Scientific Press*, for February 23, 1907, page 236, we learned that a cross-cut in the Berlin claim at Butte had cut a great body of glance, at 1800 ft. from the surface, and that in the Neversweat, at 2400 ft., a similar occurrence had been noted. Even before this it was generally reported that a cross-cut from the shaft at 2000 ft. in the Speculator claim had intercepted these rich ores in a still different lode.

Various suggestions tending to reorganize our old views either have been made or may be made in consequence of these discoveries. The hillside on which the copper mines are situated at Butte rises gradually to the north from the valley of Silver Bow creek, or more steeply to the west from the same creek at Meaderville. In the latter area shafts are said to have found the bed-rock under 600 ft. of overlying loose material. Obviously, as the valley was excavated by erosion, and as the former representative of Silver Bow creek established the low point of the ground-water upon its bed-rock, the subterranean water-level must have risen from this point, in the hill, roughly following the surface, but at a flatter slope. The present outcrops of the copper veins are from 500 to 700 ft. above the present valley, or from 1100 to 1300 ft. above the bed-rock. To estimate the ancient level of the ground-water, we must diminish 1100 to 1300 by such figures as will allow for its rise, roughly parallel with the surface. Whatever assumptions we may make, moreover, regarding wall-rock and vein-matter removed by erosion, will operate to further raise the ground-water level. It certainly can scarcely have been lower than 800 to 1000 ft. below the collars of the present shafts. The recently discovered bonanzas are from 1000 to 1500 ft. below this level, and according to our old ideas of the diffusion of the descending copper-bearing solutions, they must have penetrated at least 1000 to 1500 ft. of standing water. This seems unlikely.

Secondary Enrichment

On the other hand we may raise the question, could the ground-water have been so irregular in its distribution that no standing body of it intervened to stagnate the descending water? This seems unlikely. Again, is chalcocite necessarily a secondary mineral? May it not be of original deposition? Experience thus far leads us to think that the presumption of its secondary nature is well grounded.

Most reasonable of all would appear to be W. H. Weed's suggestion of secondary enrichment by uprising solutions of copper, set in action perhaps by the late rhyolite. From these no lean pyrite of primary deposition thus far observed would be too deep to escape, although solutions of oxidized copper salts, such as bring about enrichment by descending surface waters, are not what we associate with waters uprising from the depths. Mr. Weed applies his conclusions especially to the enargite at Butte, but as the glance is being found deeper and deeper we may at least raise the question whether its lower deposits may not also have been introduced from the depths.

Ten years ago, or even less, great apprehension was felt about the persistence of ore in depth. The newly appreciated doctrines of secondary enrichment from above had emphasized and increased the misgivings, and much experience corroborated them. Rio Tinto was most often cited, where in the San Domingo vein or lense, 4 to 5 per cent. of copper had been obtained at the surface; 2 per cent. at 260 ft.; 1½ to 1¼ per cent. at 325, and 1¼ per cent. at 425 ft. In the Dionisio, there was 4 per cent. at the surface, 2 per cent. at 650, and 2½ per cent. at 1500 ft. In the last citation there was a ray of comfort, but the general result was decidedly discouraging. At Butte too, the general yield of the ores has gone down A few years ago it was 5 to 6 per cent.; now it is 3 to 4 per cent. In Arizona, 15 to 20 per cent. was not uncommon twenty years ago. The ores run 6 to 7 per cent. now, and the glance in the porphyries 3 per cent. as it goes to the mill. Improved transportation and milling processes are responsible for bringing lower and lower ores within the range of profit, and, as we must realize, there is the tendency steadily to reduce the general average; but if, at Butte, 40 per cent. ore occurs in great stopes at 1800 ft., and 60 per cent. ore at 2400 ft., we may raise the question as to whether the old-time generalization is as sweeping as we formerly thought.

*Min. Inst., Vol. X, Toronto meeting, 1907.

CHARACTER OF DEPOSITS

Reverting again to the time-honored conceptions of the lenticular orebodies of Kiruna of the slate and schist of the Appalachian belt and of Rio Tinto, many of us will recall that these were esteemed our typical deposits. But in later years developments in the southwestern United States, in Mexico, and in Queensland, have proved the frequent occurrence and great importance of garnet zones produced by contact metamorphism in limestone along intrusive rocks. Bisbee and Morenci, in Arizona; San Pedro, New Mexico; Aranzazu and San José, Mexico; Chillagoe, Queensland; and many more have shown the importance and wide distribution of this type. Garnet, vesuvianite, wollastonite, and diopside, are the associated minerals, and the orebodies are of irregular shape. They often need secondary enrichment to bring them up to grade. They are not lenses, as are the ores at Thedford and Rio Tinto; nor veins as at Butte; nor beds as at Mansfeld; nor impregnations of shattered rock as at Nacosari; but are a new type when compared with our old conceptions.

One of our tendencies in earlier years was to connect orebodies, especially of copper, with basic eruptives. Keweenaw point and Sudbury gave good support to these inferences. It was also natural to infer that as iron and the other bases increased in rocks, therefore copper, lead, and other metals would do the same in less degree. But recent experience is just the opposite in the case of copper. Globe, Arizona, with its diabase, and the Nikolai and other greenstones of the northwest coast are almost the only basic ones that appear in the newer districts. On the contrary, we find quartz-bearing rocks of various kinds and more especially a fairly acidic variety midway between syenite and diorite, called monzonite. Bingham, Ely, Bisbee, Morenci, Nacosari, and the granite at Butte, all afford a similar experience. The great deposits of northern California are in rhyolite porphyries. We cannot but reflect that the acidic magmas are richest in dissolved vapors, that they probably in cooling yield relatively abundant magmatic waters; and that being at the outset copper-bearing, the orebodies are perhaps due to these characteristics.

CHANGE TO COPPER IN DEPTH

But the most striking feature of the last year or two is the tendency of mines first worked for other metals to yield copper in depth. From Butte we learn that the silver mines along the Rainbow lode, in which, in the upper workings, no copper was found, are now showing as much as 3 per cent. at 1000 ft. The old Black Rock claim, once a silver mine and a participant in the famous Black Rock-Niagara apex suit, is being mined and treated for copper, and others are actually yielding the red metal. The Cable gold mines, farther west in Montana, are supplying gold ore to the Washoe smelter. Bingham, once a lead-silver camp, has changed to copper. From Leadville the same report has been coming for some years, that much copper was found with the unchanged sulphides in depth. At Red Mountain, where, near the surface, lead-silver was formerly the yield of the ore, now, in the 1100-ft. adit into the mountain, copper has been found. In North Carolina, some gold mines of former years have become copper mines today. Most striking of all, at the great Mt Morgan gold mine of Queensland, the diamond drill, at 75 ft., has shown great bodies of copper-bearing sulphides, which now go to the furnace, as the earlier gold ores went to the mill.

We have for years known that lead above often passed into zinc below. We may perhaps now add a still deeper copper zone, when, in the uprising waters that brought in the ore, copper was present with the other two. Gold above may also change to copper below, or be associated with it, and apparently not always because copper once general throughout the vein has passed downward with the atmospheric waters.

An interesting corroboration is thus afforded of views advanced by W. H. Weed in the paper already cited, of which one of the closing paragraphs is: "Ascending hot-spring waters, if metalliferous, may deposit different ores with an orderly vertical distribution. Existing veins now mined often show this arrangement of metallic sulphides."†

Mining in Nicaragua

Consul E. W. Trimmer, of Cape Gracias á Dios, Nicaragua, reports that the mining industry in that district continues to show a steady improvement. Plants for the treatment of tailings by the cyanide process have been installed at several mines, and results have proved so satisfactory as to warrant a large increase in capacity. The output of gold bullion from this district now amounts to about 5000 oz. monthly. The electric power plant installed by one company has been in successful operation since February, 1906, and a new generator is now on the way and will be used to supply power to a group of mines. Transportation has been so much improved since the river steamer of the United States & Nicaragua Company was put in commission that it is now possible to get machinery and supplies into the mines at a fair cost.

The ore-bearing limits of the district have not yet been ascertained, but the belief in a fairly continuous ore-bearing

† Trans. Amer. Inst. Min. Eng., Vol. XXXIII, p. 754.

Suggestions for Mine Staff Organization

Plan for Apportioning Duties and Responsibilities of Members of the Operating Force and Conducting the Work of the Departments

BY J. BOYD AARONS*

[illegible] this paper [illegible] the organization of a Mine Staff, particularly that of a gold mine, following somewhat the system adopted in military organizations. But after outlining the duties and responsibilities of the various officers, the military analogy is not further pursued. A rigid, inflexible system of organization should not be attempted, for the reason that better work will generally be secured by giving each department head a certain amount of latitude.

General Manager's Staff

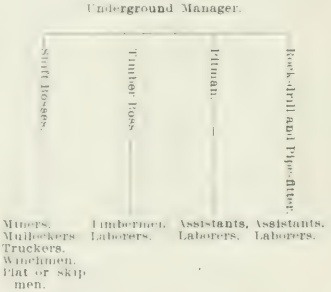
The general manager is directly responsible for the entire working of the mine. He appoints his own staff and assigns to each member of it his particular duties and sphere of action, each entirely responsible to himself for the efficient working of his department. All reports, correspondence, etc., from the mine are issued by the general manager alone, to whom also all outside communications are addressed or referred.

A clerk in the general manager's office has charge of all the mine's technical books, such as the assay books, the tonnage books, mill and cyanide-plant books, development records; and it is the duty of this clerk to enter each day, in these books, all working returns. He makes no alterations without the authority of the general manager, who attends himself to such matters as reconciliation of tonnages between the underground and mill departments, etc. This clerk will be instructed to allow the head of each department free access to the books recording the returns of his own department.

The general manager's staff is suggested in the accompanying table. It is understood that, in the case of a small mine, such a staff would be reduced by the fusion of two or more of the departments; but the full staff, with each department independently, would be necessary for the efficient working of the larger

Underground Department

The underground manager is responsible to the general manager for the economical working of everything underground. He is responsible for the safety of the underground workings and for all appliances therein. He delegates to his shift bosses and foremen the appointment and dismissal of the men working under them. But he reserves the right to veto any appointment, or to hear any complaint made by any of the men. He will see that all the men in his department are informed that, in case of dismissal, they may appeal to himself, and that, if dissatisfied with his decision, they may appeal directly to the general manager. This, however, does not apply where native or coolie labor is employed; when of this class, delinquents are reported to the compound manager.



The underground manager hands in to the general manager's office a daily return showing the quantity of ore, waste, and water raised during the day, and the places from which it has been taken. This return is generally spoken of as "tonnage or truck tallies."

He is supplied from the general manager's office with a daily list of samples taken, with full particulars of each sample, together with the result of the assay on each.

In conjunction with the surveyor, he submits a monthly report of progress.

The underground manager should generally accompany the general manager on his daily visit to the underground workings.

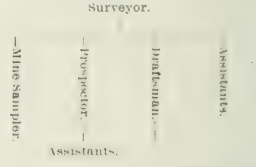
At the end of each month the underground manager is supplied from the accountant's office with a tabulated statement showing the month's costs against his department. This sheet shows the total amount of money expended and the cost per ton for each class of underground work; it also shows how each amount is [illegible] explosives, steel, candles and sundry stores, costs of power, pumping, timber, assaying and sampling, repairs).

The "underground books" kept in the general manager's office are always open to inspection by the underground manager.

Surveying and Sampling Department

The surveyor is responsible for the upkeep of all the plans, for all underground measurements, and for the efficient sampling of the mine, following out a system prescribed by the general manager. He has charge also of surface prospecting work.

The samples taken under the supervision of the surveyor are handed in to the assayer's office with a distinctive mark or number only. It is the duty of the surveyor to see that the general manager's office is supplied with a list of samples taken each day. This list will contain the distinctive mark or number of each sample, the place from which it was taken, the width the sample represents; or, if a bulk-sample, the number of trucks, skips, or tons which the sample represents. Special work, or the taking of check samples, may entail the appointment directly by the general manager of a special sampler.



The surveyor supplies a monthly return (in conjunction with the underground manager) showing the work done in development, and the amount, in tons, mined, arrived at in two ways: (1) by skip, or truck tallies; (2) by calculations based upon measurements of excavations.

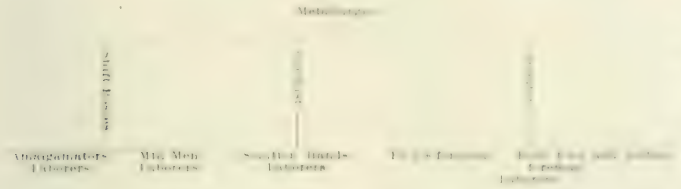
The underground books are always open, to inspection by the surveyor.

The accountant supplies the surveyor with a monthly statement showing the costs against his department, including costs per sample.

Metallurgical Department

The metallurgist is responsible for the economical treatment of the ore, taking charge of it from the moment it is landed on the surface until the residium is dumped. His staff consists of three shift bosses, a chemist to assist him in experimental work, and a smelter to supervise

the contrary.) It often requires much labor, however, to get a number of men to work together, as required, the different parts of the works being sometimes too widely separated to permit of one man efficiently supervising the work. But wherever possible, only one man per shift should be responsible to the metallurgist for the running of the plant.)



With regard to the employment of the men, the same conditions apply as in the underground department, with this important exception: the metallurgist must be personally acquainted with every man engaged for his work.

All samples taken in the mill are, as far as possible, taken automatically. The samples are handed in to the assay office, distinguished by numbers only, and a daily list of these samples, with full particulars, is supplied to the general manager's office. The metallurgist, in return, receives from the general manager's office a daily list of the samples, with their results.

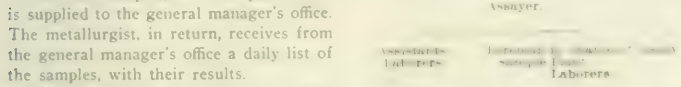
The metallurgist furnishes the general manager a daily return showing the quantity, in tons, of ore delivered to the mill, the tonnage of the residues dumped, the amount of amalgam (if any) deposited in his safe, the working times of each portion of the plant, together with explanations of any stoppages. His monthly statement shows the tonnages milled, arrived by two methods: (1) Skip, truck, or weighbridge tallies; (2) by calculations from residues dumped. It shows also the total run of each portion of the plant; the weight of the bullion recovered and its sources—by amalgamation of original ore, by amalgamation of concentrates, by cyanidation of concentrates, sands, slimes, etc.; the weight of accumulations, such as untreated concentrates, sands, slimes, slags, etc. The statement also includes an estimate of "gold in suspense," that is, an estimate of gold accumulated on copper plates, in zinc boxes, etc.

The metallurgist is supplied from the accountant's office with a monthly statement showing total and average costs for each branch of the treatment. The metallurgical books, kept in the general manager's office, are always open for inspection by the metallurgist.

Assayer's Department

The assayer is responsible to the general manager for a correct estimation of the amount of fine gold present in each sample handed in to his office from the various [illegible] gold are sought the assayer returns the amount of each metal present in each sample. He also retains for future reference a check sample of every sample turned into his office. He returns to the general manager's office a daily list of all [illegible] numbers, and their results.

As already mentioned, samples handed in to the assay office are distinguished only by a mark or number. But the assay work is facilitated and cleaner work assured if unusually high- or low-value samples are distinguished. If this practice were carried out by the various departments, the risk of erratic assays would be diminished, special apparatus being used for high-value samples.



Questions as to duplicate and check assays are left to the assayer. Being responsible for the accuracy of his reports, he must take his own precautions to insure the correct working of his office.

The assayer is supplied by the accountant with a sheet showing the total cost for the month and the costs for each assay.

Mechanical Department

With a small mine, some of the above departments would be merged in that of the mechanical engineer, who would himself combine the duties of engineer, electrician, surface foreman, and foreman mechanic, and having under him only fitters, blacksmiths, carpenters, toolsmiths, engine drivers and firemen, and the general surface hands.

It is the duty of the mechanical engineer to see that all the machinery on the mine is kept at the highest point of efficiency. He is directly responsible for every engine on the mine; and no part of the mechanical plant should be stopped without his knowledge, except in the ordi[illegible]

[illegible] ment, shown on the month[illegible] reflect on the work of the [illegible] costs become high on account of extensive repairs, the explanation is sought not from the metallurgist, but from the mechanical engineer.

returns to the general ma[illegible] necessary. His month[illegible] amount of fuel and w[illegible] horse-power developed, [illegible] ried by each engine; additions to plant, particulars of repairs, etc., and the present condition of each part of the plant. All ropes and cables are under the care of this department, and are specially mentioned in the mechanical reports.

The mechanical books are always accessible to the mechanical engineer, and he receives from the accountant's office a statement showing the distribution of the month's power costs.

Accountant's Office

[illegible] general manager for the management of all the commercial affairs of th[illegible] other than the techni[illegible] ferred to. All outgoing [illegible] and correspondence referring to [illegible] cial matters are signed by the ac[illegible] as well as by the gener[illegible] accounts sent to the head [illegible] should be signed by both a [illegible] general manager. All order[illegible] are issued by the accountant, but must be countersigned by the general manager.

keeper generally in regard to his d[illegible]

accountant to keep an accurate record of the time worked by each man in the mine. A system of timekeeping, which should be strictly adhered to, is instituted by the general manager and the accountant. This system should provide for checks on the timekeeper; that is, shift bosses and foremen should hand in to the office every day time sheets showing the work each man is engaged on, and the length of time he worked. Every man on the mine should be known to the timekeeper or his assistants; and if a search system be necessary the work caused by it is superintended by the timekeeper.

The accountant sees that the general manager is supplied with a daily return showing the number of shifts worked in each department, the total number of shifts worked, and the amount of money expended in wages for the day.

The accountant is responsible for all payments made from the mine.

Records of bullion, gold registers, and records of gold realization, not being regarded as technical details, are kept by the accountant.

At the end of each calendar month the accountant determines the total and average costs of each department. All technical details, such as tonnages (milled or mined), development footage, hours run and horse-power generated (for determining and distributing power costs), number of samples taken and assays made, are supplied to him from the general manager's office.

The segregator assists the accountant in the distribution of the wages.

The Compound

The compound manager is responsible for the maintaining of discipline in his province, for the equitable distribution of food, for the just satisfaction of complaints, and for the keeping of the compound in a sanitary condition. He is required to make a daily report to the general manager of the number and the condition of the boys in the compound; and, under the direction of a medical officer, he looks after the compound hospital.

The general manager should not make the compound manager responsible for the supply of the labor. This, as with all other sources of supplies, should be attended to directly by himself.

The compound manager is given as many white assistants as may be necessary; who will control the compound police, cooks, scavengers, etc.

Other duties that may devolve upon the compound manager vary with the country in which the mine is situated, the laws and customs governing the working of mines there, and the nature of the labor employed, white, native or coolie; and these conditions vary so greatly that all the compound manager's duties under the varying circumstances cannot be definitely outlined.

General Considerations

The most difficult part of the work of organization is the determination and limitation of the various departments. For instance, it is difficult to decide whether the sorting department should be under the metallurgist or the underground manager; or whether the mill engines should be in charge of the metallurgist or the mechanical engineer. But since these questions are of the utmost importance, some scheme of organization should be adopted.

The various officers should be required to make all important communications *in writing*, whether addressed to the general manager, or to the head of another department.

In the absence from the mine of the general manager or superintendent, another official temporarily assumes his duties and responsibilities.

New Caledonia Mines

According to a recent British consular report a large proportion of the mining labor of New Caledonia is at present of Asiatic origin, principally Japanese, with a few Indian coolies, and Javanese, some Tonkinese and a fair sprinkling of Loyalty Island natives.

Exports of Ore

Year.	Quantity, metric tons. Nickel	Chrome.	Cobalt.
1903	73,360	21,437	8,292
1904	98,655	42,197	8,964
1905	125,289	51,374	7,919
1906	130,688	57,367	2,487

Nickel—The production of nickel ore in 1906 was 130,688 metric tons, valued at £156,825, against 125,289 metric tons (£225,520) in 1905. In 1905 the ore for statistical purposes was valued at 45 frs. per ton and now is calculated at 30 frs. During 1906 several contracts were made for forward deliveries of large quantities of nickel ore during the next three years, some 60,000 tons of which has been purchased outside the nickel combination, the ore being destined for the Continent. Nickel ore could be produced much cheaper if the demand were greater and sales of ore sure, as mines once opened would then be able to keep on, in place of which the rule has been that after some two or three years producers have had to throw all their men out of work and wait for a contract before proceeding again.

Chrome—With the exception of the Tiebaghi mine and the Lucky Hit, no serious development has taken place in chrome of late; the production in 1906 was 57,367 metric tons, against 51,374 metric tons in 1905. This industry is at present virtually in the hands of one firm.

Cobalt—The demand for cobalt ores has fallen off greatly, so much so that the production for 1906 only reached 2487 metric tons, as against 7919 metric tons in 1905 and 8964 metric tons in 1904. The present price for cobalt ore of 4 per cent. grade is about 50 frs. per ton, with but few buyers, unless the grade exceeds 4½ per cent., when a small rise per tenth of unit is allowed, varying from 2s. 6d. to 3s. 6d. per tenth from 4½ per cent. upward.

Owing to the mining law which came into force last July some thousands of acres have been abandoned by the Nickel Company and others, and there is no doubt that 1907 will see a still further reduction in the mining areas of the colony, owing to the stringent measures adopted by the administration and the want of a market for the product of the mines. The mining law compels the owners of mining lands to work their properties or else pay a double rent per annum if they fail to do so after a certain period; this is tantamount to forcing production on a limited market, and as the whole of the nickel produced in New Caledonia is virtually the product of about eight or nine mines and the chrome the product of only two mines, one gets a fair idea of the result of trying to force production on the world's markets, when it would be possible to more than double the present production with the greatest of ease, if necessary, in any of the three leading minerals for which the colony is noted—viz., nickel, chrome and cobalt.

Flooding the Homestake Mine

Some details of the work of flooding the workings of the Homestake mine, Deadwood, S. Dak., in order to gain control of the fire which started on the 600-ft. level on March 25, are given in the *Pioneer Press*, St. Paul, Minn. The order to flood the mine was issued on April 22. The workings are 1550 ft. deep and there are more than 100 miles of underground channels. The space to be filled amounted to 68,393,621 cu.ft. and required 507,000,000 gal. of water. The natural inflow of water into the mine filled it to the 1100-ft. level, and from there up the filling was supplied from the surface.

Water was turned in from the Ellison shaft, the open cut and the old Lincoln shaft was opened for this purpose. By means of a flume water was brought in through a tunnel at the north end, and a great part of Whiteweed creek was turned in through the Savage tunnel by a flume 3200 ft. long, 20 in. wide and 30 in. deep.

This gave a volume of water equal to about 7500 gal. per min., and this, with the mine water and the additional supply caused by heavy rains and snow, brought the water about 80 ft. on the 300-ft. level on May 29, thirty-seven days after flooding was begun.

A conservative estimate places the loss of bullion output at $1,000,000. This does not include the cost of flooding, unwatering and repairs. The mine will be unwatered by means of 10 skips of a combined capacity of 10,000 gal., or, if steadily employed, 5000 gal. per minute.

Summer Meeting of the Coal Mining Institute

Of Unusual Interest Were Discussions of Coking and Non-coking Coals and of the Problem of Waste in Mining

SOME OF THE PAPERS PRESENTED

The summer meeting of the Coal Mining Institute of America was held in the Supreme Court room, at the court house at Pittsburg, Penn., June 11 and 12, 1907. The several sessions were highly interesting although attended by less than one-third the members. Valuable discussions followed the reading of each paper, and much light was thrown on the various questions and problems that were presented.

President Keighley in his opening address dealt generally with the sociological and technical conditions surrounding the coal-mining industry. One of the interesting statements in this address was "that the greater part of the trouble that occurs among employees in coal-mining towns is due to the excessive use of liquor sold at the different saloons." In dealing with this problem Mr. Keighley condemned the present practice of permitting saloons on or near coal properties and suggested that if no other remedy could be found, it might be well for the operating companies to establish or run their own saloons; or as a counter move have certain laws enacted limiting the profit of those selling liquor, to 6 per cent. on the capital invested. This plan of doing away with the profits accruing to the trade, it was said would make the business so unattractive that few saloons would exist. The plan suggested was said to be in successful operation in certain parts of the United States.

One of the most interesting and important papers read before the Institute was that submitted by Fred C. Keighley, general superintendent, Oliver & Snyder Steel Company. A brief abstract of this paper follows:

Why Is It That Some Coals Coke and Others Do Not

Coke is used for different purposes, and consequently it is essential that various cokes should contain different qualities. Manufacturers object when coke contains more than 1 per cent. sulphur. Time, however, is changing the opinion originally held so that the same operators, who 10 years ago, required that coke should contain less than 0.75 per cent. sulphur, are now satisfied if the sulphur content is as low as 1 per cent. It is impossible to judge all cokes according to their chemical analysis, for if the consumer is a manufacturer of fine castings he would not object to as much as 2 per cent. phosphorus; on the other hand, if the manufacturer is producing bessemer pig iron he would require that the coke be low in phosphorus.

Nearly All Coals Capable of Being Coked

The seams mined in West Virginia, Pennsylvania and adjoining States are nearly all capable of being coked, although some coals produce better coke than others. Anthracite coal comes near to being an ideal coke; semi-anthracite is partly coked while in succeeding order, we have bituminous and splinty bituminous coals, which have been less subjected to natural coking conditions. Splint coals are often chemically constituted the same as bituminous coking coals; however, it has long ago been proved that the chemical constituents of any coal do not form a sure index of its coking quality. In this relation, Mr. Keighley claimed that it is most important to consider the physical properties of any coal when determining its coking qualities.

Physical Properties Chief Determinant of the Coking Qualities of a Coal

From long experience and observation, Mr. Keighley believed that those coals having a laminated or horizontal bedding are not so easily cokable as coal that comes from a seam where the bedding is vertical. The two varieties may have the same chemical constituents and still produce an entirely different grade of coke. Where the bedding is vertical, as in the Connellsville seam, we have the highest type of coking coal. In certain parts of Ohio where the bedding is horizontal, the coal, although showing the same analysis, is difficult to coke.

The peculiar and excellent cell structure of Connellsville coke is due to the physical nature of the coal. Even in the same basin, it is true that mechanical movements of the earth have been sufficient to influence and change the physical properties of the same seam.

[illegible] while on the west side of this same basin, the earth movements have been sufficient to convert lignite into bituminous coal. One of the most important facts recently proved is that by crushing or pulverizing [illegible] structure and thus make it possible to [illegible]

[illegible] with a richer product. For this reason it [illegible] Connellsville bed, which is 9 ft. thick, differs considerable in quality in different parts of the seam. It has been found in this particular case, that better coke is produced when the lean portions are mixed with the richer coals.

Moisture, sulphur and phosphorus are generally considered objectionable in any coking coal, although in certain instances, the two latter elements fill necessary needs. Phosphorus imparts fluidity to coal and often acts as a flux to some of the refractory elements.

As to the presence of ash, it is true that there could be no coal or coke without this constituent. Ash forms a nucleus around which carbon is deposited, and is to a coal what the skeleton is to the human body.

The coking properties of certain coals is therefore due principally to the position or angle at which the atoms in the coal seem to lie; it is therefore necessary before attempting to coke certain coals, to crush or pulverize the lumps so as to change the position of the atoms in relation to each other or in other words the physical properties of the coal. When the coal is laminated or has a horizontal structure, the gases cannot so readily pass up through the charge; on the other hand, when the structure is vertical, it is possible for the gases to pass up through the coal. It is necessary for the gases to permeate all the atoms and make a thorough mixture. This one fact is probably responsible for the success or failure that follows attempts to coke many coals. Experience has shown that even Connells- [illegible] crushed.

In one instance where two grades of coal were produced from the same seam, [illegible] fact that the coal in the middle of an oven was extremely rich, while the lean [illegible] the richer coal in the middle also made an [illegible] in the coke, and form a different cell [illegible]

Investigations of the Waste in Mining and Preparation of Coal[1]

By Edward W. Parker.

During the first two years of the operation of the Geological Survey Coal Testing Plant, at St. Louis, Mo., the principal line of investigation followed was that to some extent directed by the law, which provided for "the testing of the coals and lignites of the United States to ascertain the most economical methods for their utilization."

Losses Through Wasteful Methods

The study of the most economical methods for the utilization of our coal resources has naturally suggested an investigation which would lead toward the most economical methods in the mining operations, and the prevention, as far as possible, of the waste incidental to the mining of coal and its preparation for market or for utilization. As all mining men are probably aware, there is more coal wasted per ton of coal sold or used in the United States, than in any other country on the face of the globe. The principal reason for this has been in the bountiful supply of mineral fuel with which nature has provided us, and because of this great supply we have been reckless and extravagant in the way we have mined our coal, as we have been almost criminally wasteful in the destruction of our forests. It was estimated, some quarter of a century ago, that we recovered barely 40 per cent. of the coal stored in the hills for our use. This was certainly true of the anthracite region of Pennsylvania. Coal was so plentiful and cheap that it was not considered worth while to incur the slightly increased cost of mining, which would have been necessary in order to insure a greater percentage of recovery. It is well known that millions of tons of coal, worth many more millions of dollars, have been irrevocably lost through these wasteful mining methods.

We have been improving in our behavior, driven to it largely by the approaching exhaustion of some of our rich coal beds, due to the "hogging" method of mining. But there is still more improvement to be accomplished. I have been informed that in one of the important coal-[illegible] mia there is now left in the mine from three to four feet of coal, for the reason that if it were mined out with the rest of the bed, the quality of the coke made from it would be reduced to below that of "standard" Connellsville. And yet, so I am informed, this unmined bench is a usable fuel, and well adapted to steam raising or other uses than coke making. But the operators are mining coal for coke making, and the coal unmined is lost for all time.

It must be remembered that neither the Geological Survey nor any other branch of the Federal Government, is contemplating any system of mine inspection or espionage. The survey has taken up the study of waste in coal mining, not for the purpose of securing preventive or other legislation, but simply for the the purpose of publishing information that will help the operator and the miner to secure a larger percentage of the coal in the ground, and also a smaller proportion of slack or screenings, when the market requires screened coal and the fines are practically valueless.

Character of the Investigations

The survey began this investigation about the first of the present calendar year, so there are as yet no results that can be given to the public. I think it is possible, however, that many coal men may be interested in the character of the investigation. In the first place, the field work is being done by a few young men who have been especially trained and instructed. When the usual survey requests for statistics of production were mailed, about the first of January last, a circular letter defining the proposed investigation was inclosed and operators were asked to let us know of any problems in the matter of mining waste which they had encountered, in order that we might have the benefit of any suggestions made thereby. The replies to these circulars showed that a general desire exists to coöperate with us, and many valuable suggestions for the outlining of the work were received.

The young men who have been sent to the field to collect the detailed information desired, have had experience with geologic parties in the examination of geological conditions, in the taking of samples for analyses, and in making sketches and taking notes. The work was begun in Illinois, and has been extended into the southwestern field, into western Kentucky and into Colorado. It will be taken up in Pennsylvania, Ohio, West Virginia, Indiana, etc., during the present summer.

Methods of Operation

In entering a certain district the field men are furnished with a list of mining operations, supposed to be typical of that district, and a list of men known to be interested in the subject. The field men have with them schedules of inquiries, but these are not printed in a form to have filled out by the operator or superintendent. They are made to serve as a guide in the asking of questions, the replies to which [illegible] made the basis for a report to the office.

The young man making the investigation at a particular colliery first notes the name of the mine and its location, according to district, county, and State, and the railroad or other transportation line on which it is located. He notes also the name by which the bed is commonly known, such as Pittsburg No. 8, Upper Freeport, Lower Kittanning, etc. He observes the character of the opening, as to whether or not mining is carried on by drift, slope, or shaft, and ascertains also the average depth from the bottom of the seam, below the surface. Entering the mine, he makes notes covering the general system of mining practised, whether by long-wall, retreating or advancing, or by room-and-pillar, double or triple entry, etc. If panels are used, he notes the number of rooms to a panel, and also where possible, secures copies of mine maps brought as far as practicable, to date. He visits two widely separated parts of the mine, and measures two general sections of the coal bed, making notes as to the character of the roof and floor, the partings and benches, and the bony and impure coal. These men are instructed to obtain samples of all the slate, bone, and other material thrown into the gob, taking separate samples from each portion of such discarded material which, in their judgment, might possess some fuel value. If it happens to be bone which he is sampling, the field man is authorized to take the samples either from the gob or from the dump, whichever, according to his own judgment, furnishes the best opportunity for sampling and also for possible future utilization. Samples of the roof and floor are also taken.

It might be of special interest to note here that the Geological Survey coal testing plant, at St. Louis, has recently made some tests of bony coal from West Virginia. This bone is entirely wasted, except for such small portions of it as might be used by miners for their own domestic needs. One of these samples contained 28.08 per cent. of ash; the other, 43.74 per cent. of ash. The only tests made were in the gas producer, and these tests showed that in the first case 1.48 lb. were used per electrical horsepower per hour developed at the switchboard, and in the other case, 1.95 lb. were used. These results are exceedingly interesting, showing as they do, an efficiency equal practically to that of Illinois or Indiana coals used in the producer, and from two to two and a half times the efficiency of Illinois or Indiana coals when used in the steam engine. They also show a much less consumption of coal per unit of power than is obtained from the very best steam coals under boilers. It is by the gathering and compiling of such information, and the making of these tests that the Geological Survey hopes to show the usefulness of this investigation of coal-mining waste.

Coal or Waste

Another item which the Fuel men are told to study carefully is the relation between the width of pillars, and the width of rooms. One of the principal reasons for the loss of coal in mining operations is driving too wide rooms and leaving too narrow pillars, with the result that the pillars are crushed and lost before it is possible to withdraw them. Our experience so far has been that while the initial cost per ton may be a little greater, the percentage of total recovery is much greater when wide pillars are left to support the roof and are then robbed out, allowing the roof to fall in behind. We are gathering figures covering the percentage of loss which is entailed by these different systems.

When pillars are robbed the men are instructed to ascertain what percentage of the coal is left, after robbing, and if not robbed, what is the total amount of loss represented by the coal left as pillars. The men are also instructed to ascertain whether the roof breaks through to the surface, and the thickness of the rocks affected by the roof-fall. Where any benches are left unworked in the mine, as in the case previously referred to, the field men are instructed to secure careful measurements as to the amount of coal left in these benches which is thus lost beyond recovery.

Another cause of waste is the actual method of mining. If the coal is undercut by hand or by pick, or if the undercutting is done in the fire clay, there are different percentages of coal wasted. This is particularly the case where the slack coal is not a merchantable product. It is claimed, in some districts, that a large amount of waste is caused by shooting the coal from the solid, the miners using large quantities of powder or other explosive, and making large amounts of small coal, sometimes endangering the property and lives of the men, but, from the miners' standpoint, securing a much larger amount of coal to the unit of labor expended upon it. This is a subject of much controversy between operators and miners, and if the efforts of the survey can bring about a better state of affairs, they will not have been made in vain.

There is still another cause of waste in coal mining which pertains to some fields and not to others. This arises from the payment of the miners on the mine-run or screened-coal basis. In Pennsylvania and West Virginia, Virginia and eastern Kentucky, and in some parts of Tennessee and Alabama, where the slack coal produced in mining is used for making coke, there is no question but that the miners should be paid by the run-of-mine, but where the market requires screened coal, and the slack is either wasted or sold at prices far below the cost of mining, the payment for mining on the basis of mine-run coal would undoubtedly tend toward waste. Miners [illegible] paid by [illegible] prepared size coal, the temptation to use an excess of powder and [illegible] a short shot of coal and to thereby [illegible] make an excessive amount of slack, is very apt to be indulged in.

The [illegible] particularly above the one being worked, may be adversely affected by the mining operations, and is another factor carefully noted. There are some beds in Pennsylvania which, in the earlier days of mining in that State, were considered rather thin for a profitable working, and have been irrevocably lost because of the settling of the strata due to the workings below them. Some day in the not so very remote future, the useless sacrifice of these beds will be greatly deplored.

Included in this investigation is also a study of the methods of preparing the coal for shipment, the ascertaining of whether or not all sizes are marketable at all seasons of the year, and if not, the proportion of the different sizes sold and wasted. We have also taken up the study of mechanical means of preparing and cleaning the coal by breakers, slate pickers, washers, etc., by collecting all possible data regarding the improvement in the quality of the marketable product which has been effected by washing, and thus abating waste. Large amounts of coal which were formerly wasted because of their impure character, are now being made marketable by washing.

A Brief Study of Social Conditions in the Bituminous Coal Region of Pennsylvania [1]

By C. L. Fay*

To have a reasonable conception of the sociology of the mining town it is necessary that we study the social condition of the whole region, and that we consider four classes in their relation one to the other, viz.: the native-born inhabitants, the English-speaking miners, the foreign-speaking miners and the employers.

A generation ago this region was a great stretch of agricultural and lumber interests. The communities were composed mainly of native-born citizens, sons of sturdy pioneers, raised under the influence of American institutions, filled with patriotism and recognizing a high moral standard.

The development of the mining industry [illegible] soon lost its former identity, and the [illegible] county. Many of the [illegible] children of the newcomers. As a consequence of [illegible] native population could look with any particular favor upon the [illegible] came a day for riot, revelry and carousal. While it was not necessary that they participate in these things, still it was impossible for them to escape the disagreeable and oftimes revolting and dangerous results.

The second class under consideration, the English-speaking men from Scotland, England, Ireland and Wales, formed the real basis of the social life of the early mining towns, and by thrift, study and perseverance became the dominating factor in the upbuilding of the great mining industry, until today this class occupies [illegible] class in the mining [illegible].

The foreign-speaking man, like the [illegible] community or intrude upon the rights of others. In order to better understand something of him, we must recognize the [illegible] him what he was.

[1] Read before the Pittsburgh Section of the [illegible] Mining Engineers, Pittsburgh, Pa., December [illegible], 1906.

* Industrial Secretary, Pittsburgh [illegible] Y. M. C. A., Pittsburgh, Pa.

patriotism made intelligible to him, but he meets the need in the mines. He makes a wage which he never before has known. His natural tendency is to congregate in colonies speaking his own tongue. There he is exploited by alert schemers and money-getters, easily becoming their prey. It is not long before he is revelling in drunken brawls, being incited by the liquor interests to additional drinking tournaments upon every possible excuse. Naturally this course leads him to the county jails, which become crowded beyond their capacities. The inbred class prejudice of these people is easily fomented. They readily come to look upon all employers as lords and tyrants, and, because of their numbers, under leadership they become a mighty factor in the political and industrial economy of Pennsylvania. The second generation of this class, the children born in this country, show marked development; and the more ambitious are looking toward the responsible places now held by the English-speaking class, and in some instances are looking toward the positions of authority in civic affairs. Thus we find the third class under consideration, in its new-found wealth and liberty.

The Employer

The fourth class, the employer, has an important part in this analysis. In meeting the imperative demands from ships of commerce, ships of war, railroads, steel mills, innumerable smaller industries and the fireside, he has sought—and not without profit—the riches of Mother Earth, and has furnished the means of power and warmth to the needs of a remarkable generation.

To operate the mines it became necessary to find more men willing to labor underground than was supplied by this country and the English-speaking immigrants. The serf of other lands found a hearty welcome and a place on the "pay-roll." (Indeed, in some places the demand is not yet fully met.) In the heat of the construction and development of the great coal industry it was enough for the employer that the miner could dig coal. The former was busy with the promotion of the huge mining enterprises, engrossed in the experiences of money-making and in the improvement of personal and family environment. He was in a whirl of affairs from out of which he could see his great undertaking only as a complex machine, the miner forming a legitimate part that seemingly required little attention. True, in some instances and at certain times he might think of the employee and his family in regard to their [illegible] and in individual cases here and there, but such matters usually were outside the vision of the employer. That there was a real need that serious thought and care be given by him to the mind and charac- [illegible]

tion. At many places where drunken brawls, resulting in fights and murders, became unbearable, also limiting the operation of the mines, the superintendents and foremen introduced severe measures, invoking, as far as was possible, the arm of the law, and attempted also to prevent the "beer-wagon" business and other evils, in self-protection. But these expedients were combative only, not, as a rule, remedial, and in many cases were but temporary. In other instances, where the operation of the mines was limited by general or local strikes, the employers in some districts met with representatives of the men, and a diplomatic battle would ensue until a bargain finally would be made and a working agreement entered into for a year or more.

As certain causes led the miner to believe his employer a tyrant, so certain experiences led the operator to look upon the employee as unreasonable and greedy, a spirit of conflict being the result. Many policies found place in the minds of both employer and employee. Among the more radical was, on the one side, the spirit to "crush," and, on the other side, the spirit to "force." These conditions are gradually changing, however, as the employers and the more intelligent among the employees come to realize that back of all this there is a cause which must be dealt with wisely, seriously and with patience.

The Mining Town

When we consider, then, the sociology of the mining town, we must have in mind these four classes, their relation one to the other, their past history, and history of the communities.

The type of town varies so greatly that while similar conditions obtain more or less, yet each place has its peculiar local social problem.

There is the town without a church, or other place for wholesome entertainment or recreation, nor any visible means to promote plans that will result in the moral education of the men. Eighty-five to ninety per cent. of the men are foreign-speaking, and the town has poor sanitary conditions. Surely there is little in such a community to preserve, develop or repair the human machinery. Then there is the town with its church, or churches, its Y. M. C. A. building, or a club building and athletic grounds, its various societies for the good of men, its more modern houses, cleanliness and higher moral tone. The population may include all four of the classes here considered. Then there are the towns ranging between these two extremes. The greater number, however, are nearer the former standard than the latter.

It is safe to predict that the next five to ten years will witness very marked changes in the coal industry, and with this further development the tendency will be toward more economical mining. At the same time the work will become more difficult as the lower seams are reached. New methods will be introduced. Greater skill will be required. More trained men will be needed; and with this change and growth, the social needs of the mining communities will be closely related and should not be lost sight of in the general advancement.

Necessary Remedies

The remedy for present undesirable conditions at many places, is apparent. It is education both moral and technical; it is adequate mediums for social betterment; it is better sanitation; it is legislation that will properly control the liquor traffic; it is enforcement of that legislation, and it is reasonable discipline that may for a time need to be rigid to such a degree as to appear severe.

The problem becomes an imperative demand that appeals to every intelligent American citizen and has a just claim upon the thought, time and resources of the employer, and calls also for a ready response and constructive interest on the part of the employee.

In dealing with this problem there should be the same honesty of purpose, sagacity and conservatism as is manifested in the development of the great industrial enterprises and institutions of our country.

Colliery Experimental Work of the Geological Survey*

By Clarence Hall†

From the data collected by the Fuel Testing Department of the United States Geological Survey, it appears that the large explosions in mines are caused by fire-damp or coal dust which has been ignited in many cases by blown-out shots. I have recently returned from a tour of inspection in Europe, and found that they have been working on this subject for 15 years. In Europe the mine owners, the miners, the government and the manufacturers of explosives all coöperate in the effort to prevent the dreadful explosions.

From our investigations so far, the United States is behind Europe in safeguarding the lives of the men in mines. England and Belgium have had for years splendid experimental stations, and in these countries there are but few casualties in the mines. The Belgium mines are notorious for the presence of fire-damp, yet that country has enjoyed a wonderful immunity from these terrible explosions.

Permissible Explosives

As a result of the experiments in Eng-

*From a paper read at the meeting of the Coal Mining Institute of America, Pittsburg, Penn., June 11 and 12, 1907.

†Explosives Expert, U. S. Geological Survey.

land, there are a number of "permissible explosives," and these must be used by the miners in the blasting of coal, and no others. They also have in Belgium what is known as the "limit charge," which must not be exceeded on pain of severe penalty. In the various States here there are but few regulations, and none in many States, when it comes to the kinds of powder to be used.

My investigations have thus shown there are explosives made which will not ignite fire-damp or coal dust, even when a blown-out shot has resulted, provided the miner does not exceed the "limit charge."

All explosives, if used in too large quantities, will ignite fire-damp or dust, and for that reason they have the limit charge. They have some explosives the "limit charge" of which is 900 grams; others in which 700 grams is considered the safety limit; and many are limited to 500 grams. All safety explosives are characteristic in the fact that they give a very low temperature at their ignition point, and produce a very small flame and of short duration.

I think we will have the support and cooperation of the miners, operators and manufacturers of explosives in this country, and expect to see on the market in a very short time a number of safety explosives.

Experiments Planned

We have completed our plans for an experimental station at which tests of the various dynamites and powders used in blasting coal will be made with a view of determining accurately their safety in the presence of the deadly fire-damp, and perhaps equally deadly coal dust. Explosives of all sorts will be buried by means of a mortar into a mammoth boiler-plate cylinder, which has previously been filled with gas, and the effects will be carefully noted. If ignition fails after severe tests, the explosives will be known as "permissible explosives," and their use will be urged upon the mine owners of the country.

In addition, there will be important experiments in rescue work. One part of the station will be fitted up as a miniature coal mine, and miners and operators will be taught the art of saving the lives of fellow men. We are positive that in serious gas explosions in mines hundreds of lives could be saved were it possible for the rescue party to enter immediately after the accidents. As it is now, the deadly fire-damp often holds the men back for hours, while their comrades are slowly being suffocated or burned to death.

In the experiments at the station we have found an apparatus in Europe which when worn by the members of a rescue party, enables them to enter any place where there is gas. At the experimental station the miniature mine will be filled with dense smoke and practical demonstrations in the saving of life with this apparatus will be made.

A definite location for the experimental station has not been selected, but it is probable that the station will be in the Pittsburg district. The construction of this station will approach as near as possible the working conditions of a mine, and will be erected along the lines of the English and Belgium stations. It will consist of an explosive laboratory where the analyses will be made of all explosives now being used in this country. All the explosives which have passed the tests successfully will be published. At regular intervals analyses will be made, and if any deviation is noted from the original analyses, the explosive will again be tested, and if it should not pass it will be stricken from the list and mine operators notified. We do not expect the manufacturers of explosives would alter the composition of the original explosive for the purpose of reducing the cost of manufacture, but these precautions will be taken to protect the lives of miners.

Experimental Gallery

In addition to the laboratory there will be an explosive gallery in which the explosives are to be tested, and will be in the form of a cylinder 100 ft. long and 6 ft. 4 in. in diameter, lying on the ground. An explosive mixture of fire-damp and air in one case, or coal dust and air in another, will be pumped into the cylinder and the explosive to be tested will be shot into it from one end by a big steel mortar, so that the flame and products of combustion will go right into the fire-damp. If the station is erected within the Pittsburg district, natural gas will be used for testing purposes.

The cylinder is to be made of heavy boiler plate. Safety valves will be placed all along the top, and will be left unfastened in such a manner that whenever there is an explosion the valves will fly open on their hinges. A series of port holes on the side, covered with one-half inch glass, will enable those conducting the experiments to witness the explosions from the observation house, which is to be parallel with the cylinder itself.

While these tests are being conducted, operators and miners will be invited to be present. In this gallery the limit charge of all explosives will be determined.

Safety Lamp Gallery

There will also be a lamp gallery in which all safety lamps will be tested. The same will be placed in the gallery and the explosive mixture of gas will be drawn through the gallery at different velocities. The gallery is so constructed that the same can be placed in the current. It has been demonstrated in Europe that there is a vast difference in the safety and efficiency of safety lamps. Some lamps will stand the horizontal current of a velocity in less than five minutes will [illegible]

[illegible] cannot overlook the fact that the efficiency [illegible] of the length of the flame will be determined by the camera at night.

[illegible] days ago. He suggested that we would [illegible] coal, dry and with different [illegible] water. He believed if the [illegible] saturated with water the [illegible] the ignition point of the explosion would not be sufficient to vaporize all the water and consequently there would be no ignition of the tamping, which might produce [illegible] station.

"Coalite"—A New Fuel

[illegible] Newcastle, England, a good deal of interest is now being centered in "coalite," which is a new fuel made from coal by subjecting the latter to a partial distillation, much the same as in the manufacture of illuminating gas or of coke in by-product ovens, but not carrying the distillation so far.

It is claimed that the new fuel makes no smoke and develops something like twice the heat of coal, while a "coalite" fire lasts 40 per cent. longer than an ordinary coal fire. Moreover the by-products are said to be richer than those obtained in the manufacture of coke. Out of a ton [illegible] obtained, but its calorific power being much greater than that of the coal, the ton [illegible] value, while at the same time the gas and a vast range of by-products have been ex[illegible] consumption in London alone.

[illegible] calorific value of the original coal. How[illegible]

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

Rubber valves are used in ordinary pumps when handling cold water, but brass or other suitable material is required for hot water or oil.

Compressors used for mining, tunneling and air lift-plants should be simple in construction, durable, and easily repaired. The wearing surface should be large and adjustments should be provided for taking up wear. The clearance spaces should be reduced to the minimum and air cylinders water jacketed.

The successful operation and value of a condensing apparatus depends directly on the maintenance of a high vaccum. This condition can be obtained only by an air pump that takes full strokes and the condensing chambers should be equipped with an improved device for applying the cooling water, thereby obtaining the most efficient results.

Installation of plant, either mining or milling, must be carefully considered with respect to the probability of reimbursement of the first cost of the plant. If there be only 100 tons of ore to be hoisted out of a shaft it is both better engineering and better business to raise it by windlass than to buy a steam hoist, and this same principle obtains throughout mine operation.

The power exerted by a steam engine during a single stroke of the piston is due directly to the difference in the pressure on the opposite sides of the piston. The value of a vacuum of 26 in. of mercury to an engine is equivalent to a net gain of about 12 lb. of average pressure per sq.in. of the piston area. The amount of power thus gained bears nearly the same ratio to the power developed by the engine when non-condensing as 12 lb. does to the mean effective or average pressure of the steam in the cylinder.

The Lehigh Valley Coal Company plans to erect a new breaker at Jeanesville, Penn., and ground has already been broken for the structure. The building will be 129x110 ft. Although the operations at Jeanesville have been practically abandoned for years past, it is known that there is a vast amount of coal there, which will now be prepared for market. It is rumored that when the new breaker is completed the Yorktown breaker will be abandoned, the intention being to send the coal from that mine to Jeanesville for preparation.

The grade and character of steel is usually determined by the per cent. of carbon it contains. Steel used in structural work varies in tensile strength from 55,000 to 70,000 lb. per sq.in. of sectional area, and from 0.10 to 0.25 per cent. of carbon. When steel contains 0.15 per cent. carbon, it is considered "soft"; when 0.15 to 0.30 per cent. of carbon is present, the steel is known as "medium"; above this percentage of carbon it is called "hard steel." Steel below 0.10 per cent. carbon is capable of doubling back without fracture after being chilled from a red heat.

Under normal conditions, condensing engines require from one to one and a half gal. of condensing water per minute per indicated horse-power. Surface condensers for compound steam engines require about 2 sq.ft. of cooling surface per horse-power, ordinary engines will require more surface according to the economy in the use of steam. It must be remembered that the air pump should be set lower than the condenser in order to get satisfactory results. Roughly speaking, a good condenser will save one-fourth of the fuel consumed, or in other words, increase the power of the engine one-fourth, the fuel consumption remaining the same.

To find the diameter of pump plungers to pump a given quantity of water at 100 ft. piston speed per min., divide the number of gallons by 4, then extract the square root, and the result will be the diameter in inches of the plungers for single double-acting pumps; for duplex double-acting pumps, divide by 8 before extracting the square root. To find the number of gallons delivered per minute by a single double-acting pump at 100 ft. piston speed per min., square the diameters of the plungers, then multiply by 4. For duplex double-acting pumps, multiply by 8. For example, a 10-in. duplex pump will deliver $10 \times 10 \times 8 = 800$ gal. of water per min. at 100-ft. piston speed.

Unlined linen hose is best adapted for mine work when in short lengths. "Mill hose" is better than unlined hose for long lengths, but the ordinary best quality, smooth, rubber-lined hose is superior to the "mill hose," having less frictional resistance. Use double lines of hose and a Siamese nozzle for a long distance and a hot fire. A double line, 1000 ft. long, delivers a 1¼-in. stream with the same force as a single line 287 ft. long. Small streams should be used for a small fire, but for larger hot fires use a 1¼-in. or 1¾-in. stream. When a stream is effective it always makes a black mark wherever it hits and cools the burning coal. Small streams are converted into steam before touching the fire.

The amount of scale-forming matters in any river water varies from season to season and from day to day; in wet season or after a rain, water will be found to be comparatively pure, as the scale-forming matters are diluted by rain water. In a dry season the impurities in water are highly concentrated as its volume decreases. Water found in coal mines is apt to contain a large amount of sulphuric acid; if such water is used in a boiler, it will quickly corrode the boiler. Water highly charged with carbonic-acid gas will also corrode the boiler. Water containing chlorides of calcium and magnesium should not be used in boilers, inasmuch as the hydrochloric acid (which is set free by heat) will attack the boiler.

To insure the successful running of a pump, the suction supply must be steady and full. If the suction pipe is long, the size of the pipe should be increased to counterbalance the increase in the internal friction. The run pipes should be as straight as possible, using round bends instead of elbows and Y's instead of T's. Suction pipes must be perfectly air tight. Even a small leak will prevent proper running of a pump. On high suction lifts provide a foot valve and a strainer. A pump should never be placed more than 20 ft. above the level of the water. The stuffing boxes should be loosely packed. Boiler-feed pumps should be run slowly and constantly. In case of trouble with a pump, always make sure that the water valve and pipes are all right before examining the steam end.

All natural waters contain more or less mineral matters, either in suspension or in solution, and the relative degree of purity depends on the locality in which they occur. The impurities are divided into general classes; first, corrosive impurities; second, scale-forming impurities, and third, alkaline impurities. The corrosive impurities are: Sulphuric acid, carbonic acid, sulphate of iron, sulphate of copper, chlorides of calcium and magnesium. The scale-forming impurities are chiefly: Carbonates of calcium, magnesium and iron; and sulphates of calcium and magnesium. The alkaline impurities are: Carbonates, sulphates and chlorides of sodium and potassium. Waters containing a large quantity of either sodium or potassium in the form of chloride or carbonate are very difficult to purify; neither of these latter impurities can be removed, except by distillation; but water containing these salts can be greatly improved and rendered fit for boiler use by removing the other impurities which the water contains.

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*Illustrated.

The Anthracite Suit

The position taken by the Government in the United States Circuit Court [illegible] to dissolve the combination which is said to exist among the coal-carrying railroads in New York and Pennsylvania and the leading anthracite coal companies, is a direct attack under the anti trust law against an alleged conspiracy in restraint of trade, including an agreement for the marketing of the product and fixing the price thereof. It has been distinctly the tendency in American industries for several years to aim at such monopolies, which attempts have met with more or less success. Irrespective of whether there is any agreement, illegal or otherwise, among anthracite producers and common carriers, the fact is undeniable that the price for anthracite coal has been for many years, and is still, fixed in some way; and that there has been no competition manifested by differences in price at which coal is obtainable. In other words, the sellers fix the price, which may change from month to month, or from period to period, and the consumers have only the option between paying the price asked or going without what is in this case an article of necessity. In so far as the consumers of domestic coal are concerned, the understanding extends to the retail dealers, or they have local understandings of their own. In most cities and towns of the Atlantic seaboard one price is quoted by all the local dealers. At the beginning of May a small reduction is made, sufficient to induce the consumers to carry the stocks which otherwise the dealers and producers would have to carry; but as the autumn approaches the price goes up, attaining a maximum in the winter, and so the circle is completed year after year.

From the standpoint of the producers this is an ideal condition. The Standard Oil Company has aimed to achieve the same thing in the marketing of petroleum products, and in general has succeeded, although it is occasionally subject to local competition. The United States Steel Corporation fixes the price for steel products. The American Smelting and Refining Company fixes the price for lead, but although both those concerns are by far the largest producers in their respective industries, there is sufficient outside production to afford competition, if the outside [illegible] left to their own devices. The State may [illegible] their complaisance has rested upon a [illegible] least, and the general acceptance of a [illegible] different conditions exist in the copper [illegible] a fixed price has not met with general acceptance, except for very brief periods, and [illegible] has stood the tests of many kinds of adverse conditions.

[illegible] suit must not be confused by pointing out merely the similarity in the end aimed at, viz., the regulation of price. In the case of the anthracite companies the Government charges that they have entered into illegal agreements for the restraint of trade, while some of the other trusts that we have mentioned, which are simply very big companies, probably have done nothing whatever that is illegal. The defense of the anthracite companies will doubtless be that during the former times of unrestrained competition a dangerous commercial condition existed, which was so bad that two of the railways were compelled to go into bankruptcy, while the competition from all quarters led to coal being forced upon an overstocked market at consequent cutting of prices to an extent that jeopardized many of the anthracite investments. A similar situation was among the reasons for creating other trusts. The American Smelting and Refining Company was the successor of an association which had previously been organized to do away with the disastrous competition among the Colorado and the Utah smelters. The United States Steel Corporation was organized to ward off a threatened war in the steel trade. Whatever may be said in defense of such a policy, which [illegible] an unfortunate day when competition is eliminated from our industries. As the [illegible] good basis for the Government's assertion, [illegible] of the [illegible] [illegible] [illegible]

not destroy them, but it cannot ignore the [illegible] them."

British Smelters and the New Employers' Liability Act

In addition to being included in the Alkali Act, as mentioned in a recent article, the British smelters have other difficulties to face in complying with the provisions of a new employers' liability act, which comes into force on July 1. Their inclusion in the Alkali act will not give rise to much trouble or inconvenience, but the employers' liability act is causing the smelters a good deal of anxiety. The act was passed last year in the interest of the labor party, and its provisions are very stringent. It provides that if an employee meets with any accident or contracts any disease in the course of his employment, due to the employment itself, the employer shall be liable for full wages during the period of disablement, however long; and in case of death the employer is saddled with heavy compensation. This act, of course, affects all trades and occupations, even domestic servants being included.

Among smelters the evil effects of lead poisoning is receiving the chief attention of the Government authorities, and very strict and inconvenient inquiries are being made by the officials. The inconvenience arises from the examination of processes usually kept secret, for the presence of even a Government official in such works is not at all relished. The lead smelteries and white-lead works are especially affected by this act, and even the zinc works are being worried on the subject. In the South Wales zinc works symptoms of lead poisoning are occasionally met with, but the cases are never severe, and a fortnight's rest is usually sufficient for recuperation. As a matter of fact, the blende used in most of the works rarely has a large lead content, ores containing more than 2 per cent. not being usually bought.

Some of the zinc smelters are now medically examining their men with the object of ascertaining which of them are espe- [illegible] charging such men before the act comes [illegible] have to adopt, but owing to the difficulty in ascertaining the ultimate burden im- [illegible] blamed. The South Wales smelters, and there are at the present time a considerable number of pensioners who have worked all their lives at the furnaces until they were unable to work any longer. Under the protection of a favoring law, the men's illnesses and disablements might grow rampantly. It is possible that even the good Samaritan might have passed by on the other side also, if he had been by law made liable to keep the man that fell among thieves for the rest of his life.

Coal Mine Inspectors in Pennsylvania

The bill making all persons holding mine-foreman certificates under the law relating to anthracite coal mines eligible to candidacy for the office of mine inspector, which was introduced in the legislature of Pennsylvania at the instigation of the Miners' Union, passed the legislature, but on June 12 was vetoed by Governor Stuart. Our readers will bear in mind that we opposed the bill at the time its introduction was talked of. The reasons given by Governor Stuart for his veto are the same that we advanced in our editorial upon the subject several months ago, and indeed the language of the governor's message followed closely what we said. It is unnecessary, therefore, to make further comment than to express our gratification that the proposed law has been vetoed in so positive a manner, in which the colliery operators, managers and superintendents, together with the miners who have no petty interests of their own to further, will heartily join us.

Another bill vetoed by Governor Stuart is the one providing for additional inspectors in the anthracite districts. "Under the present law," says the governor, "there are 20 inspectors in the anthracite region, and the purpose of this bill is to increase the number to 30." The governor states that he is of the opinion that there is no necessity for this large increase in the force of inspectors. This also is a proper veto. Adequate inspection is highly to be desired, but until the present force of inspectors is developed to the proper degree of efficiency in the exercise of the duties of their offices, which at present they are not (for reasons which it is not necessary to discuss at the present time), it would be useless to increase the number. The attention of the State of Pennsylvania should be directed toward organizing the [illegible] inspectors so that it will accomplish the most of which it is capable; after that it will be time to consider adding to the number if the work to be done proves more than the present inspectors can successfully handle.

Electrostatic Separation in Wisconsin

We have called attention, both editorially and through a series of important technical contributions, to the striking manner in which the process of magnetic separation has developed the zinc district of Wisconsin into an ore producer of great consequence. We have also referred to the introduction of the electrostatic process of separation in that district, which after a more or less extensive trial was abandoned. The failure of the electrostatic process, if it be considered a failure, was due rather to poor judgment in the location of the plant than to the demonstration of the inapplicability of the process. As a matter of fact, the process gave an excellent separation of the blende and marcasite, at a cost which would be moderate in a properly designed plant of suitable size. Consequently, it is interesting to receive the report that the electrostatic process is to have another trial in the Wisconsin field. If this be made under suitable conditions, and prove successful, it will add not only to the production of zinc ore, but also to the production of sulphur ore, which now is worth $4 to $6 per ton, and is produced by the electrostatic process in a good marketable form.

IN OUR ISSUE of last week we published an interesting article by Mr. Walker on the smelter smoke question in Great Britain. The new law, to which he calls attention, does not seem to worry the smelters very much. So far as our information goes, none of them has been required to do anything as yet. Indeed, the Cape works is probably the only one that may be requested to comply with the terms of the new law. However, at present everything is in suspense, and it is difficult to prophesy what eventually may be done. The steel works and tin plate works behind Swansea give out far more smoke than the smelters, yet they do not come under the new law at all. The lack of interest in the matter is evidently due to the fact that the smelter smoke question is not a [illegible] Great Britain.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

The Elmore Vacuum Flotation Process

An editorial in the Journal of May 11, 1907, on the Elmore vacuum process makes it appear that [illegible] would be interested in learning something about the operating cost of the process. An actual statement covering the costs at any one mine would in no wise serve as a criterion of the costs at another mine since such costs are dependant upon the character of the ore and upon the accessibility of the mine to sources of supply.

The items involved in the costs of operating outside of crushing, are oil, acid, labor, power, wear and tear. The treatment of every ore is more or less a study by itself, some requiring more acid or more oil than others. In general it may be stated that the operating costs on ores that are well suited to the vacuum process are about the same as the costs of a modern water concentrating plant. Items involved in the costs vary as follows: Crude oil, 1 to 3 gal. per ton of ore; sulphuric acid, 1 to 20 lb. per ton of ore; labor, one attendant per shift in a plant of 200 tons capacity or less, there being no manual labor involved. The wear and tear is so slight as to be practically almost negligible and is principally confined to the vacuum pump.

As an example of the very low concentrating cost in one instance, attention is called to the Tywarnaile mine in Cornwall where the vacuum process is in commercial use and is employed in concentrating copper ore from dumps, which assays only 0.5 per cent. copper. At this plant the total labor cost chargeable to concentration is the wages of [illegible] per shift. Three quarters of a gallon of crude oil is used per ton of ore. No sulphuric acid is required, the mine water having a sufficiently acid reaction. The entire power cost does not exceed 2.5c per ton of ore concentrated. This cost is unquestionably an unusually low one, but for a suitable ore under ordinarily favorable conditions the cost should fall well below 50c. per ton.

In a few instances, especially in remote regions or where an extra amount of oil or acid is required, the cost may slightly exceed 50c. per ton, but in such cases the extra cost is lost sight of owing to the high efficiency of the process and the high grade of the concentrate obtained. On ores where high [illegible] by water concentration is out of the question the vacuum process frequently gives an extraction of 15 to 40 per cent. better than [illegible] a ton, thus easily offsetting a few cents extra expense that might be caused by the character of the ore or by the remote location of the mine.

When operating on a sufficiently large scale (100 tons and upward) the sulphuric acid required (very weak acid only being needed) may be manufactured at the mine by utilizing the sulphurous acid gases from roasting furnaces and the acid obtained at a cost of $5 per ton or 0.25c. per lb., a further gain being thus secured by reducing the weight of the concentrates to be shipped to market and by bringing them up to a higher grade, which are items of much importance where mines are at a long distance from market and from sources of supply.

F. H. Prentiss

Denver, Colo., June 7, 1907.

Roasting for Magnetic Concentration of Zinc Ore

In reference to C. C. Mathey's comment regarding my article in the Journal of March 30 on "Roasting for Magnetic Concentration of Zinc Ores," I will make a few remarks which will end the discussion on my part.

(1) The facts and figures of tests, etc., given in my article are simple and accurate, although they are not on the high plane of efficiency claimed by Mr. Mathey in the above mentioned comment regarding the Dahl Lead and Zinc Company's roaster.

(2) It is a simple fact that a steel building, such as put up by Mr. Mathey over [illegible] does not cost more than a wooden one.

(3) Quoting from Mr. Mathey's letter, "it is enough to say that none of the roasters built by Mr. Trego at the Mills mine, Square Deal mine, Roosevelt mine and the Platt mine is now in operation." Such a problem as this cannot be set [illegible] feel sure that your readers want some [illegible] the Mills roaster *is* running whenever they have the ore which they wish to treat in that manner. The Square Deal [illegible] conditions. Several mines which have [illegible] under the same conditions.

[illegible] assaying as low as 0.8 per cent. zinc on a [illegible]

4137 Ellis avenue, Chicago, Ill., June 4, 1907.

The Terrible Mine, Ilse, Colo.

[illegible] ore to continue to considerable depth from insufficient evidence. At the time when he was at the mine the latter was full of water up to 90 ft. from the surface. Con[illegible] below that level and his statement that in the lowest workings (on the 250-ft. level) the cracks were smaller than at the surface, which he presents as a confirmation [illegible] Brinsmade to mention his authority for that statement was evidently an oversight, but, nevertheless, attention should be called [illegible] what has been advanced by Mr. Brinsmade.

[illegible]

[illegible] smelting of Mt. Lyell ore.

New Publications

FACTS ABOUT THE SOUTH. By Richard H. Edmonds. Pp. 72. 6x9 in.; paper; 25c. Baltimore, 1907: Manufacturers Record Publishing Company.

[illegible] THE UNITED STATES GEOLOGICAL SURVEY (EXCEPT TOPOGRAPHICAL MAPS). Pp. 65. 6x9 in.; paper. Washington, 1907: Government Printing Office.

A PRACTICAL TREATISE ON THE GAS AND GASOLENE ENGINE. Pp. 108; illustrated. 6½x7½ in.; paper, 50 cents. Warren, Penn., 1907: Jacobson Machine Manufacturing Company.

MITTEILUNGEN AUS DEM KÖNIGLICHEN MATERIALPRUFUNGSAMT ZU GROSS-LICHTERFELDE. Herausgegeben im Auftrage der Königlichen Aufsichts-Kommission. Pp. 100; illustrated. 7½x10½ in.; paper. Berlin, 1907: Julius Springer.

[illegible] AN DEN GEOLOGISCH-UNTERSUCHUNGS- UND BERG- UND HÜTTENSCHULEN UND ANDEREN TECHNISCHEN LEHRANSTALTEN. By Wilh. Maucher. Pp. 167; illustrated. 6x9 in.; cloth, 2.50 marks. Freiberg in Sachsen, 1907: Craz and Gerlach.

REPORT OF THE STATE BOARD OF GEOLOGICAL SURVEY OF MICHIGAN FOR THE YEAR 1905. Alfred C. Lane, State Geologist. Pp. 638; illustrated. 6x9 in.; cloth. Lansing, Mich., 1906: Wynkoop, Hallenbeck, Crawford Company, State Printers.

WEIR EXPERIMENTS, COEFFICIENTS AND FORMULAS (REVISION OF PAPER NO. 150). By Robert E. Horton. U. S. Geological Survey, Water Supply and Irrigation Paper No. 200. Pp. 192; illustrated. 6x9 in.; paper. Washington, 1907: Government Printing Office.

MARYLAND GEOLOGICAL SURVEY. THE PHYSICAL FEATURES OF CALVERT COUNTY. By G. B. Shattuck, B. L. Miller, J. A. Bonsteel, R. T. A. Burke, C. F. Von Herrmann, N. C. Grover, L. A. Bauer and H. M. Curran. Accompanied by topographical and geo-[illegible] 6½x10 in.; cloth. Baltimore, 1907: The Johns Hopkins Press.

[illegible] Uses. By Heinrich Ries, with A Report on Molding Sands, by H. Ries [illegible] cal and Natural History Survey, Bull. [illegible] Pp. 250; illustrated. 6x9 in.; cloth. [illegible] properties and uses. Tests of Wisconsin [illegible]

Large Magnetic Separating Plants in Norway

BY N. V. HANSELL*

A few data concerning two new Gröndal plants being erected in northern Norway may be of interest. One is at Syd Varanger, on the shore of the White Sea close to the Russian line and on the 70th parallel of latitude. The only way of reaching the place is by steamer around Nord-Cape. The ore is a magnetic iron ore occurring in the form of an immense hill estimated to contain about 400,000,000 tons above water level. This mass of ore stretches two and a half miles, with an average width of more than 600 ft.; the ore is lean, containing not more than 35 per cent. iron.

The separation is to be done by the Gröndal methods, the separating plant to be connected with briquetting plants. Extensive development is now being carried on. Railroads, docks and dwellings are being constructed, and the quarries are being equipped with steam shovels and the most modern machinery. The separating and briquetting plant will take care of 1,200,000 tons of crude ore yearly, from which there will be produced 600,000 tons of briquets. The plant will contain 56 Gröndal ball mills, 200 Gröndal separators and 20 Gröndal double briquetting kilns. The first shipments will be made in the spring of 1909. Most of the product will be exported to Germany.

At Salangen, a little north of Narvik, also in the extreme north of Norway, extensive preparatory work for opening some very large but lean iron-ore deposits has been carried on for some time. The conditions here are similar to those at Syd Varanger. A Gröndal plant, with an estimated capacity of 300,000 tons of briquets yearly, is being erected. This property is being opened by some German iron works, and will be ready for shipments next spring.

Tin Mining in Siam

According to a recent British consular report the chief industry of the monthon of Puket is tin mining. In the south of Kedah, where the main range of mountains which forms the backbone of the federated Malay States still extends, there is some mining, and there is also a little in the hills which separate Perlis from Setul, from which were exported about 900 pikuls of tin ore, or 54 tons. Probably not more than 200 tons was exported from Kedah. The real mining area extends from the island of Tongkah (or Junk Ceylon), where hitherto most work has been done, and the mainland opposite as far as the Burma frontier. Although hitherto the mainland has not been prospected as much as at Tongkah, there is reason to believe that it is no less rich in ore. The absence of roads and communications retards progress, and it is generally understood that the government intends to rectify this as soon as possible and turn its attention to devloping this rich province.

The exportation of tin, including metal and the metallic content of ore (estimating the latter at 65 per cent.) from the monthon of Puket is about 4000 long tons per annum. In 1906 the export from the island of Tongkah alone amounted to 18,476 pikuls (1109 tons) of smelted tin, and 30,635 pikuls (1839 tons) of tin ore. The Straits Trading Company has a branch establishment at Puket, the capital of Junk Ceylon, and headquarters of the monthon of the same name. It exported 21,164 pikuls (1270 tons) of tin ore in 1906 to its smelting works in Penang. It is probable that, owing to smuggling and the want of sufficient revenue officers, 25 per cent. more ore is exported from the mainland than is accounted for in the official returns of the mines department. It is estimated that returns for the year ending March 31, 1907, will show a considerable increase over those for the previous year, which amounted to 4231 tons.

A contract has been made with Captain Miles, of Tasmania, by the government for dredging the harbor at Tongkah. The bed of the harbor is supposed to be rich in ore and Captain Miles will have the right to the tin on condition of dredging a dock 1200x850 ft. in extent and not less than 20 ft. deep at low water, and of making a channel of the same depth therefrom to the deep-water anchorage.

Earnings of Mining School Graduates

Prof. H. L. Smyth, of the Lawrence Scientific School, in collecting information concerning the occupation and success of the graduates of the division of that institution devoted to mining and metallurgy, found that of 25 men 11 were superintendents of mines. The average earnings the first year after graduation were $878; in the second year the average salary was $1456, and this was increased in the third year after graduation to $1900. The average age of the 25 graduates who replied to letters of inquiry is 28 years and the average present salary is $2387 per year.

The production of magnesite at Eubœa, Greece, in 1906, was 32,000 metric tons. The two companies working the deposits, viz: the Société d'Entreprises and the Société des Travaux Publics ta Communaux have recently been combined.

Personal

Mining and metallurgical engineers are invited to keep this department complete. The Mining Journal, Limited, 99 Gresham street, London, E. C., will be glad to receive notes of the movements of members of the profession and others interested in the mining industry.

Robert Hawxhurst, Jr., is at present traveling in Chile and Bolivia.

Washington B. Vanderlip has left New York to examine mining properties in North Carolina and Georgia.

Frank H. Probert, of Los Angeles, Cal., was appointed U. S. Mine Examiner on May 25, at Washington, D. C.

N. F. Clark, consulting electrical engineer for the Calumet & Hecla mine, has returned to the Lake district after a trip abroad.

George Morgan, vice-president and secretary of the Eastern Mining Company, Masbate, P. I., is on his way to the United States.

Robert T. Hill, mining geologist, of New York, has gone to Cobalt, where he expects to remain a week or 10 days on professional work.

Edwin C. Holden, mining engineer, of New York, has gone to Sonora on professional business. He expects to be absent about a month.

H. A. Buehler, assistant State geologist of Missouri, has resigned to engage in professional work. His resignation will take effect July 1, 1907.

E. E. Carter, who has been associated with the Sullivan Machinery Company, has resigned to accept a position with the Traylor Engineering Company, New York.

J. Parke Channing, president of the Tennessee Copper Company and expert for the Lewisohns, spent several days in Butte recently and left for Alaska on June 11.

Fred. G. Farish sailed from Genoa on June 5 on his way to the Dutch East Indies to examine mines in Celebes. He will return to the United States about September 15.

Geo. W. Maynard, of New York, arrived at Whitehorse, southern Yukon, on May 14. He is examining a number of copper properties under bond to W. S. Thomas, of Harrisburg, Penn.

Hon. Frank Cochrane, Ontario Minister of Lands, Forests and Mines, will leave about July 1 for a visit to the principal settlements in Northern Ontario, to investigate complaints made by settlers who are threatening secession from the Province.

Ormond Higman, chief electrical engineer of the Canadian Inland Revenue department, is investigating conditions at the electric power houses at Niagara Falls, Ont., in connection with the enforcement of the Dominion Act respecting the exportation of electricity.

John B. Hobson, manager of the two Guggenheim companies operating in the Cananea district, Mexico, has gone to Quesnel Forks to direct the season's hydraulicking work on the property formerly owned by the Consolidated Cariboo Hydraulic Mining Company.

A. E. McHaffie, of the Montana Copper Company, Butte, Montana, has been in Denver for several weeks in connection with the construction of the new 150-ton concentrating plant, to be erected. The Denver Engineering Works has secured the contract.

V. F. Marsters, Chief of the Geological Commission of Peru, is at present making investigations along the coast of Peru from Pisco to the southern boundary with Chile, the chief subject for investigation being the deposits of niter, talc, coal, mica and other non metallic minerals.

H. H. Claudet has returned to Rossland, B. C., after several months' absence in Colorado and Mexico. He installed two Elmore Vacuum Oil Concentration plants in Mexico, one each at Nacozari and San Luis Potosi, and one at Denver, Colo. Two similar plants are to be installed in the Kootenay district, B. C., and one in the Lake Superior district, Ont.

Obituary

Henry G. Hanks, a pioneer of California, and ex-State mineralogist, died at Alameda, Cal., June 12. He was a native of Ohio and was 81 years of age.

Societies and Technical Schools

Wisconsin State Mining School—A bill appropriating $30,000 for the establishment of a mining school at Platteville, Wis., was passed by the State senate on June 4 without a dissenting vote.

The twenty-seventh annual convention of the association will be held June 17–22, at City Hall, Toronto, Canada, with headquarters at Hotel King Edward. There will be a technical program, entertainments and an exhibit of appliances.

A prospectus for 1907 of this school at Bendigo, Victoria, Australia, Donald Clark, director of the department of mines and metallurgy, contains a list of the courses given, dates limiting terms, and fees required in the concentrating plant, for assays and analyses, and the requirements of the various courses.

Hall, the new metallurgical laboratory at [illegible] University, was opened [illegible] on the occasion of the [illegible] meeting of the Institute. Bennett H. [illegible], of [illegible], will be host at dinner on September 30 to all members of the Institute who may be in attendance at the meeting of the Society of Engineers and Architects, Lausanne, Aug. 1–4. There will be an excursion of papers and meetings of the Institute, prior to the Lausanne meeting, and to include an "Alpine tour, from Montreux to Chamonix."

Industrial

The Power and Mining Machinery Company, Milwaukee, Wis., has received [illegible] for a 200-kw. motor-generator set for the Utah Copper Company, Utah, an equal number of the same type to the Utah Copper Company, Utah, and one 500-kw. [illegible] to the Utah Copper Company, Pennsylvania.

Trade Catalogs

[illegible] ing trade catalogs and circulars.

Crane Company, Chicago, Ill. Crane Specialties. Pp. 96, indexed, illustrated, paper, 4x6½ in. 1907.

Harrell Pneumatic Pump Company, [illegible]. Catalogs. Pp. 10, illustrated, paper, [illegible] in. 1907.

Minneapolis Steel [illegible] Company, Minneapolis, Minn. [illegible] Crane Co., Chicago, Ill. Pp. 32, illustrated, paper, [illegible] in. 1907.

Construction News

[illegible] quired.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

[illegible] A number of mining companies in this State have met and taken action in the matter of reducing their capital stock. A recent State law makes an annual license tax necessary, and this is based on the amount of capital stock of the respective companies. When the capital stock is not over $10,000, the license is $10 per annum; over $10,000 to $20,000, it is $25; $20,000 to $250,000, it is $50; over $250,000 to $500,000, license is $75; over $5,000,000, the annual license tax is $200. When it is more than $5,000,000, the license is $250. Some of the older companies were given large capital stocks, but this plan will no longer be adopted in view of this license tax, which must be paid yearly. If the corporations become delinquent, the Secretary of State reports the names to the Governor and he declares their charters forfeited. Some amendments to the original law were adopted in March of this year. Already many hundreds of corporations have been wiped out of existence by failure to pay the tax, and others are reducing their capital stock.

The law provides that five men, without salary, shall be appointed to act as advisers to the new State department of engineering. It was at first proposed to have representatives of different interests, including one who should be a hydraulic miner. This was not carried out, however, as all of those appointed are "valley men," none being from the mountains. Those who will serve as advisers are: Alex. Gordon, H. W. Weinstock and T. B. Hall, of Sacramento; George W. Patterson, of Stockton, and M. J. Boggs, of Colusa. There are no miners among the appointees.

After what looked like a final agreement had been reached, one of the machinists' unions held out, and the settlement of the ironworkers' strike was put off a week. Today, however, the last of the unions gave in and the agreement goes into force. Many thousands of men will at once resume work in the foundries and machine [illegible].

E. W. Emmons has been convicted of the crime of obtaining money under false pretenses in selling Mrs. M. E. Hurst 500 [illegible] the Dromedary Box Gold Mining Company at $1 per share. Emmons was tried once before on the same charge, but the jury, after being out [illegible] and was discharged. Emmons was ac[illegible]

Siskiyou county and of having duped women by the sale of stock.

Many protests have been made by residents of towns on both sides of San Francisco bay against the construction of the new Selby smelter at Point San Bruno, south of San Francisco. So strong has the agitation become that it is understood that the Guggenheims, who are building the smelter, will abandon the enterprise, even after having spent over $400,000 upon it, and will construct the new smelting plant on the Mexican coast.

Members of the Anti-Débris Association and supervisors of Yuba and Sutter counties have recently been at Oroville, consulting with the dredge owners and examining the local situation. They have come to the conclusion that further damage to the Feather river need not be feared under existing conditions. There is nothing being done in the river proper, for the reason that the boat which was formerly used for erecting the landlocking walls was destroyed in the March freshet. Two boats of a similar type are being built for the work, but they cannot be completed until fall. It is expected that the new boats will build 200 ft. of the walls per month when they are finished.

It now looks as if Greenhorn creek, which is filled with débris from the old hydraulic mines at You Bet, Nevada county, will shortly be worked by a dredge. George L. Hay, of Grass Valley, and others have bonded the property. About six miles of Greenhorn have been obtained, together with 80 acres carrying the famous Blue Lead channel. Tests have already been made and found satisfactory, but more extensive operations in this line will be made shortly. The gentlemen associated in this deal have great faith in the dredge scheme and are confident that as the dredge moves up stream it will pile up sufficient restraining dams to hold in check all débris. This summer, it is announced, operations will be well under way.

Many promising gold properties are being opened up in the East Avawatz range, two miles east of Crackerjack, San Bernadino county, several new camps having been established. While this range has as yet been barely scratched in the search for the yellow metal, the results obtained seem to warrant the belief that the East Avawatz will soon rival the balance of the Crackerjack district. The purchase of the Clearwater springs by Crackerjack people last week means the early installation of a water system for the town and surrounding mines. The springs are located about four miles west of Crackerjack.

The Bully Hill Mining Company, of Shasta county, has commenced the work of remodeling the De La Mar smelter that has stood idle considerably over a year, pending the completion of the railroad connecting with the Southern Pacific above Kennett. One furnace has been torn down, and the converter stands, and considerable of the machinery has been removed. The machinery and converters will be used again, but the general plan of the smelter will be changed largely and made up to date in every particular.

Investigations of interest to the mining population of Trinity county are in progress. The United States Geological Survey will make a contour map of the county. Surveyors have been taking elevation at Mount Bally and about Weaverville to determine the hights of some of the larger mountains of the county. The preliminary work of the contour map was begun some months ago. Simultaneously an investigation is in progress to determine the sources of the great deposits of gravel in the Weaverville basin.

From the information gathered at the construction camps it is certain that Bodie, Mono county, will be connected by rail with the outside world by Nov. 1, and possibly six weeks earlier than that date. The force of 400 men, which Contractor McLain is using in southern Nevada, is to be placed on the work of connecting the present gap. The train service will extend from Bodie to Mina, where transfers will be made to the Southern Pacific, and to the Tonopah & Goldfield Railroad.

The new hoisting plant of the Midas Mining Company, at Knob, Shasta county, has been completed and is in operation. While the new shaft was under construction, Harrison gulch, or Knob, was very dull for a year or more. Now, however, the camp is reviving, and the company is putting on every miner that comes along and is sending away for more.

It is reported that Blackburn and Peer, who are operating an ore-separating machine on the ocean beach, near Watsonville, on Monterey bay, have received an order for 4000 tons of magnetic iron ore from the Pacific Smelting and Steel Company, of Los Angeles. This is the largest enterprise for utilizing "black sands" ever started here.

After three years' litigation the ranchers near Benicia and Glen Cove, on Carquinez straits, have reached a friendly settlement against the smelting company for damages alleged to have been caused

by the fumes from the reduction of lead ores. A month ago, after little or no progress had been made in the settlement of the various suits which were on the calendar of the Solano County Superior Court, the claims of all of the plaintiffs were taken up by an attorney and after several conferences with the smelter people secured the settlement which has been announced as satisfactory to those who brought the suits. The various damage suits against the smelter will now be dismissed, and as the injunction is in full force, and the smelter people are using every effort to erect a preventative it is believed that the nuisance will be abated. The claims paid are said to have aggregated $30,000.

Salt Lake City

June 14—The name of the Crown Point Mining Company, with property in the Tintic district, has been changed to the East Tintic Mining Company. The Utah-Yerington Mining Company has been organized with headquarters at Provo, and will develop property in the Yerington, Nev., district. John Roundy, of Provo, is president.

The first and second sections of the Utah Copper Company's new Garfield concentrating mill, are in operation, and it is expected that by July 1 the third section will be in commission. Each section has a capacity of 500 tons of ore daily. The initial unit, containing six sections of 500 tons each, will in all probability be in operation about August 1.

The directors of the Utah mine, at Fish Springs, Utah, and who own a controlling interest in the stock, have given an option on a majority of the stock on the basis of $2.50 a share. The company is capitalized for $100,000, of an equal number of shares.

The May Day Mining and Milling Company, operating in the Tintic district, has acquired the Uncle Sam, Cora, Inez and Humbug No. 2 fractional claims from the Uncle Sam Consolidated Mining Company, the consideration being 400,000 shares of the capital stock of the May Day company, the shareholders of the latter having authorized an increase from 400,000 to 800,000 shares. The Uncle Sam company still retains some valuable territory, and will continue the production of ore as heretofore. It is the owner of the Humbug group, and a one-fourth interest in the Richmond Anaconda mine.

Mining conditions in the Gold Springs district of Iron county, are very satisfactory at the present time. Much activity is being displayed, particularly by the Jennie Gold Mining Company.

The Nevada Douglas Copper Company, Salt Lake, which owns mines in the Yerington, Nev., copper district, will soon be operating with power drills. The electric transmission line of the Truckee General Electric Company, will be connected up June 15, by which time the Mining Douglas company will be ready for the reception of power. All of the heavy mine equipment ordered a number of months ago, is on the ground, and in process of installation.

The Nevada Hills Mining Company has declared a dividend of 10c. a share on the issued stock, amounting to $75,000, payable June 20. The company is only about a year old, and has paid $225,000 to shareholders. The mine is situated at Fairview, Nevada, but the headquarters of the company are now in Salt Lake City.

Another suit has been filed in the Federal court at Salt Lake, against the Utah Consolidated, United States Smelting, Refining and Mining and Bingham Consolidated Mining and Smelting companies by a farmer, F. P. Carlisle, who also represents a number of others for damages to the amount of $101,330.82 to lands, crops and live stock said to be caused by smelter smoke.

The North Bingham Consolidated Mining Company has been organized to develop a group of six lode mining claims situated in North Bingham. The officers and incorporators are: Jesse Knight, president; William W. Mathews, vice-president; W. Lester Mangum, secretary and treasurer; William Christopherson and J. William Knight, with headquarters at Provo.

Samuel Newhouse recently made a statement to the effect that the Newhouse Mines and Smelters corporation would soon declare its initial dividend. The directors will meet in New York during the early part of July for that purpose, and it is stated that the initial payment will probably be made early in the coming autumn, which will amount to 50 cents a share, or on the basis of $2 a share annually.

The old Lincoln mine, in the Lincoln district, Beaver county, has been sold, and will be rehabilitated. The company owns the first patented mining claim in Utah, and in the 70s was an important producer of silver-lead ore. The lower workings have been under water for a number of years. Arthur Rice, a mining engineer of Denver, is to be the superintendent.

The ore and bullion settlements reported by Salt Lake banks last week amounted to $358,000.

The minority stockholders of the Honerine Mining Company, who called a meeting recently to enter a protest against the levy of a 20-cent assessment by the board of directors, have reached the conclusion that [illegible] best for obtaining funds with which to meet the corporation's outstanding obligations; these amount to approximately $[illegible]. The Honerine company has marketed 58,000 [illegible]

[illegible] ore, which of course will mean increased mining costs. Ores on the 800-ft level are said to be slightly lower in value, but conditions are far from discouraging. The management has not only begun sinking on the ore but the development of virgin territory to the west of the present workings is also being given attention. There has been no change in the plans to build a smelter of larger capacity than the present one.

Denver

[illegible] tunnel at Cripple Creek has been begun by the contractors, Charles Stream and Charles Lund. An intermediate shaft will be sunk to a depth of about 700 ft. and when this has reached a certain depth work will be commenced on both sides. For the present operations will be carried on from the portal on one side, with a force of 30 men.

The El Paso Consolidated Gold Mining Company has declared a dividend of one cent per share, amounting to $24,500, payable on June 25, which makes the total paid by this company $1,300,000.

The directors of the Work Mining and Milling Company will hold a meeting June [illegible] to declare a one cent dividend aggregating $15,000. The Little Clara lease continues to be profitable and is the main source of revenue.

After litigation since 1879, the commissioner of the general land office decided the dispute between the Ely Mining and Land Company and the Clipper Mining Company, in favor of the latter. The suit, which involved the title to about 35 acres of mineral land, was originally commenced in the District Court at Leadville, thence to the State Supreme Court, then through the Federal Court to the land office, to the Secretary of the Interior and again back to the Leadville land office. At the latter, the Register decided for the Clipper Company and the receiver for the other side, the decision of the Register being approved now.

An open-shop program has been agreed upon and posted by the mine owners in the Silverton district and taking effect at once a modified wage schedule has been put in force. There will not be any discrimination between union and non-union men. The schedule refers to those employed in the mills as well as at the mines.

At a meeting in Omaha of D. O. Clark, manager of the Union Pacific Coal Company, and Thomas Gibson, president of district 22 of the United Mine Workers, a temporary settlement was made of the strike at Rock Springs, Wyoming.

Nearly 200 delegates, from the metalliferous mining States of the West and British Columbia are in Denver at present, attending the annual meeting of the Western Federation of Miners.

The Cañon City Mica Mill and Mining Company has contracted with the Royal Gorge Mica Mining Company for a large amount of the raw material. It is stated on good authority that the plant of the United States Mica and Milling Company will be moved to Aurora, Illinois, the raw material to be shipped to that point.

There is considerable talk in regard to the construction of a pipe line from the oilfields near Lander, Wyoming, to Denver.

The Newhouse tunnel is at last on a self-supporting basis. About three quarters of the projected distance has been completed and the line of Gilpin county has been crossed.

On July 1 the United States Reduction and Refining Company will pay a dividend of $1.50 per share on its preferred stock amounting to $591,871, and the Iron Silver Mining Company, Leadville, will pay 10c. per share or $50,000. It is also stated [illegible]

Toronto, Ont.

[illegible] the special act of the Ontario legislature confirming the title of the Cobalt Lake Mining Company to the bed of Cobalt [illegible] ground that a prior discovery gives them when the legislature intervened and passed an act giving the Cobalt Lake Company a clear title.

It is contended on behalf of the Florence Mining Company that this legislation is *ultra vires*, and the company has petitioned the Canadian Government to disallow it. Judge Britton, before whom the case was being tried, refused to hear the full argument until the act had been considered by the Government at Ottawa, stating that the measure was one which seemed to imply confiscation. Further proceedings therefore stand over until the Dominion government either disallows the act, or permits it to become law by lapse of time, one year being the period within which the power of disallowance can be exercised.

Great irregularities have occurred in connection with the staking and recording of claims in the Larder Lake area, which will render the work of inspectors in passing claims one of almost insurmountable difficulty. Owing to the country being unsurveyed prospectors were unable to give specific descriptions of their locations, many of which are simply described as being next to claims previously staked out. Moreover the locations are of all sizes, some greater and others less than the prescribed acreage. To make matters worse, several thousand of these claims have never been recorded in the Haileybury record office, the papers being merely filed away. A great many prospectors are now going into the district to work on their claims or to make the discoveries that will enable them to pass inspection, which in many cases could not possibly have been at the time of staking.

James Mountford, a financial agent of London, England, who was in Toronto on his way to Cobalt, with a view to making investments, dropped dead in the entrance of the provincial Parliament buildings, on June 5, owing to heart disease.

Considerable losses have been occasioned at the Nipissing mine by the stealing of ore by employees, which is largely bought by unscrupulous parties for the salting of wild-cat claims. To put a stop to the practice detectives were engaged whose operations resulted in the arrest of eleven men on June 3, eight of them being employees. Ore was found in boxes and bags in the bunk houses. The following day the accused were brought up for trial and three of them convicted, one receiving a sentence of one year's imprisonment, and the other two, six months each. Other arrests are likely to follow.

London

[illegible] Some of the British Columbian companies controlled in England are more or less at a standstill. The Rossland-Kootenay Company, which was one of the Whitaker Wright derelicts, has not been able to do anything at all in the way of business during the past two years, in spite of the energetic endeavors of Williamson Milne, the chairman, and of Bedford McNeill, the consulting engineer. The properties are being nursed carefully until such time as some adjoining mine cares to utilize the company's resources of low-grade fluxing ores.

The Snowshoe Gold and Copper Mines, Ltd., is in a somewhat similar position. During the last two years the mine has not been worked by the company and the negotiations for leasing it to the Consolidated Mining and Smelting Company of Canada have not been very satisfactory. The mine has certainly been worked for short periods under these conditions, but a final agreement with the latter company has not been arrived at. Efforts are still being made to further develop the property and about 30,000 tons of ore have been extracted during exploring operations recently. The ore runs very low, not being more than 1½ per cent. copper and 1⅓ dwt. of gold per ton. At the present time there is no great prospect of the mine improving at all.

The Tomboy Gold Mines Company, of Telluride, Colorado, is doing well at present, and a sum of $96,000 is to be spent out of profits in remodeling the metallurgical plant so as to increase the extraction by a dollar a ton. Developments at the 2100-ft. level are opening up well and there is every likelihood of great bodies of ore being found. Work at the lower levels has been interfered with to some extent by the opening of the 2100-ft. level, and during the last year stoping has been confined to the 1200-ft. level, where ore richer than the average is found. It is probable, therefore, that the financial results for the year ended June 30 will be rather better than shareholders should look to for continuance. The estimated divisible profit for the year now coming to a close is about $672,000, and out of this dividends amounting to $540,000 will be paid. In the course of a month or two the lower levels will be in a condition ready for stoping, and after that the monthly profit will be rather less, amounting to about 38,400.

It comes as somewhat of a disappointment to hear that the Fremantle smelter in West Australia is to be given up. A year ago the prospects of the smelter were not over bright, owing to the richer gold ores from Kalgoorlie not being received by the smelter nowadays, and owing to the lack of supply of ores from South Australia and New South Wales. It was hoped, however, that Mr. Kaufman's efforts in opening up new mining districts in West Australia would help to keep the smelter occupied. These expectations have not been realized and so the operations are to cease. The smelter has had a hard struggle in its time. For 10 years from its commencement it lost money, and additional capital had often to be subscribed. During the last five years, however, profits have been made and dividends distributed.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Arizona

COCHISE COUNTY

Tombstone Consolidated—A prospecting station has been established at the 1000-ft. level with room for four station pumps, each having 2,500,000 gal. daily capacity. The mill is grinding 200 tons per day.

YAVAPAI COUNTY

Arizona Copper Company, Ltd.—Production for the month of May was 1880 tons (2000 lb.) of copper.

Arkansas

SCOTT COUNTY

Witte Coal Company—The property of this company at Coaldale, including mines in operation, and a lease on 1000 acres of coal lands, has been purchased by the Hiawatha Coal Company. Jerome Sengel has been appointed superintendent.

California

AMADOR COUNTY

Defender Mining Company—This company is drifting at the 240-ft. level to strike a point where three ledges are expected to unite.

Tom and Dick—This mine at Defender is being examined by S. P. Sharpless and other Eastern men with a view to its purchase.

BUTTE COUNTY

Mammoth Channel—G. H. Richards, of Goldfield, Nevada, is organizing a company to work this channel near Oroville.

CALAVERAS COUNTY

Jassy Bird—This mine is shipping large quantities of sulphurets to the Selby smelter.

Reed—This gravel mine, near San Andreas, has been bonded to J. J. Hickey and Charles Lamb, who have assumed charge of operations.

DEL NORTE COUNTY

Omara Gold Syndicate—[illegible] ledge and other smaller ones, on Bluff creek, near the Siskiyou county line.

HUMBOLDT COUNTY

California Mining and Dredging Company—This company has leased the extensive holdings of the Orleans Bar Gold Mining Company, of Orleans Bar. H. de C. Richards will continue as general manager. The hydraulic ground will continue to be worked and probably some dredging will later be done in the bed of the Klamath river, at that point.

INYO COUNTY

Independence Mining Company—This company has purchased in Lee district, the Lee-Combination and Lee Washington properties. H. W. Preston is manager. The new mill for the Lee properties will have a capacity of 100 tons a day, with a 60-ton cyanide plant.

LASSEN COUNTY

Lassen Mining Company—The output of the Golden Eagle has been reduced to a minimum at Hayden hill, and the mine is virtually closed for the present. Scarcity of labor is given as the main cause. This has been the only productive mine in the county.

MADERA COUNTY

Minarets—One hundred and ten mining locations have been made at the Minarets in the high mountains. These mines have been located several times and subsequently abandoned.

NEVADA COUNTY

At You Be—J. S. Goodwin is preparing to erect a 20-stamp mill to crush the cemented gravel from the Nevada claim.

Marcotte—The tunnel in this mine, Washington, has opened up good quartz and Fred Marcotte is about to install a 5-stamp mill.

Mayflower and Yuba—These properties at Maybert are being operated by a new company. The mill has been rebuilt and 10 stamps added, and an aërial tramway will connect with the Mayflower mine and the Yuba mill. The latter mine will be pumped out this summer, after lying idle many years.

PLACER COUNTY

Evening Star—It is expected that this mine, which has been idle some years, will soon resume operations.

Southern Cross—R. J. Trimble, superintending it in shape for active work, and will soon be running the mill night and day.

Three Star—On the 1200-ft. level the [illegible]

PLUMAS COUNTY

Blue Bar Mining Company—This company has purchased from Ralph R. Blewett, 13 claims in the eastern [illegible] river.

SAN BERNARDINO COUNTY

Big Four Mining Company—The [illegible] mines owned by this company at Vander[illegible] Leastalk, near Vanderbilt.

Consolidated Mines Company—This Los Angeles corporation is working on a desert property 45 miles north of Barstow and 25 miles from Johannisburg.

SHASTA COUNTY

Mammoth Copper Mining Company—[illegible] Four new blowers have been added.

Mammoth Copper Mining Company—It is reported that this company will put in a converter plant at its smelter, at Kennett. It is expected that the new blast furnaces will be ready for operation by August, which will double the present smelting capacity.

SIERRA COUNTY

Bonanza King—[illegible] to the Stauffer Chemical Company, of San [illegible] Considerable new machinery is being put in, including a compressed air plant, drills, etc.

SIERRA COUNTY

Bonanza King—L. C. Crane and other Nevada men, have bonded this mine in the north bank of the Middle Yuba river.

El Dorado—This quartz mine, on Kanaka creek, near the Tightner, is being opened by H. L. Johnson. It was worked for many years, but has of late been idle.

Oriental Gold Mining Company—The company has opened the old Oriental mine, and it is expected to begin to pay dividends this summer.

Haypress Mining Company—This company, at Forest, has opened a large gravel channel, and will connect with the ground [illegible] formerly belonged to the Slattery Bros.

SISKIYOU COUNTY

Thompson & Thompson—[illegible] mill.

Mammoth Copper Mining Company—[illegible] if they could be obtained.

Quartz Mountain Copper Company—[illegible]

conditions of the bond, and the property has reverted to the original owners.

TRINITY COUNTY

Bear Tooth—This mine, in New River district, has been started up for the season, with F. P. Burris in charge.

[illegible] Mining Company—At this mine, Jos. Porter, superintendent, a large reservoir intendetd to impound 100,000 tons of tailings, has been completed. The first clean-up at the new mill has been made.

Sykes—This gravel mine at Trinity Center is hydraulicking day and night on a 60-ft. bank. A nine-ounce nugget was found recently.

TUOLUMNE COUNTY

Large Shasomut Mining Company—At this mine, owned by John Rosenfeld's sons, of San Francisco, a large vein has been uncovered at the 2500-ft. level. The same vein has been cut at the 1200-ft. level. At the deeper point the vein carries six feet of solid sulphurets.

Colorado

LAKE COUNTY—LEADVILLE

Bartlett—In sinking the shaft below the tunnel level a good body of ore has been opened. Several carloads recently sent to the smelter yielded $20,000 per car. The shaft will be sunk deeper.

Delaware Shaft—Good progress is being made in sinking this shaft of the Rebate Mining Company, Rock hill. The shaft has entered the solid formation and should reach the blue lime by the middle of July. The shaft is being sunk to the southwest of the Crecentia. The Alhambra shaft, further to the south, is now down 504 ft., and is in the contact.

Fryer Hill—The different mines on this hill continue to keep up the daily output of iron and silicious ores. The Fitzhugh and the Jimmie Lee continue to ship high-grade silicious ore. Pockets of native silver are found in both properties.

Jay Bird Group—Eastern capitalists were in the camp during the week looking over this group, California gulch, consisting of the Jay Bird, Grover Cleveland, Eurydice, Frank and California Gulch claims.

Late Season—The snow in the timber is from 8 to 10 ft. deep. It will be a month before claims above timber line can be reached. The mines in the district dependent on wagon haulage, are also suffering for it is impossible with the present condition of the roads to haul half of the output.

Mammoth—A good body of ore has been opened in this property in the northwest Lower drift; the orebody is now 8 ft. wide and 6 ft. high. The ore was first struck in the bottom of the drift, and is gradu[illegible] an independent shoot, or the continuation of one of the Fryer hill orebodies to the north.

Mosquito Range—On account of the backwardness of the season but little work is being carried on in this section. The only mine that is working a force of men is the London; the output for the month is in the neighborhood of 2500 tons.

Idaho

BEAVER DISTRICT

Father Lode Mining Company—The properties belonging to this company have been bonded to W. A. Nicholls, of Spokane, for $60,000. The company owns the Brittle Silver, Nipsic, Romola Fraction, Father Lode, Kearsarge and Lackawanna claims.

Charles Dickens—A body of concentrating ore has been struck in the lowest level of this mine. As soon as more jigs and tables arrive the mill will work double shift.

COEUR D'ALENE DISTRICT

Coeur d'Alene Vulcan—A long crosscut tunnel will be run on this property, which comprises seven claims adjoining the Argentine on the west, the Killbuck on the south and the Chicago-Boston on the east. The group extends from the Argentine into Lake gulch and is traversed by three ledges, the central one of which is the Argentine vein. C. F. Ruddy is manager and Eastern capitalists control the property

Illinois

JOLIET

New Coke Plant—Plans are announced for the erection of 280 coke ovens at Joliet. The Illinois Steel Company will expend $2,300,000 on this industry in the next two years. The annual output will be 800,000 tons of coke to supply four blast furnaces.

Indiana

GRANT COUNTY

[illegible] Coal and Coke Company—This company, Marion, has incorporated to do a mining and coking business in southern Indiana. The directors of the new company are: J. B. Ratterman, Isaac A. Ayers and W. W. McGuffin.

GREENE COUNTY

[illegible] Coal Company—This is the name of a new corporation, Linton, organized by Elmer Yeomans, Oscar Vancleve, A. M. Beasley and other prominent coal mine operators. The company has secured 5000 acres of land north of Linton and will drill a large number of oil wells. The company has ordered machinery and will employ the idle miners to drill the wells. Completed wells in [illegible] excellent producers.

Kentucky

HOPKINS COUNTY

Midland Coal Company—This company, composed of Kentucky and Indiana capitalists, has purchased about 2800 acres of coal land near White Plains. One mine will be opened one-half mile south of White Plains and another one a mile west of that place on the Illinois Central railroad.

Louisiana

CALCASIEU COUNTY

Union Sulphur Company—A flood, caused by heavy rains, interfered with operations at the mines at Sulphur City, near Lake Charles, about the end of May, but the newspaper reports of damage to the mines were greatly exaggerated. As a matter of fact, production was checked for only four days, and shipments for only two days. There has been no loss of any wells through settlement of the ground or otherwise. As the sulphur is extracted, the ground naturally settles, but not until after the expected extraction of sulphur has been effected. Up to the present time, settlement has occurred over an area of about one-fourth of a square mile, the maximum settlement having been 12 ft. The natural elevation of the land at this place is about 18 ft. above sea level.

Michigan

HOUGHTON COUNTY

Allouez—The No. 2 shaft is sinking at the rate of 100 ft. a month. It is now down 300 ft.

Atlantic—The shaft is down 487 ft. on section 16, having been sunk 82 ft. during May. It is passing through a broken formation.

ONTONAGON COUNTY

Adventure—Superintendent Brady has advistd that work on the upper part of the mine be stopped, and that all energy be devoted to surface explorations in the hope of opening up better paying veins.

Mass Mining Company—This company has started diamond drilling on the Riddle Farm. This tract is to be explored thoroughly in view of opening on the Baltic lode.

Michigan—The mill at Keweenaw Bay will soon be ready for the machinery. It will in all probability be ready for operation in November. Michigan is at present using one head in the Atlantic mill, and is stamping about 500 tons a day. The production for May was 166 tons.

Missouri

ZINC-LEAD DISTRICT

New Production—The week ending Saturday, June 1, 1907, marked the largest week's new production in the history

at the Missouri Kansas district. These ore ... now mill ... that work ... will ... their ... are ... three sold nothing, preferring to hold the ore in hopes of a higher price. By the four mills 210 tons of zinc ore was sold, one of these had two carloads or 60 tons left in the bins, another had nearly one carload. ... the bins and the others have probably 50 tons. These nine mills will produce from ... running order, which will be shortly. The mills are the Big Three, Joplin; San Gabriel, Hyde Park, Admiral, Lanning district; and the Church-Mitchell, Luke & Ash, Continental, Rhea, and Ice Plant, in the Webb City section. These mills will more than offset the curtailment due to the flooding of the mines at Badger. The Badger district produces about 300 tons per week.

Kramer Mining Company—J. W. Burgess has closed a deal with this company conveying one-half interest in a 200-acre farm north of Carl Junction, about eight miles northwest of Joplin, at a consideration of $25,000. This tract of land adjoins a 300-acre lease now held by the same company. The Burgess land has been prospected by drilling and every hole has shown an orebody of the same character from 175 to the 225-ft. level. A shaft shows a sheet formation, more similar to that found in the Webb City district than any other place in the entire district. The Kramer company has let a contract to F. W. Caulkins, of Webb City, for the erection of a concentrating plant of 500 ton capacity, modern in every particular, to cost $30,000. The company is composed of the Kramers of "Cascaret" fame.

Rex Mining and Smelting Company—This company, operating southeast of Joplin, has decided to do deep drilling for the deep runs of ore which it is thought underlie the present workings. The first hole will be put down north of the big mill; it is intended to sink to a depth of 500 to 600 ft. The Granby Mining and Smelting Company is also doing deep drilling on the land at Leadville hollow northwest of Joplin.

Montana

Butte District

... companies have filed their annual statements with the county assessor for taxation of net proceeds, the reports covering the year ended May 31. They show net proceeds: Boston & Montana, $7,... Anaconda, $5,819,184.52; Butte & Boston, $1,249,467.03; Trenton, $481,623.96; Parrot, $141,730.80. Total, $14,741,004.59. Washoe had no net ... gone into improvements. Parrot shows a decrease of $135,284.20 over 1906 and Trenton a decrease of ... Boston & Montana, ... $1,423,203.67 over 1906, and Coalition showed a total net of $1,432,700.55, an increase of $397,555.55. The seven companies show a total ore extraction of 4,008,790 tons, to which can be added 124,608 ... by the Washoe, 8,441 by the Original, 2001 by the Reins and 3170 by the Alice. Neither La France Copper, East Butte nor Pittsburg & Montana made returns, which indicates that they did not make expenses, although La France reported net proceeds of $149,000 for the year ended May 31, 1906. The Original reported net proceeds of $663,259.51 for this year.

Butte & Boston—The company is concentrating its work to the Calumet, having stopped sinking the Belinda after reaching a depth of 840 ft. The Calumet will touch the 1000-ft. level about June 14, and after a station is cut and a pump installed crosscutting north and south will be prosecuted.

Copper Exploration—All work on this property has ceased and the pumps pulled from the 1000-ft. station. About 2000 ft of crosscutting was done at the 1000-ft. level without the discovery of ore.

Davis-Daly—The crosscut from the 1800-ft. station of the Original has passed through the vein intersected 1600 ft. south recently. Manager Palmer reports the vein 25 ft. wide and containing a lot of commercial copper ore. He says drifting will begin east and west in this orebody soon. Sinking has been resumed in the shaft of the Mt. Moriah and will be continued from the 600- to the 1000-ft level. Drifting east from the 500-ft. station of the Smokehouse continues, and the company expects to go about 100 ft. more before striking commercial ore. The shaft ...

Jim Moriarty—This company, ... principally of lake country men, has struck 6 ft. of good copper ore southeast of its shaft at a depth of 250 ft.

Nissen—The company is doing preliminary work preparatory to sinking the shaft from the 700- to the 1000-ft level. The shaft is on an incline and will be carried down with the pitch of the vein.

Nevada

Combination Copper Company—The Combination Mines Company has ... vein in the direction of the Reilly ladies of the Florence. On the third, or 180-ft level, the south drift No. 220, has advanced ... ond level. The company has ordered ...

Jumbo Extension—The Jumbo Western Company ... high-grade ore in the 232-ft level. The new strike was made ...

Tonopah Belmont—The ... overcome since the pumping plant has been completed. Drifting and crosscutting is being done at the 400-ft. level, and crosscuts are being run from several of the upper levels. In addition to the operations of the company there are eight leasing companies developing the mine. The shaft in the O'Keefe lease, which is down to the 300-ft. level, is in country carrying promising quartz stringers.

Tonopah Mining of Nevada—... and will be continued to the 500-ft. level before crosscutting is commenced. This property is owned and operated by the Consolidated Mining Company, which aims at picking up the Red Top vein at depth on the dip. The mine is well equipped with a power sinking plant.

West End—... in the 300-ft. level, continues to develop well, and there is every prospect of its continuing to the 400-ft. level.

Hayes-Tonopah—... have been opened up in this property. The ore in the stopes between the 300-ft and 450-ft levels is the richest yet encountered in the mine.

Montana-Tonopah—The ... vein at the 410-ft level of high value. Ore is being sacked for shipment.

Pocahontas—Crosscutting is being continued from the 120-ft. level to catch one of the surface veins on the dip. Within the past few days a promising vein has been cut in a surface trench. The ore is contained in a black quartz, which resembles that found in the Taylor mine, which adjoins the Pocahontas, and carries rich tellu... ore.

Wandering Boy—... has been struck in the Wandering Boy ... the Comet in the West End, Tonopah and Montana mines. The ore ...

Hayes—The ... shipping.

mine, and good progress is being made with the erection of the new surface plant.

Tonopah Extension—Some of the richest ore in the camp is being broken in the north ledge between the 400- and 600-ft. levels. The construction of a mill near Tonopah is still under consideration.

WHITE PINE COUNTY—ROSEBUD

Brown Palace—No. 1 tunnel is in 200 ft., and it is estimated that it will require driving 100 ft. farther before the ledge is reached.

Dreamland—The new shaft has been sunk to a depth of 30 ft. It is in a 6-ft. vein. The old shaft is 56 ft. in depth.

Durango Girl—This property has been purchased by the Rosebud Development Company. Development work will be commenced immediately. This mine consists of four claims and a fraction.

New Mexico

Kelly—This mine of the Tri-Bullion Mining Company, is making rapid progress on its new plant. It has a hoisting capacity of 1000 tons daily.

Magdalena Tunnel Company—This company has bought Utica Nos. 1, 2, and 3, mining claims, situated in the Magdalena district. This adds valuable ground to the company's extensive holdings.

New Jersey Zinc Company—This company has purchased the Morris-Lily and the Little Floe mining claims, in the Magdalena district, the consideration being $30,000. The property lies west and down the mountain from the Graphic and Kelly mines.

Pennsylvania

ANTHRACITE COAL

[illegible] of Anthracite—One hundred years ago the first shipment of anthracite coal was made from Plymouth, and arrangements are being made to celebrate the anniversary of that event. Abijah Smith shipped the first cargo in an ark floating down the Susquehanna river. The discovery made six months after this by Jess Fell, of Wilkes-Barre, that the coal would burn in an open grate, with intense heat and without an air blast, brought many orders.

Archbald Coal Company—This company, Scranton, has been organized with a capital of $25,000.

Division Mine Foremen—Thomas R. Thomas, Olyphant, has been appointed division mine foreman by the Delaware & Hudson Company, and Richard Beer has [illegible] the Carbondale district.

[illegible] This company, chartered by the Pardee interests, will issue bonds for $2,000,000 for the extension of its business, it being [illegible] house to furnish power, light and heat in Schuylkill, Columbia, Northumberland, Carbon and Berks counties. The company makes use of the culm at the Harwood mines to generate the power.

Hubert Coal Company—This company will develop the large tract of land on Broad mountain, about four miles from Pottsville, known as the Susanna Silliman and Henry Tiel tracts. A few days ago a mortgage to the Scranton Trust Company was recorded in the Schuylkill court house for $200,000 to cover bonds for this amount. The bonds expire in 1922. The tract was originally leased by Frank G. Clemens and covers an area of 640 acres. A large breaker will be built by the company this summer.

Lehigh Valley Coal Company—This company is building a large breaker at Jeansville, 129x110 ft. The operations of the company have been abandoned for many years. A new colliery will also be built. Upon the completion of the new breaker the Yorktown colliery breaker will be abandoned, the intention being to deal with all the coal at the new breaker.

Lehigh Valley Changes—A number of important changes have been announced by the Lehigh Valley Coal Company. G. W. Barrager has been appointed district superintendent of the Drifton division, A. H. Lewis of the Lehigh division and Edgar Kudlick engineer of both divisions.

Pennsylvania Coal Company—A compressed-air motor exploded while being charged in the No. 14 colliery of this company at Fort Blanchard, killing two men and seriously injuring seven others.

South Dakota

CUSTER COUNTY

Clara Belle—Work at this property is being pushed in an effort to locate the course of the old vein by an incline shaft 250 ft. from the old shaft. The shaft has been sunk 250 ft. and 500 ft. of drifting has been done.

Dundee Group—Ore assaying high in silver has been discovered on this property, owned by Frank Ames, and adjoining the Meritt ground, near Custer peak. The vein was but a few inches wide at the surface, but now shows a good width. It is found in the quartzite.

Mica—A new mica mine has been discovered two miles north of Custer. The vein is now 15 ft. wide and one wall has not yet been encountered. The property is owned by Chas. Baty.

Niagara—This group of claims, east of Hill City, is now under bond to Don McGonigal and Jack Hazlett, and work is being pushed with three shifts of men. The main vein is 14 ft. wide and shows good value. It is opened by a shaft.

Saginaw Mining Company—This company is working 25 men in the shaft, sawmill and in mill construction. The mill will have a capacity of 100 tons per day.

LAWRENCE COUNTY

Strike Called Off—The strike of miners and mill men in the Black Hills that has tied up mining for the past five months has been called off. The operators agreed to grant the eight-hour day upon condition that the men should consent to a reduction of 25c. a day for the first three months of work; thereafter the men to receive their former scale of wages. During this 90 days the miners will receive $3.25 a day and muckers and shovelers $2.75. The principal mines affected by this settlement are the Mogul, Golden Reward, Imperial, Dakota, Golden Crest, Gilt-edge Maid, Maitland, Lundberg Dorr and Portland Clinton.

Branch Mint Company—This company has nearly finished construction work at its mill. Fifty men are at present employed in mine and construction work.

Globe—The controlling interest in this ground has passed into the hands of Dr. Cornell, of Elkton, Mich., who will push work. The orebody on the ground consists of a fissure vein intersecting the formation almost at right angles. The vein is at the present depth 7 ft. in width. A mill will be built.

Golden Crest—The annual meeting of the Golden Crest was held at Two Bit and the following old officers re-elected: Robt. L. Bailie, Detroit, president; Edwin Henderson, Detroit, vice-president; Fred Mc. L. Strout, Deadwood, vice-president. These three constitute the board of directors. At a special meeing of the company it was decided to increase the capital stock from $1,000,000 to $5,000,000 and to authorize the issuing of bonds to the amount of $250,000. The proceeds of the sale of bonds will be used to increase the capacity of the wet-crushing cyanide mill from 50 to 250 tons per day.

Utah

BEAVER COUNTY

Talisman—This company marketed five cars of ore last month. Of this number, four were silver-lead and the fifth zinc ore.

IRON COUNTY

Jennie Gold—This company has reached the 300-ft. level and is driving for the vein at that point. The mine has been opener on the levels above from which ore is being extracted.

JUAB COUNTY

Tintic Ore Shipments—Shipments last week amounted to 169 carloads, the contributing mines and respective amounts being: Ajax, 4; Bullion Beck, 8; Beck Tunnel, 12; Centennial Eureka, 52; Colorado, 11; DePue, 6; Eagle & Blue Bell, 1; Eureka Hill, 1; Grand Central, 6; Go-

dyn. 2; Lower Mammoth, 1; La Clede, 1; May Day, 1; Rolfe & Vivian, 8; Scranton, 6; Little Bess, 11; Uncle Sam, 6; Yankee Consolidated, 8; miscellaneous, 2.

Alpha—This Alta company is employing a vigorous campaign of development and is not making regular ore shipments. The management contemplates providing its own facilities for treatment. William Hatfield, of Provo, is manager.

SALT LAKE COUNTY

Columbus Consolidated—A drift on the 400-ft. level from the No. 3 shaft has encountered a vein of high-grade ore about a foot in width. The mine is situated at Alta.

Markham Gulch Mill—This Bingham plant is giving good satisfaction and is still running ore from the Utah Apex mine.

South Columbus—The management of this Alta mine is preparing to inaugurate regular ore shipments and expects to market 500 tons within the next 60 days. Recent development has disclosed high-grade copper ore containing silver.

Utah Apex—Physical conditions at this property are better than they have ever been. The management has made the statement that a mill of 400 tons daily capacity could be kept running indefinitely on low-grade ore developed in the mine.

SUMMIT COUNTY

Park City Mines—During the month of May the mines of Park City were represented at the sampling works by 8556 tons of ore, the contributing mines and respective amounts being: Daly West, 2440; Ontario, 562; Silver King, 1639; Keith Kearns, 672; American Flag, 126; Uintah Treasure Hill, 20; Daly Judge, 1880; other mines, 1208.

Canada

BRITISH COLUMBIA—BOUNDARY DISTRICT

Crow's Nest Pass Coal Company, Ltd.—Following the settlement of the strike of the employees of the coal companies of southwestern Alberta and the British Columbia section of the Crow's Nest Pass this company has resumed work at Coal creek and Michel, but men are not yet obtainable in sufficient numbers to allow of working to full capacity. The directors have appropriated $1,250,000 for further development and expansion. Fully 500 more men will be required.

Giant-California Mining Company, Ltd.—This new incorporation has acquired the Giant and California mines, at Rossland, and W. Y. Williams has been appointed mine manager. The California mine has lain idle several years. The Giant was owned by an English company which shipped 4344 tons of ore before suspending operations in 1903. The property lies [illegible] the Le Roi mine.

[illegible] Mining Co., controlling [illegible] Rossland, of which W. H. Aldridge, of Trail, is managing director, has purchased six 12-[illegible] from the Jeffrey Manufacturing Company, of Columbus, Ohio, for underground work in the mines. Three are for the Centre Star-War Eagle gold-copper mines, at Rossland; two for the St. Eugene lead-silver mine, at Moyie, East Kootenay; and one for the Snowshoe copper-gold mine, at Phœnix.

Granby Consolidated—This company is operating the hoisting engine recently installed at its new Victoria shaft, Phœnix. It is a Rand 250-h.p., double-conical-drum engine, driven by a Westinghouse 3-phase variable speed induction motor; the capacity is [illegible] B. W. Hodges is manager of the company's copper mines.

Pacific Coal Company—This company, Lewis Stockett, manager, which also owns the Bankhead colliery, Alberta, is putting in a 250-h.p. Rand duplex engine, for operating a ventilating fan at the coal mine it is opening at Hosmer, Crow's Nest Pass.

[illegible] in the Le Roi No. 2 company's mine, at Rossland, is believed to have been discovered on the 900-ft. level. Drifting at this depth is in progress, the vein is reported to look promising. Assays so far give a lower gold value than on the 700-ft. level, but copper is about the same.

Payne Consolidated Mining Company, Ltd.—The Payne mine, group of mineral claims, concentrating mill, etc., situated near Sandon, in the Slocan district, were offered for sale by auction in Montreal, Quebec, on June 5. For several years operations on the property has been restricted to mining and milling on a small scale by lessees. The Payne was one of the earliest and most valuable locations made in the Slocan and during the company's days of prosperity an aggregate of $1,303,000 was paid in dividends.

The Dominion Copper Company, Ltd.—This company now supplies compressed air from a central power house at its Idaho mine, Phœnix, Boundary district of British Columbia, to four of its mines, the Idaho, Brooklyn, and Stemwinder, all adjoining properties; and the Rawhide, distant about a mile from the powerhouse. The air is compressed by a Rand 25-drill, duplex, tandem compound engine, electrically driven, and having a capacity of about 2800 cu.ft. per min. of free air. [illegible] W. [illegible]

ONTARIO—COBALT DISTRICT

[illegible] Mining Co. The mining and [illegible] operations [illegible] the following mines: Contagas, 441,760 [illegible] Foster, 40,000 lb. The total shipments [illegible] 8,672,450 pounds.

[illegible] Mining Co. [illegible] Sherbrooke, Quebec, is being installed [illegible] been abandoned. About 20 tons of niccolite ore, showing 23 per cent. nickel and 34 per cent. arsenic, but no silver, are ready for shipment.

[illegible] carrying 64 per cent. nickel has been found on this property, which lies about 5½ miles northwest from Cobalt town. It was found in a seam at about 38 ft. depth. A steam plant is in operation.

[illegible] a good deal of dissatisfaction expressed with regard to the management of this mine, Cobalt, the stock of which has for some time been steadily depreciating. At a [illegible] Chas. O'Connell presented a report attributing slow progress to adverse weather conditions and delay in the delivery of plant. A crew of 15 men were at work. Total shipments had been about 90 tons of graded ore, realizing about $65,000, and 24 tons low grade. It was decided to discontinue shipping for the time being and to carry on systematic development work.

[illegible] being dug from Kerr Lake across the Silver Leaf property, which will reduce the level of Kerr lake by about one foot.

[illegible] *pany*—This company, of which C. R. Chisholm, of New York, is president, has just purchased several properties in Cobalt and adjacent mining areas. N. B. Brown, [illegible] location in [illegible] about 4 [illegible] that [illegible] will also be [illegible] [illegible] Chisholm [illegible] Mining Co. [illegible] Mining Co. [illegible] W. [illegible]

QUEBEC—CHAUDIÈRE DISTRICT

[illegible] Mining Co. [illegible] and [illegible] ore [illegible] Sherbrooke, Quebec, is being installed [illegible] been abandoned. About 20 tons of niccolite ore, showing 23 per cent. nickel and 34 per cent. arsenic, but no silver, are ready for shipment.

boiler are installed. Two good veins have been found. The shaft on the main vein is down 90 ft., a crosscut of 10 ft. being necessary at the 75-ft. level to follow the vein. The veins cross each other and will be connected by drifting. Native silver was found a short distance below the surface. There is much niccolite in the ore, but little cobalt.

[illegible] Lake District

Grace Gold Mine—J. H. Caslor, of Buffalo, president and manager of this company, Eagle Lake district, announces that operations will be resumed with the opening of navigation. The stamp mill under construction is expected to be finished JJuly 1. About 35 men will be employed.

Quebec—Black Lake District

American Asbestos Company—This company is pushing work in two quarries. The big mill produces from 20 to 25 tons of asbestos per day. The entire plant is operated by electric curent. The company has acquired the Montreal & Glasgow and the Manhattan properties, which have not been operated for more than 10 years, and has about 60 men at work developing. At present the deposits yield considerable crude asbestos No. 1; some of the rock is hauled to the big mill.

Dominion Asbestos Company — The foundations for the new mill of this company are almost completed. The mill will treat about 300 tons of rock per day, yielding about 20 tons of mill fiber. The company recently bought about 275 acres of asbestos ground from the Standard Asbestos Company.

Montreal & Glasgow—The old mill is at present dismantled; some of the parts will be used in the construction of a new milling plant at East Broughton. This was the first mill erected for the purpose of mechanically separating asbestos from the gangue.

New Mills—Two new mills have recently been erected about 6 miles from Coleraine station, one by Boston people and the other by manufacturers of Providence, R. I. The properties on which these companies are operating are considered new ground outside the Thetford-Black Lake asbestos belt, but are reported to be as rich as those of the latter field.

Standard Asbestos Company—This company has installed another Cyclone pulverizer. The daily output of mill fiber is from 16 to 20 tons. The quarry which is near the mill has been extended westward. About 80 men are at work.

[illegible]

Maritime Coal, Railway and Power [illegible] the entire property of the Canada Coal and Railway Company extending from Maccaro, Nova Scotia, to the company's coal dock on the Bay of Fundy, and inland besides an extensive submarine area held under lease from the Provincial Government, also 12 miles of railway fully equipped. A policy of active development will be pursued by the purchasing company.

Yukon

Gold Dredges—There will be at least nine gold dredges operating in the Yukon this season: the Canadian Klondike Mining Company's electrically operated dredge with a capacity of 3000 cu.yd. per day, working on the Boyle concession; the Bonanza Basin Gold Dredging Company's steam-driven dredge, stated capacity 3750 cu.yd. per day, working near the mouth of Klondike river; the Lewes River Dredging Company's steam dredge, capacity, 1200 cu.yd. per day, operating on Bonanza creek; Ogilvie Dredging Company's steam dredge, capacity 400 cu.yd., working on Klondike river; the Forty-mile Dredging Company's dredge, similar to that of the Bonanza Basin Company, working on Forty-mile river; another dredge to work in the Forty-mile district; and three dredges of the Yukon Consolidated Goldfields Company.

Yukon Consolidated Goldfields Company—This Guggenheim organization, which last summer commenced the construction of a hydro-electric plant, on Little Twelve-mile river, for the purpose of supplying electric power for the operation of its gold dredges, and the excavation of a big ditch from Twelve-mile river to its area of gold-bearing ground on Hunker and Bonanza creeks, expects shortly to have three steam shovels at work on the ditch. The power station, transformer station, and a 33,000-volt transmission system 30 miles in length were practically completed several months ago.

Mexico

Chihuahua

Parral Mines, Ltd.—This company having passed through liquidation, has been reorganized under the title of the New Parral Mines Syndicate. Operations are to be resumed. A cyanide mill will be built.

Guadalajara

Lerma Mines, Development and Power Company—This company has been organized in Philadelphia to work mines in the Tequila district and to install a hydraulic-electric power plant on the Santiago river. A concession on the river north of Tequila has been secured and development of the mining property has been begun.

Guerrero

Ebuta—The stamps at this property of the Rio del Oro Exploration Company, Placeros del Oro, began dropping on May 11. Forty men are at work taking down ore.

La Lucha—The chief vein on this property of the Compañia Minera La Columbia y Anexas is improving at depth. A small stamp battery, a Chilean mill and cyanide plant are working regularly, and new boilers, and additional cyanide plant and battery of stamps are being installed.

Siam

According to the *Echo des Mines*, April 29, 1907 (through *Min. Journ.*, May 4), in Siam tin is mined principally in the provinces of Puket and Kedal by two English and one Dutch companies. The annual production is about 5000 metric tons. Vast districts are yet unexplored, though probably their mineral wealth is considerable. In these places the government is constructing roads and improving the existing ones.

Tasmania

The results of working at the Briseis Tin Mines in Tasmania during 1906 have been very satisfactory. The amount of gravels treated at the company's mine was 401,800 cu.yd. yielding 1018½ tons of black tin; and the output from No. 1 mine was 214,190 cu.yd. yielding 389½ tons of black tin. The respective yields of metallic tin were 746 and 285 tons. The Briseis Company takes 58 per cent. of the No. 1 output leaving 42 per cent. to the owners of the property.

The total net proceeds of working received by the Briseis Company were £168,123, and the net profits were £128,557. Out of this £7000 has been written off and £5000 has been spent in purchasing an adjoining property from the Ringarooma Company, besides £20,000 placed to reserve. A balance of £58,193 was brought into profit and loss account from last year. For 1906 dividends amounting to £112,500 have been distributed, on a paid up capital of £600,000 and £42,000 carried forward. The future prospects of the company are in no way different from last year. The estimated life of the mine is only a few years, but as the facts on which the estimate is based are by no means certain, the life may be longer than is anticipated.

Cartagena, Spain

Messrs. Barrington & Holt report prices for Spanish ores for the fourth week of May, 1907. Quotations for iron ores are: Ordinary 50 per cent. ore, 9s. 9d.@10s. 3d.; low phosphorus, 10s. 9d.; specular ore 55 per cent., 12s. 6d., all f.o.b. shipping port. For manganiferous ore, same terms, quotations for No. 3—12 per cent. manganese, and 35 iron—are 14s. 6d. No higher grades on the market. For iron pyrites, 40 per cent. iron and 43 per cent. sulphur, 11s. 9d.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New [illegible]—Business is reported but mines are producing well up to capacity. The warm weather of the past few days will undoubtedly affect the general tone of the market, which at this time of the year is usually extremely dull. In the Alabama fields the question of a new wage scale comes up for consideration this week, and will probably be settled amicably and with few delays. The western markets are easy, and are taking fair amounts of coal. The activity of the iron furnaces and the steel industries naturally keeps the coal production up to full capacity, but domestic lines show the usual dullness at this time.

The bituminous trade shows activity in certain places, but is dull in others. The scarcity of vessels materially affects coastwise and Sound trade, and freight rates are easily maintained at their present high figure.

Scarcity of labor in the Welsh coal fields has forced manufacturers in Portugal and Italy to purchase coal in the United States, and the Italian Government, through its ministry of marine, has begun to contract for American coal and has closed for 20,000 tons of bituminous coal for the use of the navy.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to June 8, were as follows, in short tons:

	1906	1907	Change
Anthracite	1,781,277	2,[illegible]	I. [illegible]
Bituminous	17,[illegible]	19,[illegible]	I. [illegible]
Coke	1,[illegible]	3,[illegible]	I. [illegible]
Total	21,291,241	25,[illegible]	I. [illegible]

The total increase this year was 17.1 per cent.

New York

Anthracite

June 19—The usual dull condition of the summer season is now prevalent in the Atlantic trade, and this condition is likely to be accentuated if the present spell of warm weather continues. This statement may be qualified somewhat in that there continues to be a rather pronounced activity in the sale of small steam sizes. Car supply remains without further improvement. We quote prices as follows: Broken, $4.45; egg, stove and chestnut, $4.70; pea, $[illegible]; buckwheat, $[illegible]; rice, $[illegible]; barley, $[illegible]; all f.o.b. New York harbor.

[illegible] others. This activity, where existing, is due to lack of facilities to fill orders coming from that particular territory. The salient feature of this week is the continued shortage of water transportation. Most of the orders now being filled are upon season's contracts and very little new business is in sight.

Trade in the far East is calling for considerable quantities of coal and shippers apparently are having difficulty in keeping orders from this territory from accumulating. The maintenance of winter freight rates indicates that the demand for vessels must be large.

Trade along the Sound is quiet and it is a question whether the high rates on Sound barges have not affected the taking on of coal at this time.

Trade in New York harbor is quiet and prices are inclined to be weak. Good grades of steam coal are quoted at $2.50@2.60, f.o.b. New York harbor shipping ports.

The all-rail trade is quiet, all consumers being apparently well supplied. Transportation from mines to tide is slower than it should be, requiring from 10 days to two weeks. Car supply is up to demand, except in a few instances.

In the coastwise vessel trade, vessels are scarce and in large demand. Rates are unchanged from last week and are quoted as follows: From Philadelphia to Boston, Salem and Portland, $1.05@1.10; Providence, New Bedford and the Sound, $[illegible]; Lynn and Boston, $[illegible]; Portsmouth, Gardiner and Saco, $1.15; Bath, $1.10. We hear of season charters for the balance of the year at $1.05 and discharge and loading and discharging [illegible].

Birmingham

[illegible] far with the coal market in Alabama. Efforts [illegible] production in coal and these efforts will, within two months, show much success. By that time it is believed that several [illegible] toward Walker county is fast nearing [illegible]. This [illegible] pushed up to 2500 to 3000 tons. Other companies in Alabama are making preparations for an increased production. There is a demand for every ton of coal that can be mined, while outward shipments are of some consideration. Good prices prevail. The new wage scale of the union miners is under consideration this week and will no doubt be agreed upon. The commercial coal companies deal only with the union miners, except the Alabama Consolidated Coal and Iron Company. The miners' organization now contains only about three thousand members, a difference of nearly eight thousand being shown since 1904 when the strike at the mines of the iron companies began. The [illegible] the secretary of the State organization in that many of the miners who were out on strike did not have to pay dues and since the strike has been declared off they have not renewed their membership and are not yet paying dues though claiming affiliation. The district is still receiving labor from foreign countries and from this country and as fast as the men come in they are given employment.

Chicago

[illegible] gradually showing signs of the usual summer weakness. Heretofore the active demand [illegible] trade an active business. The needs of [illegible]

Fine coals are [illegible] natural,

sizes of bituminous coal are weak, and the market can take care, safely, of very little of this kind of coal.

Prepared sizes from Illinois and Indiana mines bring $1.80@2.10 for standard products; run-of-mine from the same mines sells for $1.60@2 and screenings are in active demand at $1.35@1.65.

Of eastern coals smokeless is probably the most active, though the dull season is evidently opening for that also. Run-of-mine from New River and Pocahontas mines brings $3.15@3.35. Hocking Valley is somewhat dull at $3.15, with the probability of a lower price. Pittsburg ranges $2.90@3 for 1¼-in. lump and Youghiogheny sells for about $3.20 (¾-in.), with the demand not active for either.

Anthracite, coming forward in good quantities by lake, is not in large demand, most of the coal moving now being that contracted for on May prices. The usual summer inactivity seems to have overtaken the market.

Pittsburg

June 18—Most of the mines in the district are in operation this week, as the car supply is excellent. Prices remain about the same on the basis of $1.20 for mine-run coal at the mine, but there has been a decided drop in the price of slack. On contract sales have been made at 85c., but during the week a number of sales were made at 60c. for early delivery. Coal from the river mines is being shipped as fast as it is mined, as the rivers are still navigable. Several tows went out last night and today and some large tows of empty coal boats and barges were returned from lower ports.

Connellsville Coke—The coke market is stronger, although some spot coke can be bought at a low price. The H. C. Frick Coke Company has contracted for the entire output of several independent concerns for 1908. For second half furnace coke is quoted at $2.65 to $2.75 and foundry coke is firm at $3.25. The *Courier* in its summary for the week gives the production of both fields at 420,467 tons. The shipments aggregated 14,596 cars, distributed as follows: To Pittsburg, 5211 cars; to points west of Connellsville, 8514 cars; to points east of Con-

Iron Trade Review

New York, June 19—The market for pig iron continues dull and quiet so far as new business goes. Production goes on steadily and shipments are up to the limit of capacity. But they are not as regular as heretofore, due to the change of freight rates operative in June, and because some consumers underestimated their second-quarter needs and are asking for July quotas in June. Others are requesting a

being. Southern iron is being sold into the second quarter of 1908, but there has been no forcing of business.

Western pig iron is easy and shipments are going forward regularly. Shipments of English pig iron are being made to Baltimore, New York and Philadelphia, and an advance in freight rates from 5s. 6d. to 7s. 3d. has taken place.

Little business is being done in pig-iron certificates on the Produce Exchange and prices remain unchanged.

Little new business is reported in steel shapes and products, the mills being still much behind on their orders and working full capacity. This is especially true of wire products and steel-sheet mills.

Scrap iron and steel is easier and inactive, but prices easily maintain their past level.

Baltimore

June 17—Imports of ferromanganese for the week were 706 tons; of manganese ore, 660 tons; of ferrosilicon, 506 casks; Receipts of iron ore were 11,800 tons from Cuba. Other imports included 3000 tons of iron pyrites from Spain; 5000 bars, 389 cakes, and 486 ingots of copper. Exports included steel in billets, nails, wire and pipe and copper in miscellaneous form.

Birmingham

June 17—Alabama pig-iron manufacturers are now selling a little iron into the second quarter of the coming year. The same price is given as that being sold for first-quarter delivery, $18.50 per ton, No. 2 foundry. The statement is reiterated that there is no forcing of the market and that the business is coming in quietly though steadily of its own volition; little iron is to be had for delivery during the third quarter of the present year. A few sales are still being made for fourth-quarter delivery. Iron for delivery during the third quarter of this year is quoted at $22.50 per ton, No. 2 foundry, $21.50 per ton for the fourth quarter and after that $18.50 per ton. The production is showing a little improvement. Furnaces which were blown in during the past fortnight are doing as well as could be expected. The Sloss-Sheffield Steel and Iron Company will blow in their Hattie furnace in the Sheffield district by June 25; the Philadelphia furnace by July 1; and the No. 4 North Birmingham furnace by August 1. All three furnaces are being improved considerably. This company only has three furnaces in blast at present and the lack of iron is being felt.

There is little spot iron being dealt in by Alabama iron manufacturers, the companies in many instances being behind on business booked some weeks previously. Spot iron is still being quoted above $23.50 per ton, No. 2 foundry.

All indications point to the production in this State being somewhat greater than it was in May. Iron ore is still scarce,

and development is still going on in the orefields.

No change is reported in the steel situation. The large plants are in full operation and the products are being handled promptly.

Chicago

June 17—The tone of the iron market is not lively, but there are as yet no signs of weakening of prices. Sales are almost wholly in small quantities, for delivery as soon as the iron can be shipped. Contract making is apparently entering the dull summer season, the tendency of melters being still to hold off in the expectation of a drop in prices. There are some users of iron, however, who deem it prudent to contract now not only for fourth-quarter needs, but also for the first quarter of 1908. Selling agents profess to see in the market only signs of continued steadiness and say they are not actively seeking business. With general conditions of business so good as they are now, the market seems unlikely to weaken materially. The tone of sales for all branches of the iron-products market is remarkably strong.

For third- and fourth-quarter delivery No. 2 Southern iron is quoted at $20@21.50 Birmingham, the higher prices obtaining for the earlier deliveries and the lower for later deliveries in the year. For the first quarter of the coming year $18.50@19 prevails. Northern iron for the last quarter brings $25.50@26. For delivery within the next thirty days Southern is quoted at $22.50@23, or $26.85@27.35 Chicago. Northern iron on the same condition of delivery brings $26.50@27. Lake Superior charcoal, scarce, sells for $27.50 spot delivery.

Coke is plentiful, with no notable surplus subject to demurrage conditions. Connellsville 72-hour sells for $5.85, and West Virginia 72-hour for $5.40.

Cleveland

June 17—The scrap-iron market has attracted considerable attention during the week on heavy sales of old steel rails. Railroad offerings of this material brought around $17.50@18.75.

Heavy tonnages have been handled down lake this week in iron ore. Lake rates remain about the same, but a heavy demand for tonnage is noticeable. The Detroit river was partially blockaded by the sinking of two vessels, but a heavy stream of ore has been piling up on the Cleveland and Lorain docks. Indications point to a movement of 6,000,000 tons this season.

The pig-iron market has been fairly active, with a better inquiry for deliveries during the first half of 1908, with sales for that delivery at furnaces at $21.50 and slightly better. Deliveries for last half are quoted as follows: No. 1 foundry, $24.50; No. 2, $24; No. 3, $23.50; Besse-

mer, $23.50. No. 2 Southern $[illegible] and Gray Forge, $22.50.

The machinists' strike still continues in a number of Cleveland plants, but indications point to a quick settlement, as the strikers show signs of weakening. All of the shops have been operating on reduced help, but are now nearly back to the full quota again.

Coke has been a feature of strength in the manufacturing industry on heavy buying of furnace quality. Prices carry a range from $2.15@2.25 for spot delivery, with late deliveries at $2.25@2.50, with a nominal market at $2.35. Foundry is bringing $3.25 for last half.

The coal market continues rather weak with a small run of sales. Supplies in the city are heavy, and are not being reduced. Pittsburg No. 1 [illegible] at $1.50 on track, run of mine at $1.85 down to $1.75, and ¾ lump from $1.90@1.95.

Philadelphia

June 19—Comparative inactivity is the feature of the pig-iron market; forward buying has reached its limit for the present. Inquiries for both domestic and foreign iron, which were made two or three weeks ago, are not being pressed. In several instances concerns which have booked additional work have not covered this new business, as has been the custom. The oversold condition makes producers indifferent to the course of the market. It is only the tail end of productive capacity that has to be disposed of and the producers know that even should prices weaken, they have very little to lose. Some effort at re-selling is no sign of weakness, but only a disposition to get rid of high-priced pig and take chances on lower prices later. Foundry is moving in small lots. Mills are well protected by contracts for forge. Foreign iron is not so strong and contemplated purchases, by a few large consumers, have been side-tracked. Basic is quoted at $23@24, according to fourth- or third-quarter delivery. No. 2 foundry for similar delivery is $25@24. Gray forge, $22.50@23. English No. 3, $22.50.

Steel Billets—There is no change in conditions. Business is good. Prices are unchanged. Some grades of foreign steel have sold at $38. It is understood that the mills are gradually catching up, but on the other hand there is business in sight for mid-summer, the disposition of which means the choking up of mills, badly as ever.

Bar Iron—Conditions of demand in western markets have favored this market by inducing [illegible] consumers to anticipate autumn demands. The retail demand has also improved, and the entire bar mill industry is in a most vigorous condition. Steel bars are well oversold.

[illegible] and influences surround the sheet iron industry, and buyers are anxious to carry supplies in stock.

[illegible] of business is being quietly done in the way of renewing contracts. Premium prices continue to be paid for early deliveries, and this sort of business is on the increase. The mill people are giving assurances respecting prompt delivery for the summer and autumn.

Plates—The plate mills of this territory feel perfectly safe against competition from outside sources in view of the enormous volume of business in sight in western territory. Local demand is good, and prices are closely bordering premium rates because of the policy of so many small buyers who prefer to pay a little more, in order to get plates just when they need them.

Structural Material—The trend of [illegible] recent business has been in small lots for local requirements at satisfactory prices. A great deal of construction has to be completed during the next four months, outside of railroad requirements, and orders for this class of work are coming along. The office people say that a large amount of business is shaping up which will probably be ready for figuring about August.

Steel Rails—Rail makers are figuring on considerable trolley-line work for 1908 delivery, to say nothing of work for delivery this fall and early winter. Details as to the financing of trolley-line construction have been completed, and the prosecution of work will now be rushed.

Standard sections are being ordered daily in large and small quantities.

Scrap—Steel scrap has still the right of way, and the supply is below the demand. All kinds are moving a little more freely than for some weeks. Recent sales of railroad scrap have eased demand somewhat. Machinery scrap is scarce at $21. Long and short scrap is offered at $19.50; old iron rails are nominally $28.

Pittsburg

June 18—The inactivity in the iron and steel markets is attributed by several producers to what they term the usual mid-summer dullness. This seems to be stretching a point somewhat to cover the apparently unfavorable conditions, as [illegible] the only new business of any consequence noted for several weeks was the placing [illegible] States Steel Corporation a week ago for delivery before Oct. 1. As the car-making concerns early in the year announced that they were filled with business for the en[illegible] have canceled orders. The report that there had been extensive cancellations by railroads is denied in some quarters and [illegible]

[illegible] sheets and structural material early this year, deliveries are improved and only regular prices are being paid.

There is no weakness in the established prices in any line, and it might be possible to obtain a higher price than is named for prompt deliveries of merchant pipe and boiler tubes. The National Tube Com[illegible] Unless there are cancellations or postponements of orders, the mills of this district will be kept fairly busy until well into the fourth quarter. The steel bar trade is regarded as one of the encouraging features from the fact that the agricultural-implement makers have come into the market for fully 200,000 tons, or nearly their entire requirement for the year beginning July 1. They paid the full price of [illegible] taken as an indication that they have con[illegible] it curtailed its structural-steel production and began putting its steel into billets, the Cambria Steel Company has sold fully 40,000 tons, the Carnegie Steel Company [illegible]

[illegible] sentatives of the Amalgamated Association of Iron, Steel and Tin Workers and the Republic Iron and Steel Company ended [illegible] present agreement expires on June 30 as [illegible] be appointed to adjust the differences, and the mills will be kept in operation pending [illegible]

The conference on the Amalgamated Association's new scale and the American Sheet and Tin Plate Company opened this [illegible] will not be granted. It will [illegible] 6 per cent this year under [illegible] did not benefit, as the increase was ab[illegible]

base a quotation. A number of inquiries have been received for small lots of No. 2 foundry iron, but so far only one sale, 100 tons, for June delivery has been recorded. The price was $24.50 at furnace. It was re-sale iron which is said to be the cause of the decline of 50c. a ton from the spot quotation that has prevailed for several months. Gray forge is quiet, and it is believed $21.50, Valley furnaces, could be done for June delivery.

Steel—The bessemer-billet market is easier and $30, Pittsburg, is quoted. Open-hearth billets are still scarce and are quoted nominally at about $33. Steel bars remain strong at 1.60c. and plates at 1.70c.

Metal Market

NEW YORK, June 19.

Gold and Silver Exports and Imports

At all United States Ports in May and year

Metal.	Exports.	Imports.	Excess.
May, 1907	$4,797,411	$ 2,441,870	Exp. $2,355,541
1906	7,722,148	34,911,028	Imp. 29,188,880
11 mos. 1907	12,410,407	20,216,984	Imp. 7,806,577
1906	42,014,722	60,108,698	Imp. 31,814,376
May, 1907	4,326,210	3,496,458	Exp. 829,758
1906	5,589,546	4,405,959	1,133,587
11 mos. 1907	23,888,040	18,803,468	5,055,142
1906	28,918,841	19,916,816	9,002,025

These statements cover the total movement of coin and bullion to and from the United States. Figures are furnished by the Department of Commerce and Labor.

Gold and Silver Movement, New York

Gold and Silver Exports and Imports from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week	$ 1,000,124	$ 180,278	$	$ 17,961
1907	5,615,351	17,128,436		716,249
1906	27,909,550	918,272		
1905	5,268,550	14,308,575		1,719,749

The joint statement of all the banks in the New York Clearing House for the week ending June 15, shows loans $1,130,755,000, a decrease of $1,689,200; deposits, $1,114,272,300, a decrease of $4,869,200, as compared with the previous week. Reserve accounts show:

	1906.	1907.
	$	$
	$	$
	$	$

Specie holdings of the leading banks of the world, June 13, are reported as below, in dollars:

England			175,018,655
Germany			
Belgium			54
			20

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The European statements are from

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell as follows for the year to June 6:

	1906.	1907.	Changes.
India	£ 8,245,113	£5,445,244	D. £ 2,799,869
China	.....	.....	.....
Straits	1,750	491,862	I. 490,112
Total	£ 8,246,863	£5,937,106	D. £ 2,309,757

Imports for the week were £138,000 in bullion and £7000 in Mexican dollars from New York. Exports were £130,710 in bars and £57,000 in Mexican dollars to India, a total of £187,710.

Prices of Foreign Coins

	Bid.	Asked.
Mexican dollars	$0.52½	$0.54
Peruvian sols and Chilean	0.47	0.50
Victoria sovereigns	4.85	4.87
Twenty francs	3.85	3.89
Spanish 25 pesetas	4.78	4.80

SILVER AND STERLING EXCHANGE.

June.	Silver. Sterling Exchange.	Silver. New York Cents.	Silver. London Pence.	June.	Silver. Sterling Exchange.	Silver. New York Cents.	Silver. London Pence.
13	4.8700	66⅞	30⅛	17	4.8725	67	30⅞
14	4.8700	66⅞	30⅛	18	4.8735	67	31⅛
15	4.8710	67	30⅛	19	4.8730	67⅛	31

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

June.	Copper. Lake cts. per lb.	Copper. Electrolytic cts. per lb.	Copper. London £ per ton	Tin. cts. per lb.	Lead. cts. per lb.	Spelter. New York cts. per lb.	Spelter. St. Louis cts. per lb.
13	24 @24¼	22¾ @23	95	41½	5.75	6.40 @6.45	6.25 @6.30
14	24⅛ @24¼	22½ @23	97⅛	42	5.75	6.40 @6.45	6.25 @6.30
15	24⅛ @24¼	22 @22¾	....	42⅛	5.75	6.40 @6.45	6.25 @6.30
17	24⅛ @24¼	22¾ @23	97⅛	42½	5.75	6.40 @6.45	6.25 @6.30
18	24⅛ @24¼	22¾ @23	99	43	5.75	6.40 @6.45	6.25 @6.30
19	24⅛ @24¼	22¾ @23	99	43½	5.75	6.40 @6.45	6.25 @6.30

London quotations are per long ton (2240 lb.) standard copper, which is now the equivalent of the former G.M.B.'s. The New York quotations for electrolytic copper are for cakes, ingots or wirebars, and represent the bulk of the transactions as made with consumers, basis, New York, cash. The price of cathodes is 0.125c. below that of electrolytic. The lead prices are those quoted by the American Smelting and Refining Company for lots of shipments of desilverized lead in 50 ton lots, or larger. The quotations on spelter are for ordinary western brands; special brands command a premium.

Copper—There have been further transactions, about the same in volume as last week, in electrolytic copper for export, near-by delivery, at further concessions in price, and there have been some small transactions in Lake copper and casting. In so far as domestic business is concerned there has been the same stagnancy as for many weeks previous. The general condition of the market remains unchanged, the sellers who withdrew some time ago still maintaining the same position. There have been rumors of negotiations with the large consumers, which may end the dead-lock, but if there have been any such negotiations they have not gone far. In the meanwhile we are now very near the time at which all of the producers will have filled their contracts, and the question is largely to what extent consumers may have proved to have overbought. There is a growing conviction that an early reduction in the so-called official price for copper will take place. On this account producers and second-hands have become urgent in their efforts to effect sales. The close is weak at 23¾@24¼c. for Lake and 22¼@22¾c. for electrolytic. The market for casting during the week has been 21¼@21¾c.

The spot position of the g.m.b.'s market had become so oversold that the bull operators utilized the opportunity to make a drive against the bears, which resulted in an advance of the spot position to about £99, and the decrease in the statistics of 500 tons facilitated the aforesaid campaign. The close is easy at £99 for spot, £93 15s. for three months'.

Refined and manufactured sorts we quote: English tough, £102; best selected, £106; strong sheets, £113.

Copper Sheets—The base price of copper sheets is 32c. per pound.

Copper Wire—The base price of copper wire, No. 0000 to No. 8, is 27¼@27½c. per pound.

Tin—The advance in London has had but very little effect upon the New York market. Buyers covered fairly freely on the recent break, and having no confidence in a higher market, are now disposed to await developments. The close is cabled as easy at £187 10s. for spot, £181 10s. for three months'.

The New York market has been steadily advancing, closing at 43½c.

Lead—The price for desilverized remains steady at 5.75c., New York, and 5.67½c., St. Louis. Corroding brands are 0.1c. higher.

A corner in June deliveries caused a great deal of excitement in the London lead market, and business was done at as high as £22, which is a record price for upward of a generation. On the same basis, futures sold at £1@£1 10s. less. There is much less activity at the end of the week, but the market is still very unsettled. Quotations at the close are £20 15s. for Spanish lead, and £21 for English.

Spelter—Business with consumers has been of small volume and there is now a tendency to buy only from hand to mouth, probably a direct reflex of the weaker iron and copper markets. Quotations at the close are substantially unchanged at 6.40@6.45c. New York, 6.25@6.30c. St. Louis.

So far, the low prices prevailing in Europe have not stimulated the demand, and the close is barely steady at £24 10s. for good ordinaries, £24 15s. for specials.

Antimony—Although the week the market ... dull, but ... metal freely offered. Quotations are 12½@13½c. for Hungarian and outside brands, while for other grades the market is nominal at 13@14c. for ... Cookson's.

Platinum—A slight appearance of strength in the market has checked the decline in prices, which remain unchanged from last week and are quoted as follows: Ordinary metal, $20 per oz.; refined metal, $28.50. Scrap is worth $20@21.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., ... dollars.

Wisconsin Ore Market

Platteville, Wis., June 15—The 60 per cent. ore remained about the same as last week, selling from $48@48.50, while lead was the same as last week. The buying of ore remained steady throughout the week and a large portion of next week's tonnage has already been sold, there being no surplus in the bins.

The local producers express themselves quite strongly that the present zinc ore price will be maintained throughout the summer, providing the supply of cars meets with the demand of the producers. The continued rainy weather the early part of the week, showed a slight inclination toward a material dropping off of the tonnage, but the continued fair weather that set in the last part of the week has added very much toward bringing up the tonnage for the entire week. Taken as a whole, the zinc market has held its own for the past two months.

All the lead that was produced was reported sold, while dry bone and sulphur suffered no material change.

Shipments of the district, by camps, for the week ending June 15 were as follows:

Camps	Zinc, lb.	Lead, lb.
Platteville	1,240,000	
Hazel Green-Buncombe	480,000	
Benton	440,000	
Linden	264,000	
Highland	180,000	
Mineral Point	90,000	
Galena	1,140,000	
Livingston	240,000	
Cuba City	90,000	

Missouri Ore Market

Joplin, Mo., June 15—The ... unchanged at $51 per ton for the choicest ore, on an assay basis of $46 to $48 per ton of 60 per cent. zinc. The average price was $43 per ton, ... of low-grade ores.

As high as $78 per ton was paid for a few bins of lead ore by one buyer, while the representatives of three of the purchasing agents were offering only $73 at the close of the week. The average price was $74.56.

The shipment of the week represents approximately the output capacity of the district since the new concentrating mills have been placed in commission, increasing ... and running to ... higher than before the flooding of the Badger mines. These mines are being rapidly drained and should be in operation not later than the latter part of July. Providing the old mines continue with an ... per week larger than last summer, or about 6300 tons.

Following are the shipments of zinc and lead from the various camps for the ... week ending June 15:

	Zinc, lb.	Lead, lb.	Value
Webb City, Carterville	3,150,000	441,000	$...
Joplin	2,394,000	198,000	81,351
Duenweg, Empire	1,440,000	270,000	59,760
Alba-Neck City	1,050,000	240,000	44,100
Prosperity	420,000	240,000	28,476
Prosperity	357,000	54,000	17,174
...	180,000	84,000	11,...
...	180,000	72,000	7,...
Spurgeon	450,000	107,470	2,...
Aurora	316,200	54,000	8,...
Oronogo-Duenweg	270,000	72,000	7,...
Badger	120,000		4,...
Carl Junction	90,000		2,...
Zincite	144,000		4,511
Carterville	147,000		4,...
Webb City	114,000		3,...
Cave Springs	54,000		1,...
Short Creek	57,000	12,000	1,...
Totals	12,...	1,...	$...
24 weeks	280,...	41,...	$...
Zinc value this week	$7,...	24 weeks	$...
Lead value this week	$1,...	24 weeks	1,...

ZINC ORE AVERAGES.

Month.	1906	1907
January	47.38	48.81
February	47....	49....
March	47.62	49....
April	44.97	47.34
May	40.51	46.88
June	40....	46....
July	40....	46....
August	40....	46....
September	40....	46....
October	41.55	46....
November	41....	46....
December	42....	46....
Year	43....	47....

LEAD ORE AVERAGES.

Month.	1906	1907
January	...	80
February	...	80
March	...	75
April	...	75
May	...	77.40
June	...	80
July	...	80
August	...	80
September	...	80
October	...	80
November	...	80
December	...	80
Year	...	77.40

Chemicals

New York, June 19—The general chemical trade is without special features. Business holds very active, with no new developments.

... have a firm tone. Few sales are reported outside of regular consuming lines. There have been a few calls for the salt from ... erally purchased all its requirements early in the spring. Prices remain at $7.50 per ... the ... smaller amounts.

... change over last week. The demand is ... the market being ...

... tively.

Mining Stocks

... the preferred at $97½. The curb was listless and little interest was displayed in the Cobalt stocks.

The Nevada stocks, dealt in on the curb showed more activity but prices had a ten... was greater with these than with the silver stocks.

Boston

... part of last week, but reached their lowest point Monday, June 17. Pressure has been ... stocks are selling at the lowest prices of the year, notably Calumet & Hecla, which touched $755, against a high price of $1000 a share early in the year. The features have been Utah Consolidated, Old Do... Butte and Copper Range ...

... recovered to $50, ex-dividend. Although denials have been made regarding the ... has been very feeble in the market, ... free offering and no support. Old Do... ...mon also suffered ... market ... re...

which $2,000,000 has been paid in dividends. The Shannon Copper Company has recently sold about 300 acres of land to the Arizona Copper Company for a smelter site. The curb has followed the general market.

Colorado Springs

There has been a fair amount of trading on the local mining exchange the past week, but prices have been weak and declining, with the exception of the stock of three or four companies that have declared dividends. These stocks have held their own. There is a general feeling among the brokers that the summer slump is on and that prices will continue to decline until September.

STOCK QUOTATIONS

NEW YORK June 18		BOSTON June 18	
Name of Comp.	Clg.	Name of Comp.	Clg.
Alaska Mine	1	Adventure	
Am. Nev. M. & P. Co.		Allouez	
Amalgamated	82½	Am. Zinc	6
Anaconda	55	Arcadian	4⅞
Bonanza		Atlantic	11⅝
British Col. Cop.		Bingham	1⅜
Buffalo Cobalt	2¾	Boston Con.	
Butte & London		Calumet & Ariz.	154
Butte Coalition*	24	Calumet & Hecla	770
Butte Cop. & Zinc		Centennial	24⅛
Cobalt Contact		Con. Mercur	
Colonial Silver	2½	Copper Range	76⅜
Cum. Ely Mining		Daly-West	15
Davis Daly	1½	Franklin	14
Dominion Cop.	50	Greene-Can.	15
El Rey		Isle Royal	15
Foster Cobalt	25	Lacsalle	13
Furnace Creek	4	Mass	1½
Giroux Mine		Michigan	
Gold Hill	1½	Mohawk	55⅜
Granby, New		Mont. C. & C. (new)	29¼
Greene Gold	1⅜	Nevada	
Greene G. & S.	1	North Butte	77½
Greene-W. P. & D. Val		Old Colony	
Guanajuato	3⅜	Old Dominion	1
Guggen. Exp.	212⅝	Osceola	125
Hancock	50	Parrott	18⅝
McKinley Dar	1¼	Phoenix	
Mexican	61	Quincy*	113
Mines Co. of Am.	1½	Rhode Island	4½
Mitchell Mining		Santa Fe	
Mont. Shoshone (new)	8¾	Shannon	10⅝
New Utah M. & S.	1⅜	Tamarack*	101
Newhouse M. & S.		Trinity	18⅞
Nipissing Mines	11	United Cop., com.	65
Old Hundred	2½	U. S. Oil	10⅝
Silver Queen	1	U. S. Smg. & Ref.	48
Stewart	2	U. S. Sm. & Ref., pd.*	42⅜
Tennessee Copper		Utah Copper	49⅜
Union Copper		Victoria	
Utah Apex	6½	Washington	
West Columbus	1	Winona	7
		Wolverine	
		Wyandotte	

N. Y. INDUSTRIAL	
Am. Agri. Chem.,	
Am. Smelt. & Ref., pf.	92⅜
Am. Sm. & Ref., pf.	104⅛
Bethlehem Steel	
Colo. Fuel & Iron	43½
Federal M. & S., pf.	98
Inter. Salt	37
National Lead	
National Lead, pf.	99
Pittsburg Coal	
Republic I. & S.	24⅝
Republic I. & S., pf.	88
Sloss-Sheffield	
Standard Oil	660
Tenn. C. & I.	
U. S. Red. & Ref.	
U. S. Steel	34⅝
U. S. Steel, pf.	97⅛
Va. Car. Chem.	
Va. I. Coal & Coke	30

*Ex Div. †Ex. Rights.

BOSTON CURB	
Alumack	
Ariz. Com.	
Bonza Mt.	
East Butte	
Hancock Con.	
Keweenaw	
Majestic	
Nipissing	13⅛
Shannon	10⅛
Stewart	4
Superior	
Superior & Pitts.	11⅛
Troy Man.	2⅜

LONDON June 19	
Name of Com.	Clg.
Rhodesia	8 6d
Camp. Rand	
Langlaagte	
Am. Nattie	9
Cent.	
Columbia	
Iron Run	
Ore. Binet	

S. FRANCISCO June 12	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.20
Best & Belcher	.70
Caledonia	.05
Challar	.08
Con. Cal. & Va.	.07
Crown Point	.20
Exchequer	.30
Gould & Curry	.15
Hale & Norcross	.43
Mexican	.45
Ophir	1.90
Overman	.10
Potosi	.12
Savage	.50
Sierra Nevada	.34
Union	.28
Utah	.05
Yellow Jacket	.75
TONOPAH STOCKS	
Golden Anchor	.20
McNamara	.30
Montana-Pitts. ex.	.08
North Star	.23
Rescue	.17
GOLDF'D STOCKS	
Black Ants	.06
Blue Bull	.30
Columbia Mt.	.47
Comb. Frac.	2.75
Conquerer	.11
Daisy	1.25
Florence	4.25
Frances-Mohawk	1.05
Goldfield Con.	6.65
Grandma	.10
Great Bend	.60
Red Hills	.38
St. Ives	.99
BULLFROG STOCKS	
Amethyst	.26
Bonnie Claire	.40
Mayflower Con.	.38
Montgomery Mt.	.15
Original	.08
MANHAT'N STOCKS	
Gold Wedge	.05
Manhattan Mg.	.07
Pine Nut	.09
Ruby Wonder	.25
Stray Dog	.16
Yellow Horse	.04

NEVADA June 19 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	13.25
Tonopah Exten.	1.62½
Montana Tonop'h	3.00
Belmont	3.12½
Tonpah Midway	1.30
West End Con.	.85
Jim Butler	.95
GOLDF'D STOCKS	
Sandstorm	.40
Kendall	.30
Red Top	2.50
Jumbo	2.50
Goldfield Mining	1.55
Dia'dfield B. B. C.	1.00
Atlanta	.44
Mohawk	12.00
Silver Pick	.48
Laguna	1.00
BULLFROG STOCKS	
Mont. Shoshone C.	8.00
Tramps Con.	.58
Gold Bar	.58
Bullfrog Mining	.17
Bullfrog Nat. B.	.21
Homestake Con.	
MANHAT'N STOCKS	
Manhattan Con.	.48
Manhat'n Dexter	.13
Jumping Jack	.12
Stray Dog	.15
Indian Camp	.05

COLO. SPRINGS June 15	
Name of Comp.	Clg.
Acacia	9¾
Black Bell	3
C. C. Con.	
Dante	4½
Doctor Jack Pot.	7½
Elkton	55
El Paso	43
Findlay	60
Gold Dollar	7¾
Gold Sovereign	4¾
Isabella	22
Index	
Jennie Sample	
Jerry Johnson	8
Mary McKinney	57
Pharmacist	5
Portland	1.20
Un. Gold Mines	8½
Vindicator	80
Work	18

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Smelters Sec., pf., B	June 1	$1.25	$375,000
Baltic	June 15	10.00	1,000,000
Beck Tunnel Con.		0.10	40,000
Bunker Hill & Sullivan	June 4	0.60	180,000
Butte Coalition	June 26	0.50	500,000
Calumet & Arizona	June 20	5.00	1,000,000
Camp Bird, Ltd	June 26	0.12	98,400
Central C. & C., pfd	July 15	1.25	25,438
Federal M & S., pf	June 15	5.00	300,000
Federal M & S., pf	June 15	1.75	210,000
Iron Silver	July 1	0.10	50,000
Lower Mammoth	May 31	0.05	9,500
Mohawk, Mich.	July 10	5.00	500,000
National Lead	July 1	1.25	186,318
National Lead, pfd.	June 15	1.75	261,820
North Butte	June 10	2.00	800,000
N. Y. & Hon. Rosario	June 24	0.10	15,000
Quincy, Mich.	June 10	4.50	93,750
Sloss-Sheffield, pfd.	July 1	1.75	117,250
Texas & Pacific Coal	June 29	1.50	30,000
U. S. Cast Iron Pipe & Fdy.	June 1	1.00	150,000
U. S. C. I. Pipe & Fdy., pfd.	June 1	1.75	262,500
U. S. Reduction & Ref., pfd.	July 1	1.50	59,187
Utah Con.	July 15	1.50	450,000
Va. Car. Chem., pfd.	July 15	2.00	360,000

Assessments

Company	Delinq.	Sale.	Amt.
Benson, Cal.	June 9	June 29	$0.10
Bullion, Nev.	June 10	July 2	0.05
Etna King, Cal.	June 8	July 1	0.03
Forty-nine G. Fl., U.	June 26	July 15	0.01
Hoosier Boy, Utah	June 25	July 20	0.20
Jersey Lead, Utah	June 8	June 25	0.03
Mabel Gravel, Cal.	June 3	June 25	0.10
New Year Wing, Utah	June 11	June 29	0.02
New Superior, Utah	June 17	July 5	0.10
St. Joe, Utah	June 13	July	0.02
Silver Nevada	May 28	June 18	0.10
Uncle Sam, Utah	May 27	June 17	0.05
Yankee, Utah	June 17	July 2	1.25

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65.288	68.673	30.113	31.769
February	66.108	68.835	30.464	31.852
March	64.597	67.519	29.854	31.325
April	64.766	65.462	29.984	30.253
May	66.976	65.981	30.968	30.471
June	65.394		30.186	
July	65.105		30.113	
August	65.949		30.529	
September	67.927		31.483	
October	69.823		32.148	
November	70.818		32.671	
December	69.050		32.003	
Year	66.791		30.868	

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18.310	24.404	18.419	24.525	78.869	106.739
February	17.869	24.869	18.116	25.236	78.147	107.466
March	18.361	25.065	18.641	25.560	81.111	106.594
April	18.375	24.224	18.688	25.260	84.793	98.625
May	18.475	24.048	18.724	25.072	84.867	102.375
June	18.442		18.719		83.994	
July	18.190		18.585		81.167	
August	18.380		18.706		83.864	
September	19.033		19.328		87.831	
October	21.203		21.722		97.269	
November	21.833		22.398		100.270	
December	22.885		23.350		105.226	
Year	19.278		19.616		87.282	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36.390	41.548	July	37.275	
February	36.403	42.102	August	40.606	
March	36.662	41.313	September	40.516	
April	38.900	40.938	October	42.832	
May	43.313	43.149	November	42.906	
June	39.260		December	42.750	
			Av. year.	39.819	

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5.600	6.000	16.850	19.828
February	5.464	6.000	16.081	19.641
March	5.750	6.000	16.922	19.593
April	5.404	6.000	15.959	19.975
May	5.685	6.000	16.725	19.688
June	5.750		16.813	
July	5.750		16.525	
August	5.750		17.109	
September	5.750		18.266	
October	5.750		19.350	
November	5.750		19.261	
December	5.900		19.609	
Year	5.657		17.870	

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6.487	6.732	6.337	6.582	28.225	27.125
February	6.075	6.814	5.924	6.664	26.844	25.938
March	6.209	6.837	6.056	6.687	24.563	26.094
April	6.078	6.685	5.931	6.535	25.781	25.900
May	5.997	6.441	5.846	6.291	27.000	25.563
June	6.096		5.948		27.738	
July	6.006		5.856		26.800	
August	6.027		5.878		26.938	
September	6.216		6.066		27.563	
October	6.222		6.070		28.075	
November	6.375		6.225		27.781	
December	6.593		6.443		27.988	
Year	6.198		6.048		27.020	

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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Gold-dredging Practice at Ruby, Montana—I

How the Conrey Placer Mining Company Has Met a Series of Difficult Conditions in Handling Clayey Gravel and Boulders

BY J. P. HUTCHINS*

During a recent visit to Ruby, Madison county, Mont., which I have not been for many years, I was greatly impressed with the dredging operations of the Conrey Placer Mining Company, particularly as illustrating marked progress and successful development under peculiar and difficult conditions. The commendable resourcefulness of the operators and the many features in dredge design which they have introduced, will be described in this article. I take this opportunity to thank A. D. Wiseman and Charles Kammerer, of the Conrey Placer Mining Company, for many courtesies in visiting [illegible] a dredge

material, which was mined by open cutting with hand shoveling (often with ground sluicing of over-burden), when the material was shallow, or by drifting and [illegible] deep, were used. Attempts have been made to work parts of the gulch gravel with various types of mechanical excavators, but not with success.

One noteworthy installation included a [illegible]

ing; they always give most generously the benefit of their valuable experience and manifest a strong desire to aid anyone in solving the many problems involved in dredging.

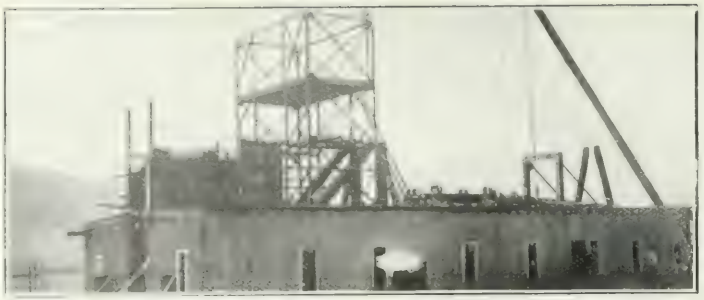
Location of Ruby Valley

The material being dredged is about 5400 ft. above sea level in Ruby valley, Madison county, Mont., just below the debouchment of Alder gulch from the foothills of the Gravelly range. Alder gulch was one of the rich placer deposits discovered in the early sixties. In 13 miles of its course, with an average width [illegible]

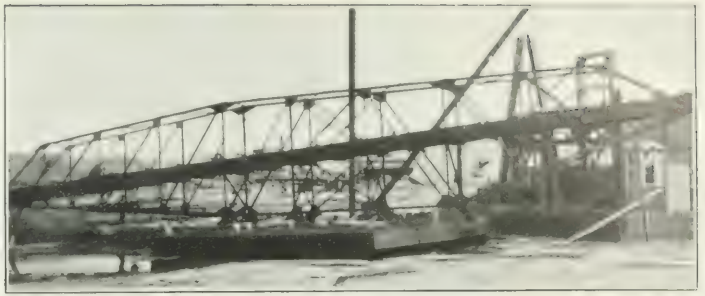
struction, but it had only one movable suspension point, the hoisting end, while only occasionally as the exigencies of the work and the need of dumping room dic

peculiar one; it combined the use of

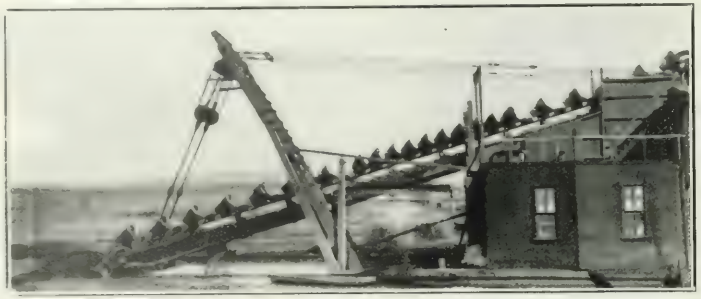
*Mining engineer, Nassau building, New York.



[illegible] IN COURSE OF CONSTRUCTION



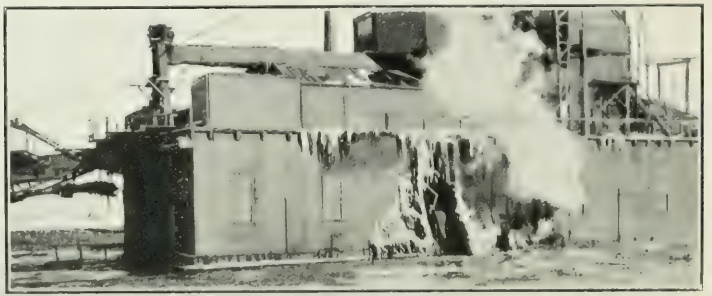
SLUICE AND SUCTION SCOW No. 2 DREDGE



TWO AND ONE-HALF CUBIC FOOT CONNECTED BUCKETS ON THE SAME CHAIN

BUCKET LADDER OF 12.5 CU. FT. DREDGE

DREDGE IN WINTER, SHOWING REDUCED FREEBOARD



ICE ACCUMULATIONS IN WINTER

of 60 ft. is met, 2.5 miles from the mouth of Alder gulch. In this circumstance the deposit resembles a true flood-plain gravel though it seems to be an area of debouchment resulting from deposition by decreasing stream gradient or smaller volume of steam flow or, as is more likely, through a combination of these two factors. To the present time the maximum depth of material handled has been 40 ft. with the 10-cu.ft. bucket dredge. Ruby valley is a large area of alluvial or, possibly, lacustrine gravel, all said to be slightly auriferous.

Through the center of the deposit and running generally west is a trough supposed to have been the original channel of the creek before its choking with gravel. A greater gold content and an occurrence of larger boulders within its limits indicate the probability of this belief.

Tenacity of the Gravel—Bedrock

The gravel, though not indurated, in the ordinary sense, is tenacious and compact, due to the existence of clay irregularly through it, but particularly near bedrock. The material is generally most tenacious near bedrock where a greater amount of clay and heavier pressure have combined to give a tenacity difficult to overcome, first in excavating with the buckets, second in discharging from the buckets, third in screening in the trommels, and fourth in sluicing. It has been found that best results are attained when a chain speed of 30 to 35 ft. per minute is maintained by the buckets in tight and loose gravel respectively. When greater speed is attempted it is difficult to fill the buckets and a lower actual capacity results although theoretically the capacity should be higher.

A greater amount of time seems necessary to disengage tenacious or sticky gravel from place than to accomplish the same result with cemented gravel. The former seemingly must be slowly torn and wrenched from the digging bank, while the latter, though harder, seems to crumble and detach itself by breaking away from the digging bank at a more rapid rate, as if the impact of the buckets had some effect. In other phases, namely, in discharging from buckets, in screening and in sluicing, tenacity makes time an important and necessary factor to do complete work.

[illegible] sionally encountered. With the open-connected bucket now used, no particular difficulty is encountered in handling. Several notable dredging failures in rich [illegible] small close connected buckets in gravel of similar character. Perhaps a 3-cu.ft. close-connected dredge, would be failures at Ruby. Not only are large boulders encountered but the extreme tenacity makes either long pitch close-connected buckets or open-connection essential.

Buckets

[illegible] on with close-connected buckets on the 7.5-cu.ft. dredge. As is shown in an accompanying illustration, a number of buckets were close connected among open-connected buckets. It was found that a larger capacity was obtained; just how much, has not yet been determined. Indicator cards showed that it required about 14 per cent. more power to run the chain when the close-connected buckets were digging. This would signify that probably the close connection is preferable, for it is likely that more than 14 per cent. more material was excavated.

Not enough experimenting has been done at Ruby, nor have observations been determinate enough, to say that it takes more or less power per cubic yard excavated with the one or the other type of connection, but the opinion is that the close-connected buckets will dig with less power per cubic yard excavated, will dig [illegible] apparatus, will dig with less surging, will dig with less wear and tear per cubic yard excavated, and will thus be more economical and reduce operating cost. Indicator cards also showed an increase of about 17 per cent. in the power required to dig the indurated bottom gravel over that needed in loose top material.

Character of the Bedrock

The "bedrock" is an extremely tenacious clay; it varies in color from light cream to dark brown. It seems to owe its origin to deposition of tufa and volcanic ash from slow-moving or still water. It resembles the Oroville bottom, though it is more tenacious and sticky. It is generally smooth, with but gentle undulations. There is no particular concentration of gold on or near it, and no [illegible] the circumstance that when any considerable volume of it is excavated by the buckets it must be pried or dug out of them (for it will not discharge) make it only unnecessary but undesirable to attempt [illegible] ment. Not only are the [illegible] with deep crevices, which [illegible] drill. In one part holes were staggered [illegible] content with dredging recovers indicates [illegible] Holes were drilled in it and about 5 per [illegible] principally in the gold saving phase of the [illegible] centage of the loss, causing, as it does, faulty discharge from the buckets and incomplete disintegration and washing in the screen and sluice.

[illegible] asmuch as early day placer mining, carried on near the point where the experiments [illegible] However, it is certain that there is a per[illegible] amalgam, is sometimes found on the dump. [illegible] filling the riffles to such a degree as to permit contact with [illegible]

The save-alls (colloquially called "dees [illegible] the gold recovered. This again shows the [illegible] is slow, and thus allows considerable time for the buckets to empty themselves as they round the upper tumbler.)

car. This installation was a failure; [illegible] to placer-mining machines mounted on cars, it was also incapable of excavating the tenacious gravel. Attempts to work it were soon abandoned.

[illegible] double-lift dredge, named the "Maggie Gibson." This machine had been at work at Bannack, Mont., and was re-erected on leased ground belonging to the Conrey Placer Mining Company. Open-connected buckets of 5 cu.ft. capacity, weighing about 600 lb., 3-in. steel pins, a lightly-built trussed I-beam ladder, a weak sprocket wheel on an upper tumbler shaft of only 8 in. diameter, and other features of parallel weakness, resulted in many breakdowns.

A 12-in. dredging pump was used to elevate the material (after its discharge from the buckets at a point about 17 ft. above water level, and its passage through the 4x5-in. openings of a chain-driven revolving screen) to a sluice about 80 ft. long, sustained on an auxiliary scow.

A 48x48-in. wooden spud was first used as a means of anchorage, but it was often broken. This is explained as follows: The oversize (which was discharged from the screen over the side) formed a loose layer of coarse boulders on the bottom; into this the spud buried itself to a considerable depth by its boring action as the dredge was swung from side to side in lateral feeding. The leverage on the spud was tremendous and the character of the resulting fractures in every instance showed that torsional stress was largely if not entirely to blame for the trouble. A contributory factor was the loose fit of the spud in its casing, thus permitting considerable play and heavy shocks. Had a long, instead of a short, round point been used on the spud, thus allowing easier turning in the boulders, it is probable that no trouble would have been experienced. This dredge ran for five years, until the lease expired.

The first elevator dredge installed (in 1899) by the Conrey Placer Mining Company had 5-cu.ft. open-connected buckets. They weighed about 750 lb. They were of [illegible] encountered. Buckets of 7.5 cu.ft. capacity, weighing 1400 lb., are now used on this dredge. The dredge is 100x44x7 ft., and draws 5.25 ft. of water; it has three 70-h.p. boilers, and 14 and 10-cu.in. centrifugal pumps lifting 24 ft. The dredge is of the single-lift type, discharging mate- [illegible] volving screen having 3-in. perforations. Oversize is chuted over both sides, while the fine material drops into a sluice, 140 ft. long, articulated at the stern, 52 in. wide [illegible] allow continuous running in one-half of it up). This partition was soon removed principally because unequal distribution of material on the two sides of the partition, due to listing, gave bad results.

The No. 2 dredge has 10-cu.ft. buckets, is 110x44x7 ft., and draws 5 ft. 4½ in. It contains 200,000 ft. of lumber, board measure, has two 6-in. and four 4-in. longitudinal bulkheads, and two 100-h.p. boilers. The sluice is 4 ft. 3 in. wide and 2 ft. 4 in. deep.

ANCHORAGE

Because of the difficulty from broken spuds encountered on the "Maggie Gibson," a new method of anchorage was used. With a dredge having an auxiliary sluice scow, a pivotal point coincident with the point of articulation of the sluice to the dredge is highly advantageous. An A frame was erected at the stern and from the top of this frame, four cables were led to quadrant anchorages by a device resembling the top gudgeon of a derrick. The dredge thus dug and tailed in two arcs, each subtending angles of about 90 deg., and each bisected by the longitudinal median line through the dredge when digging and tailing in the middle of the cut. This arrangement was soon afterward adopted on the "Maggie Gibson," and it has been installed on the other dredges at Ruby. Considerable difficulty was experienced until the machinery for holding the mooring lines was improved and strengthened so as to withstand the heavy strains resulting from digging tenacious gravel.

Moving ahead usually takes 25 to 30 minutes. The aft lines are slackened, the forward lines are reeled in, then the slack of the stern lines is reeled in after the buckets are lowered and turned in contact with the digging bank and the dredge "kicked back" until the forward lines are taut. The lines are not strained to their limit in moving ahead as a small amount of slack is considered advantageous in excavating. Winchmen who have worked elsewhere on spud dredges, generally prefer the mooring lines and the elasticity resultant from using them. The No. 3 dredge, with 12.5-cu.ft. buckets, has double 1¼-in. forward lines and single 1-in. aft lines. They lead to a four-drum winch weighing 45 tons. This will give some idea of its massive character.

[illegible] ontinued.]

Immense numbers of jute sacks are annually used in the shipment of nitrate from Chile. They come principally from Australia and the East Indies and cost, delivered in Chile, about 10c. American each. They hold about 100 kg. each and are never used the second time, as the nitrate rots the fiber. During 1906 about 20,000,000 sacks were used, and the demand is constantly growing. The jute sacks are not ideal, as much of the nitrate sifts through, which makes them disagreeable to handle.

Prices in the Klondike

Consul G. C. Cole, of Dawson, in *Daily Consular and Trade Reports*, June 6, 1907, gives the cost of living and the wages paid for labor in the Yukon territory as follows (retail prices):

FUEL AND LUMBER.	
Coal, native, per ton	$15.00 to 20.00
Wood, per cord	12.00 to 15.00
Spruce, native undressed, per M	45.00
Fir, imported undressed, per M	125.00
Oak, imported undressed, per M	400.00
FOODSTUFFS	
Oats, per ton	80.00 to 120.00
Hay, native, per ton	60.00 to 80.00
Hay, imported per ton	80.00 to 120.00
Beef, per pound	.25 to .50
Pork, per pound	.40 to .50
Ham, per pound	.35
Bacon, per pound	.35
Turkey, per pound	.50
Chicken, per pound	.50
Cheese, per pound	.40
Butter, per pound	.50
Lard, per pound	.20
Tea, per pound	.50 to .75
Coffee, per pound	.35 to .65
Rice, per pound	.08 to .10
Flour, per hundred	6.00
Potatoes, per hundred	8.00 to 14.00
Eggs, domestic, per dozen	2.00
Eggs, imported, per dozen	1.00
Milk, per quart	.35
Milk, canned, per case of 4 dozen	7.50
Canned vegetables, per case	4.00 to 8.50
Canned fruits, per case	6.00 to 8.50
Oranges, per box	12.50 to 25.00
Apples, per box	4.00 to 6.50
BOARDING.	
Hotels, per day	3.00 to 6.00
Restaurants, per meal	.50 to .70 to 3.00
Board and room, per month	90.00 to 150.00
HORSES.	
Cost of draft horses per span	1,000.00 to 1,800.00
Boarding horses per month	60.00 to 100.00

The wages of mechanics per day of 10 hours are $10; common laborers, with board, $4 to $5; without board, $6; draft teams, per day (two horses), $25; clerks, per month, $150 to $300.

Everything consumed in the way of living costs from two to three times as much as in the United States. There is no article sold for less than 25c., no matter how trivial, as there is no money in circulation of a less denomination than that. The cost of living will remain high so long as the means of getting supplies into the country remain as they are, and what is true of the Yukon territory is true of the Yukon valley from the Alaskan line to the coast.

The Central Zinc Company

The new works of the Central Zinc Company at West Hartlepool, England, are well advanced and should be in operation by the late autmn. The concentrates from the Central mine, at Broken Hill, belonging to the Sulphide Corporation, are to be smelted there. Plant capable of treating 10,000 tons of zinc concentrate is being erected. The output of zinc should be about 80 tons a week. The land purchased for the works extends over 52 acres and cost £100 an acre. It is situated on the north bank of the mouth of the river Tees. The North Eastern Railway Company is building a branch line 10 miles long to connect the works with its railway system

The Disposal of Smelter Smoke

Suggestion That Smoke Be Conveyed by Flue to Remote Places Where It Will Be Harmless. Computations To Show Feasibility

BY HERBERT LANG*

The problem involved in getting rid of the smoke of smelting works by discharging it into the atmosphere of the immediate vicinity of the furnaces is steadily becoming more difficult in populated regions, and smelting companies, in consequence of the hostility of the public, abetted by complaisant courts, are finding themselves in no enviable position. I do not suppose that the methods of abating the smoke nuisance have ever before been subjected to such anxious examination. The problem is a great one, and the solutions which have been offered heretofore are fresh in the minds of engineers the world over. Only one radical method is known in metallurgical literature, viz., the conversion of the sulphur dioxide, the actively injurious constituent, into sulphuric acid, which renders it completely innocuous, but is out of the question under ordinary circumstances for reasons that are well known. In this direction I have nothing to add to what has already been so well said, but it has not, as it seemed to me that a solution of the difficulty may be found to lie in the cheap conveyance of the smoke to distant, sterile and unsettled localities. In fact, I have for several years been expecting that someone would suggest such a course as I now suggest, that experiment be made to determine its feasibility. Is it not possible or practicable to convey these hurtful fumes through long pipes of acid-resisting material, forced by machinery, to points several or many miles distant? I believe it is, and I would not be surprised to see in time such a method made use of. It is well known that examples exist where the smoke of such works has been carried for considerable distances—in one case, viz., the Alston Moor lead works in England, as far as five miles. But in this case natural draft is (or was) made use of, which limits the velocity of the gases and hence involves the employment of conduits of large cross section. Now that so much experience has been acquired in the propulsion of air and other gases through comparatively small pipes, and so many [illegible] on [illegible] and [illegible] ure, we are entitled to assume that smelter fumes may be thus handled, and perhaps with great advantage.

A Pyritic Smelting Problem in Which Injurious Effects

The subject came before me in connection with the designs for a copper [illegible] sulphide ores by the pyritic process. The site of the works is on the edge of a highly cultivated and prolific region chiefly given up to the culture of the grape, which of all plants might be most injuriously affected. The grape is a rapid grower, assimilating moisture with avidity, and withal is very sensitive to exterior influences. Ten million dollars' worth of these tender plants lie within what I may call the sphere of influence of this smelter, and the state of mind of their owners while the works were going up may be imagined. But the actual facts of the case were different from what may be pictured. It would have been inexcusable rashness to build the works there, except for two facts, which have a great bearing on the choice of site, namely, the direction of the air currents, and the propinquity of a high hill, to which smoke ducts may be led. For the greater part of the year, and especially during the dry season, the winds blow persistently from the northwest. The tract to the southeast, to which the winds would naturally carry the smoke for the greater part of the year, is in the main uninhabited, and is at present valuable only for its grasses, which serve to keep alive a few stray cattle. It is not impossible, however, that with the rapid spread of population in this State, portions of this tract, especially those susceptible of irrigation, may in time become settled up, and it is necessary to be prepared for this undesirable condition. There is a hill, rocky, sterile, and almost [illegible] three miles from the site and rises a thousand feet above it. Across the intervening space which is reasonably level, it would be practicable to construct a flue capable of conducting the fumes to the top, whence they would be discharged into the atmosphere at a hight sufficient to [illegible] with air that no harm could be caused by [illegible] plants in any direction. This hill is a [illegible] of the barren [illegible] and I am fully convinced [illegible] would get to the top [illegible] cause it [illegible] to anything. I believe, therefore, that by taking advantage of the [illegible] of the [illegible] would wait

Dimensions Can Be Worked Out

[illegible] construction of such a flue much study should be bestowed upon the details, the more so as the whole subject is in a tentative condition, and nothing as yet reduced to practice. It is evident that a construction similar to the dust chambers [illegible] would be quite out of the question where [illegible] miles. The material of construction, the [illegible] by which the gases are to be propelled are the most important considerations. As the whole subject is experimental, I considered that a wooden flue, placed [illegible] smoke at first from the stack adjoining [illegible] protect the neighbors and improve the con-

*Mining and [illegible] Angeles, California.

applications of coal tar, asphaltum, and the like, which resist to a great extent the action of the vapors; and if these applications are made with sufficient care and frequency there is no doubt that the wooden structure will have a reasonably long life; but it is found in practice that there are always spots that cannot be reached by the paint brush, and it is there that the fumes are found to react most injuriously.

[illegible]

Many forms of the wooden flue suggest themselves. Of these I conclude that the cheapest per unit of capacity would have the A-section, like the steep roof of a house. This would be easy to construct, requiring little carpenter work; would shed the rain; and if made broad at the base would resist the winds very well. The earth would form the bottom, while the side boards would meet at the top. The outside would be battened. The principal objections would be the propensity of lumber to become warped by the sun's heat, producing leaks, and the inefficiency of the triangular section as compared with the circular form, which would be preferred in case that metal flues were adopted. The remote corners of the triangle would be almost useless as a passageway for the smoke, in which interfering currents would doubtless be set up. I estimated that a conduit of this description having a cross section of 24 sq.ft. could be built at the place designated for $11,000 per mile. It is hardly necessary to say that the application of forced draft would be essential to the success of the undertaking in any case, whatever form of conduit were adopted, for it would not be possible within the limits of practical expenditure to build a tube so large that natural draft would suffice. On account of the impracticability of admitting hot gases into the wooden duct, and of the cooling effect of a metallic one, the ascensive power of the gases would be very small, while to overcome their friction and to generate a velocity commensurate with the amount to be handled, a considerable power would be necessary. The amount of smoke in this case is nearly 25,000 cu.ft. per minute, reduced to the temperature of 125 deg. F., at which it is supposed they will enter the horizontal part of the flue, being the wooden part in case that material were adopted. Prior to this they will have passed through such a length of sheet-steel dust catchers and flues that their heat will have become largely dissipated and their dust [illegible]

[illegible]

Sturtevant "Monogram" type, in the line at intervals of about a mile, through which the gaseous current will pass, these to be driven by electricity from a parallel line of wire. It would be necessary, of course, to provide means for cleaning the interior of the tube from deposited solids, which would undoubtedly gather, and this would necessitate doors, slides, or other means of getting in, or else some mechanical arrangement to serve the same end and obviate the cost of hand work, which would perhaps be quite an item of expense. I presume it would be good policy to make the tube large enough to admit of the formation of considerable deposits of zinc, antimony, arsenic, lead, etc., or other matters, without seriously diminishing the capacity of the flue. The tube should be duplicated at the lower end, where the fumes tend to precipitate most copiously, so as to admit of one side being cut out and cleaned, while the smoke was passing through the other.

While this style of flue would probably answer the comparatively transient needs of most smelters, there are reasons for preferring other types of construction. Most engineers would prefer a sheet-steel tube of equivalent section, although of greater first cost, on account of its greater durability under these circumstances and of its better mechanical appearance. It seems probable that a cylindrical tube 5 ft. in diameter would be equal in efficiency to a triangular one 8 ft. high by 6 ft. wide at the ground, the former having a sectional area of 24 sq.ft., the latter of 19.63 sq.ft. The 5-ft. tube of No. 8 sheets, I estimated could be provided and set up for $15,000 per mile. I assume that the amount of power necessary to compensate for friction in the cylindrical pipe would be 32 h.p., assuming the correctness of the tables in the Sturtevant publication, "Mechanical Draft," and probably quite as much in the case of the triangular wooden flue.

It would undoubtedly be quite feasible to employ smaller and less expensive sections, but always bearing in mind that a diminished section means increased power of propulsion. I have calculated the power necessary in the case of a 4-ft. cylindrical tube of the same length and find that about 100 h.p. would be needed to overcome friction. A 2-ft. tube would consume for the same purpose nearly 3000 h.p. A limit would therefore be quickly reached in our efforts to reduce the first cost of the conduit by diminishing its size.

Other Considerations

Where the operations of the smelting works are expected to be in a measure permanent, it would be natural to canvass the merits of brickwork and cement concrete as materials for such flues. The expenses in constructing such would no doubt be greater, and so would be the engineering difficulties involved in arranging for their rapid cleaning, inasmuch as they would of necessity be seated upon or buried in the ground, and difficult of access.

There are some situations in this and other countries where some solution of the fume problems is of great and pressing importance. It appears to me that in a situation like that of the Salt Lake plants the solution would be found to lie in the direction which I have herein pointed out. The surrounding mountains would surely furnish convenient eminences to which the smoke might be carried, the interests at stake being, as viewed from the outside, sufficient to render some radical movement advisable, even if it proved very costly. This suggestion is so obvious that I must own that I shall be surprised if it has not been canvassed before by the parties in interest in many smelting works not only in this but in foreign countries. Should I proceed farther in this matter and gain experimental or practical knowledge of its actual workings, it will give me pleasure to communicate them to the readers of the JOURNAL.

By-product Coke for Domestic Fires

In a paper read by Paul Schlicht before the Society of Arts at London, May 8, an earnest plea was made for the use of coke in domestic fires, and particularly for coke made in by-product ovens, by which certain quantities of inflammable gas are left in the fuel, rendering it more flaming than that turned out in the ordinary way. The use of bituminous coal in domestic fires was condemned as being very wasteful, for about 14 times the air necessary to burn the coal was generally sent out of the chimney. This is impregnated with steam and sulphuric acid, as well as with particles of carbon, which produced fog. In addition to this, in the consumption of every ton of coal 100 lb. of coal tar are destroyed; also many valuable constituents useful in the arts and in medicine, besides oils useful for lighting and motor purposes, together with solids that might be employed in road-making. If in place of such form of combustion the coal were treated in the modern by-product oven, there would be, in addition to the products named, about 14 cwt. of coke, suitable for domestic and metallurgical purposes. Flaming coke can be made in the by-product ovens in from four to five hours less time than the low volatile coke required for metallurgical purposes, a certain percentage of hydrogen and hydrocarbons being allowed to remain in the coke.

Precipitating Copper from Butte Mine-water

BY A. C. Brannon.*

Having made note of the recovery of copper by precipitation at Butte, Mont.,

PLANT AT EAST BUTTE FOR RECOVERY OF COPPER.

THE FLUMES AT THE [illegible]

in order to [illegible] Morgan [illegible] the [illegible] and [illegible] it was copper. Morgan undertook the business, but had little success, and died a few months after. [illegible]

[illegible] copper [illegible] Morgan [illegible] copper [illegible]

*Butte, Montana.

time it ate up the pipes through which it was pumped to the surface, wherefore the companies weakened the water by passing it over iron underground. Ledford contested this on the ground that he was to have the entire right of precipitation, and sued the Anaconda company and was awarded a few thousand dollars' damages.

After Ledford's successful venture the companies refused further lease, deciding to do their own precipitating. At the present time nearly all the large companies have two precipitating plants of their own, one underground and one at the surface. In many of the mines drifts [illegible] for the sole purpose of precipitating copper.

means of floors 18 in. apart. These floors are made of 2x4-in. scantlings, placed 3 in. apart, running lengthwise. Tin cans and scrap iron are placed on the several floors. By means of a small motor the copper water is raised to the top of the tower, where it is distributed to fall equally and constantly over the scrap iron. The tin cans and smaller pieces of iron are eaten up in a comparatively short time, but the larger pieces must be scraped or knocked against the walls regularly in order to remove the precipitate. The latter is washed to the bottom and then into the tanks alongside of the towers.

The owners of these plants sell their output to the smelters at 4c. less than the market quotation for copper. The average precipitate runs between 40 and 60 per cent. copper, but J. C. Kemp, who operates [illegible] consisting of six towers between 30 and 50 ft. high. Other prominent operators are W. A. Clark, the Boston & Montana, the East Butte company, John MacGinniss, F. E. Speidel, J. M. Kennedy, Emil Hansen, Fred Rowe, William Kelley and Green & Bryant. Several new towers are being erected at the Gagnon mine.

The Supply of Scrap Iron

One peculiar feature of this work is that the streets and alleys of Butte are entirely free of tin cans. Operators pay $10 a ton for precipitating material, and say they are fortunate to secure it at that price. So scarce is such material becoming that a carload was recently shipped to Butte from Spokane. Men and boys are making a living in all the larger towns of Montana by supplying material for the

TOWER SYSTEM PUMPING PLANT ON THE RIGHT, TANKS IN THE FOREGROUND.

Methods of Precipitation

There are at present two methods of precipitation, viz., the box system and the tower system, the latter being generally conceded to be the more successful; the [illegible] is more thoroughly exposed to the preci-

[illegible] from the old Colorado smelter, often has precipitate as high as 84 per cent. Men working near the long-disused Parrot smelter, by allowing the water to seep through the tailings, have precipitates running close to 70 per cent.

It might be thought that the plants would be compelled to close in the winter time, but not so. The water coming from the mines is quite warm, and the chemical action in precipitation liberates heat. The water has a greater percentage of copper in it during the winter months because there is no surface water, caused by rains, with which to contend. As a matter of fact almost as much copper can be made in winter as in summer.

There are about 50 concerns operating in the Butte district, comprising about 75 towers, besides the numerous box systems. [illegible] plants. Two persons with a team can easily gather a ton a day. A tin can will make its own weight in copper.

As an example of what profit can be made from this work the following may be cited: F. E. Speidel and others constructed a tower plant on the banks of the Silver Bow creek, south of Butte, at a cost of $4000. It paid for itself in eight months. However, all operators are not as fortunate. The expense of operating a tower plant is small, as two men on a shift can care for three towers. Seven hundred tons per month is a conservative estimate of the output of the copper precipitate in the district, to make which costs 8c. per pound.

According to an official report, monazite sand has been discovered in Kangaroo island, which belongs to Australia.

The Electric Furnace in Steel Making and Copper Smelting

By J. Swinburne

Until within the last two or three years the electric furnace was used exclusively for the manufacture of such refractory substances as carbide of calcium, for the treatment of which the temperature at which the ordinary furnace works is too low. Since then, however, the electric furnace, somewhat modified, has been applied not only to the reduction of ores, but also to the production of steel of any desired grade, and of alloys such as those of iron with molybdenum, titanium, chromium, tungsten, vanadium, etc. It is to this class of work that I shall refer in particular.

The question of electric smelting is controlled chiefly by the prime cost of electrical energy. Wherever this can be obtained either by means of water-power or by cheap coal, within reasonable distance of the supplies of raw material, and in a favorable position for the distribution of the finished product, there is a great future for this branch of metallurgy.

Relative Cost of Iron Ore

Assuming that electrical energy can be produced at a cost of 40s. per h.p. year, 1 h.p. for 8760 hours (a cost based upon the use of water-power and which could hardly be equaled if coal be used), the cost of the production of one ton of steel-making pig would be £1 15s. 6d. This figure includes: electrical energy at £2 per h.p. year, lime, electrodes, coke, labor, miscellaneous material, repairs and maintenance, general expenses and sinking fund. It does not include the cost of the ore delivered to the furnace. These figures are taken from trials of about 90 tons. It will therefore be seen that for the reduction of iron ore, the electric furnace can compare favorably with the blast furnace where the conditions mentioned above can be met.

If coal must be used for generating the electric current, using a gas-producer plant of fair size and efficiency, this cost would probably be increased to £2, 7s. 6d. During the trials referred to a number of castings were made, the results of which were excellent. The metal ran fluid and gave sharp solid castings which in every case were soft for machining.

Where a good ore is procurable the advantages of the electric furnace over the blast furnace are obvious, the chief advantage being a [illegible] which can be obtained except in the [illegible] of large [illegible] of this power at subsidiary points.

which I have patented are each for a distinct [illegible] iron and for converting the pig thus made into steel. The cost of producing [illegible] £6 3s. This represents a good grade of crucible steel selling at, say, £14 per ton.

The cost of producing 1 ton of steel from the pig produced in the electric furnace and charging the pig according to the estimate of £1 15s. 6d. per ton, and also including, coal, electrodes, electrical energy, labor, molds, tools and sundries, repairs, depreciation and sinking fund, would be £3 6s. per ton.

Every grade of steel can be produced. Mr. Harbord, late of Cooper's Hill College, London, and the metallurgical expert sent out by the Canadian government to investigate the question of electric smelting in America and on the Continent, concludes his report by saying: "Steel equal in all respects to the best high-class Sheffield crucible steel can be produced in the electric furnace at a cost considerably less than the cost of producing a high class crucible steel in the ordinary way."

Iron sand such as that found in New Zealand and elsewhere has been smelted electrically with success; the steel produced gave the analysis show in the accompanying table:

ANALYSIS OF STEEL MADE FROM IRON SAND IN THE ELECTRIC FURNACE

Carbon	[illegible]
Silicon	[illegible]
Manganese	[illegible]
Sulphur	[illegible]
Phosphorus	[illegible]
Titanium	[illegible]

In addition to the use of the electric furnace in iron and steel smelting, ores of manganese, zinc and copper can also be reduced. A series of experiments was made on two classes of copper ore, one a pyrite containing roughly 7 per cent. copper and 9 per cent. sulphur; the other a low-grade ore from Chile, mixed with manganese and lime. The ores were crushed and the furnace was charged with a hand shovel, all charges being carefully weighed and sampled. The furnace was one having two carbon electrodes. When the charge had been placed, the electrodes were lowered and the current [illegible] electrodes.

ANALYSIS OF [illegible]

Silicon	[illegible]
Iron	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Copper	[illegible]

ANALYSIS OF [illegible]

[illegible]	[illegible]
Alumina	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible] was the usual [illegible] [illegible] of a valuable [illegible] [illegible] [illegible]

cations be used as a mixing vessel for the conversion of the iron into steel in one operation.

The steel or converting furnace is mounted upon trunnions for tilting like an ordinary Bessemer converter, and is not only provided with a mouth for pouring, but also has tapping holes in the side. When the metal is at the lowest point in the furnace hearth it can be tapped. At this stage it is preferable to pouring, it not being an uncommon occurrence for pouring from so low a point to cause a distinct change in the quality of the steel, even though both metal and slag may be quite settled and quiescent prior to pouring. Here again electromagnets are located in immediate line with the electrodes to assist the arc and to maintain a constant temperature during the earlier stages of the work.

The current passes through the positive electrode, through the narrow airspace between the electrode and the slag line, through the slag and molten metal, and returns in a similar manner to the negative electrode. The essential part of this invention lies in the utilizing of the magnetic action in connection with the electric arc, and the regulation of the current is obtained by making the air space deeper or shallower, either by hand

Mining in Argentina

According to a recent British consular report, the prospects in mining for gold, silver, and copper in Catamarca and Rioja are good. The difficulties of transport are being overcome by the construction of railways. The Famatina Copper Company is reported to have 80,000 tons of ore in sight. Mining in Neuquen territory to the west of Bahia Blanca is a new industry. A number of companies have been formed to work the reefs and development is being carried on vigorously with good prospects. The auriferous area is said to be very large, and copper and soft coal are also found. Water power is plentiful. A railway is projected from Bahia Blanca to Chos Malal and thence across the Cordilleras to Antuco. For many years this district has been worked for gold by Chileans by ground sluicing. A 15-stamp battery is being erected, and Hitherto most of the gold produced has

According to *Engineering*, May 10, 1907, the first move of the new Union of German Brass Works, recently formed at Cologne, has been to put up the price for brass considerably, a fact which is being

Legal Status of Canadian Provincial Corporations

By Phillips Thompson

A legal question involving the interests of every company operating under a charter of incorporation issued by any of the Provincial Governments of Canada has arisen in a case now before the Supreme Court at Ottawa. This suit of the Canadian Pacific Railway Company against the Ottawa Fire Insurance Company involves directly the question of provincial rights in the matter of granting incorporations. The more important points to be decided are:

1. Is every charter issued by virtue of provincial legislation to be read subject to a constitutional limitation that it is prohibited to the company to convey on business beyond the limits of the province?

2. Can an insurance company incorporated under a provincial act carry on extra provincial business, i.e. make contracts and insure property outside the province or make contracts within to insure property beyond?

The case is regarded as of such significance that counsel representing the Dominion Government and several of the provinces, are in attendance. In the course of the hearing on June 3, E. L. Newcombe, Deputy Minister of Justice, who appeared for the Dominion Government in answer to a question from the court advanced the contention that a company operating under a provincial charter would be precluded from purchasing its raw material abroad and from selling its finished product either in a foreign country or in another province of the Dominion.

C. Ritchie, representing the province of Ontario, urged that a decision to that effect would practically nullify the whole provincial power of incorporation, as it would be almost impossible for any company to carry on business without for some purposes over-stepping the territorial limits of the province. The purchase of raw material and special machinery, the sale of the manufactured product and the taking of mail orders were instances of common commercial operations, which under the contention put forward on behalf of the plaintiff would involve nearly every provincial company almost daily in some *ultra vires* proceeding. In Ontario alone companies had been incorporated with an aggregate capitalization of over $1,400,000,000, not one in twenty of which could carry on its business exclusively within the limits of the province.

The case naturally excites great interest in mining circles, as the great majority of companies are operating under Ontario charters, which would be rendered practically void if the view of the Dominion Government were sustained. All important companies would in such case have to apply for incorporation to Ottawa, which would entail a loss of from $150,000 to $200,000 per year revenue to the province.

Sulphuric Acid Manufacture in Great Britain

In Great Britain sulphuric acid is made almost entirely from pyrites, imported chiefly from Spain. Brimstone is used less and less every year, and is reserved for the manufacture of acid for very special purposes. Sulphureted hydrogen derived from the waste gases of sulphate of ammonia manufacture has been applied extensively during recent years and is an important source of supply of sulphur. British producers of sulphuric acid complain of the increasing difficulty in obtaining pyrites free from or low in arsenic, and several new plants for de-arsenication have had to be erected. The process now used by the United Alkali Company for removing arsenic produces it as pure arsenious acid, instead of the mixed mud of arsenious sulphide as formerly. It is interesting to note that in the midland counties of England "coal brasses" from the coal mines are used as a surce of sulphur at the sulrphuric-acid works.

The Philipsburg Mines, Mont.

In a recent bulletin of the Geological Survey, it is stated that a production of over $32,000,000 in gold and silver, from which nearly $15,000,000 has been paid in dividends, is the record of two mines located in the Philipsburg quadrangle, Montana, and the total production of the quadrangle is provisionally estimated at $45,000,000 to $50,000,000.

A number of mining camps are located within the district, the most important being Philipsburg, Cable, Georgetown, Combination, Henderson and Flint, and some of these were among the first in Montana to receive the serious attention of quartz prospectors.

The Granite Mountain and Bimetallic mines are about 2½ miles southeast of Philipsburg, on the steep western slope of Granite Mountain, which rises 3,000 ft. above the valley of Flint creek. Although located on the same ore shoot and controlled from the first by nearly the same interests, the mines were worked separately until 1878, when a consolidation was effected, since which time they have been operated as one. More than half of the total mine production of the Philipsburg quadrangle is credited to the Granite mine.

How One Corporation Helped Its Employees

Sociological Department of Colorado Fuel and Iron Company Furnishes Education and Amusement, Incidentally Increasing Production

BY LAWRENCE LEWIS*

advanced liberally from these sources for the erection or enlargement of public school buildings in new districts, and for various improvements in the coal camps. Generous rivalry was encouraged among the people of neighboring camps, as to which should show the greatest efforts to improve and more or less [illegible] too bleak settlements. Every Christmas,

at Old Rouse, Starkville, El Moro, Rockvale and Santa Clara, the first named usually [illegible] by contributions from employees, the others maintained from the first by General Manager Kebler, by President John C. Osgood and by other officials and friends.

"general charge of all matters pertaining

any other matters which should assist in bettering the conditions under which the

*Concordia, Mass.

exclusive of an elaborate cover, with occasional special editions of 36 and even of 48 pages, was established as the organ of the medical and sociological departments. This was found of great assistance in developing *esprit de corps*, and in arousing interest among employees in their work, in bringing the people of the various camps closer together and in stimulating healthful rivalry for the improvement of general living conditions and for making of the camps better places to live in.

Principle of Cooperation

In all this work, Dr. Corwin has discarded purely paternal methods for those of suggestion, awakening of interest and cooperation. No effort has ever been made to force improvements upon indifferent communities. The people are educated up to the point of asking for betterments, and then the department meets the employees at least half way. The principle has been kept constantly in mind that no improvement can be made with any security of ultimate success or per-

were informed by illustrated articles in

sations with the men and their families,

in other camps. But only in those places where the demand seemed most sincere and insistent and the need greatest and where consequently, a considerable measure of success was assured from the first, were new kindergartens established. The same method of suggestion has been followed in all other branches of the work. The employees and their families justly feel that they themselves are largely responsible for almost every improvement.

Branches of the Work

The efforts of the sociological department may be grouped roughly under four heads; educational work; non-sectarian religious work; improvements in general sanitation and housing; and regulation of the sale of liquor and the provision of places of entertainment and amusement to help keep the men out of the saloons.

Educational Work

Although all the betterment work is educational in the broadest sense—an effort to teach the men to help themselves—educational work in the narrower sense may be classified under the following subordinate headings: (a) improvement of the public schools; (b) surgeons' lectures; (c) night schools; (d) reading rooms and reference libraries; (e) circulating art collections; (f) circulating li-

meetings, women's clubs and industrial classes; (i) boys' and girls' clubs; (j)

institutions; (k) domestic science instruction; (l) teachers' houses, serving as models of economy and better taste; (m) normal instruction, especially adapted to qualify teachers for the peculiar needs of this field.

Detailed consideration of these thirteen subdivisions would make a long article. Suffice it here to note, as an example of the expenditures of the company on these "educational" branches of its betterment work, that between 1901 and 1903 the Colorado Fuel and Iron Company erected ten public school buildings in camps at an aggregate cost of $24,056.90, receiving in return warrants of school districts. Of this amount only $1224 had been repaid at the close of 1903 and very little since. Nor did the above

sum include the expense of converting company houses in three camps to the uses of public schools; nor the cost of the elaborate school-house of stone and wood, at Redstone, which Mr. Osgood paid for out of his own pocket; nor the $3900.67 advanced by the company during one year (1902-3) for public school nor teachers' salaries; nor in addition, the salaries of kindergarteners paid by the company; nor the $1,307.00 advanced during the one year, which was but typical of other years, nor of free text-books which are now uniform throughout the camps. All this work has accomplished most gratifying results. But, aside from the improvement of the camp public schools, which are now in a state of high efficiency, perhaps the greatest success

along such educational lines has been achieved with the kindergartens, the circulating library and the reading room.

The Earliest Period

In the early days, the company was, like most corporations, pressed for money to develop what are generally regarded as the essentials, the opening of mines and the building of coke-ovens. Consequently the houses put up at that time were necessarily of the cheapest sort. In most cases of a monotonous "box-car" style of construction with battened walls, without eaves or porches or any ornamentation, they had not the slightest attractiveness except as shelters against the elements. Painted a dull mineral red, these company houses, although sanitary, were so ugly that there was no inducement for the miner to beautify his dooryard, and little around which he could twine associations of "home". In these early days, too, some houses were built upon company ground by the men themselves according to their old-world ideas of sanitation; others were erected by private individuals with the permission of the company, as investments.

Seven or eight years ago, Dr. Corwin made a careful personal inspection of El Moro, to which his attention had been called by the inordinate expense of that camp to the medical department, because of the abnormally high percentage of sickness among the coke-workers living in houses built on company ground by employees and padrones. The superintendent, too, had reported that, although there were surely enough men living in the camp, there was a shortage of coke-oven labor, which had "caused the shortage in production of coke complained of," etc. Dr. Corwin soon got at the underlying cause. In one adobe bunk-house 40x15 ft., the doctor found that 38 Italians, each earning an average of $2 a day, lived in the midst of unspeakable filth and vermin. The roof was leaky and there was but one small window. In a room 10 ft. square, meals were cooked by the padrone and eaten by the men.

When the chief surgeon reported this and other like conditions to the president and Mr. Osgood, they immediately ordered the buildings condemned and torn down and the camp generally cleaned up. The padrone system was no longer permitted to build upon the company's land any sort of dwelling they desired. These had varied from dug-outs and shacks to the poorer sort of adobe or mud huts. The general improvement in health and the lowered death rate at El Moro was so gratifying that the management was encouraged to extend to other camps the work of improving sanitation and replacing unfit structures on company ground with decent dwellings.

Present Conditions

But many disease-breeding structures remained on land adjacent. Indeed, not until early in 1901, when planning eight new towns, was the Osgood-Kebler management able to carry out, untrammeled by other property owners, their own ideas of how coal camps should be built. These new towns, where the company erected all the buildings, were laid out with proper care for general sanitation and drainage, and with regard not only to the comfort of the individual houses but also to the general appearance of the camp. Building has been and is being done by the company, which has put up 895 two-, three-, four-, five-, and six-room frame cottages with protecting porches, and many of these houses are painted white, with green blinds. The houses are rented at $1 a month per room, making a four-room house rent for $4 a month, a five-room house for $5 a month, and so on. Single men's dwellings rent for $10 a month. The reasonableness of these rents can be gathered from the fact that the average for all Colorado Fuel and Iron Company houses and of course many of the very best miners earn as high as, or the interest on the money invested and

flourish across the river in the old settlement of Varros, over which the company has been unable to secure control.

At Redstone, near which place Mr. Osgood has his beautiful mountain home, the erection of houses was put in the hands of an auxiliary corporation, the Redstone Improvement Company. Mr. Osgood also spent a large amount of his own money in making this a model town in all respects, even superior to the more typical new towns like Segundo. "This certainly is a most beautiful camp!" I exclaimed to Superintendent T. M. Gibb of the branch railway and of the coke ovens and czar of Redstone. "Huh? This isn't a *camp*—it's a mountain village!" was his reply. Here five-room dwellings, furnished with baths and complete water connections, rent for $18.50 a month. They are wired for incandescent electric lights, for each of which the tenant pays 35c. a month, provided he wishes to use electricity. [illegible] Redstone is commendably

[illegible] call it from that phase of the question which is most objectionable to them is, of course, the most difficult practical question with which the sociological department has to deal. In an isolated mining camp, on the desert or far up in the hills, the saloon used to be not merely the workingman's only club but also his only place of amusement. Here, sometimes, were pool and billiards, often music and song and always a rendezvous where he could smoke and chat and drink in an atmosphere of a certain sort of good fellowship. The temptation was almost irresistible for the miner—and sometimes even for his wife and children also—to spend in these places an undue proportion not only of his time out of working hours but also of the money that by rights belonged to his wife and children as well as to himself.

It used to be that the superintendents dreaded the approach of holidays and

railroad men in wages; and a loss of more thousands to the company due to delay in shipments of fuel and non-productiveness of hundreds of thousands of dollars of capital invested in mines, coke-ovens and two lines of railroad.

The general demoralization in a camp caused by most of the men and even some of the women and children loitering around saloons and, every so often, going on a drunken debauch was of even more grave ultimate importance than the direct financial loss. It tended to lower the self respect and the social state of an entire community, consequently, to decrease the efficiency of the workmen and to undo the good results accomplished by kindergartens, schools, libraries and sanitary work

Failure of Prohibition

For the regulation of the sale of liquor, several experiments have been tried by the company. Prohibition, as usual everywhere, failed. In some camps where

REDSTONE INN, REDSTONE, COLORADO

SCHOOL AT REDSTONE, ONE OF THE COKING CAMPS

worthy of notice for it has been set aside as a special object lesson and is kept open to public inspection.

The Redstone Improvement Company has erected, also, the very attractive Redstone Inn, which affords not only accommodations for transients but also board and rooms at a reasonable rate for foremen, mechanics, railroad men and other of the better paid employees of the allied companies. This inn is fitted up in rather elaborate style and has its sitting room, its reading room, its card and game

With the improvement in the character [illegible] on the part of the workmen in seeing them properly furnished. Many of the employees have papered the walls of their dwellings, have put curtains as well as

the monthly pay-days which were made occasions by the men, and sometimes by their families also, for grand sprees from which only a part recovered enough to go to work the next day. A typical case was the Fourth of July celebration in 1901 at Coalbasin, followed by a total suspension of work in the coal mine for four or five days until the majority of the 265 men had time to sleep off the effects of four barrels of whiskey, eight kegs of beer and a large quantity of "jugged" and "bottled goods" smuggled into the camp in spite of the utmost vigilance of the company. Closing this mine temporarily compelled the shut-down of the coke-ovens at Redstone, where the Coalbasin coal is reduced to coke; the enforced idleness of 100 coke workers; the suspension of trains on the coal road be- [illegible] road" from Redstone to Carbondale; and even the laying off of men at re- [illegible] used. This meant a loss of thousands of

the company owns all the land, attempts were made to prevent drinking by refusing the saloon an entrance. With the possible exception of the Japanese, however, most of the men regard drinking as an incident of their daily life and consider prohibition or extreme restriction as an unwarranted invasion of their personal liberty. Where prohibition was tried, the result was always the same. Intoxicants were shipped into the camp in spite of the utmost efforts of the company, and were sold secretly in dwellings, in the rear of stores or bunk-houses, at "blind-pigs", or from "wet bread wagons". Periodically, employees went off on sprees to the nearest saloon town. Drinking became more closely associated with lower forms of vice; while drunkenness, of the aggravated sort, often as a result of bravado, was frequently more persistent than where saloons were allowed to run.

In view of the failure of prohibition, the company has tried several experiments for the regulation of the sale of [illegible]

club; and the soft-drinks club.

strictly responsible for the order and sobriety of his place. The "no-treating rule" is not enforced; but decency and a few cases of [illegible] the manager's position. The regulated saloon has been found preferable to the unregulated saloon; but experience has shown it is not so good as the restricted club.

The [illegible] Osgood personally is due the credit for two practical tests of the restricted club which embodies measures more closely restricted than those in force in the regulated saloon yet in no sense prohibitive. Mr. Osgood's theory is that the average workman, if allowed to buy intoxicants under well advised restrictions, in a place and under [illegible]

limit; billiards, twenty-five cents a cue, pool, ten cents a cue.

[illegible] the sale of liquor in the camp, no treating, [illegible] preaching intoxication. [illegible] be paid for at the time they are incurred. Rules embodying these and minor regulations are printed in English, Italian and German and are posted in prominent [illegible]

supporting since early in its history. Not since the club was well started has the mine been closed down a single day on account of "mornings after" pay days or "celebrations"; nor have there been any cases of chronic drunkenness such as were not uncommon before the club was opened, and when Coalbasin was nominally a prohibition town.

The Redstone Club

ITALIAN QUARTER, REDSTONE.

[illegible] THE MINES IN [illegible]

sociated with vice, will not abuse his privileges.

The Coalbasin Club

After the costly celebration of July 4, 1901, Mr. Osgood risked several thousand dollars of his own money in an experiment of building a club-house by which he expected to convert Coalbasin from a prohibition to a temperance town. On June 22, 1902, the Coalbasin Club was organized among the miners. It is managed by a board of seven directors elected for one year; it has a membership which varies between 100 and 200; and the monthly dues are 50 cents. The club-house is a one story frame building of four rooms and pleasant verandah. There is a bar-room, with a billiard and pool room, a card and game room and a reading room furnished with magazines and periodicals, adjoining. Profane or vulgar language is prohibited.

Playing games for money in the club [illegible] stakes to exceed the following limits: Poker, penny ante and twenty-five cent

results of the Coalbasin Club that he laid out still more of his money in erecting a larger and more elaborate clubhouse at Redstone. This is as well appointed as any club building in Colorado, outside of Denver, Colorado Springs and Pueblo. It is two and one-half stories high over a substantial basement. The commodious lounging room, in which is the bar, is fitted with big leather cushioned armchairs, settees and tables for serving refreshments. Steam heat is supplied, but [illegible] room adds cheer and comfort on cool evenings.

This club also has a monopoly of liquor dealing and the "no treating" rule pre- [illegible] pay an initiation [illegible] membership has been about ninety.

ter social atmosphere could be found in any industrial community than in this delightful mountain village.

The Saratoga Club

[illegible] saloon problem, the soft-drinks club [illegible] one of the company houses has been [illegible] billiard table, another is furnished with [illegible]

providing sources of amusement to compete with those found in the saloons, where there is the ever present temptation to drink and to drink too much, has passed the experimental stage, in fact it has always been highly successful.

Aside from the social features of the clubs at Redstone and Coalbasin, are the amusement halls which the company has erected at Starkville and Sunrise. In each of the new public school buildings one end of the kindergarten room is fitted up with a stage and scenery. Here illustrated lectures, dramatic entertainments, meetings and dances are often held of evenings. The reading rooms and circulating libraries, containing books in Italian as well as English, have already been referred to. Fostered by the sociological department four excellent brass bands have flourished in the camps besides numerous other instrumental and many vocal organizations.

All this betterment work is now costing the Colorado Fuel and Iron Company between $20,000 and $30,000 annually. At the beginning, of course, it cost far more each year. Except in the cases specified to the contrary, it is all absolutely free to the men. A staff of over 20 persons is regularly employed by the department.

Doubtless the work of the medical and sociological departments has its purely commercial side; doubtless the shrewd business men in control realize the great economic truth that better sanitary and social conditions for employees and their families make for better work and heavier tonnage. But it would be a mistake to regard this as the sole or even the primary motive of this company which is striving to give its men a square deal to help them to help themselves to better [illegible]

Australian Mining Notes

[illegible]

The returns for the first quarter of the year 1907 show that the Broken Hill mines have contributed a considerably augmented output, and the value of the [illegible] for the first three months of 1906. Some anxiety is felt respecting the prosecution of future operations owing to the threat[illegible] some months past there has been no rainfall to replenish the reservoir on which the town and the mines depend. The number of miners employed in and about [illegible] installed 9600, and it was confidently anticipated that this number would be augmented [illegible] cessation or limitation of operations be[illegible]

[illegible] reports rainfall can relieve the situation. The necessity of providing an independent water supply has been brought home to the several companies, and united action to this end is to be immediately taken.

The lode at the 1100- and 1200-ft. levels in the Proprietary mine is opening up satisfactorily. The ore mined during the past four weeks totaled 41,596 tons, and the output could be considerably increased.

Another creep has occurred at Block 10 mine, between the 400-ft. and 600-ft. levels, which has caused the temporary suspension of all work in the affected area, and the confining of operations to the lower levels. The directors of Block 14 mine have decided to pursue a policy of development, and the main shaft is to be carried down to 800 ft., and two additional levels opened up.

Tin

The drifts which are being worked by the Briseis company, in Tasmania, are yielding satisfactorily, and during the past month 105¼ tons of tin oxide were recovered. At the Mount Bischoff mine some rich ore is reported to have been discovered in the Wheal Bischoff section, which has had a brightening influence on operations. The value of the tin-ore won in New South Wales during the first quarter of this year is £143,000. The yield, as hitherto, has been chiefly contributed by the dredges working in the Tingha-Inverell districts, and handsome profits are being earned. There is every promise of the Stannery Hills Company ranking shortly among the foremost tin producers [illegible]

Zinc

The Broken Hill Proprietary Company using the Delprat process, is maintaining a fair output of zinc concentrate, but only slight progress is being made in the matter of zinc distillation. In fact, work is in abeyance at present, pending the tempering of further batches of retorts, as those previously made proved unsatisfactory.

Copper

The benefit of the increased price of copper is likely to be fully shown in the result of the operations of the Mount Lyell Company, Tasmania, for the half-year just closing, as, although the material handled has been of a much lower grade, it is expected that an increase of £15,000 will be shown on the net profit earned during the previous term, and which amounted to £230,000. These figures are based on an approximate output for the half-year of 3800 tons of copper, and, considering that the ore treated only averaged 2.25 per cent. copper, the results are exceptionally gratifying.

In the State of Queensland the copper-mining industry continues to make great headway, the output for the first three months of the year being estimated at 2602 tons, valued at £279,694. The largest contributor was the Mount Morgan Company, and during the month of March, 10,478 tons of ore were treated at the copper reduction works, producing 345 tons of copper and 4362 oz. of gold.

A company with a working capital of £175,000, known as the Great Fitzroy Gold and Copper Mines, Limited, has been formed to work a big property north of Rockhampton, formerly known as the Mount Chalmers Gold Mine, but which has now developed into a copper proposition. The directors of the company are W. L. Bailleu, W. J. Loring, Phillip Charley and G. P. Doolette. It is reported that the value of the ore in sight has been estimated at £1,000,000, and active operations to develop the orebodies are at once to be entered on.

It is represented that negotiations are in progress for the purchase of the Wallaroo and Moonta mines, the largest and most profitable copper-producing properties in Australia.

In New South Wales a suspension of operations was threatened by a strike of the miners for an increase in wages and improved working conditions, but wiser counsels prevailed and an amicable settlement was arrived at. The value of the copper produced in this State during the first quarter of the year is £235,000.

Gold

The gold yield of the four principal States of Australia for the first four months of this year compares unfavorably with the production for the same period in 1906, as shown in the accompanying table:

GOLD PRODUCTION OF AUSTRALIA.

	1906.	1907.	Changes.
	Oz. Fine.	Oz. Fine.	Oz. Fine.
Western Australia...	604,581	555,242	D. 49,339
Victoria	247,003	215,579	D. 31,424
Queensland	153,748	150,936	D. 8,632
New South Wales	109,522	83,885	D. 16,847
Total	1,114,854	1,005,642	D. 106,212

The decline noticeable during 1906 continues, and under present conditions there are small prospects of any improvement. The activity displayed in mining for the industrial metals has caused the gold mining industry to be greatly neglected. Comparatively little prospecting is being carried out, the demand for competent miners at high wages having attracted the prospectors to the established metalliferous mines. Consequently, no new gold mines are coming to the front, and as the ore which is now being won on the principal fields is of much lower grade, the outlook, so far as this branch of the industry is concerned, is not a bright one.

Tellurium is an element almost without use in the arts; small amounts are used in medicine, but the output of one of our copper refineries for one day would stock a large chemical supply house with enough tellurium to last a year.

A Concrete Shaft Sinking Through Quicksand

[illegible] the cylindrical concrete shaft known as the Bangor shaft is being sunk by the Foundation Company for New York for Pickands, Mather & Co. at Biwabik, Minn., on the Mesabi range, has reached a depth of 110 ft. and the work has progressed rapidly and without any serious delays. This shaft is unique and presents a new and successful method of sinking through quicksand which reduces the chances of loss or delay to a minimum. Briefly, the method [illegible] to which are attached an inside and an outside form, between which concrete is allowed to set. The diameter of the inner form is, at the Bangor shaft, 24 ft. 6 in. while that of the outer form is 22 ft. 6 in. This permits the formation of a hollow cylinder of concrete 4 ft. thick.

Inside of the two forms is placed a hollow steel cylinder, with flanges at top and bottom, about 6 ft. in diameter and 8 ft. high. Two successive sections are joined by bolting through the flanges. Through this inside cylinder all the sand is brought up in dredges, of either the clam-shell or orange-peel types, no attempt being made to elevate the water, which remains in the shaft all through the sinking.

When the clam-shell bucket has removed sufficient sand the shoe is allowed to drop and 8 ft. of concrete is poured between the two forms. Reinforcing rods 1-in. square are first placed all around and near the outer form, every fourth rod being staggered; these rods are made of special high-carbon steel and are bent at right angles, 6 in. from the ends, to allow them to hook on to the next set of rods. A steel band every 4 ft. gives added strength to the reinforcement.

The dredging then continues, the sand coming up the center cylinder and the water remaining behind in the shaft, until the excavation permits another drop of about 8 ft., when two more sets are placed and concrete added. In this way the concrete shaft is sunk deeper and deeper through the sand, and with each drop new sections of the form and of the steel cylinder are added.

[illegible]

There is an impression among those who have heard of the work but have never seen it, that the shaft is being sunk entirely by the aid of compressed air. This is not true. Should the sand become too compact, or should large boulders be encountered which could not be handled by the clam-shell bucket, it would be necessary to remove the water from the inside cylinder and send men down to break the ground or work the [illegible] to the steel sinking cylinder and compressed air is turned on. This expels the water from the cylinder on the principle of the laboratory wash-bottle, the outward pressure of air preventing the inward flow of the water. When the ground [illegible] lowered through the air-lock and the [illegible] doors takes place. When the ground is again suitable for simple excavation the air-lock is removed. When the ledge is reached, at a probable depth of 120 ft. air will be required to anchor the shaft securely in place.

[illegible]

The Foundation Company started sinking the shaft [illegible] and expects to strike the ledge with only 10 ft. more of sinking, probably in July 1907. Recently the Syracuse shaft, adjoining the Bangor, was turned over to Pickands-Mather & Co., after having been completed by the Foundation Company.

In sinking shafts through quicksand the principles used in river and harbor pier construction have been applied, and no attempt was made to remove water or lower the water level by pumps. When complete, the shaft will consist of a hollow cylinder of concrete with walls 4 ft. thick, impervious to water, and containing two skip-ways, a ladder compartment and ample room for water and air pipes. The work has been done on contract and it is stipulated that the shaft must be perfect or the contract is void. Complete [illegible] has been finished.

Liquid Air as an Explosive

A few notes on the use of liquid air as an explosive are given in the *Montan-Zeitung* (May 15, 1907). The substance was first used only in combination with others. It is now used alone, its explosive power depending upon its property of turning suddenly into vapor at an elevated temperature. If the vessel in which the liquid air is contained is sufficiently [illegible] necessary to place the cartridge in place in the [illegible] culated so that the proper [illegible] by gun-cotton. The explosive must [illegible] the cartridge [illegible] the [illegible] of the explosive must be used in the [illegible] and [illegible].

Placer Gold on Snake River

[illegible] the shining colors of gold flakes from the [illegible] Claims have been located and staked out, [illegible] hold them.

In the summer of 1906, a Geological [illegible] gold [illegible] a preliminary report on the country has been prepared by Alfred H. Brooks. The [illegible] Snake [illegible] [illegible] or a [illegible] [illegible] [illegible]

Disposal of Slag from Smelting Works

By Herbert Lang*

One of the best planned and best conducted smelting plants that I have ever seen is that of the Compagnie du Boleo, at Santa Rosalia, in Lower California. It is a copper smelter, and has several very interesting and advanced features. I was much interested and at the same time a little chagrined to notice in use at that works some improvements that I had fondly supposed were of my own invention, and others that I had had some time in mind, and was about to install at a certain works. But I desire to speak more particularly of the method of utilizing the slag which falls from the smelting. This is used in the construction of the large breakwater that surrounds the anchorage and forms the harbor of Santa Rosalia—a harbor said to be the best and almost the only one on the Gulf coast north of La Paz.

The Breakwater of Santa Rosalia

The breakwater is in the form of the letter L, and extends around the north and east sides, leaving an entrance at the south. As many as four or five deep-water ships find room inside, as well as the miscellaneous flatboats, lighters, steam tugs, dredgers, and the numerous paraphernalia which the exigencies of the work have collected there.

The slag is drawn first into large tanks fixed upon flat cars running upon the narrow-gage railway which extends from the mines to the smelter, and from the latter to and over the breakwater, which serves as a wharf. Figs. 2 and 3 show sufficiently the mechanism in question, while Fig. 1 gives some impression of the harbor. The tank, when filled with hot slag, is drawn by a locomotive crane to a convenient point, where its contents are tapped out into molds, and cast in masses which are then added to the work already completed. The method of casting is not by any means what it might be, as will be seen. Rough cavities are scooped in the dirt alongside the track, in which a staple or hook of [illegible] tank, for anything will answer) is placed, at such a hight that it will project above the surface, and the tank is tapped, and sufficient slag allowed to flow out to fill the cavity to the requisite hight, when the car is pushed forward to the next one, mold or cavity, and so on. When the rough, shapeless masses have cooled and solidified, the crane lets down its block [illegible] the projecting hook or staple in the cake, and lifting it from [illegible] to the end of the breakwater and places it in position there, which it is enabled to do by reason of the very long boom. The breakwater built up thus is not a very strong structure, the masses not fitting closely, and portions have been washed away bodily in the fierce storms to which the region is frequently subjected. It is aimed to cement the masses together by tapping fluid slag into the work as it proceeds, but the brittleness engendered by the necessarily rapid cooling of the cementing slag renders this more or less abortive.

Suggested Improvements

This method might, I should think, be improved upon by using more care in casting the blocks, which should approach the rectangular form if they are to be of any great use. I dislike to appear in the attitude of a critic of a work which is in the hands of persons whose skill and ingenuity are clearly of the first order; and there can be no question as to the usefulness of the great structure that they have reared, by what seem to be crude, very crude, methods. But there is an opportunity for progress in even so simple an art as the casting of slag cakes. Their handling of the slag in such copious quantities proves that they appreciate the essential conditions. Now if they will cast it in prismatic blocks, of a size that can be handled by the cranes, it will advance the art another step. It would mark a still further advance on the art if the blocks were to be cast *in situ*, which would allow them to be made of any size, even of hundreds of tons in weight, which would be immovable, and impregnable to wave action. It might reasonably be expected that the amount of material necessary for the work would then be much decreased, as compared with that necessary to the hit-or-miss method now in use, where mere bulk is made to serve the purpose, which is merely to resist the onslaught of the seas.

FIG. 1. BOLEO WORKS, SANTA ROSALIA

Use of Slag Blocks

In a communication on the subject of the lay-out of smelting works, published in the Journal of March 23, 1907, I referred incidentally to the use of slag blocks, and mentioned that I had evolved a plan to use them in filling in the worked-out stopes of a certain mine. As I had in previous issues described my method of annealing and toughening the blocks by prolonged exposure to a slowly decreasing temperature, which the more attentive readers of the Journal will recognize as my process for utilizing the heat of molten slag, I did not think it necessary to enter into explanations as to how this was to be accomplished, nor what were the results to be expected. Two gentlemen have offered criticisms of my proposal as to such use of the blocks. One remarks that the slag will prove too brittle; the other that the roads will be too rough to haul it over. The answer to these criticisms is simple. There are methods of removing the brittleness, while in the case in hand I have constructed a standard-gage railway to connect the furnaces with the mine chiefly for the purpose of delivering the blocks at the pit mouth. What more can be desired?

In the *Zentralblatt für Eisenhüttenwesen*, Vol. II, No. 3, a description is given of the iron-ore deposits at Kiirunavaara and Luossavaara, Sweden. At the former locality the ore, containing 50 to 70 per cent. of iron and 0.05 to 3 per cent. of phosphorus, occurs at the surface. The chief impurity is apatite. The amount of ore available is estimated at 215,000,000 tons. At Luossavaara the ore does not lie open at the surface, but is, as a rule, richer in iron (67 to 71 per cent.) and poorer in phosphorus. The amount available is estimated at about 18,000,000 tons.—*Min. Journ.*, May 4, 1907.

FIG. 2. HANDLING [illegible] SANTA ROSALIA, MEXICO.

FIG. 3. HANDLING [illegible] SANTA ROSALIA, MEXICO.

Heat Production and the Constituents of Coal

The Varying Proportions of Combustible Elements Present and How They Affect the Heat Value of the Fuel

BY S. W. PARR*

When a chemical analysis of coal is made we may assume the purpose to be twofold: first, to indicate what proportion is fuel as distinct from that part which will not burn; second, to afford some information as to the behavior of the material when brought into service. Two topics are therefore suggested as being of fundamental importance in connection with coal analysis: first, fuel units, and, second, fuel ratios.

Fuel Units

In the ordinary chemical analysis of coal, determinations are made of the ash and water. These are obviously non-combustible, and since the purchaser is supposed to be buying fuel, he is interested to know how much inert material he is obliged to pay for in the mixture. Similarly, the engineer is interested to know the evaporative efficiency of his steam generators. If the amount of ash and water were constant in all coals, he would probably base his estimate on a pound of coal as the unit; but the water and ash vary widely. Their combined amount may be anywhere from 5 to 35 per cent; hence, these variables, at least, must be eliminated if we would arrive at any common basis of comparison. The most natural fuel unit, therefore, to suggest itself is that portion which remains after deducting the ash and water. This is referred to as "fuel" by the engineer. Others have suggested the term "pure coal." Neither expression is satisfactory, though less objection attaches to the latter, as may appear later.

Combustible Constituents

The constituents of coal which directly contribute to the production of heat are carbon and hydrogen. Sulphur adds a small increment, but ordinarily only a fraction of a per cent., and since it is foreign to the coal proper, it is not now enumerated with the true fuel constit-

Let us suppose that the carbon and hydrogen may be readily determined and as easily available as the factors for ash and water; what advantage would there be, and what use would likely be made of them? The first suggestion that presents itself is the possibility of establishing on this basis a fuel unit which would be fairly uniform in value and comparable with itself. This cannot be done if we take as the fuel unit the "ash and water free" portion of the coal.

A concrete illustration of this point may be made as follows: A semi-bituminous coal of the Pocahontas variety, for example, may have 85 per cent. of "combustible," as that term is ordinarily used; that is, "ash and water free." A coal of the true bituminous sort may also have 85 per cent. of "combustible," but the material is not the same in both cases, and indeed there is little relationship in the matter of heat value. For example, in the first case, the carbon and hydrogen, the real fuel constituents, may amount to 80 per cent. of the total coal.

In the other type, there is associated with the "ash and water free" portion a relatively large amount of non-combustible material, so that as a result we may have in this case only 65 per cent. of the coal present as carbon and hydrogen, and hence available for heat production. These latter factors, therefore, of 80 per cent. and 65 per cent., if used to indicate the fuel units, would more nearly express the relative value of these coals. If we go one step further and take their reciprocals, we shall have 125 and 153 respectively. These figures represent in each case the number of pounds of actual fuel of the unit type above described. A term has been suggested for these numbers, that of "gross coal index."[1] It has the advantage of being based on a common unit and hence expresses always a readily interpreted value.

The Gross Coal Index

As illustrating the use of such a factor, we may tabulate a few of the results from the United States Government Coal Testing Plant, Bull. No. 261, as in Table No. 1.

Comparison columns have been added, the first showing the amount of coal needed in each case to make 100 lb. on the basis of the unit ordinarily described as "ash and water free." According to this column, coal No. 1 is very nearly equal in value to No. 2, and similarly coals Nos. 4 and 5 are nearly equivalent; whereas, according to the carbon-hydrogen basis, these samples are rather widely separated as to their true values.

TABLE NO. 1.

No.	Coal.		Ash. Per Cent.	Moisture. Per Cent.	Gross Coal to Make 100 lb. of "Ash and Water Free."	Gross Coal to Make 100 lb. of Actual Combustibles; (C + H).	Error per 100 lb. of Actual Combustible. Per Cent.
1.	W. Va.	No. 10.....	4.63	0.5	105	110	5
2.	Ky.	No. 1.....	4.44	1.92	106	120	14
3.	Ala.	No. 1.. ..	12.64	1.55	116	130	24
4.	Kan.	No. 2.. ..	18.27	2.63	126	136	10
5.	In.	No. 1.....	16.52	5.21	127	142	15
6.	Ill.	No. 5.....	19.19	6.16	132	154	22
7.	Mo.	No. 3.....	23.30	5.51	140	162	22
8.	N. Dak.	No. 1.....	14.85	13.42	138	175	37
9.	Tex. Lig.	No. 1.....	14.85	13.40	139	180	41

per cent., while the average of 50 West Virginia, Pennsylvania, and Ohio coals shows 3.85 per cent.; so that in the case cited above, the semi-bituminous fuel unit of 80 per cent. would be made up of approximately 76.15 per cent. carbon and 3.85 per cent. hydrogen, and the bituminous unit of 60 per cent. would consist of 61.25 per cent. carbon, and 3.75 per cent. hydrogen.

These figures are somewhat misleading, it is true, in that they seem to indicate a smaller variation than really exists. In the Illinois samples, for example, the hydrogen constitutes approximately 6 per cent. of the absolute fuel, while in the eastern coals it amounts to 5 per cent. This gives a small advantage in heat value per unit of fuel in the case of western and other coals high in volatile matter, because the heat value of hydrogen is approximately 4¼ times that of carbon. But this feature is more than offset by the greater difficulty attending the combustion of coals high in ash, and with combustible matter so largely in the volatile form. At any rate, the error is in the right direc-

tion in that its tendency is to give a more nearly accurate relation of potential values, while the very opposite is true of the unit designated as "ash and water free."

Concerning the "gross coal index," therefore, which is only a concrete form of expression for the unit we are advocating, it is a factor which, if established, would convey to the every-day user of coal some intelligent idea of relative values.

Methods for Determination

It has been said above that the fuel constituents are essentially the carbon and hydrogen of coal. It is in place, therefore, to consider methods for their determination to see if they may be made available for use as a basis for coal data, or

Fig. 1

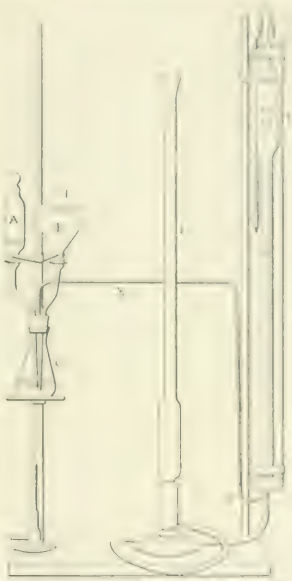


Fig. 2. Apparatus for Total Carbon Determination

bustion of coal by use of sodium peroxide as carried out in the Parr calorimeter brings all the carbon of the coal into the form of carbon dioxide joined with the chemical employed, as sodium carbonate. The principal part of the apparatus for effecting this reaction is shown in Fig. 1.

It consists of a closed chamber in which the ingredients are thoroughly mixed by shaking, after which, ignition is brought about by dropping a short piece of red-hot wire into the charge, or by means of the electric current, as may be preferred. So much of the description of the calorimeter is necessary for a proper understanding of the method for arriving at the amount of carbon present. The calorimeter bomb, it will be thus seen, lends itself readily to the purpose of carrying the

After obtaining the carbon, as sodium carbonate, it is transferred to any apparatus for liberating and measuring carbon dioxide gas, a very convenient form for which is shown in Fig. 2.

The fused material is put into the flask *C* and acid from *A* is admitted; the volume of gas liberated is measured in the jacketed pipette *P*, and at the same time note must be taken of the temperature and barometric pressure. After reading the volume, the gas is discharged into some form of absorption pipette having the usual KOH solution, and after completion of the extraction of CO_2, the residual gas is returned for reading under exactly the same conditions as to temperature and

further correcting for such carbonate as may be in the reagents employed, the weight of the carbon is directly deduced. It would seem from this brief description that by a comparatively simple process we may arrive at the most important of the two fuel constituents.

Available Hydrogen

Fig. 3. Calorimeter Thermometer

ing and plotting a number of such points, we get the curve shown in Fig. 3.

It will now be in order to test the value of such a curve by means of data that have not entered into its location. Such data we may find in the Second Preliminary Bulletin[1] of the United States Fuel Testing Plant at St. Louis. Application of the curve to the coal there analyzed shows an even greater concordance for the hydrogen so deduced than for that constituent as determined by the method of ultimate analysis, comparison being made in each case with the hydrogen required together with the total carbon (and sulphur) to yield the indicated calories as observed by means of the Mahler calorimeter.

In the chart herewith, Fig. 4, the horizontal straight line represents the standard of comparison, while the broken line shows variations above or below in tenths of a per cent. as derived by means of the curve. The continuous line shows the same values as derived from ultimate analysis, and the table following summarizes the variations in a form for convenient reference.

TABLE NO. 2.

	Available Hydrogen.	
	From Curve.	From Ultimate Analysis.
Total plus error	26.0	4.0
Total minus error	69.0	142.0
Highest plus error	5.5	1.3
Lowest minus error	5.5	9.5
Average per sample of all errors	1.4	2.1

From this comparison of results it would appear that the extreme of error by use of the curve is much within that resulting from the ultimate analysis, and that on the average the error represented by the latter is 50 per cent. greater than the average error represented by the curve method.

These considerations indicate that the determination of the two prime fuel constituents of coal may be readily available. The only possible fuel constituent remaining is sulphur. It is not a part of the coal proper and does not enter into the case as above considered. It has a small fuel value, but a large influence in its relation to other constituents; hence, a brief reference to its determination should be made.

SULPHUR

If an analysis be made of the sulphur in the ash from a boiler grate, it will be found ordinarily to be of such small amount as to indicate that the original sulphur content of the coal has been very largely utilized as fuel. In the combustion of coal for calorimetric measurement by use of sodium peroxide, as we have seen above in the case of carbon which is all brought into the form of sodium carbonate, similarly in the case of sulphur, its final state after combustion is that of sodium sulphate. From this condition, it may be readily precipitated as barium sulphate and determined gravimetrically, or this precipitate may be made to show directly the amount of sulphur by means of some form of turbidimeter.

In the apparatus shown in Fig. 5, the graduated tube indicates in millimeters the depth of the turbid liquid through which may be seen a light of constant power. This graduated tube has a clear lens bottom which dips below the surface of the liquid in the flat-bottomed cup placed in the dark chamber below the tube. Light from the candle is admitted through a ¼-in opening which thus serves as a diaphragm to cut out the reflected rays. In this process the sodium peroxide fusion is dissolved, made slightly acid, and an aliquot part shaken in a flask with one or two good sized crystals of barium chloride. The content of sulphur is read off at once by means of the photometer.

ACTUAL FUEL UNITS

But while the sulphur may be thus con-

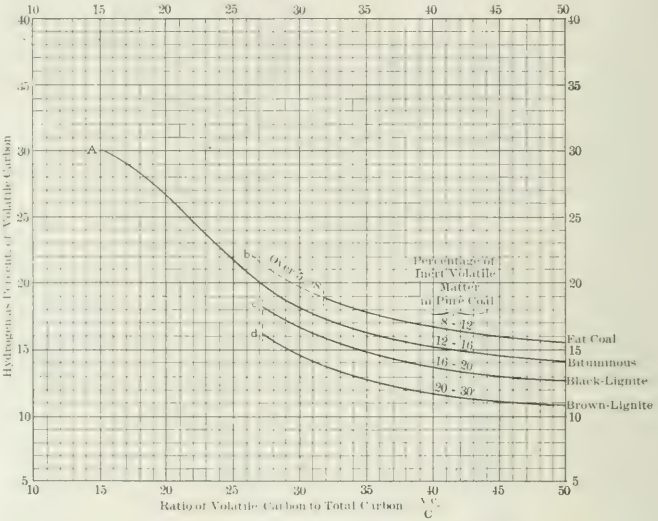


FIG. 3. CURVE FOR INDICATING AVAILABLE HYDROGEN

TABLE NO. 3.

	Ash. (Iron as Fe)	Moisture	Inert Vol. Matter.	Total Non-Combustible.	Sulphur.	Total Carbon.	Available Hydrogen.	C + 8 H + 8 S.	Gross Coal Index.
	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
1 Ala. 1	12.47	1.55	9.29	23.90	0.73	72.16	3.90	76.24	131.1
2 Ala. 2	12.17	2.58	11.21	26.98	1.02	69.24	3.78	73.27	136.4
3 Ark. 1	12.45	1.17	6.05	19.92	1.27	75.68	3.40	79.39	125.9
4 Ark. 2	8.65	0.74	5.18	16.47	1.90	80.03	3.50	84.00	119.4
5 Ark. 3	11.32	0.80	6.38	19.80	1.30	76.37	3.83	80.52	124.1
6 Col. 1	6.16	13.49	15.59	35.82	0.58	61.13	3.05	64.32	155.4
7 Ill. 1	12.16	6.28	11.78	34.47	4.25	62.01	3.52	66.59	150.1
8 Ill. 2	22.57	5.41	10.73	42.91	4.30	54.06	3.03	58.16	171.9
9 Ill. 3	10.93	5.86	10.35	29.01	1.77	67.30	3.69	71.43	139.9
10 Ill. 4	11.37	11.40	10.78	34.99	1.34	61.79	3.32	65.46	152.7
11 Ill. 5	17.78	5.16	12.12	38.82	3.76	58.02	3.16	62.12	160.9
12 Ill. 6	14.08	5.14	13.53	36.14	4.45	60.51	3.30	64.92	154.0
13 Ind. 1	12.85	8.66	10.26	34.35	2.58	62.20	3.44	66.28	150.8
14 Ind. 2	11.80	6.24	10.89	33.53	4.60	62.97	3.50	67.62	147.8
15 I. T. 1	9.63	1.87	11.90	27.39	1.99	69.85	3.76	74.10	134.9
16 I. T. 2	10.75	1.70	10.60	24.61	1.56	71.49	3.90	75.78	131.9
17 Ia. 1	11.57	5.21	9.84	34.82	5.20	61.80	3.38	66.48	150.4
18 Ia. 2	15.04	4.25	11.84	36.33	5.20	60.36	3.31	64.97	153.9
19 Kan. 1	11.52	3.74	8.50	28.10	4.84	68.22	3.68	72.98	137.0
20 Kan. 2	15.87	2.23	8.67	33.17	6.40	63.14	3.69	68.43	146.1

[1] U. S. Geological Survey. Fuel Testing Plant, St. Louis, Mo.

is approximately but one fourth that of carbon and but one seventeenth that of hydrogen. Its effect, therefore, as fuel would be given its fair proportionate valuation if it were transferred to a carbon basis by dividing the percentage content in each case by four.

The table below, which has been made up from analytical data contained in Bulletin No. 290 of the Fuel Testing Plant of the United States Geological Survey, is presented to illustrate the results as above outlined and to assemble them in such manner as to give the information in available form for the user of coal.

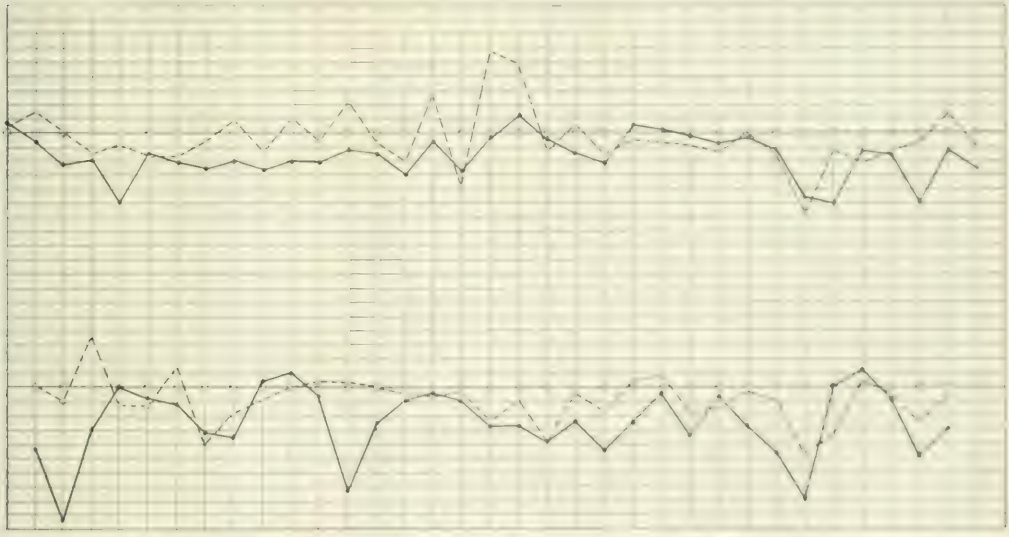
Pure Coal

While we have been arguing for a unit which would have value from a fuel standpoint, we should not leave the discussion of fuel units without further reference to pure coal. From what has already been said regarding the low fuel value of sulphur, it is manifestly unfair to compare coals on this basis which have widely varying sulphur constituents. This may be more clearly demonstrated by the following illustration: A certain Indiana coal has 7.55 per cent. of sulphur. The same coal washed has 2.93 per cent. When calculated to "pure coal," that is, to "ash and water free," the natural coal shows 14,170 B.t.u., while the washed part shows 14,478 B.t.u.

Evidently the standard of "purity" varies even though the samples are the same, the washed portion being simply taken from the main lot. As a matter of fact, wherever the pure-coal basis is made use of, it should exclude not only ash and water but pyrite as well. In the illustration above given, if the two analyses be calculated to such basis and the pyrite excluded with the ash and water, the heat value for each case is identical, viz., 15,050 B.t.u. This extreme case of treatment is unusual, but the illustration is not overdrawn. It is taken from the table given herein prepared by W. F. Wyer[illegible] and the calculations and the remarks [illegible]

TABLE No. [illegible]

No.	Sample	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



[illegible] Coal. [illegible] Coke. [illegible]

FIG. 4. COMPARISON OF VALUES FOR ILLINOIS BITUMENS

Calculated from Report, Coal Testing Plant, St. Louis, 1905.

The calculation for this correction is based on the fact that iron passes on burning to ferric oxide loses in weight to the extent of five-eighths of the amount of

[illegible] the matter by reason of some work done on samples from the same mines, but covering a wide range as to sulphur content by reason of the washing or floating [illegible]

[illegible] rection for this ingredient cannot be [illegible]

[illegible]

[illegible]

[illegible]

[illegible] the table, which are grouped in pairs, it is evident that no such use of the pure-coal idea could be made without introducing also the correction for sulphur. Other disturbing elements may be present, but they may prove to be of minor effect. One fact, however, must be borne in mind: the deterioration of certain kinds of coal is of sufficient moment to make it necessary that comparisons be made on freshly mined samples. Recent experiments here have demonstrated a very positive drop in heat values on samples stored in the laboratory, a total of from 3 to 5 per cent. being found in certain cases. The subject of deterioration as well as the discussion of fuel ratios must be reserved for some other time.

The Commercial Situation

[illegible] before the Virginia Bankers' Association, at the Jamestown Exposition, June 21, Vice-President Frank A. Vanderlip, of the National City Bank, of New York, discussed the business and financial outlook. He said in conclusion:

"But now, what of the future? Industry as yet has shown only scant signs here and there of declining activity. The crop outlook is not altogether satisfactory, but considering the advanced prices and the great stores left over from other harvests there is nothing in that situation to bring real disaster. The mercantile situation seems healthy. Labor is still fully employed at the highest rate of wages ever paid. The banking position is sound But in spite of all this, in spite of a half-year's record just closing, which in most lines of business will be the equal of last year's phenomenal figures, nearly all experienced business men are of the opinion that we are facing a practically certain recession in trade, that we have ahead of us a period of smaller industrial totals. Such a view is almost universal among well-informed business men. There is no longer the disposition courageously to enter upon new enterprises. Railways are curtailing expenditures. Bankers are inclined to exercise caution in extending accommodation. Most manufacturers and merchants are planning their fall campaigns with much conservatism.

"That the period ahead of us is one in which commercial activities will be cur-

[illegible] decrease, there is really little division of well informed opinion. The question that is desirable to consider is only in relation

[illegible] but a dip, lasting only a few months, giv-

[illegible] rious disturbance?

[illegible] answer to that lies wholly

no inherent reason in the conditions of agriculture, trade, industry and finance in the United States that would make necessary a period of further disturbance and depression. There are a thousand influences that should lead toward continued prosperity and renewed accomplishments throughout the fields of industry and commerce. The business of the country will turn into one of these roads, solely as the result of whether or not the public and the public's legislative representatives are wise and patient or are hasty and inconsiderate. If the intricate problem of railway regulation is worked out in a spirit of fairness and intelligence, if the vastness of the problem is recognized, if the involved relationships encountered are taken into account and the far-reaching effects of paternal regulations when applied to so great and complicated a network are reckoned with, and if an intelligent understanding of the complications will lead to a patient attitude toward results, then I believe we will resume the road toward further prosperity. The moment that investors have become convinced that the problem is to have fair and patient consideration in its solution, we will start on that road again with full measured pace."

The Production of Arsenic as a By-product in Sulphuric-acid Manufacture

By Edward Walker

Until recently the arsenic removed from sulphuric acid has been wasted, owing to its production in the form of sulphide, which is not a commercial commodity. During the last year or two the United Alkali Company has conducted experiments with a new process by means of which the arsenic is recovered as arsenious acid. The process promises to be a commercial success, and in all probability will bring an important new supply of arsenic on the market, as well as make it possible to use highly arsenical ores profitably in sulphuric-acid manufacture.

The process is described in a series of British patent specifications, the most important of which is No. 5151 of 1906. That the process is a success is shown by the fact that five plants are already in operation, and that arrangements are being made for building several more.

According to this process, the arsenical sulphuric acid, as it flows from the Glover tower is first brought into contact with a reducing agent such as charcoal, in order to bring the arsenic to the arsenious state. It is then brought into contact with dry hydrochloric-acid gas, the result being that the arsenic is converted into liquid arsenious chloride. This chloride is an oily liquid and a good deal of it can be separated from the sulphuric acid by settlement. The sulphuric acid drawn off from the settling tanks still contains arsenious chloride. To remove the latter, air is blown through the acid. The chloride comes off as vapor, and is taken to a scrubbing tower. Here it comes in contact with water, with the result that arsenious acid and hydrochloric acid are formed. The hydrochloric acid is used over again, and the arsenious acid is collected as a commercial product. Very often, however, the arsenic contains selenium. If so, some of the arsenious chloride, which had previously separated as an oily liquid is added to re-dissolve the whole of the precipitated oxide, and then, on addition of water, the selenium is found to be precipitated.

The process is naturally one which requires very careful attention, owing to the existence of arsenic as a volatile compound. The manufacturers and the alkali inspectors, however, speak well of the process, so it should develop into a standard method of recovering arsenic.

Fume Filtering at the Works of United States Smelting Company

The new bag-house for filtering the smoke of the lead blast furnaces at the plant of the United States Smelting Company at Bingham Junction, Utah, was put in commission about June 1. It consists of a brick building 192 ft. long, 58 ft. wide and 60 ft. high, and contains 2080 cotton bags, each bag being 32 ft. 6 in. in length and 18 in. in diameter. About 12 ft. above the ground level there is a steel floor covering the entire space between the walls. In this floor, at regular intervals, about 2 ft. apart, holes are cut 18 in. in diameter. A nipple 18 in. in diameter and 6 in. long extends upward from each hole, over which the lower ends of the bags are slipped. The general design and operation of the bag-house follow conventional practice.

The fan delivering the smoke into the bag-house is driven by an electric motor which receives power from a special General Electric 750-h.p. steam turbine in the power-house. In case this steam turbine should be shut down for repairs, the power to run the motor can be furnished from another dynamo. It is thus possible to keep the bag-house in operation continuously, and there is no chance that a shut-down in the power house would stop the operation of the bag-house.

Turbine pumps may be used for high pressures by mounting two or more impellers on one shaft and inclosed in one piece, the water being delivered from the diffusion vanes of one stage to the impeller of the next stage. The discharge head in this case is the sum of the heads produced by all the impellers.

Colliery Notes, Observations and Comments

Practical Hints Gathered from Experience and from the Study of Problems Peculiar to Bituminous and Anthracite Coal Mining

DEVELOPMENT AND MANAGEMENT

All discharge pipes, exhaust connections, etc. should have easy bends.

When a long suction pipe is used, many engineers advocate having a foot-valve to keep the pipe full.

The points in favor of compressed-air haulage are; simplicity, safety, convenience, economy and reliability.

By using a locomotive the expense of maintaining a footway for animals used in hauling is avoided. Often from $1 to $2 per day is saved on this item alone.

A yearly cost of from $1500 to $1800, or $5 to $6 per day will operate a light locomotive that will do the work of from 10 to 25 animals. The saving cost of the engine is often saved in less than a year.

The injector on a supply pipe should be provided with a strainer to prevent any stoppage of the tubes by chips, waste or any other dirt in the feed water. Such stoppage is a frequent cause of trouble when a strainer is not used.

In laying rails on stringers instead of ties or cribwork, reverse-point spikes are used. Stringers laid on ties or crib-work should be tied by wooden cross-pieces let into the top faces of the stringers, in order to prevent rolling or spreading.

Drain pipes for condensing water from heaters or traps in the exhaust pipe should be connected with the condenser and fitted with a check valve and also a stop valve. Failure to obtain a good vacuum is usually caused by air leaks.

At a Pennsylvania plant a light locomotive is economically used for hauling larries to supply a double battery of coke ovens. The locomotive is standard gage, 56½ in. Five or six larries are hauled per trip and from 100 to 400 ovens are [illegible] per day.

In a mine where steam locomotives are used the system of ventilation should provide fresh air to the working-s independently of the main haulage where the locomotives run. The haulage should be used for the return air only, so that the products of combustion cannot cause annoyance to anyone.

Storage-water tanks should always be provided with an overflow pipe of ample size, and the supply should be controlled by a ball-cock and float. Storage tanks of moderate size are preferably made of wood, lined with planished or tinned copper. Sheet lead, zinc or galvanized iron should not be used for lining tanks containing drinking water; also they are not [illegible].

An exhaust [illegible] type of condenser are governed by the conditions of the water supply. The water supply should preferably be arranged under pressure. If the condenser works under suction, it should not be placed too low. The discharge pipe should always be carried down to the lowest level and should not, in any case, be led above the foot-elbow.

In hauling coal from mines to the point of shipping, several authorities claim that it is cheaper to haul with narrow-gage mine cars than to run a wide gage track to the mines. The gages most commonly used for such purposes are 36 and 44 in. A light road of such width can be built cheaply in rough and hilly countries. The arrangement of tracks at each end should be planned for making up trains by gravity and exchanging trains with the least delay.

The experience of mine superintendents has shown that on narrow gage, with locomotives, motors and cars of short wheel-base and with sharp curves, it is best to widen the gage of the track 1/16 in. for each 2½ deg. of curvature. For instance, a 40-deg. curve should have 1 in. increase in the gage of the track. On very sharp curves, it is well to widen the gage as much as can be done and still keep the required amount of bearing on the rail for car wheels, allowing for wear of flanges and wheels hugging one rail.

When a curve comes on a grade, the grade should be reduced on the curved part of the track, so that the combined resistance of the flattened grade and the curve will not exceed the resistance of the steeper grade on the straight part of the track. In practice, the compensation for curves on grades is at the rate of 0.02 ft. grade in each 100 ft. for each degree of curvation. Sharper curves may be used on narrow gage than on wide gage, because there is less difference between the length of the inner and outer [illegible] shorter wheel-base.

[illegible] percentage of the grade. It is always so [illegible] The resistance due to friction varies with [illegible]

The shorter the radius of the curve the greater is the resistance. The length of [illegible] speed, the condition of the cars and track. [illegible] If [illegible] from binding against the rails the resistance may be very great. Irregular curves, [illegible] greatly decrease the hauling capacity of [illegible] It is therefore preferable to increase the [illegible] construction rather than save on first cost [illegible] operating expenses.

[illegible] belief among shot firers in English mines that hang-fires are impossible when firing by electricity. It is supposed that when [illegible] out delay. This idea is rather [illegible] [illegible] here it has [illegible]

Metallics

The intensity of a magnetic field is the greater, the closer the particles to be attracted can be presented to the magnet. The interposition of a belt, or drum, or similar device, which may be necessary to effect the removal of the attracted material from the magnetic field, inevitably reduces to some extent the intensity of the latter.

In a thoroughly modern zinc work, costing about $16 per ton of annual capacity, in the United States, the smelting of 2000 lb of sulphide ore would require approximately the labor of 2.25 men for one day at an average wage of $2; in other words, the labor cost of smelting would be $4.50 per ton. Wages range from 15 cents per hour to 25c. per hour ($1.50 to $3 per day).

The final element in the valuation of zinc ores, namely, the percentage of metal extraction, is difficult to generalize inasmuch as it depends greatly upon the character of the ore mixture that is smelted and the metallurgical practice. An extraction of 90 per cent. of the zinc in the ore is sometimes effected, but this is above the average. On a good grade of ore an extraction of 88 per cent. would be a very fair result, and with a poor grade of ore and in inferior plants the actual result will be a good deal below that figure. In the early treatment of Colorado ore in Kansas the extraction was only about 72 per cent. The retorts in use would not stand the high temperature necessary to distil off the last of the zinc, and residues assaying high in zinc were discharged from the furnace. Improved practice, including the manufacture of a superior retort, has bettered that result, but the extraction from these ores is still inferior to that which is yielded by the clean ores of the Joplin district.

The main points of difference between the multiple system and the series system of copper refining are in power cost, compactness, and cost of preparing anodes. The power required is practically half greater in the multiple tank. The series tank has relatively no contacts or conducting bars and the electrodes are very close together, the anodes being thin even plates. To produce such anodes they must be either rolled or specially hand-cast, and the grade of material used must be good. The interest on the metal tied up in process and on the investment in plant is less in the series system. The series system requires no starting sheets, but much closer supervision to keep the quality of the cathodes up. As lead-lined [illegible] to the relatively high voltages employed, tank maintenance becomes an important item. The fact that large refineries on both systems are being satisfactorily op[illegible] ing of the pros and cons in each case, although much more material is refined by the multiple than by the series process.

According to Richards ("Ore Dressing," I, p. 488), a man is able to pick from a moving belt a little more than 4.8 tons of galena of 1-in. size in 10 hours, which would make the cost 20½c. per ton with labor at 10c. per hour. With labor at 37½c. per hour the cost would be 76c. per ton. The cost of picking blende on the same basis would be $\frac{7.4}{4.0}$ times as much, or $1.40, because of its lower specific gravity. These estimates are established on a theoretical basis, or rather on an experimental basis, which fails to take into account all of the varying conditions. Thus, a man can pick more galena (or blende) from a stream of ore which carries a large proportion of the mineral in clean, free and unmistakable pieces, than he can from a stream of ore carrying only a small proportion of pieces and these of doubtful classification. Richards' table is, however, valuable in showing how rapidly the quantity of material that can be picked diminishes, and the cost per ton increases as the size of the individual particle diminishes. In other words, it is much cheaper to pick mineral of 2-in. size than 1-in. size.

Zinc ore is being today, in spite of increased cost for both labor and gas, smelted more cheaply in Kansas than it can be in Europe. Even with coal it can be smelted with approximately the same cost, although this is hardly being done at the present time. European smelters have the advantage of very much cheaper labor than the American, and, unlike the experience in some other arts, the low-priced European smelterman has in zinc smelting practically as high an efficiency as the high-priced American. The difference in the labor cost per ton would be greater were it not that the American smelters economize in labor through the use of mechanical roasting furnaces and other mechanical devices, wherever they can be installed, to a greater extent than the European. The European smelter has, moreover, an advantage in various other items in the cost of smelting, but these are all offset by the cheaper cost of fuel in America, although the inferior character of the coal in the chief zinc-smelting districts requires the consumption of a greater quantity of it per ton of ore.

The cost of culling mineral is largely dependent upon the character of the ore, but it is seldom much in excess of the cost of milling in the general practice of mills of small or moderate size. Under ordinary circumstances culling by hand is to be advised as a step in the milling process, where all the ore from the mine, having been broken by a crusher to the size determined for the next machine, passes [illegible] through a trommel from which the coarse material would go to the picking table and the rejected stuff from the latter to the next crushing machine. In this case there is no extra cost for crushing, and only the cost of culling, minus the cost of milling the mineral picked out, would have to be considered against the increased saving of mineral. For example, if the cost of milling be 50c. per ton of crude ore and 16 tons be concentrated into one, the cost per ton of contrates is $8; leaving out of account the question of losses in treatment (very important) and cost of repairs on picking tables, interest, amortization, etc. (comparatively unimportant), it would be an equal thing to produce a ton of culled mineral of the same grade at $8 in so far as operation only is concerned. Having regard to the recovery of mineral, instead of the 75 per cent. which milling may yield, the hand sorting will yield 100 per cent. If the mineral be worth $75 per ton, consequently, instead of one ton obtained by milling, there is 1 1/3 ton obtained by culling, or a yield of $100 instead of $75. The gain is therefore $25 + $8 = $33, from which is to be deducted, of course, the cost of culling.

Magnetic lines of force are analogous to electric currents, and like the latter form closed circuits. The magnetomotive force in a magnetic circuit is directly proportional to the number of ampere-turns. The reluctance is directly proportional to the length of the circuit and inversely proportional to the sectional area, and also to the permeability of the substances in the circuit. Magnetomotive force ÷ reluctance = magnetic lines of force. By the term permeability is meant a numerical coefficient which expresses how much greater the number of lines generated in a substance by a given magnetomotive force is than those which would be generated in air by the same force. It is not possible to obtain much more than 20,000 magnetic lines per square centimeter in soft, annealed wrought iron, without using enormous magnetomotive force, and in designing electromagnets it is not generally good economy to go above 16,000. Leakage is the number of extra lines which must be produced in order to attain a desired strength of field. This will depend upon the shape of the magnet and the length of the air gap. In a magnet of which the poles are bent around to face each other, with an air gap of only 0.25 in., the leakage may be about 0.3 of the useful lines; for larger air gaps it will be greater. In a poorly-designed magnet it may be much greater. Where a very strong field is desired, the lines of force may be condensed by beveling off the poles so that their sectional area is less than that of the core, but this is done at some loss of power, inasmuch as halving the area does not by any means double the strength of the field.

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*Illustrated.

Zinc Smelting in New Countries

The art of zinc smelting is a peculiar one, inasmuch as there are few metallurgical processes which for their success are so dependent upon the quality and training of the labor that is necessary in carrying it out. Given the best design of plant that the engineer can furnish, his plans and those of the manager may be defeated, in fact probably will be defeated, until the management has developed the right kind of labor organization. In districts remote from those wherein zinc smelting has been carried on for many years, where experienced zinc smelters are unavailable, the difficulties are enormously enhanced. For this reason projects for zinc smelting in new countries, like Mexico for example, should be approached very cautiously. In this connection the following remarks from the report of the Canadian Zinc Commission may be quoted:

"While the labor cost in smelting a ton of ore is a fundamental consideration in determining rentability, there is another important consideration which must be reckoned upon in starting a new plant in a new locality. This is the question of obtaining skilled men. The zinc smelter is made, not born. There is no metallurgical process in which so much is dependent upon the skill of the workman as in zinc smelting; nor is it possible to eliminate manual labor by mechanical devices to so great a degree as it is in other smelting processes. No matter how perfectly the zinc smeltery be designed, how elaborate its construction, and how modern its methods—poor smelter-men will neutralize all the advantages planned by the engineers. This is one reason why zinc smelting has been for 100 years confined largely to certain localities, where men skilled in the art are obtainable; it is a reason why European smelters are sometimes slow to extend their plants; and it is a reason why certain modern and very costly plants established in new localities have proved disappointing for several years while the workmen have had to be trained, in spite of the proportion that could be imported from older smelting centers. This is a consideration which often is not taken into account in planning a new plant, but it cannot be too much [illegible]."

The recent experience of the Broken Hill Proprietary Company has been [illegible] somewhat on the above lines. During [illegible] was engaged in the [illegible] was given a trial. Evidently the latter was not successful, because the chairman [illegible] annual meeting. "I may tell you at once that the distillation of zinc is a very intricate problem, as all producers find out [illegible]. The [illegible] plant will soon have another trial. In the meanwhile we learn from the Australian papers that Mr. Delprat, the distinguished general manager of the Proprietary Company, has gone to Europe to investigate the methods of zinc smelting in use there. Nothing has been said respecting the new type of distillation furnace erected at Port Pirie. It is a remarkable fact that the promoters of new zinc-smelting enterprises in foreign lands, not content with the difficulties by which they are naturally confronted, as pointed out above, seem always to find it necessary to increase them by designing a new and special type of distillation furnace, apparently only for the excitement of giving a new form of furnace a trial in a new works, with new men. The combination, which certainly is exciting, usually proves a difficult one, and the outcome is a return to some standard type, which had been evolved through long experience.

Production of Arsenic

The article by Mr. Walker, elsewhere in this issue, on the production of arsenic as a by-product in sulphuric-acid manufacture, records a new development that is likely to be of considerable importance in the chemical, metallurgical and mining industries. It is important, in the first place, in adding to the commercial supply [illegible] contracted for delivery f.o.b. works, but [illegible] price has been correspondingly higher. [illegible] having been [illegible] of the year [illegible] plants [illegible] [illegible] [illegible]

will have a bearing upon plans for the treatment of arsenical ore, such as that of Cobalt, Ontario.

Another result will be to increase the value of pyrites containing a little arsenic, which will be less objectionable for sulphuric-acid manufacture than heretofore. It is well known that sulphuric acid made from arsenical pyrites is itself arsenical and acid of that character is excluded from many important uses. The removal of the arsenic from such acid, by precipitation as sulphide, is a simple chemical process, which has been extensively practiced, but it has involved additional expense, and the precipitate of arsenic sulphide has been not only of no value, but also has been a nuisance to dispose of. We have no recent information as to the magnitude of the amount of this by-product, but a few years ago, two important chemical companies of the United States were each producing about 150 tons of arsenic sulphide per annum, both of them burying the substance in the earth to get rid of it. It may be remarked here that the annual production of white arsenic in the United States is about 800 tons, while the consumption is about 4000 tons. The production of white arsenic in Great [illegible] 1800 tons per annum.

The Disposal of Smelter Smoke

The article by Mr. Lang, which is published elsewhere in this issue, takes up one of the live questions of the day in metallurgical practice. There was a time, only a few years ago, when the smelters of the West were at liberty to discharge their sulphurous gas into the atmosphere without restraint, but as agriculture has developed in their environments complaints of damage to crops and cattle have become frequent, and there has been much litigation. To those smelters who are in places where there is no market for sulphuric acid, the only way out of difficulties has been to erect high and costly chimneys which will discharge the gas so high in the atmosphere that it will not cause trouble; or to remove the works [illegible]

to think that Mr. Lang has underestimated the cost of such removal, and we hope that there will be a discussion upon that point, as well as upon the general feasibility of his idea. This is a kind of problem that can be settled only by engineering computations. The case of the lead works at Allston Moor, England, where smoke is carried through a flue for a distance of five miles or so, which is cited by Mr. Lang, is an interesting precedent.

Sociological Work of Mining Companies

The sociological work done by the Colorado Fuel and Iron Company for the benefit of its employees is described in another part of this issue. The article deserves attention since it shows the results which can be attained by systematic work in this direction. Not all large corporations are indifferent to the health and welfare of their employees; some have endeavored to aid them in various ways, but in few cases have plans to that end been so carefully and thoroughly worked out as in this instance. The officers of the company upon whom the work devolved certainly deserve much credit for what they have done, and much is also due to the higher executive officers who supported them in their work.

The results of this work have been encouraging. On the purely commercial side there is no doubt that well-housed employees, contented with their surroundings, are apt to do better work, and give less trouble. At the same time tact and judgment are necessary in work of this kind to avoid too great a sense of unearned benefit. It must be managed so as to make the men partners and not beneficiaries; and to make them feel that they are working for their own advantage, and of their own volition. The example set in Colorado may well be studied elsewhere, and by other large companies.

THE ADDRESS OF Frank A. Vanderlip, vice-president of the National City Bank, of New York, on the business and financial outlook, made before the Virginia Bankers' Association last week, has attracted wide attention, as does everything that Mr. Vanderlip says in his public addresses and writings. An important feature of his recent remarks was the frank [illegible] United States are now facing a practically certain recession in trade, which heretofore has been strenuously denied in many quarters. However, as the weeks have slipped by, it has become more and more certain that the conditions of 1903 are being repeated in a measure; in what measure it has not yet been possible to say, but the general feeling is that while there will be a further recession in business, it will probably not go anywhere near so far as in 1903. The point in Mr. Vanderlip's address about which there will be disagreement is his opinion that political conditions will determine the parting of the ways between further prosperity and a great depression. Inasmuch as the conditions which are now affecting commerce and industry appear to be not only of American effect, but also of European, it is hard to believe that the causes are to be ascribed solely to American political conditions.

A MEETING OF chemical engineers was held at Atlantic City, June 21, to discuss the advisability of organizing an American society of chemical engineers. Unfortunately, the meeting was not very well attended, wherefore the expression of views was not sufficiently representative to determine finally the advisability of going ahead with the project; but a committee (Dr. Chas. F. McKenna, of New York, chairman) was appointed to take up the matter further by correspondence with the leading chemical engineers of the United States. The American chemical industry has now attained so much importance that there is a good field for such an organization as is now proposed; indeed there is a real need for it.

THE ERECTION of a memorial to the late John Stanton was recently proposed by Capt. James Wilcox, of the Mass Mining Company, and the idea has been taken up by several prominent men in the Lake Superior copper country. Just what form the memorial will take has not yet been determined, but the present plan is to erect a shaft or statue in some central place, probably in the campus of the Michigan College of Mines at Houghton. No man deserves such a memorial more than John Stanton; his long identification with the copper country, his success as a mine manager and the high example he set of unswerving integrity should all be held in remembrance and set forth as an example.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice or Suggested by Articles in the Journal, and Inquiries for Information

CORRESPONDENCE AND DISCUSSION

Utilization of Black Sand

It was my [illegible] investigation at Portland, Oregon, for two [illegible] During that period under the direction of Dr. David T. Day my duties lay in the direction of experimenting upon the different sands which came to the pavilion to find out what minerals they contained and what methods we could employ for separating those minerals so that they could be put in condition to market. In general the conclusions were as follows:

That if we sized the sands on 8-mm., 2-mm. and ½-mm. screens, this would give us four sizes. The first upon 8-mm. was in every instane rejected as having no value. However, it could have been jigged or hand-picked if that appeared necessary. The second size (which passed through the 8-mm. and rested on the 2-mm.) was jigged in certain cases, which took out quite a lot of gold, and we found some of the other heavy minerals. We did not go further with this concentrate but commercially it would be in condition to treat further if its value so indicated. The third size (which passed through 2-mm. and rested on ½-mm.) was run on a Wilfley table, and this in case of certain hydraulic clean-up sands yielded much free gold, together with other heavy minerals available for after separation. The portion which went through the ½-mm screen was in every case treated on Wilfley (or other riffle table, of which we had with us the Pinder, the Woodbury and the Christenson tables), and this treatment yielded a concentrate of heavy mineral and, if so desired, a middling product, and tailings which were let go to waste.

The treatment was mainly that devised by Henry E. Wood, of Denver, and consisted in drying the concentrates and subjecting them to several successive treatments of Wetherill magnets, taking out the strongly magnetic minerals with a weak current in the first passage, and successively weaker magnetic grains with stronger currents in the following passages. We found, for example, that magnetite was lifted out with 0.2 ampere, chromite and ilmenite were lifted out with 0.8 ampere, that garnet was lifted out with 1.75 amperes. Hypersthene was lifted out with 1.9 amperes; this being a useless [illegible] zircon was left behind with the gold. The [illegible] mostly with the zircon.

[illegible] seemed to us important, to the list of known methods of handling these minerals. First, we found that a 2-gal. bottle revolved slowly endwise on a flange on the end of a shaft would extract in one hour from a kilogram of black sand all of the fine native gold when the sand was treated wet with 50 grains of concentrated sodium amalgam. This assay of sand proved so valuable that some of our Wilfley table runs checked up to a point of

gave 99 per cent. of the value fed. [illegible]

case of a sand bank, it was found to have value. It consisted of a steam shovel with a contributing conveying belt discharging upon a main conveying belt, and that delivering to the mill. Mr. Hammond, of Portland, and Mr. Woodbury, of San Francisco, also contributed a bucket-elevator plan with bridge and hopper over it for much the same scheme for beach work. So far for the black sand and the beach sand.

Now in regard to the dredge and hydraulic sluices, which seem to be the greatest want, I would suggest the apparatus shown in the accompanying diagram. In thinking this out there has been the [illegible] to put the apparatus in and try it, to find out what its faults are, correcting them and trying it again, and in this way developing the perfected apparatus. I have been obliged simply to think and think, to try to bring up every obstacle and mishap that could happen, with the efforts to meet them and the suggestions that are here given.

The idea is that of a hydraulic classifier. It consists of a pit *a*, between the riffle blocks of the sluice at the bottom of which is a screen plate *b*, with holes ¼-inch diameter punched in it. Over this is to be laid rounded pebbles about the size of a hen's egg, which will take the blows of the boulders rolling over the top and prevent them from settling into the pit and wearing out the screen. These pebbles can come up to the level of the top of the riffles. Under the screen is a space *c*, which acts like a hutch of a jig up which water to a limited extent is brought to pass through the sieve. The wash water is introduced from a pipe *d*, in a separate side compartment, and between its portion of the hutch *f* and the space *c* is a vertical partition *g*, running part way down to force an equal rising current to all parts of the sieve *a*. A spigot *h* is provided for discharging the sand as fast as it comes into the hutch. The bottom of this hutch should have a steep angle, as much as 60 deg., to give free discharge of the sand.

In regard to this device I see some difficulty that can only be overcome by experiment and trial. For example, the size of the pebbles may prove too small or too large. It is barely possible that the quicksand around these pebbles may form a natural sand filter, having larger pebbles at the bottom and smaller pebbles at the top, and in this way become absolutely impervious for the downward passage of sand. Should these difficulties happen, [illegible] raising the screen nearer to the top of the riffle blocks. The spigot *h* will need a pretty large hole in it in order to discharge the material, and in consequence will use considerable water. This hole will certainly need to be as large as 1 in. [illegible] run freely with ¼-in. grains.

structing and installing this device successfully, we shall now have a free discharge of heavy sand from this spigot to be dealt with. The natural method of dealing with it will be to put it through screens and provide the machinery indicated above as having been successfully used at the Portland Fair. It will, therefore, require a little mill to treat this material. There is another method which might give hope of success, viz., to put in a Missouri zinc jig, or a Hancock jig, as the machine to treat this spigot product. In this case it is presumable that the hutch product of the jig would be the only part which would have value. However, I believe that the riffle table as illustrated by the Wilfley, Pinder, Woodbury, Christenson tables, would be the machines best for handling this product. Several of these classifiers could be put in to secure all the values. The ordinary undercurrent is not mentioned here, because that is well known to all hydraulic miners.

ROBERT H. RICHARDS.

Massachusetts Institute of Technology, Boston, Mass., May 29, 1907.

Crushing Mills—Makers vs. Users

Recently the writer was approached with the request to write an article on tube mills. There is something of greater importance to both the builder and the user of crushing, grinding, drying and pulverizing machinery; but to cover it a voluminous article would be required. I would therefore invite interested parties to publish their opinions on both sides of the subject of a national alliance between the builders and the users of mills and only wish to mention a few items which will show the immense value of such combination.

First and most contemptible is the bribing of employees, which has spread to such an extent that one only wonders that the employers do not notice it in a forcible way.

Second is the necessity of education on both sides. At present the purchaser is of the opinion that the builder of the machine ought to know exactly what his machine can do on a certain material. He does not consider that the builder cannot acquire full knowledge, even if he had the opportunity, as to what his machine can do on the thousands of different materials that are reduced by crushing, grinding, or pulverizing machinery. The reports from customers differ to such an extent that they are entirely unreliable.

I wish to mention only one instance which occurred in two different departments of one large concern. A mill was sent to Iowa to grind gluten meal, and the makers received the report that the mill was utterly useless for the requirements. Only six weeks after this report another was received from a plant in Glen Cove, stating that the same mill was the best they ever saw.

As stated before, the papers would prove to be too small for an article which would explain in any intelligent manner all that could be obtained from a combination of the parties mentioned above.

I am very desirous to hear opinions and suggestions about such a combination and am always ready to assist.

R. F. ABBE.

New York, June 13, 1907.

Slag Blocks in Place of Mine Timbers

I have read with interest Mr. Lang's suggestions as to the use of slag-blocks for props in place of timber in the mines. I have also read Mr. Austin's reply, in which he explains that they fail, owing to their breaking upon handling. Some years ago I was instructed by the superintendent of this mine, Mr. Chalmers, to experiment with slags for the same purpose, and our experience was identical with Mr. Austin's; but we are still hopeful of making slag blocks that will not fall to pieces. The question unanswered is the ingredient necessary to prevent the twinning of the crystals, etc., largely the cause of the breaking of the blocks. The pieces that do hold together are beautifully tough; our trouble was that the corners of the blocks fell off, leaving edges like that of broken glass, which would cut the miner's hands when wall building.

I do not think the question should be allowed to rest, as it is one of the most important items on a mine far from civilization and from cheap and suitable timber. Mr. Jones, our analyst, found the composition of the slags to be approximately as follows: Silica, 47.0 per cent.; sulphur, 0.44; FeO, 21.9; Al_2O_3, 21.5; MnO, 1.5; CaO, 3.9; MgO, alkalies, etc., by difference, 3.76 per cent.

My object in writing this is to emphasize the importance of the utilization of turnace refuse cheaply worked up into useful material at the point of production.

FREDERICK L. WILDER,
Head of Reduction Department, Morro Velho mine.

Villa Nova de Lima, Minas Geraes, Brazil, May 30, 1907.

The Thermit Patents

We notice in your issue of June 1, 1907, under the above heading, that Mr. Vautin and Messrs. Sulman & Picard were "at the back of weldite." We wish to point out that our firm never held any interest in that company, and our only connection with them consisted in acting for them occasionally in a professional way, and being retained by them in the recent action taken by Thermit, Ltd., against them with regard to the patent rights.

SULMAN & PICARD.

London, June 11, 1907.

Patents Relating To Mining and Metallurgy

A Selected and Cl[illegible]ed List of New Inventions Described during the Past Mo[illegible] in the Publications of the Patent Office[illegible]

UNITED STA[illegible]S AND BRITISH PATENTS

[illegible] copies of the specifications of [illegible] these patents issued by the United States Patent Office will be mailed to THE ENGINEERING AND MINING JOURNAL upon receipt of 25 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

ALLOY — Aluminum Alloy. Alexandre Chamberland, Paris, France. (U. S. No. 856,392. June 11, 1907.)

SMELTING PROCESS. A. G. Betts, Troy, New York. Reducing aluminum ores in the presence of iron or other metal to produce an aluminum alloy, and then electrolytically extracting the aluminum from the alloy. (Brit. Nos. 7277 and 7277a of 1906. May 4, 1907.)

WELDING. S. O. Cowper Coles, London, England. Method of joining pieces of aluminum, utilizing the heat of combustion of the two heated ends for joining the melted ends together. (Brit. No. 28,354 of 1906. May 25, 1907.)

CEMENT

HYDRAULIC CEMENT—Manufacture of Hydraulic Cement. Bernard Enright, South Bethlehem, Penn. (U. S. No. 854,342. May 21, 1907.)

COAL AND COKE

BRIQUETS. Process for Manufacturing Briquets from Coal, Peat and Bog-Earth. Jakob Buss, Munich, Germany, assignor of one-half to Carl Fohr, Schloss Wallenburg, near Miesbach, Germany. (U. S. No. 854,565; May 21, 1907.)

COAL CUTTING MACHINE. Friedrich Stiepel, Essen-on-the-Ruhr, Germany. (U. S. No. 854,612. May 21, 1907.)

COKE. Process of Coking Coal. Samuel B. Stebbins, Buffalo, N. Y. (U. S. No. 855,069. May 28, 1907.)

COKE WORKING APPARATUS. George F. Myers, Columbus, Ohio, assignor to John C. Pennie, Montclair, N. J. (U. S. No. 856,980; June 11, 1907.)

DRILLS. Ingersoll-Rand Co., New York, N. Y. In percussive drills for working in coal, methods of automatically governing the cutter when not striking coal. (Brit. No. 9665 of 1906. May 18, 1907.)

COPPER

ELECTROPLATING. S. O. Cowper Coles, London, England. Improvements in the art of and method of electrolytically depositing copper sheets and tubes in a mandrel revolving at a high speed. (Brit. No. 13,972 of 1906. May 18, 1907.)

GOLD AND SILVER

CHLORINATION BARREL. William J. Armbruster, St. Louis, Mo. (U. S. No. 856,384. June 11, 1907.)

GOLD-WASHER. Benaiah K. Jayne, New York, N. Y., assignor to Idaho Machine Co., a Corporation of New York. (U. S. No. 855,040. June 4, 1907.)

GOLD-WASHING. Machine for Handling Dirt and Saving Gold. Marc L. Proctor, Elkhart, Ind., assignor to Terra & Proctor, Elkhart, Ind., a Copartnership. (U. S. No. 854,702; May 21, 1907.)

PLACER MINING MACHINE. [illegible] Placer Mining Machine. James F. Pe[illegible] and John O. Hill, Topeka, Kan. (U. S. No. 855,200. May 28, 1907.)

SEPARATION OF GOLD. Apparatus for separating Gold from Magnetic Sands. Albert Ross, Chevy Chase, Md., assignor by mesne assignments, to Washington Loan and Trust Co., a Corporation. (U. S. No. 854,967. May 28, 1907.)

IRON AND STEEL

ALLOYS. Art of Heat Treatments of Steel Alloys. James Churchward, New York, N. Y. (U. S. No. 855,756; June 4, 1907.)

[illegible] (U. S. No. 856,[illegible]; June 11, 1907.)

CASTING AND CONVEYING MACHINE. [illegible] (U. S. No. 854,[illegible]; May 21, 1907.)

COPING [illegible] Reinecke, [illegible] (U. S. No. 855,[illegible]; June 4, 1907.)

ELECTRIC FURNACE. Paul [illegible], France. [illegible] the manufacture of [illegible] (U. S. No. [illegible]; June 4, 1907.)

FERROALLOYS. Process of Smelting Refractory Ores and Producing Ferro-Alloys. Edgar F. Price, Niagara Falls, N. Y. (U. S. No. 855,479; June 4, 1907.)

IRON ORE. Process of Reducing Iron Oxides. [illegible] W. Lash, Cincinnati, Ohio. (U. S. No. 856,[illegible]; June 11, 1907.)

MANGANESE STEEL. [illegible] Manganese Steel. [illegible] Robert A. Hadfield, Sheffield, [illegible] (U. S. No. 856,200. June 11, 1907; and Brit. No. [illegible] of 1906. May 11, 1907.)

SPONGE IRON. [illegible] Thum, Hamburg, Germany. Improvements in the method of [illegible] (Brit. No. [illegible] of 1906. May 11, 1907.)

STEEL. [illegible] Manufacture of Hard Firming, Fe. Improvements in the manufacture of [illegible] in furnaces having neutral linings, with the object of removing the phosphorus [illegible] about removing the whole of the carbon. (Brit. No. [illegible] of 1906. May 4, 1907.)

STEEL INGOT. J. F. Mackrell, New York, N. Y. Method of producing ingots of iron and stocked with other metals, such as [illegible] (Brit. No. [illegible] of 1906. May 11, 1907.)

STEEL INGOT. [illegible] Ingot Moulds. [illegible] Adams, Pontypool, [illegible] (U. S. No. [illegible]; June 4, 1907.)

WELDING. Société L'Air Liquide, Paris, France. [illegible] Oxygen and [illegible] (Brit. No. 26,709 of 1906. May 16, 1907.)

PETROLEUM

LUBRICATING OIL—Process for Obtaining Lubricating Oil from Crude Oil. William J. Ryan, Chicago, and Charles R. Burke, Oyster Bay, [illegible] (U. S. No. [illegible]; May 21, 1907.)

OIL WELL. [illegible] Frank H. Taylor, [illegible], Ohio. (U. S. No. [illegible]; May 21, 1907.)

PLATINUM

PLATING. [illegible] A. C. Hyde and R. R. Swan, Lon England. In making articles of steel [illegible] coated with platinum, heating the [illegible] in an atmosphere of hydrogen to a [illegible] just below the melting point of the metal, in order to make the platinum [illegible] (Brit. No. 18,8[illegible] of 1906; June 1, 1907.)

TIN

ELECTROLYTIC TIN. [illegible] and [illegible] Mage, Avignonnince. Improvements in the [illegible] (Brit. No. [illegible] of 1906. May 10, 1907.)

ZINC

LEACHING. [illegible] C. S. Bell and R. W. Raper, [illegible] England. Improvements in the [illegible] for removing zinc from [illegible] with ferric sulphate. (Brit. [illegible] of 1906. May 25, 1907.)

LEACHING. [illegible] J. B. Hyde, Mc[illegible], V[illegible] A leaching [illegible] which [illegible] adapted for [illegible] in which opposite [illegible] of ore and leach

[illegible]

ORE DRESSING

CRUSHING. [illegible] Sturtevant Mill Co., Portland, Me., assignor to Portland Company of Maine. (U. S. No. 854,[illegible]; May 21, 1907.)

CRUSHING MILL. [illegible] Grinding Mill. [illegible] (U. S. No. [illegible]; May 21, 1907.)

CRUSHING MILLS. [illegible] (U. S. No. [illegible]; May 21, 1907.)

CRUSHING ROLLS. [illegible] (U. S. No. [illegible]; May 21, 1907.)

CRUSHING ROLLS. [illegible] (U. S. No. [illegible]; May 28, 1907.)

DISINTEGRATORS. [illegible] (U. S. No. [illegible]; June 4, 1907.)

GRINDING MILL. [illegible] (U. S. No. [illegible]; June 4, 1907.)

GRINDING MILL. [illegible] Ohio, assignor to The Sturtevant Mill Co., Boston, Mass. (U. S. No. 854,861; May 28, 1907.)

GRINDING MILL. [illegible] (U. S. No. [illegible]; June 4, 1907.)

MAGNETIC SEPARATION. [illegible] (U. S. No. [illegible]; June 4, 1907.)

MAGNETIC SEPARATOR. [illegible] (U. S. No. [illegible]; May 28, 1907.)

ORE DISTRIBUTER. [illegible] (U. S. No. [illegible]; June 4, 1907.)

ORE DISTRIBUTER. [illegible] (U. S. No. [illegible]; June 4, 1907.)

ORE PROCESS. [illegible] (U. S. No. [illegible]; June 4, 1907.)

ORE REDUCTION. [illegible] (U. S. No. [illegible]; June 4, 1907.)

SCREEN. [illegible] (U. S. No. [illegible]; May 21, 1907.)

SEPARATOR. [illegible] (U. S. No. [illegible]; June 4, 1907.)

SEPARATOR. [illegible] (U. S. No. [illegible]; June 4, 1907.)

SEPARATOR—[illegible] Separator. [illegible] assignor to [illegible] Chicago, Ill., a corporation of New Jersey. (U. S. No. 854,768. May 28, 1907.)

METALLURGY GENERAL

[illegible] and W. J. Malden, [illegible] use of lime [illegible] making ore ores into briquettes. (Brit. No. 9210 of 1906; May 18, [illegible]

ORE-TREATING APPARATUS—Production of Cylinders for Ore-Treating Apparatus. Edgar Kilgore and George O. Seward, Holcombs Rock, Va. (U. S. No. 856,475; June 11, 1907.)

COMPOUND INGOTS—J. F. Monnot, New York, N. Y. Method of making compound ingots [illegible] can be made into sheets and [illegible] of iron and copper or iron and aluminum [illegible] bringing the iron into contact with [illegible] other metal, which has been raised to a temperature considerably above its ordinary melting temperature. (Brit. Nos. 8913 and 8915a of 1906; June 8, 1907.)

DESULPHURIZING—N. Lebedeff and B. Pomeranzoff, St. Petersburg, Russia. Improvements in the method of removing sulphur from ores by mixing the ores with equal quantities of clay and submitting the mixture to a gradually increasing temperature [illegible] (Brit. No. 5479 of 1906; May 4, 1907.)

FUSION OF METALS—Apparatus for Fusing Metals. Adolph E. Menne, Crenzthal, Germany, assignor to Colnmusener-Bergwerks-Actien-Verein, Crenzthal, Germany, a Corporation of Germany. (U. S. No. 857,247; [illegible] 18, 1907.)

INGOT-MOLD. Francis McMahon, Cambridge, Mass. (U. S. No. 856,955; June 4, 1907.)

METAL EXTRACTION—Process of Extracting Metals from their Ores. William L. George, Williams, Ariz., assignor to George Metal Extracting Co., of Arizona. (U. S. No. [illegible] May 28, 1907.)

METALLIC OXIDES—Process of Reducing Metallic Oxides. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia. (U. S. No. 854,018; May 21, 1907.)

METALLIC SULPHIDES—Process of Reducing Metallic Sulphides. Frederick M. Becket, Niagara Falls, N. Y. (U. S. No. 855,157; May 28, 1907.)

NODULIZING. J. Savelsberg, Papenburg, Germany. Agglomerating fine iron or other [illegible] with a flux and [illegible] into a suitable vessel. (Brit. No. 9426 of 1906; May 25, 1907.)

SMELTER FUMES—W. W. Fyfe, London, England. Improved chamber for catching fumes from smelting and similar operations. (Brit. No. 11,465 of 1906; June 8, 1907.)

SULPHIDE ORE TREATMENT—H. Baker, Runcorn, England. Improvements in the inventor's process for treating sulphide ores with chlorides for the production of lead, copper or zinc chlorides, with the object of preventing the undue precipitation of these metals from the solutions obtained. (Brit. [illegible] of 1906; May 18, 1907.)

MINING MACHINERY AND APPARATUS

BOREHOLE SURVEYING INSTRUMENT. [illegible] W. O. Schweder, Johannesburg, Transvaal. (U. S. No. [illegible] June 11, 1907.)

CAGE—MINER'S CAGE. Wilhelm Massing, Rotheck, Germany. (U. S. No. 856,276; June 11, 1907.)

CONVEYOR. August H. Dahl and Arthur E. Whitney, New York, N. Y., assignors of [illegible] New York, N. Y. (U. S. No. [illegible] June 11, 1907.)

CONVEYOR. William T. James, Chicago, Ill. Filed Aug. 27, 1906. Serial No. 332,149. [illegible] June 11, 1907.

[illegible] Metal Canvas, or Conveyor Tightener. George E. Clarke, Toronto, Ontario, Canada. (U. S. No. [illegible]

CONVEYING. Apparatus for Conveying Loads between Points of Varying Distance. Walther Mollier, Hamburg, Germany, assignor [illegible] May 28, 1907.

CONVEYING SYSTEM. Alvin C. McCord, [illegible] (U. S. No. [illegible] June 18, 1907.

DREDGE-BUCKET JOINT. Alexander T. [illegible] (U. S. No. [illegible]

DREDGER CUTTER. [illegible] Francisco, Cal. (U. S. No. 856,487; June 11, 1907.)

DREDGER CUTTER. John F. Ollrich, San [illegible]

DRILL. Core-Drill. Robert M. Downie, Beaver Falls, Penn., assignor to Keystone Driller Co., Beaver Falls, Penn., a Corporation of Pennsylvania. (U. S. No. 854,570; May 21, 1907.)

DRILL—Hydraulic Drill. James Charlton, Houston, Tex. (U. S. No. 854,464; May 21, 1907.)

DRILL—Mining-Drill. William Hauxwell, Canal Fulton, Ohio. (U. S. No. 854,350; May 21, 1907.)

DRILL—Pneumatic Drill. Albert C. Murphy, East St. Louis, Ill., assignor to Standard Railway Equipment Co., East St. Louis, Ill., a Corporation. (U. S. No. 856,285; June 11, 1907.)

DRILL—Pneumatic Drill. Peter H. Murphy, St. Louis, Mo. (U. S. No. 856,651; June 11, 1907.)

EXCAVATING-DIPPER. George W. King, Marion, Ohio, assignor to The Marion Steam Shovel Co., Marion, Ohio, a Corporation of Ohio. (U. S. No. 856,707; June 11, 1907.)

MINE CARS—Check-Holder for Mine-Cars. William J. Conneli, Huntington, W. Va., assignor of one-third to A. E. Youmans and one-third to J. W. Kootz, Huntington, W. Va. (U. S. No. 855,388; May 28, 1907.)

MINING-AUGER. Charles C. Lockhart, Brookfield, Nova Scotia, Canada. (U. S. No. 855,108; May 28, 1907.)

RESCUE APPARATUS. Westfalia Company, Gelsen Kirchen, Germany. Improved method of strapping on chest bags used for rescue work in mines. (Brit. No. 13,705 of 1906; May 25, 1907.)

ROCK DRILL, CHUCK. Charles A. Hultquist, Lowell, Ariz. (U. S. No. 856,877; June 11, 1907.)

ROCK DRILLS. G. H. Rayner, Sheffield, England, and C. Walton, Whitehaven, England. In percussive rock drills, an improved method of making the valve, so that steam shall not escape when it becomes slightly worn. (Brit. No. 24,036 of 1906; June 8, 1907.)

SAFETY-FUSE. William J. Phelps, Detroit, Mich. (U. S. No. 856,292; June 11, 1907.)

SAFETY LAMPS. J. Prestwich, Manchester, England. Method of preventing oil running over the bonnet and into the base, in miners' safety lamps. (Brit. No. 22,679 of 1906; June 1, 1907.)

SAFETY LAMPS. R. Wolf, Zwickau, Germany. Improved frictional igniter for miners' safety lamps. (Brit. No. 3835 of 1907; May 11, 1907.)

TIME CHECKS—Device for Collecting Miners' Checks. Frank C. Greene, Cleveland, Ohio. (U. S. No. 853,971; May 21, 1907.)

METALLURGICAL MACHINERY AND APPARATUS

BRIQUET MACHINE. David E. Bangs, Medford, Mass. (U. S. No. 855,379; May 28, 1907.)

ELECTROLYTIC TANK. John F. Biller, Trail, British Columbia, Canada. (U. S. No. 856,277; June 11, 1907.)

GAS-PRODUCER. Arpád de Gálocsy, Ladislas de Bánó, and John Terény, Budapest, Austria-Hungary. (U. S. No. 856,137; June 4, 1907.)

GAS-PRODUCER. Arpád de Gálocsy, Ladislas de Bánó, and John Terény, Budapest, Austria-Hungary. (U. S. No. 855,845; June 4, 1907.)

MECHANICAL ROASTERS. R. F. Abbé, New York, N. Y. Improved gearing for driving rotating cylinders used in roasting or grinding ores. (Brit. No. 17,752 of 1906; May 25, 1907.)

ORE TREATMENT—Apparatus for Treating Ores. Thomas D. Pitts, New York, N. Y., assignor to New Cyanide Process Co., New York, N. Y., a Corporation of New York. (U. S. No. 855,324; May 28, 1907.)

PRODUCER GAS. Process of Generating Producer-Gas. Max F. Mangelsdorff, New York, N. Y., assignor to Combustion Utilities Co., a Corporation of New York. (U. S. No. 854,228; May 21, 1907.)

PULP DISTRIBUTER. Revolving Distributer for Pulp or Liquid. Edward H. Moyle, Los Angeles, Cal. (U. S. No. 855,328; May 28, 1907.)

STAMP MILL. George Coon, Mount Vernon, Wash. (U. S. No. 855,[illegible] May 28, 1907.)

TUBE MILL LINING. M. F. Abbé, New York, N. Y. In preparing linings for tube mills, [illegible] to minimize the use of cement, and thus decreasing the time during which the mill is out of commission while relining is going [illegible] (Brit. No. 7714 of 1907; [illegible] 1907.)

TUBE MILL LINING. M. F. Abbé, New York, N. Y. In tube mills using pebbles as [illegible] an angle with the plane of motion of the pebbles, so as to decrease the wear at the joints. (Brit. No. 7126 of 1907; June 1, 1907.)

TUBE MILLS. M. F. Abbé, New York, N. Y. An improved feeding device for tube mills. (Brit. No. 2463 of 1907; May 18, 1907.)

FURNACES

ELECTRIC FURNACE. Aldus C. Higgins, Worcester, Mass. (U. S. No. 856,061; June 4, 1907.)

ELECTRIC FURNACE CONSTRUCTION. O. Frick, Saltsjobaden, Sweden. In electric induction furnaces, method of construction to prevent leakage. (Brit. No. 22,519 of 1906; May 25, 1907.)

ELECTRIC FURNACE ELECTRODES—Cooling-Jacket for Electric-Furnace Electrodes. Frederick M. Becket, Niagara Falls, N. Y., assignor to Electro Metallurgical Co., a Corporation of West Virginia. (U. S. No. 855,441; June 4, 1907.)

ELECTRIC FURNACE PRACTICE. E. Gronvall, A. Lindblad and O. Stahlane, Ludvika, Sweden. In electric transformer furnaces, shaping the crucible to get the greatest effect from the induced current. (Brit. No. 1658 of 1907; May 25, 1907.)

ELECTRIC FURNACES. Allmanna Svenska Elektriska Aktiebolaget, Westeras, Sweden. In electric furnaces improved arrangements of the rotating magnets. (Brit. No. 5345 of 1907; May 11, 1907.)

ELECTRIC RESISTANCE FURNACE. Edgar F. Price, Niagara Falls, N. Y. (U. S. No. 855,486; June 4, 1907.)

FOREHEARTH. Charles M. Allen, Lo Lo, Mont., assignor to Ralph Baggaley, Pittsburg, Penn. (U. S. No. 856,616; June 11, 1907.)

FURNACE LINING. H. L. Hartenstein, Constantine, Mich. An improved lining for electric smelting furnaces, consisting of asbestos, lime and coke held together with an agglutinant such as pitch, tar or rosin. (Brit. No. 10,161 of 1906; May 25, 1907.)

FURNACE-TOP. Charles H. Clark, Ensley, Ala. (U. S. No. 857,158; June 18, 1907.)

ORE-ROASTING FURNACE. Antonio Ducco, Turin, Italy. (U. S. No. 855,289; May 28, 1907.)

ORE-ROASTING FURNACE. William H. Smyth, Berkeley, Cal. (U. S. No. 854,766; May 28, 1907.)

SMELTING-FURNACE. Edwin Bosshardt, Cologne, Germany, assignor of one-half to Henry Garda, Leipzig, Germany. (U. S. No. 855,927; June 4, 1907.)

SMELTING FURNACES. W. H. Webb, W. G. Brettell and A. J. Adamson, Liverpool, England. Apparatus for producing the right humidity and temperature of air used in smelting furnaces. (Brit. No. 10,536 of 1906; May 11, 1907.)

INDUSTRIAL CHEMISTRY

CALCIUM CARBIDE—Process of Producing Calcium Carbide. Edgar F. Price, Niagara Falls, N. Y., assignor to Union Carbide Co., Niagara Falls, N. Y., a Corporation of Virginia. (U. S. No. 855,476 and 855,477; June 4, 1907.)

CHROMIUM PIGMENTS—Process of Regenerating Waste Liquors from the Manufacture of Chrome Pigments. Alexander S. Ramage, Detroit, Mich. (U. S. No. 855,019; May 28, 1907.)

EXPLOSIVES. Process of Manufacturing Nitro-Glycerine Explosives of Reduced Freezing-Point. Oscar A. W. Stohrer, Charlottenburg, Germany. (U. S. No. 855,595; June 4, 1907.)

HYDROGEN GENERATION — Process of Generating Hydrogen. Carleton Ellis, White Plains, and Byron E. Eldred, Bronxville, N. Y., assignors to Combustion Utilities Co., N. Y., a Corporation of New York. (U. S. No. 854,157; May 21, 1907.)

NITRIC ACID. Method of Concentrating Nitric Acid. Emil Collett, Christiania, Norway. (U. S. No. 854,928; May 28, 1907).

SODIUM SALTS. L. Riviere, Paris, France. Modification of the process for producing stannate of soda by digesting tin oxide or scrap tin plate under pressure with caustic soda. (Brit. No. 10,309 of 1906; June 8, 1907.)

SULPHURIC ACID—Apparatus for Concentrating Sulphuric Acid. Antonio Gallard, [illegible] Spain. (U. S. No. 856,048; June 4, 1907.)

ANALYTICAL CHEMISTRY

ANALYSIS OF GASES. Apparatus for Analyzing Gases. William Jones, New York, N. Y., assignor to Jones-Julia Mfg. Co., New York, N. Y., a Corporation of New York. (U. S. No. 854,696. May 21, 1907.)

Personal

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Louis Janin is in El Paso, Tex. on his way to Denver from Mexico.

D. W. Brunton has returned to Denver from a trip around the world.

Frederic Nicholls, of Toronto, has returned to that city from England.

P. G. Lidner has returned to New York after 5 months' absence in Bolivia.

G. C. Weber, of Idaho Springs, Colo., has gone to Omaha, Neb., on mining business.

L. W. Aldrich, of Boulder, has gone to Nevada and California on mining business.

E. N. Van Courtlandt, of Denver, is at present at Bingham, Utah, on professional business.

Richard A. Parker returned from Idaho to Denver a few days ago and is in Nevada at present.

George E. McClelland, of the Idaho Springs district, Colo., has returned from a trip to the East.

Edward S. Wiard has returned to Denver from a four months' professional trip to Chihuahua, Mexico.

W. J. Pentland is general manager of the Compañia Minera Juarez, S. A., at Caborca, Sonora, Mexico.

Norval J. Welsh, general superintendent of the Santa Brigida mines, Ocampo, Chihuahua, Mexico, has resigned.

James A. Simmons, of New York, has been looking over mining interests in Gilpin and Clear Creek counties, Colorado.

Forbes Rickard, of Denver, has been making an examination of mines in the Pine Creek district, Gilpin county, Colo.

R. B. Brinsmade left Lawrence, Kan., on June 4, for El Paso and other points in the southwest on professional business.

John Owen, manager of the Saratoga property near Idaho Springs, Colo., has returned from a business trip to the East.

August Heckscher, has been elected president of the Central Foundry Company, New York, to succeed A. F. Gartz.

H. H. Claudet, of Claudet & Wynne, Rossland, B. C., has returned from an extended trip to Mexico and Denver, Colorado.

C. E. Rowe, head of the School of Mines of the University of Texas, is spending the summer in Denver, Colorado.

G. W. Teal and T. J. Sipple, of Boulder, Colo., have returned from a trip to look at mining property near Guanajuato, Mexico.

C. I. [illegible], general manager of the Mexican Mines Corporation, of Chihuahua, has been seriously ill for several [illegible].

J. H. [illegible], president of the Dominion Iron and Steel Company, has returned to Sydney, N. S., from a trip to England.

A. O. [illegible], of Peru, Ind., is in the neighborhood of Cripple Creek, Colo., looking after property of the Mc Pherson Mining Company, of which he is president.

A. [illegible], of Chicago, is on a visit to the mining properties in which he is interested in Pachuca and the state of Puebla, Mexico.

J. F. James succeeds T. B. Bassett, resigned, manager of general transport of the Belen Mining Company, near Cumpas, Sonora, Mexico.

A. B. Roeder, president of the United Rico Mines Company, of Rico, Colo., has been visiting New York on business in connection with his company.

J. E. Carpenter, of Eldora, Colo., manager of the Swarthmore Copper Company, is making a visit to Ohio to consult with stockholders of that company.

John Hays Hammond, mining engineer of New York, received the honorary degree of doctor of laws from St. Johns College, Annapolis, Md., June 18.

Duncan MacVichie, in charge of the Coram and Heinze mine interests in Utah, spent several days in Butte recently inspecting Davis-Daly Estates mines.

O. J. Potter, of Breckenridge, Colo., left this week for London, England, having accepted a position with an English dredging syndicate operating in Russia.

Harvey B. Small, a graduate of the Colorado School of Mines of '01, and in charge of property in Colombia, South America, is making a visit to Colorado.

Charles Howbert, of Colorado Springs, has gone with his family to his mining properties, at Cieneguita, southeastern Sonora, Mexico, and expects to be there a year.

Alexander McLeod, consulting geologist, Sydney, Cape Breton, Canada, is making an examination of iron-ore properties in Newfoundland, for Alabama capitalists.

Jacob Bewley, Bristol, Tenn., has resigned as assistant vice-president of the Virginia Iron, Coal & Coke Company to take effect July 1. He will enter the coal business.

Angus Sutherland, for a number of years in charge of the Mattie mine at Lake [illegible], Col., has resigned a position with the Boston Consolidated Mines Co. at Bingham, Utah.

G. H. Armstrong, formerly manager of the [illegible] department of Millikin, May & Company, has been appointed general manager of the Pittsburg-Connellsville Coal and Coke Company.

[illegible], president [illegible] of the Minnesota Copper Company, arrived in Marysville, Cal., last week [illegible] Company, Limited.

[illegible] C. Church, mining engineer, of New York, has gone to Alaska, where he will proceed to San Francisco and thence to the Far East. He will be absent for about 6 months.

[illegible] Church, for many years connected with the Anaconda Copper Mining Company, has resigned as chief engineer of that company, to take effect July 1. He intends to travel for [illegible] months, visiting Europe.

[illegible] M. C. Thiel, consulting metallurgist of the Mogul Mining syndicate, is on the Rand. He is superintending the beginning of operations of the new Langlaagte Deep & Metzler mill at Turf.

Allen H. Rogers, mining engineer, of New York City, recently returned from South America, and the news came to Denver about the fall in [illegible] of gold. Colorado produces 40 percent [illegible].

[illegible] Bloomfield, general manager of the Colonial & Hecla mine, received the honorary degree of Bachelor of Science from the University of Michigan at the recent Graduating Exercises of that School.

William Mitchell Bloss, of the Bonanza gold mines, President Bloss of the Bonanza Development Company, and Superintendent R. E. Ellwell, of the Pharmacist mine, arrived in the Marysville, Utah, district, on June 7.

[illegible] E. Clarke, who for many years was connected with the Brooklyn Rapid Transit Company, and has since been engaged in consulting engineering, designing and construction, for the Copper Range Consolidated Copper Company, has resigned from that company to take a position with the United Metals Selling Company.

A. H. Brown, formerly superintendent of the Consolidated Mercur Gold Mines Company's property at Mercur, Utah, has been appointed superintendent of the Lower Stevenson Mining Company, at Mammoth, Utah. He succeeds the late William Ball.

W. B. Thomas, of Pueblo, Colo., and Lawrence W. Lindley, of Kansas City, Mo., were recently in the Manitou Lake gold mine, Ore. Mr. Howard has for some years been developing the property, and has taken up [illegible] on a small scale.

Lloyd W. Miller, for 6 years a member of the engineering staff of the Transcontinental Company, operating in the Argentine Republic and Chile, has resigned and returned to Denver to be with the Lucky Mc Mining, Milling and Development Company, near Cripple Creek, Colorado.

[illegible] E. Lathrop, late manager of the Cleveland, is spending the week in Denver, where various members of the [illegible] family reside. He has recently passed the examination, at San Francisco, of U. S. Surveyor of the Port of Honolulu, and expects [illegible] Oahu [illegible] in connection with the [illegible] of roads in the Hawaiian Territory, [illegible].

Obituary

Reese G. Brooks, coal operator, of Scranton, Penn., died at his home in that city, June 12. He was born in 1846 and for years was a prominent independent coal operator, but later sold his collieries to the coal-carrying companies.

Charles Francis Patton, one of the oldest members of the American colony in Mexico City, and identified with mining in Mexico during almost his entire life in the Republic, died in the American hospital, Mexico City, on May 29, of locomotor ataxia.

Isaac N. Bunton, a well known coal operator of the Pittsburg district, died at his home in Pittsburg, June 8. He was active in the organization of the coal-shipping firm, Joseph Walton & Co., about 30 years ago, and later in the formation of the Monongahela River Consolidated Coal and Coke Company.

Gilbert C. Simpson died June 8, of a hemorrhage from the lungs, in El Paso, Texas, where he had gone to purchase an assaying and chemical outfit preparatory to opening up an office in Chihuahua, Mexico. He had for the past year been in charge of the ore-buying agency of the American Smelting and Refining Company. Mr. Simpson was a native of Glasgow, Scotland, and had been for nearly ten years in Mexico as assayer and chemist. He was a member of the American Institute of Mining Engineers.

Walter Grant, civil and mining engineer, was drowned the last of May in the Rio Grande, near Boquillas, Houston county, Texas, where he had gone preparatory to building a wagon road in the northern part of Mexico for Carlos Moser, of Mexico City. Mr. Grant was born in Liverpool, England, about 37 years ago, and had spent the greater part of the last 15 years in Mexico. Among his more important works in the republic was the construction of the San Diego mill, Santa Barbara, Chihuahua, for the Torreon Metallurgical Company.

Societies and Technical Schools

Michigan College of Mines—This institution has received an appropriation from the State of $4300 for building and equipping a paper-pulp and Stereopticon lecture room and meteorological building. Professor Hood and the class in mechanical engineering are busily engaged in drawing up plans and specifications for the new power plant.

American Society for Testing Materials—The annual meeting and exhibition of this society will be held at Atlantic City, N. J., June 20 to 22, inclusive. The meeting will be attended by representative chemists and metallurgists. There were interesting and valuable discussions in connection with which the steel-rail question, which is now absorbing so much attention, was largely in evidence.

Columbia University Summer School—The eighth summer session of Columbia University will open July 9 and continue until Aug. 17. This is the first time that engineering courses have been offered and the announcement is made that courses will be offered in hydraulics, structural and concrete steel, gas engines and experimental engineering, covering the period of six weeks. Frederick A. Goete is dean of the Faculty of Applied Science.

Lake Superior Mining Institute—The following circular has been issued by the secretary at Ishpeming, Mich.:

The thirteenth annual meeting of the institute will be held on the Minnesota Ranges, beginning Wednesday, July 24. Local committees are arranging a program for this meeting, which will be very interesting, and a large attendance is desired. The last meeting on these great ranges was held in 1902, since which time many new mines have been opened and much progress made at the older mines. Members are invited to prepare papers for this meeting and to send the same to the secretary as early as possible, so that they can be distributed to members in advance of the meeting. The paper by Dr. B. W. Jones on "Mine Sanitation," read at the last meeting, proved very interesting, and it is suggested that the matter be given further attention at this meeting. The subject of sampling ore at mines and upper and lower lake docks is receiving much attention at present, and papers should be prepared and brought up at this meeting.

On April 20, 1907, the following circular letter was addressed to some of the members, and is again presented herewith, for the information of those not receiving it:

"A paper containing biographical sketches will be read at the next meeting of the Institute by J. H. Hearding, of Eveleth, Minn. May I ask you to send to Mr. Hearding any biographical data that you may have concerning any of the old settlers or prominent men of the Lake Superior district who have been connected with the mining industry, or with its development in a commercial or business way? We desire to make this paper as full and complete as possible and wish the sketches to bring out the work and the history of the subjects. It will of necessity be rather brief and on account of limited space may have to be condensed to some extent; but we desire to include in the biographical sketches all data that will be interesting to the general public. This paper will be a very interesting feature in connection with our work in the Lake Superior field and a fitting tribute to the pioneers of this district who contributed much to its present success. An early compliance will greatly oblige."

Industrial

The offices of the Allis-Chalmers Company at Seattle, Wash., G. W. Pulver, district manager, have been moved to No. 115 Jackson street.

The Cutler-Hammer Manufacturing Company, Milwaukee, Wis., has purchased the business of the Wirt Electric Company, Philadelphia, Penn., and will continue the manufacture of Wirt apparatus in addition to its own line of electric controlling devices.

Trade Catalogs

Receipt is acknowledged of the following trade catalogs and circulars:

Buffalo Forge Company, Buffalo, N. Y. Buffalo Electric Disk Wheels. Pp. 4, illustrated, paper, 3½x7 in.

American Rotary Tunnel Machine and Development Company, Denver, Colo. Tunnelology. Pp. 35, illustrated, paper, 8x11 inches.

The Green Fuel Economizer Company, Matteawan, N. Y. Bulletin 105. On drying brick and tile. Pp. 16, illustrated, paper, 6x9 in.

Blaisdell Company, 334 Pacific Electric Building, Los Angeles, Cal. Catalog G. The Blaisdell Pressure Filter. Pp. 11, illustrated, paper, 6x9 inches.

Keystone Driller Company, Beaver Falls, Penn. Catalog No. 2B. Keystone Percussion Core Drills. Pp. 19, illustrated, paper, 8½x11½ inches.

Pittsburgh Coal Washer Company, Pittsburg, Penn. Engineers and Contractors Complete Coal Washeries, Coal Tipple Equipments. Pp. 32, illustrated, paper, 6x9 inches.

C. W. Hunt Company, West New Brighton, S. I., N. Y. Pamphlet No. 073. An introduction to the general line of machinery manufactured by the company. Pp. 32, illustrated, paper, 3½x6 in.

Stromberg-Carlson Telephone Manuacturing Company, Rochester, Ill. Quality apparatus. Pamphlet No. 1. Series and bridging dry battery wall telephones. Pamphlet No. 2. Central energy portable desk telephones. Pp. 10, illustrated, paper, 3x6 in.

Construction News

Tolland, Colorado—The Union Exploration Company will install an air compressor plant at the Gold Run property. New Yorkers are interested and D. L. Webb, Equitable Building, Denver, Colo., is agent.

Idaho Springs, Colorado—The Stanley Consolidated Gold Mines Company intends to erect a large and modern concentrating plant on its property on Clear Creek. A. G. Brownlee, Idaho Springs, Colo., is manager.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at Denver, Salt Lake City, San Francisco and London

REVIEWS OF IMPORTANT EVENTS

San Francisco

June 19. The U. R. Stitt Mining Company, which is operating a mill near Magalia, Butte county, has been troubled with water in the ground-sluices and is about to install a large electric plant to furnish power to be used in working the mine. On the west branch of the Feather river, about one and a quarter miles above Magalia bridge and about 100 ft. below the mouth of Empire gulch a power plant will be erected that will supply all the power and lights needed to operate the mine. The water will be taken from the river several hundred feet higher up, and will be conveyed to the plant in a 3-ft. pipe, and will have a 66-ft. fall. After being used through the power-house the water will be turned back into the river, so that none will be wasted, and corporations will not be deprived of what is due them, it is claimed. The plant will be of the twin or two-unit style and will develop 300 kw. or 600 horse-power.

The California & Massachusetts Copper Mining Company, operating the Tom Head mine, Tehama county, has prepared designs for a smelting plant, which manager N. E. Guyot expects will shortly be installed. The plant is designed for a capacity at the present time of 300 tons per day and is so arranged as to be enlarged to 600 tons by units of 300 tons capacity each. The furnaces are similar to those used by the Anaconda Company, United States Mining Company, Balaklala Company, and at other modern plants. The entire plant is electrically driven, the current being furnished by a generating station, operated by water and located near the river. The smelter and blower-room buildings will be steel structures and the power plant will be concrete and steel building. The smelting plant will be located on a gradually sloping site in order to facilitate the handling of material into the flues and the disposal of slag.

E. M. Hamilton, defendant in a suit brought by the Big Three Mining Company of Kern county to gain possession of overlapping mineral claims in Kern county, has in the circuit court won every point in his contentions. Hamilton owned the Globe and Ajax claims and a couple named Cooper located joining and overlapping claims which were later sold to the Big Three Mining Company.

The Sierra Exploration and Mining Company has been organized with O. C. [illegible] consisting of six claims situated two and a half miles west of Sisson in Siskiyou county. A force of men has already started to work. The original locators prospected these claims thoroughly devoting three years to the work. They have done much development to determine the character and extent of the ore. A wagon road that connects with the main road to Sisson has been completed and negotiations with the Northern California Electric Light and Power Company to furnish electric power (which will be converted into compressed-air power) have been concluded.

The big stone quarries operated at Rocklin, Placer county, are in danger of being tied up despite the granting of the demands of the quarrymen for increase of 25c. a day. The quarrymen have been receiving $2.75 for eight hours and their demands for an increase have been granted by nearly all the companies operating. It is with the stone cutters that the trouble is anticipated. This branch is now receiving $4.50 for an eight-hour day. It is known that the men intend to ask for an increase of a dollar per day before the next pay-day. It is the sentiment that this request will not be granted without a contest.

Large numbers of prospectors who have been over the Nevada fields are flocking into the country about Victorville, San Bernardino county. A number of good mines are being opened up. The Sidewinder, the oldest mine in the district, 18 miles north of Victorville, has a mill running. Several other mines will have mills running next fall. The Gold Eagle has already started its mill. There are other active properties in Ord Mountain district northwest of Victorville; and at Copper mountain six miles north. Some gold properties are being opened near the Ocean View [illegible] north of Victorville.

The Vulcan group, lying between the Balaklala and Shasta King mines, Shasta county, [illegible] interesting activities. This property was formerly owned by William T. Shaw, its discoverer, and J. R. Lyle. Some months ago the Vulcan Gold Company was formed and the claims placed on sale and the company had no difficulty whatever in raising by the sales [illegible] of shares. It appears that the claims will be developed to a large mining enterprise before long.

Salt Lake City

June 20. The [illegible] of the Bingham Consolidated Mining Company have completed the [illegible] of the property in preparing for a resumption of operations, and the organization of a new corporation has been effected. The new company, known as the Bingham Consolidated Mining Company, has a capital stock of $1,000,000, of which 900,000 shares will be divided among the stockholders of the Bingham Consolidated, the balance going to [illegible] holders of the Bingham Consolidated Copper and the balance placed in the treasury. [illegible] will be president.

The second section of the new concentrating mill of the Utah Copper Company, [illegible], is now running, and another section will be completed in a few days, thus increasing the capacity of the mill to 3,000 tons daily. The Copperton mill of the same company in Bingham [illegible] is treating 1,500 tons daily.

The old Dyer mine in Uintah county, which is equipped with a small smelting plant and has produced considerable copper ore, has for the second time passed into the hands of John C. Dyer, of Milwaukee. Several years ago he bought the mine at auction for $63,000 and later disposed of it to the Uintah Copper Summit Mining Company. For the greater part of the past two years, it has been [illegible]. It was reported [illegible] that the property had been sold to the Colorado Fuel and Iron Company, but such seems not to have been the case.

The litigation which has been pending in Park county for the past two years between the Grand Central and Monarch Mining companies is [illegible]. In the District Court at Salida the case will [illegible] during the coming week. The case has been [illegible] in the [illegible] court, and the Supreme Court of the State affirmed the decision in the lower court, and the case now comes up on [illegible] the amount of damages the plaintiff is entitled to. The last word said [illegible].

Jesse Knight, [illegible] of Provo, has secured control of the Knight Consolidated mine in the Uinta district. The company has been [illegible] and the [illegible] will [illegible] to [illegible] mining. It is [illegible] that [illegible] Knight family of Provo is [illegible].

Dividends have been [illegible] for [illegible] to [illegible] the [illegible] Tintic mining companies. [illegible] Tintic Standard [illegible] $40,000.

Colorado, $40,000; Lower Mammoth, $9500. The directors of the Utah mine at Fish Springs have posted the usual monthly dividend of 3 cents a share, or $3000.

The United States Smelting, Refining and Mining Company has completed the installation of its new bag house system for the collection of flue dust and eradication of the smoke and fume evil and is in successful operation at the Bingham Junction smelter of that corporation.

Denver

June 21—The Golden Cycle Mining Company, in order to secure payment of a bond issue of $1,000,000, has given a trust deed for that amount, to the International Trust Company, of this city, covering the mines in the Cripple Creek district, and the reduction works at Colorado City. There are 1000 bonds of $1000 each, bearing interest at 6 per cent., and payable in five years.

The contractors for the construction of the new Cripple Creek drainage tunnel, have already thrown up the contract and the drainage tunnel company, consisting of the mine owners who have subscribed to it, will go on with the work. The rock proved so hard that in five days the best efforts advanced the breast only 18 ft., whereas the contract required driving an average of 10 ft. daily. It is understood that the tunnel committee will pay for the work done, less 25 per cent. forfeit.

Within a short time the enormous dump of the Portland Gold Mining Company, at Victor, will be shipped to the reduction works at Colorado Springs, which is made possible by the reduction of freight charges on low-grade ore. Possibly, the Stratton Independence dump will also be shipped, the aggregate of the two companies being about 750,000 tons of ore, running about $5.50 per ton.

On account of the additional trouble in handling the ore twice, the railroad companies have notified the managements of the sampling works, of an extra charge of 20 per cent. for hauling Cripple Creek ores, sampled in the district.

The largest cave-in ever known to have occurred in this vicinity, occurred a few days ago, when about 10,000 tons of dump rock fell a distance of 400 ft. in the old Anna Lee workings of the Portland property. No work has been done there for some time.

The tungsten fields of Boulder county are keeping up a good production. Last month nearly $100,000 worth of ore was shipped, of which about one-half came from the Wolf Tongue property.

Work on the construction of a new matte smelter, at Lake City, under the direction of Nelson Hopper, president of the Lake City Mining and Smelting Company, has begun. At first the capacity will be 75 tons daily.

Secretary James F. Callbreath, Jr., of the American Mining Congress, has issued the call for the tenth annual session, which is to be held at Joplin, Missouri, November 11 to 16.

The acting Secretary of the Interior has restored to the public domain for entry, about 80,000 acres in the Durango district, and about 225,000 acres in the Santa Fé district in New Mexico.

During the first five months of the current year mining companies operating in the Cripple Creek district have paid dividends to the extent of $522,755. This does not include the profits realized by close corporations or leasers.

London

June 15—A year ago I gave some information in this column of the satisfactory state of the Scottish shale oil industry, and mentioned how, with modernized plant, the producers were well able to meet the competition of the standard oil trust. This year the Scottish companies are doing even better. The reports of the four chief companies show, in every case, that the profits have increased. The four companies are the Broxburn, Pumpherston, Young's, and the Oakbank. The Pumpherston has made the largest profit and the largest increase, having made a gross profit for 1906 of £116,046 as compared with £94,515 in 1905. The aggregate gross profit of the four companies was £342,664 in 1906, as compared with £314,492 in 1905.

The nineteenth annual report of the Burma Ruby mines has just been published. The report for the twelve months ended Feb. 28 shows a profit of £21,978, of which £6818 goes as royalty to the Government of India, leaving a divisible profit of £15,150. Out of this a dividend at the rate of 5 per cent., absorbing £14,950, has been paid. During the year 1,890,944 trucks of ruby earth were washed at a cost of 7.7 pence per truck, which is a slightly lower cost than last year. The washing was divided between five mills, each of which has two main pans and a safety pan. The construction of the Magok drainage tunnel progresses favorably, and 4000 ft. of it have already been driven. The remaining 1400 ft. should be finished by the end of the present year. The company is addressing a petition to the Indian Government asking for a reduction of the royalty. Up to the present the government has received three times as much in royalty as the shareholders have received in dividends. The government gets 30 per cent. of the net profits and the fact that the government has received more profits than the shareholders, is explained by the expenditure of large sums of money out of net profit on the improvement of the conditions at the mines.

The boom in smokeless semi-coked coal continues. Following on coalite, and the Scottish smokeless Coal Syndicate's product which [illegible] comes "Carbo," which is being placed on the market by the Gas Light and Coal Company, the organization which supplies most of London with illuinating gas. It is being sold at 23s. a ton. At this time of year best bituminous coal is sold in London at about 25s. a ton. In appearance "Carbo" is very like "coalite."

Johannesburg

May 27—The general strike that has been declared by the Transvaal Miners' Association is probably the most destructive strike from the men's point of view ever started. The trouble began at the Knights Deep mine. Although most of the miners on this property were non-union men, the Miners' Association saw an opportunity for a master strike, so the cause of the Knights Deep was taken up. At first they succeeded in bringing out several mines on a sympathetic strike, but there were many setbacks, and in order to liven things up the executive committee ordered a general strike of all underground employees of mines affiliated with the Chamber of Mines. The proclamation has met with extraordinary success, and today every mine affiliated to the Chamber of Mines is affected by the strike.

One group, however, is exempt from the disturbance. All the mines controlled by J. B. Robinson, which are not affiliated to the Chamber of Mines, are unaffected by the strike.

There are hundreds of men, principally Africanders, who have been longing to get work on the Rand, and who will now jump into the vacant jobs, in spite of intimidation. These men are willing to work for less than half what the labor aristocrats demand for their services. They are of course, untrained, but being eager and intelligent, it will not be long before they can be "licked into shape." Many recruiters are out among the Boers, and before long there will be enough white labor to replace the malcontents. This breaking in of raw farm labor will disorganize the mines for awhile, and no doubt stamps will be hung up, but the ultimate result will be beneficial to the mining industry. It is felt that a great improvement will be made if the white laborers, born and bred in this country, are used in the mines. They do not intend to leave South Africa, and all their earnings will be spent here. The Boer leaders have pointed out to their people what a great chance is offered them, and the Dutchmen are steadily coming to the mines for employment.

Hardly any stamps have been hung up. Every effort is being made to keep the mills running. Managers, surveyors, samplers, office men, etc., are now in the mines superintending the work which the strikers left. Chinese and Kafirs are now so efficient that they do not require much supervision. Every precaution is being taken to prevent acts of violence.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

WALKER COUNTY

McCollum—These coal mines have been purchased by the Tennessee Coal and Iron Company.

Kelso Mining and Manufacturing Company—This company, James Kelso, of Jasper, general manager, has leased 700 acres of coal lands about seven miles south of Jasper, and, it is reported, will construct a railroad 12 miles long, for the shipment of coal.

Arizona

YAVAPAI COUNTY

Knight Copper Company—This company has been organized by Humboldt men to take over a group of copper claims near that place. The group consists of five claims. Although little work has been done there is an excellent showing. The ledge is from 10 to 25 ft. in width having a porphyry hanging wall and schist for the foot. Development work has been started by the new company. The property will be equipped with machinery in a short time.

New England-Arizona Gold and Copper—This company is installing a new air compressor and will change from hand work to machines. Its shaft has reached a depth of 240 ft. Considerable ore has been exposed.

Proposed Smelting Works—J. W. Boileau has secured from the City of Prescott a grant of an additional 80 acres of land upon which to construct his proposed smelter. The terms of the grant are such that construction work must be started and prosecuted within six months from the time of the grant. The site as now proposed contains 160 acres.

Starlight Group—This group of mines, situated in the Weaver mining district, has been taken under bond and lease by William F. Whitney, of Wallingford, Conn. The original owners, Genung & Scott, have reached a depth of 140 ft. The ledge is strictly gold-bearing, and will permit of recovery by amalgamation.

Storm Cloud—These mines are being operated by the H. J. Beemer Company, one car of ore [illegible] to the Humboldt smelter. Most of the ore shipped is taken out in development work.

California

AMADOR COUNTY

Kennedy Mill and Mining Company—The pipe-line for delivering fuel oil from [illegible] has been completed. The oil from [illegible] to the boilers of the mine, and no trouble has been experienced.

[illegible]

Chrome Mine—A chrome mine [illegible] has been leased to Charles Berry et al. by S. E. Starrett, of Oroville. Assays show 55 per cent. chrome and 5 per cent nickel.

CALAVERAS COUNTY

Moosehead, Water, Power and Mines Company—This New York company has purchased from E. C. Rigney and Thomas Thorkelsen the Moosehead claims adjoining the Sheepranch quartz mine, 12 miles from San Andreas. The claims are patented and cover a large area. The company owns 15 miles of ditches and has options on dams and reservoir sites, and has a bond on the San Antonio ditch system. The company is now hydraulicking with two giants.

EL DORADO COUNTY

Woodside-Eureka—At this mine, Georgetown, high-grade ores are being found at a depth of 170 feet.

FRESNO COUNTY

Corcoran Mercury Mining Company—At this quicksilver mine, 25 miles from Coalinga, 1500 tons of ore are on the dump. A new shaft has been sunk 200 ft. deep. The company has decided to continue its lease on the mine for two years more.

INYO COUNTY

Dunlap—At this mine, W. G. Scott [illegible] in the tunnel and it is thought that the pay shoot has been struck earlier than expected.

Greenwater—Through the inability of Nash and Wallace to meet the $75,000 payment on May 24, Arthur Kunze, original locator of Greenwater and the Schwab mine, again becomes the owner of the claims and properties in the district, including the Greenwater and Grand Central groups.

Greenwater Pride Mining Company—The [illegible] on the north end of the Pride claim have cut through 30 ft. of ledge matter. This [illegible] will connect it with the Bullion workings.

[illegible]

[illegible] Miller and [illegible] while prospecting on the Indian Creek [illegible] found a large vein of lead ore, which they have named the Eureka.

MARIPOSA COUNTY

Tuolumne Gold Mining Company—This company has begun operations under management of F. A. Truesdell. Under contract, etc. have been shipped, or put in cars, [illegible] and passage and the [illegible] way.

Yosemite Consolidated Gold Mining Company—This company, of which O. S. Williams, of Los Angeles, is president, has purchased 23 claims comprising [illegible] acres at Horseshoe Bend, on the line of the new Yosemite Valley railroad. An electric power plant and a 20-stamp mill are to be installed.

NEVADA COUNTY

Lincoln—At this mine on the Conley ranch, Canada hill, a hoist is to be erected which will permit the company to sink the drift 200 ft. deeper.

Mistletoe—This mine at Rough and Ready, formerly owned by Clifford Gresham, has been transferred to a new company, composed of L. M. Clark, F. M. Spaulding, M. Clark, I. C. Lindley and Henry Goering.

Magenta—A new [illegible] has been installed at this mine by the new management, and another pipe line is being finished.

Town Talk—One property on Union Valley, between the Idaho, Maryland and Empire mines, has been bonded by E. E. Heler, who intends organizing a company to develop it.

Young America—Robert Gray, the principal owner of this mine at French Corral, is making [illegible] to work it on an extensive scale.

PLACER COUNTY

Lake Shasta—Manager Ryan, of this mine at Ophir, is opening the 300 and 400 levels.

Hermosa—Superintendent Stevens [illegible] to run to the [illegible] and will put on an extra force to [illegible].

Last Chance—The [illegible] was leased by F. E. Hewitt and others, [illegible] to be prospected by Wm. H. Berg and other men from Nevada, who intend to put on a [illegible] and employ [illegible] to get the start.

Combined Mines—This mine, in Dutch Flat district, has been leased and a new [illegible] will [illegible] ordered, to be operated by [illegible] power.

[illegible] differences with the Mayflower are settled, Peter Crary will start up this old mine.

PLUMAS COUNTY

Nevada-Plumas—High-grade ore has been struck in this property at Beckwith. A long tunnel is being run to crosscut the vein at depth.

SAN BERNARDINO COUNTY

Tungate and Caldwell—Work on an extensive scale has commenced on this mine, adjoining the Crackerjack Gold Mining Company's property on the north. The shaft will be sunk 200 ft. at once.

SISKIYOU COUNTY

Arbuckle and Temple—This mine, near Callahan, has been sold to men from Eureka, Humboldt county, and F. H. Heinze has been selected as superintendent. A mill will be erected.

McFadden and Chapman—Work has been resumed on this mine at Mill Creek, near Callahan.

Dr. Maggi—The first carload of ore from this mine has been hauled to the railroad and shipped to the smelter at Kennett.

Yellow Butte Copper Mining Company—This company has been organized to open and work the Yellow Butte mine on the east side of Hay Stack mountain. The officers are: W. P. Veuve, of San Jose, president; J. D. Ball, of San Juan, San Benito county, secretary; L. D. Ball, of Yreka, superintendent. A hoist and other machinery have been ordered.

Colorado

Land-fraud Arrests—Ten prominent citizens of Colorado were arrested June 24, charged with conspiracy to defraud the Government under the coal and timber land law. Those arrested are: John B. McMillan, Robert Forester, chief geologist of the Denver & Rio Grande Railroad; Otis B. Spencer, formerly clerk of the District Court; F. W. Keitel, a coal operator in Routt county; John A. Porter, formerly president of the Porter Fuel Company; Edgar M. Briggs, president, and John J. McGinnity and Charles D. McPhee, directors of the New Mexican Lumber Company; Alex Sulenberger, president of the Pagosa Lumber Company, and Charles H. Freeman, of Pagosa.

All were arraigned before United States Commissioner Sanford H. Hinesdale and held in $5000 bond each. The grand jury indicted 73 persons in all, representing six States.

BOULDER COUNTY

[illegible] Mining Company—Denver and West Virginia capital is interested in the [illegible] of the area of coal land, and [illegible] of operating coupled near Lafayette. The mines are to be equipped for a daily [illegible] of 1500 tons.

CLEAR CREEK COUNTY

Golden Glory Tunnel Mining Company—Denver and eastern capitalists are interested in driving a tunnel into Saxon mountain, below Georgetown, and are figuring on installing an air compressor plant and drills. A. A. Arbuckle, of Georgetown, Colo., is manager.

Inspiration Mines and Tunnel Company—Nebraska, Iowa and Colorado capitalists propose to drive a parallel tunnel from Gilson gulch to cut the mines of that section as well as others in Gilpin county. Electric power will be used. J. J. Hoban, Idaho Springs, is manager.

Stanley Mining and Milling Company—The Hyland mill and water rights on Clear Creek, have been purchased by this company and the water rights will add to the power resources. A. G. Brownlee, Idaho Springs, Colo., is manager.

GILPIN COUNTY

Free Gold Group—This group in the Perigo district has been sold to F. A. Burnell, of Denver, for a consideration of $22,000. Development work will be extensive.

Keystone—Denver and Eastern capital is interested in the purchase of this property from J. C. Jenkins, Central City. Heavier machinery is to be installed, and A. J. Smith, Central City, Colo., is to be superintendent.

King Bee—Southern capitalists are interested in starting up the Clifton Bell group, in Russell district, with A. H. Heller, Central City, as manager. Machinery is to be installed, and the company will develop the holdings through the Newhouse tunnel.

Saratoga Mining, Smelting and Reduction Company—Articles of incorporation of this company have been filed showing $1,000,000 capital. The officers are: President and general manager, John Owen, Idaho Springs; secretary and treasurer, H. T. Rogers, New York City. The corporation has been formed for the purpose of purchasing the Saratoga group of nineteen claims situated in Russell district, as well as other property, the option on the Saratoga calling for $500,000.

Eagle Mining Company—Denver and Eastern people are interested in the purchase of the Mabel tunnel property in Russell district, and machinery is to be installed. Robert Denton, Central City, Colo., is manager.

LAKE COUNTY—LEADVILLE

Best Friend—This property, upper Big Evans gulch, has been worked steadily during the winter and considerable ore is ready to be shipped whenever the roads become passable. The ore is found in a fissure vein which averages 3 ft. wide and contains gold and silver.

Cleveland—Drifting north and south from the bottom of the shaft, South Evans, is proceeding satisfactorily and the streak of ore followed runs well in gold. Winnie, the adjoining property to the south and owned by the same company, New Monarch Mining Company, is still producing an average of four carloads of high grade ore. The property also produces 1200 tons per month of medium-grade ore.

Damascus Mill—The experimental stage at this plant has been passed, and it is the intention of the company to enlarge the plant and also to install a wet process for the treatment of the low-grade ores of the camp.

Dinero Tunnel—The tunnel, Sugar Loaf, is approaching the 100-ft. point and it is expected that several veins will be cut in the next 200 ft. The Bartlett claim in the same district is shipping high-grade ore. The company is making preparations to sink the shaft deeper.

Little Jonny—This property, Breece hill, continues to yield rich ore in several parts of the mine. A set of lessees on No. 4 shaft at the 900-ft. level recently took out 63½ lb. of ore that netted 33 lb. 10 oz. pure gold. From other parts of the mine lessees are shipping good ore amounting to 8000 tons per month.

Louisville—This property, Iron hill, is being worked from the Yak tunnel, a lateral having been run from the main tunnel, cutting the shaft at a depth of 600 ft. Electrical machinery was installed and the present work is being carried on 150 ft. below the tunnel level; 75 tons daily of lead and iron sulphides are being shipped, and the output could be doubled.

Weston Pass—Several properties in this section will resume operations this summer, among them being the Ruby and Colin Campbell. Both have good bodies of lead; extensive development will be carried on. The section is eight miles directly south of Leadville.

ROUTT COUNTY

Oil—California capitalists have formed a company with a capital of $1,500,000 to sink for oil, and are arranging for the purchase of the Milner tract, near Steamboat Springs. A. E. Lea, of Los Angeles, Cal., is at the head of the syndicate and the headquarters of the company is to be at Steamboat Springs.

Georgia

MURRAY COUNTY

Iron Mountain Mining Company—This company, organized in Atlanta, has acquired large deposits of iron and manganese ores in Murray county and will erect washeries and build a branch road to its mines.

Kentucky

BELL COUNTY

Black Raven—These coal properties at Four Mile have been leased to Crawford & Company, a new corporation, of which

W. M. Nixon ... president of the Brushy Mountain mines, Tenn., is president. The daily output of the Blue Ridge ... is about 2,000 tons of coking coal.

Kentucky

Black Hawk Coal Company—The company has been organized in Middlesborough with a capital stock of $30,000 to develop coal deposits about nine miles from Artemus, said to be the Dean seam. The officers include John Howard, Charles I. Dawson and ... P. Newsome.

Louisiana

Caddo Parish

Jennings Heywood Oil Corporation—This company has two new wells in the old portion of the field producing 500 bbl. daily.

Crowley Oil and Mineral ...—This company has paid the seventeenth dividend of 10 per cent. on a capital stock of $200,000.

Caddo Parish

Hughes Hunter—The ... well ... Shreveport, came in May 23, at 2170 ft., and is flowing 100 bbl. daily. Ten big gassers, having an estimated daily capacity of 125,000,000 ft., have been completed in this field. Some of the gas is being sold at Shreveport at 25 cents per thousand to private consumers, and 10 cents per thousand to manufacturers. The gas will eventually be piped as far west as Fort Worth, Tex.

Michigan

Houghton County—Copper

Centennial—Work is approaching the mineral in the No. 2 shaft. Fifteen additional drills have been put in operation.

Hancock—The annual meeting held in the office of the company at Hancock resulted in the election of the following: J. D. Cuddehy, James Hoatson, Thomas Hoatson, S. B. Harris and A. F. Rees. Parts for the new hoisting engine for the new shaft are being received.

Montana

Butte District

Anaconda—The shaft on the High Ore is 2830 ft. deep, and is going 45 deeper, after which no more sinking will be done for some time. The odd 75 ft. will be a sump. Sinking at the St. Lawrence was resumed at 2100 ft. Drifting in the vein of the Anaconda mine at the 2200-ft. level continues, but at the 2300-ft. level it will be necessary to supply air before further work can be done. This will con... [illegible]

Parrott & Mitchell—The ... on Old West Colusa, hoped for the ... is down nearly 1700 ft., and the Mountain View ... is working from the ... level to connect with the 2200-ft. level of the High Ore. The company is shipping ... tons of ore a day, the capacity of the smelter. It is doing considerable development work for Coalition in Minnie Healey and Tramway ground.

Coalition—The company ... its advantages and is ... production of nearly 1800 tons a day. This output will probably not be augmented much until Jan. 1, when the new shaft on the Tramway will be in use and new territory opened in the Rarus, Cora and Minnie Healey. At the 1300 and 1400-ft. levels of the latter great bodies of high grade ore have been blocked out recently.

Colusa Leonard—The company ... have ore in the Thomas vein cut by way of the 1800-ft. station of the Original, but none of it has been raised to the surface. Development continues on all claims.

East Butte—The president of the company ... copper ore of fair grade at a point about 130 ft. north of the 400-ft. station of shaft No. 11, and says the vein in the bottom of No. 1 is still strong and productive.

La France Copper—According to the report of this company to the assessor for taxation purposes, the daily production for 360 working days of the year ended May 31, was 95½ tons of ore, the total being 34,336 tons, 3½ tons a day more than during the previous year. The total net earnings for last year were $151,012, $1027 greater than the previous year. La France is a branch of United Copper.

Pittsmont—The ... is 1030 ft. deep, and a station is being cut at 1000 ft. Amazon Butte is 400 ft., and is preparing to crosscut its veins north and south. Butte & Bacorn is down 1000 ft. in its Calumet shaft, and will crosscut north and south from the bottom. Colusa Leonard Extension is 690 ft.

North Butte—This month the ore production of the company has been as great as it has been during any similar period. The crosscut north of the 1600-ft. level of the Jessie has advanced 70 ft. since June 1, which brings it within about 250 ft. of the Berlin vein, for which it is driving. Shipments aggregate between 1300 and 1400 tons of ore a day, a large portion of ...

Nevada

... District

... ft. level, where a station is being cut to ... crosscutting and drifting was done on ... closing any very high grade ore. There are indications, however, that the lessees ... Ophir.

... Ore ... is being ... [illegible]

... [illegible] ... [illegible] ... Both are in low-grade ore.

Velvet—The Bartine and Hassell lease ... [illegible] ... the Codd lease, in the ...

... [illegible]

... of silver ore giving high assays. Some of the assays also yield gold.

Columbia—A vein of milling-grade ore is being developed in the Lucy B. claim on this property.

... [illegible] ... 450-ft. level for driving. When it is completed sinking will be continued to the 550-ft. level.

... [illegible] ... railroad station.

... [illegible] ... developed in the Pioneer, has been ... [illegible] ...

... [illegible] ...

connected and improved the ventilation of the workings. A fair-sized orebody of milling grade has been opened in the northeast drift from the West shaft.

MANHATTAN

Consolidated—The new mill for this mine has arrived at Reno and will be forwarded as soon as the freight blockade is raised.

Giant—A shipment of 5 tons of ore from the Walker lease was made during the week. The ore assayed a little over $25 per ton. The ledge from which this ore was mined was opened up a month ago, and is developing well.

Gold Crater—The returns from a recent ore shipment average $100 per ton.

Gold King—A shaft will be sunk on the rich vein on the Uno claim.

Granny—Shaft-sinking has been resumed from the 200-ft. level, and will be continued until the 350-ft. level is reached.

NYE COUNTY—TONOPAH

Ore Shipments—Ore shipments over the Tonopah Railroad for the week ending June 13 were: Tonopah Company, 1242 tons; Belmont, 224; Tonopah Extension, 220; Montana-Tonopah, 100; Midway, 37; Jim Butler, 30; total, 1853 tons. Shipments from Goldfield were 811 and from Lone Mountain 30 tons, making a total of 2694 tons. In addition the Tonopah Company sent 1978, and the Belmont 1060 tons to the mills, a total of 3038 tons.

Belmont—The new 60-stamp mill has been running steadily on the company's ore during the past two weeks.

Jim Butler—About 100 tons of high-grade ore weekly are being shipped and a large amount of ore of milling grade is being stacked.

West End—The new shaft has been sunk to a depth of 130 ft., and the usual amount of development work is being done. During the week a shipment of 40 tons of high-grade ore was made to Salt Lake.

Pennsylvania

ANTHRACITE COAL

District President John Fahy, of district No. 9, United Mine Workers, has agreed to serve as secretary of the Anthracite Conciliation Board, to succeed William Dettery, who resigned as a member of the board.

The Lehigh Coal and Navigation Company is electrifying the tow path of the canal from Coalport to Weissport, a distance of four miles, as an experiment to demonstrate the advisability of equipping the entire length of the canal.

As the result of a partial report made by Engineer Lewis M. Haupt, consulting engineer to the directors of the Lehigh Coal and Navigation Company, the miners will be recommended to make shipments of coal from the Panther Creek district by way of the canal of the Lehigh Coal and Navigation Company. Professor Haupt states that the coal can be sent to dealers who have wharfage facilities for 15c. a ton less than by way of the railroads.

George M. Christ, of Pottsville, has been awarded a contract to build a breaker for the McTurk Coal Company; at Girardville and also one at Excelsior.

David D. Randall, mining engineer for the Susquehanna Coal Company, was given a banquet at Kingston upon his appointment as superintendent of the Penn colliery, of the same company, at Shaft, Penn. He was also presented with a gold watch by his fellow employees.

Congressman T. D. Nicholls, president of District No. 1, United Mine Workers, is indignant at Governor Stuart, of Pennsylvania, who vetoed the bill, passed by the legislature, prohibiting a miner from having charge of more than one chamber. Mr. Nichols in discussing the action of the governor said "Unless the present miners' certificate law can be interpreted to mean that a miner cannot have charge of more than one working place, then there is nothing to prevent the employers from employing one miner to have charge of several places, as has already been done at a colliery in Olyphant and to have the laborers mine the coal in some of the places and to take care of themselves while doing this work."

South Dakota

Men Wanted—Six hundred more miners and mill men are needed in the Black Hills, owing to the resumption of work after the settlement of the strike. The fire in the Homestake has been extinguished and that company will need a large number of men.

LAWRENCE COUNTY

Branch Mint Mining and Milling Company—The new mill of this company at Galena is nearly completed and 120 stamps will be dropping within a short time. All the machinery and tanks of this, the largest cyanide plant in the Black Hills, have been installed. There are twelve tanks 6x18 ft.; nine, 7x18 ft.; four, 6x36 ft., and one, 6x30 ft., besides 17 tanks, 12x18 ft., for the treatment of slimes by decantation. The building is 86x140 ft. and has room for five more tanks. The Hoodoo shaft is down 400 ft. and there are more than 2000 ft. of tunnels crosscutting the orebodies. The bins at the mill are already full. J. D. Hardin is president of the company.

Texas

The Texas legislature at its last session passed the Gross Receipts Tax Bill. The vigorous fight made by the oil operators resulted in many modifications of the obnoxious clauses. As passed the crude oil producer is only taxed one-half of one per cent. on gross receipts; pipe lines, 2 per cent.; wholesale dealers in refined oils, 2 per cent.; tank car lines, 3 per cent. Dealers in crude oil (other than actual producers) escape all taxation.

The labor troubles, which have caused some annoyance in the Texas fields, have been settled. The operators made no concessions whatever, and the strike ordered by the Oil and Gas Workers' union was a failure.

The King Crowther Oil Corporation has been reorganized and revived. This company received hundreds of thousands of dollars from Eastern investors in 1902, and then was placed in the hands of a receiver. The location of its Texas wells(it claims 15 proved wells, capacity not stated) is about 60 miles south of San Antonio. Apparently no effort is being made to sell stock in Texas and Eastern investors can readily learn what operators here think of its property and its methods.

Field operations in the coastal field were quiet in May, only 54 wells being completed, of which 45 were producers, a decline of 37 wells compared with April.

The May production declined about 90,000 bbl. The gross output was 1,351,000 bbl., and the consumption 1,750,000 bbl., leaving stocks of crude at 5,870,000 bbl. The Security Oil Company and the Gulf Refining Company used Glenn crude in some of their stills, so that the refinery consumption of Texas crude decreased about one-third. The Batson field showed an increased flow, while all other fields declined. Part of the decrease was occasioned by excessive rains flooding the fields.

The crude oil market is very firm, and in many cases fuel oil is bringing $1.05 to $1.10 f.o.b. on cars. The Standard Oil Company is out of the market, prices being too high for their use to ship to Eastern points.

The May output of the various fields and current credit balance prices are as follows: Batson, 216,000 bbl., 86 cents; Humble, 312,000 bbl., 90 cents; Saratoga, 210,000 bbl., 86 cents; Sour Lake, 211,000 bbl., 86 cents; Spindletop, 114,000 bbl., 88 cents; and Jennings, 270,000, 80 cents.

Utah

BEAVER COUNTY

Frisco Contact—Work at this property has been retarded by the scarcity of miners.

Newhouse Mines and Smelters—The mill of this company is handling an average of 800 tons daily. Additional crushing facilities are being installed that will bring the capacity up to 1200 tons a day.

BOXELDER COUNTY

Salt Lake Copper—This company is making regular shipments of copper ore

from the property [illegible] coma, Nevada

[illegible] County

[illegible] tic mines forwarded to the Salt Lake valley smelters a total of 153 carloads, the contributing mines and amounts being: Ajax, 3; Bullion Beck, 3; Beck Tunnel, 8; Bullock, 1; Carisa, 5; Centennial Eureka, 57; Colorado, 6; DePue, 6; Eagle & Blue Bell, 4; Eureka Hill, 9; Grand Central, 6; Gemini, 5; Lower Mammoth, 8; La Clede, 1; May Day, 4; Mammoth, 10; Scranton, 6; Uncle Sam Con., 4; Victoria, 3; Yankee Consolidated, 4 cars.

Piute County

[illegible] have called on shareholders for another assessment and expect to resume development work shortly.

Annie Laurie Mill—This plant is being overhauled and re-equipped with modern machinery.

Salt Lake County

Columbus Consolidated—This Alta company is shipping from 50 to 60 tons of ore daily. The usual dividend will be posted in July, 20c. a share, or $56,000

Standard Copper—The Burning Moscow vein has been encountered in the Saginaw vein at a distance in from the portal of 600 ft. Eighteen inches of good shipping ore is exposed. The [illegible] was made 125 ft. below the older workings of the mine.

Silver Shield—This Bingham company is operating a small mill, which is being supplied with ore carrying values of about 8 per cent. lead, 10 oz. silver, 1 per cent. copper and $1 in gold.

Ute Copper—This company, recently formed by a syndicate of Salt Lake and Ohio mining men, has a force of men engaged in cleaning out the old workings of the Winnemuck mine in Bingham.

Summit County

Ontario—Work has been suspended at this property and preparations are being made to pump out the lower workings before renewing the attempt to reopen the drain tunnel.

Tooele County

New Stockton—The mill on this property is to be enlarged to treat 150 tons of ore per day. It is now handling about 50 tons and two cars of concentrates are being marketed weekly. J. J. Trenam, of Salt Lake, is manager of the company.

West Virginia

Raleigh County

Slab Fork Coal Company—This company, incorporated several months ago with a capital of $300,000, will, it is reported, develop about 2700 acres of coal land in the Windy Gulf district, accessible to both the Deepwater and Chesapeake & Ohio railroads. W. G. Caperton will have charge of operations.

Canada

[illegible] ore for the week ending June 15, were as follows: Comagas, 278,000 lb.; Nipissing, 57,400; Right-of-Way, 72,830; total, 408,230 pounds

[illegible] miles south of Haileybury, on the shore of Lake Timiskaming, is preparing to make shipments and commencing extensive development work. The two shafts are being timbered to the depth of 40 and 25 ft., respectively, substantial camp buildings are approaching completion and the force of 15 men will be increased. J. B. Phillips is superintendent.

Cobalt Lake—No. 4 shaft is down 74 ft., and sinking is progressing at the rate of about one foot per day. It is 65 ft. below the water level. At the 76-ft. level in No. 5 shaft, the vein is found to hold its width with a more even distribution of silver. As soon as the compressor is ready, eight drills will be started in addition to the two now in operation.

Erie-Cobalt—A third vein of calcite has been discovered in the cross-cut from the 100-ft. level. It is 6 in. wide and carries a good proportion of silver. Forty-eight men are at work.

O'Brien—Two good surface strikes were made this week. One vein was upward of 2 ft. wide, the other 3 in.

Philadelphia Cobalt Mining Company—At the St. Denis mine, Lorraine township, owned by this company, a main shaft has been sunk on No. 5 vein from which a cross-cut can be driven for about 25 ft. to cut vein 6. Both of these carry cobalt and silver, and there are others which promise well. The mine was visited last week by President H. B. Hanford, Philadelphia, and a party of officials and directors. Machinery has been ordered.

Mexico

Transportation Difficulties—The mining and smelting industries of the republic are suffering from the inability of the railroads to move ores and coke. The American Smelting and Refining Company has, it is reported, more than 100,000 tons o. ore tied up along the Mexican Central lines, and all the smelters are suffering for lack of fuel. A number of [illegible] because of failure to ship and realize returns.

[illegible] This company [illegible] the Chisholm and Borough groups of mines in the Porcupine district of the Province of Ontario, has now finished a [illegible] on the property of the company.

Africa

[illegible] 392 in value

[illegible] The Chamber of Mines reports the gold output for May at [illegible] which is 12,542 oz. less than in April, but 75,817 oz. more than in May, 1906. For the five months ended May 31 the total was 2,180,474 oz. in 1906, and 2,631,173 oz., or $54,386,346, in 1907; an increase this year of 450,699 oz., or 20.7 per cent.

There were distributed to the mines during the month of May 7649 natives, while 7804 left through time expiry and other causes, the net loss on balance being 155. The number of the Rhodesian group of mines, the number of natives employed at the end of the month was 91,669

[illegible] Gold production in May is reported at 24,854 oz. bullion; an increase of 8443 oz. over May, 1906. For the five months ended May 30 the total was 88,004 oz. in [illegible] The bullion reported this year was equal to $2,332,100 in value.

New Zealand

[illegible] ports of gold for March and the three [illegible]

[illegible] The bullion reported this year was equal [illegible]

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

In the Alabama coalfields the controversy between the miners' union and the coal operators, concerning the concessions by both sides is still in abeyance. Many union miners have deserted the union mines to work in those not recognizing the unions. The demand for coal is exceptionally strong in this field and the present rate of production indicates a large output for the year.

In the West the usual summer dullness has set in but business is reported better than for other years at this time. Prices are fairly strong but show a tendency to weaken.

The feature of the Atlantic seaboard soft-coal trade is the scarcity of vessels and the prevalence of winter freight rates. It is rumored that certain shippers contracted for large vessels early in the year at low rates and have since been active in boosting the rate so as to profit by the difference in prices.

The local demand for anthracite has fallen off considerably and the usual summer dullness has set in. Small steam sizes are not quite so scarce and producers are slowly catching up with this class of business.

Coke is weak and subject to demurrage conditions.

Coal-traffic Notes

Shipments of coal and coke originating on the Pennsylvania Railroad Company's lines east of Pittsburg for the year to June 15 were as follows, in short tons:

	1906.	1907.	Changes.
Anthr.	[illegible]	[illegible]	[illegible]
Bit.	[illegible]	[illegible]	[illegible]
Coke	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The total increase this year was 189 [illegible]

Shipments of bituminous coal and coke over various railroads in western Pennsylvania and West Virginia are reported as below, in short tons, for the four [illegible]

	Coke.	Total.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]
Total, 1906	[illegible]	[illegible]

[illegible] tons, or 11 per cent. In addition to the [illegible]

and 375,689 tons in 1907; an increase of 115,588 tons.

Shipments of coal over the roads in the Ohio Coal Traffic Association for the four months ended April 30, are reported as below, in short tons:

	1906.	1907.	Changes.
Hocking Valley	1,224,208	1,102,642	D. 121,566
Toledo & Ohio Cent.	553,867	547,676	D. 6,191
Baltimore & Ohio	500,057	671,132	I. 111,075
Wheeling & L. Erie	924,985	1,109,278	I. 184,293
Cleve., Lorain & Wh.	698,365	823,136	I. 124,771
Zanesville & Western	380,314	488,661	I. 108,347
Toledo Div., Pen. Co.	767,377	854,320	I. 86,943
L. Erie, Alliance & Wh.	298,977	383,393	I. 84,416
Marietta, Col. & Clev.	.....	6,040	I. 6,040
Total	5,408,150	5,986,278	I. 578,128

The total increase shown this year was 10.7 per cent.

Shipments of coal from mines on the Southern Railway for the three months ended March 31, were: Tennessee district, 372,878; Alabama district, 588,857; total, 961,735 short tons, an increase of 33,559 tons over last year.

Coal receipts at St. Louis for the four months ended April 30, were 2,698,061 tons in 1906, and 2,516,016 tons in 1907; a decrease of 182,045 tons.

Receipts and shipments of coal at Chicago for the four months ended April 30 were, in short tons:

	Receipts.	Shipm'ts.	Balance.
Anthracite	566,184	412,373	153,811
Bituminous	5,367,117	1,423,578	3,943,539
Coke	147,641	104,157	43,484
Total	6,080,942	1,940,108	4,140,834
Total, 1906	4,720,241	1,486,155	3,234,086

The balance represents approximately the city consumption. Bituminous receipts were from Pennsylvania, 355,179; Ohio, 324,791; West Virginia, 211,825; Indiana, 1,076,723; Illinois, 3,398,599 tons.

Coastwise shipments of coal from the leading Atlantic ports for the four months ending April 30 are reported as follows:

	Anthracite.	Bituminous.	Total.
New York	5,591,300	4,475,904	9,967,204
Philadelphia	534,338	1,509,743	2,244,081
Baltimore	73,278	1,132,307	1,205,585
Newport News	.....	818,215	818,215
Norfolk	.....	551,713	551,713
Total	6,198,922	8,492,945	14,790,867
Total, 1906	5,290,760	7,478,817	12,769,581

The total increase this year was 2,126,584 tons, or 16.8 per cent. New York includes all of the New York harbor shipping ports.

New York

Anthracite

[illegible] The local coal market shows great dullness and considerable falling off in business, which is usual at this season of the year. The small sizes continue in good demand, however, but the extreme [illegible]

the year has been somewhat relieved, especially in buckwheat Nos. 1 and 2; rice, barley and pea are still very scarce, and in stong demand. Car supply is fair and nearly up to all requirements. We quote prices as follows: Broken, $4.45; egg, stove and chestnut, $4.70; pea, $3.10; buckwheat, $2.60; rice, $1.90; barley, $1.60; all f.o.b. New York harbor.

Bituminous

The Atlantic Seaboard soft-coal trade is dull so far as current business is concerned, but fair shipments are being made upon season contracts. Lack of water-transportation facilities is still the feature of the business at this time. Trade in the far East is calling for considerable coal, and it is reported that some consumers are a little short. Consumers in this territory are not putting in their stocks to the extent they would if the winter freight rates were not prevailing. Trade along the Sound has quieted down and orders from this district are simply regular contract business.

New York harbor trade is dull and prices are low; good Clearfield coal is being offered at $2.40 f.o.b. New York harbor shipping ports. All-rail trade is quiet; most consumers have fair stocks on hand and are not ordering for present delivery to any extent. Transportation from mines to tide is fairly good. Car supply is satisfactory when the embargoes are not considered. Main-line railroad superintendents are using their embargoes with the producers to an extent which injures business. Shippers are unable to calculate when their supplies will be cut off, with or without cause, and without notice being given.

In the Coastwise vessel market vessels are scarce, and in good demand. Current rates of freight are quoted as follows: From Philadelphia to Boston, Salem and Portland, $1.10@1.15; to Portsmouth, $1.15@1.20; to Lynn, Newburyport, Saco, Bath, Gardiner and Bangor, $1.25; to the Sound, 90c., with towages where usual.

Birmingham

June 24. The convention of the Alabama district No. 20, United Mine Workers of America, adjourned *sine die* Thursday of the past week, resolutions being adopted that the matter of making a contract with the commercial coal operators who recognize union labor be left to the district officers; it was understood that the concessions asked for by the

operators, that pay days be monthly instead of semi-monthly and that a rule be established allowing each miner a laborer, should be disallowed. The commercial operators at a meeting held on Saturday instructed their scale committee to insist on the concessions and this association adjourned *sine die* also. This means that if the two bodies cannot get together between now and July there is likely to be a suspension of work. The commercial coal operators claim that they are at a disadvantage in that the non-union mines have but one pay day a month, which means that trouble and expense in the double pay day are avoided and again the miners are inclined to work steadier with only one pay day a month. They further claim that the non-union mines permit the miners to have a day laborer and as a consequence many of the union men are leaving the union mines and going to the non-union mines. The resolutions adopted by the union miners cries down the labor or contract system and forbids the district officials granting the concession. W. B. Wilson, the national secretary of the United Mine Workers of America, was here and in his talk to the miners said that he believed that President John Mitchell would give the miners of Alabama moral and other support in their contention. The organization in this State has a membership of something over 3000. Of this number between 700 and 1000 work for the Alabama Consolidated Coal and Iron Company, which signed a wage contract with the union. The Alabama Consolidated is the only iron company in Alabama recoginzing the miners' union.

Chicago

June 24—Summer dullness seems to be upon all branches of the coal trade. With the coming of warm weather over Chicago territory generally the wholesalers look for no briskness in sales until the harvesting business begins. Business, however, is generally in better condition than is usual at the opening of summer. There is yet little demurrage coal forcing down prices, though it must be said that the amount of coal on tracks is increasing, shipments having been large from the mines. Prices in consequence are fairly strong, though showing a tendency to weaken.

Illinois and Indiana domestic coals have little sale and steam coals are running to fine sizes with the better grade of screenings strengthening. Lump and egg sell for $1.85@2.05, [illegible] and screenings for $1.35@1.65. Eastern coals are not selling actively, but demurrage is not so threatening as in the case of western coals, shipments being well restricted in general. Smokeless brings $3.15@3.35 [illegible] and $3.40@3.65 for lump and egg. Hocking is quiet at $3.15. Anthracite is featureless as regards new business, and Pittsburg and Youghiogheny are in light demand.

Cleveland

[illegible] taken a decided slump during the past week and, as a heavy supply is accumulating, dealers are sacrificing prices. Par[illegible] receipts during the week from the Pittsburg and southern Ohio fields. Pittsburg grade is bringing 50c at the mine and $1.45@1.55 on track here. No. 8 is quoted at $[illegible] and run-of-mine 10 to 15c. less. Pittsburg grade is quoted $2@2.10, maintaining a steadier market than the other coals on account of heavy consumption.

An item of interest to the local trade has been the ruling by the Pennsylvania that no more steel hoppers will be brought into the city over the Baltimore & Ohio as it wishes to reserve the cars for the lake trade. Its effect will be to add further switching charges to deliveries.

Columbus, Ohio

June 22—The new car service rules, established by the State commission, which give 72 hours of free unloading time on cars of 60,000 lb. and over, will not go into effect until Aug. 1. After a recent discussion of the situation this delay was granted by the Ohio Railroad Commission. Under the original order of this body the rules were to have been in force on and after May 15. The railroads asked for further time, on the plea that they could not get their new tariffs filed with the Interstate Commerce Commission 30 days before the proposed change, as required by law. The commission then extended the time until June 15 under the impression that the rules would then be accepted without contest. Subsequently there was a concerted movement to fight them. This fell through, but the railroads failed to qualify before the Interstate Commerce Commission with the 30 days' notice, and the latter body, though solicited by the Ohio commission to waive this technicality, refused to do so. As the majority of the railroads of the State have agreed, individually, to accept the rules, the further extension was granted, in the expectation of a peaceable settlement. Among the roads who will [illegible] with the rules without controversy are the Hocking Valley and the Pennsylvania; and it is doubtful whether any resistance will be made by the other lines.

Pittsburg

June 25—There is but little change in the coal market this week. Prices are fairly strong, except for slack, there being a further decline for early delivery. [illegible] The bulk of the business is being done on the basis of $1.05@1.10. The demand for delivery in the last half 85c is quoted. Mine run coal is quoted at $1.05@1.10. [illegible] to [illegible] and [illegible] half furnace coke is quoted at $2.50@2.75. Foundry coke for prompt and second half [illegible]

[illegible] to points west of Connellsville, 8,048 cars; to points east of Connellsville, 840 cars.

Foreign Coal Trade

The production of coal in the German Empire for the four months ended April 30, is reported as follows, in metric tons:

Coal	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]
Coke	[illegible]	[illegible]	[illegible]
Briquets	[illegible]	[illegible]	[illegible]

A large proportion of the briquets is made from brown coal, or lignite.

Imports of coal into Germany for the four months ended April 30 were, in metric tons:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

1057 tons.

Exports of coal from Germany for the four months ended April 30 were, in metric tons:

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

the United States.

Exports of fuel from Great Britain, with coal sent abroad for use of steamers in foreign trade, for the five months ended May 31, were as follows, in long tons:

	1906.	1907.	Changes.
Coal	[illegible]	[illegible]	I. 2,072,006
Coke	287,452	354,356	I. 66,904
Briquets	660,572	573,885	D. 86,687
[illegible]	[illegible]	[illegible]	I. 2,112,253
Steamer coal	[illegible]	7,592,875	I. 54,861
Total	30,708,660	32,885,774	I. 2,167,114

The total increase this year was 7.1 per cent. Exports of coal to the United States, included above, were:

	1906.	1907.	Changes.
Atlantic ports	20,384	7,321	D. 13,063
Pacific ports	20,463	15,679	D. 4,784
Total	40,847	23,000	D. 17,847

The larger exports this year were 4,507,011 tons to France; 3,382,734 to Germany; 3,371,836 to Italy; 1,204,388 to Sweden.

Iron Trade Review

New York, June 26—The usual summer dullness has affected the Western and Eastern markets, but in the Alabama field there seems to be a continued activity and it is predicted that the June production will be at least 5 per cent. more than in May. However, buying has quieted down generally, and the foreign market has weakened on account of the cessation of new business from this country. Consumers who have contracted are incessant in their demands, and there seems to be no let up along manufacturing lines. In the South a number of new furnaces are nearly completed and several are about ready to blow in. The demand for pig iron in the East is confined to basic iron which is offered at 50c. less. Foreign iron is also off 50c., with no takers.

One of the interesting topics of the week in steel circles was the announcement that the Carnegie Steel Company had notified the Pennsylvania Railroad that in order to roll the rails, to be ordered by that road for next year, under what are known as the "Cassatt specifications," it would be necessary to ask $33 a ton, or $5 above the regular price, for standard bessemer steel rails. The Pennsylvania estimated its requirements for 1908 at 142,000 tons, but deferred placing the contract until the railmakers had figured on the cost. The quality of rails desired under the specifications furnished has not been made public as the secret has been carefully guarded. It is merely a rumor that the Pennsylvania will not pay the price asked.

Baltimore

[illegible]

iron. Receipts of iron ore were 4900 tons from Cuba. There was also recived 5200 tons of manganese ore from India.

Chicago

June 24—The iron market is dull and signs indicate indefinite continuance of this condition. Sales are for small quantities and quick-delivery. Pig-iron is about 50c. lower than a week ago. Contract iron holds to practically the same quotations, but there is little contract business being done. The market is a waiting one; both sellers and buyers, however, expect this in the normal course of summer business. Such buying as is occurring is for lots to piece out requirements, with here and there an order placed for fourth quarter of 1907 and first quarter of 1908 delivery.

On general sales Southern brings, for quick delivery, about $22@22.50, Birmingham ($26.35@26.85 Chicago) and Northern $26@26.50. For fourth-quarter delivery Southern brings $20@20.50, and Northern iron, $25.50@26. Lake Superior charcoal sells at $27.50 for quick delivery.

Cleveland

June 25—There is little news in the lake trade. Heavy receipts from upper lake ports continue to swell the iron-ore stocks on the docks.

Pig iron has ruled dull with a small volume of business handled. Quotations are hanging around $21.50 for deliveries during the first half of 1908, at furnace. Last-quarter delivery is quoted around $22.50@22.75. Prices show little change from last week. No. 1 Northern foundry is quoted at $24.50 for last-half delivery; No. 2 $24; No. 3 $23.50; bessemer $23.90; No. 2 Southern $24.35; gray forge $22.50.

Pittsburg

June 25—Despite the dullness in the iron and steel markets as to new buying, reports given out this week by large interests show that more business has been booked so far than in any previous year, and that the mills will have some difficulty in filling orders in some of the principal lines this year. This is notably the case in merchant pipe and boiler tubes, plates and steel and iron bars. A representative of one of the largest producing concerns in this district declared today that he would welcome an entire cessation of orders for a month, as it would give his company time to arrange for filling the orders already placed. He said that while there are no large contracts being made the aggregate of the small orders taken since the first of the month is enormous.

The closing of the big new steel plant of Milliken Brothers, on Staten Island, has affected the market in the Pittsburg district. It developed today that the concern had contracted heavily for both bessemer and basic pig iron from the Valley furnaces and also had been a large buyer of heavy melting scrap. This material is rapidly being resold, but as the contracts were at top prices the sellers will likely be the losers. Some secrecy is being observed regarding the resale of the material, but it is understood all will be out of the market before the end of the week. The failure of the new company will benefit some producers of structural material who have some open capacity, as the orders booked will necessarily have to be transferred. A great deal of this business is expected to go to Eastern mills.

The sheet and tin-plate mills have made some progress in catching up on deliveries, and are booking business for the fourth quarter at the same prices as have prevailed since the opening of the year. As outlined in the last report, the American Sheet and Tin Plate Company refused the demands for an advance in wages made by the Amalgamated Association of Iron, Steel and Tin Workers. After a three days' conference the Amalgamated withdrew its demands and the company signed the scales for another year dating from July 1. Another conference on the iron wage scale opened this morning in Detroit between representatives of the Western Bar Iron Association, and the Amalgamated. Unless demands for an advance are withdrawn it does not seem likely that a settlement will be reached. No trouble is expected by the manufacturers, who express confidence that the present agreement will be renewed for another year.

Pig Iron—Outside of a few small sales of all grades of pig iron and the resale of 5000 tons of bessemer iron bought by Milliken Brothers to the Jones & Laughlin Steel Company there have been no transactions of any consequence. The price paid for the resale iron is not made public. For prompt delivery, bessemer prices have declined to $23.50, Valley furnaces. This is regarded as the maximum price for delivery during the next few weeks. Buying for second half has stopped, and when it begins prices are likely to be a trifle lower. No. 2 foundry iron for June delivery remains around $24.50, Valley furnaces, but there have been no sales on which a quotation can be made. Gray forge is unchanged, and is quoted nominally at $22.90, Pittsburg.

Steel—The Cambria Steel Company continues to sell bessemer billets, the latest contract calling for 7000 tons. Bessemer billets are quoted at $30, and open-hearth at $31 to $32, Pittsburg. Sheet bars remain at $31, steel bars at 1.60c., and plates at 1.70c.

Sheets—The sheet market is fairly active, although there have been no particularly large sales lately. All the mills are well filled with orders. The American Sheet and Tin Plate Company [illegible]

...ating at 67 to 172 days' sight, and has booked enough business to keep them going steadily until the fourth quarter. Prices remain unchanged, brass tubing quoted at 2.60c. and galvanized at 3.75c. for No. 28 gage.

Lake Market. The market is quiet and prices are firm, spot and July being quoted for spot and $63.50@64 for last-half delivery.

Metal Market

NEW YORK, June 26.

Gold and Silver Exports and Imports

At All United States Ports in May and year.

Metal.	Exports.	Imports.	Excess.
Gold.			
May 1907..	$4,506,414	$ 2,641,870	Exp. $ 1,864,544
" 1906 .	5,722,148	44,911,428	Imp. 39,189,280
Year 1907	12,410,167	29,286,064	Imp. 16,875,897
" 1906..	28,934,422	20,108,626	Imp. 8,825,796
Silver.			
May 1907..	1,926,219	3,196,458	Imp. 1,270,239
" 1906 .	5,599,546	4,465,959	1,133,587
Year 1907	23,858,136	18,503,165	5,354,971
" 1906..	28,918,841	19,916,816	9,002,025

These statements cover the total movement of gold and silver to and from the United States. These figures are furnished by the Bureau of Statistics of the Department of Commerce and Labor.

Gold and Silver Movement, New York

For week ending June 22 and years from Jan. 1

Period.	Gold.		Silver.	
	Exports.	Imports.	Exports.	Imports.
Week.....	$ 6,172,038	$ 61,100	$ 857,344	$ 38,171
1907.....	14,156,500	5,676,514	13,854,000	815,452
1906.....	5,704,521	44,691,293	29,815,137	1,028,200
1905.....	33,521,946	5,827,407	15,487,892	1,820,098

Exports of gold for the week were chiefly to Paris and London; of silver, to London. Imports for the week, both gold and silver, were from the West Indies and South America.

The joint statement of all the banks in the New York Clearing House for the week ending June 22, shows loans $1,134,352,100, a decrease of $5,403,100; deposits, $1,100,582,..., an increase of $7,200,100, as compared with the previous week. Reserve accounts show:

	June 22.	June 15.
Specie	$188,...,800	$200,...,200
Legal tenders	81,...,500	4,...,100
Total reserve	$273,...,300	$282,...,300
Surplus	$10,...,075	$ 1,...,000

The surplus over legal requirements this year shows an increase of $1,111,075, as compared with the previous week.

Specie holdings of the leading banks of the world, June 22, are reported as below, in dollars:

	Gold.	Silver.	Total.
Aus.-Hung. Bk.			$...,...,...
England	$19,...,...		19,...,...
France	136,...,...	$109,...,...	245,...,...
Germany	119,...,...	...,...,...	...,...,...
Spain	7,...,...	...,...,...	...,...,...
Netherlands	26,...,...	28,...,...	54,...,...
Belgium	15,...,...	...,...,...	...,...,...
Italy	121,...,...	24,...,...	145,...,...
Russia	81,...,...	35,...,...	116,...,...
Aust.-Hungary	46,...,...	6,...,...	52,...,...
Sweden	10,...,...	...,...,...	10,...,...

The banks of England and Sweden report gold only. The New York banks do not separate gold and silver in their reports. The [illegible] for [illegible] and Germany [illegible] Imperial Bank of Germany.

Shipments of silver from London to the East are reported by Messrs. Pixley & Abell, as follows, for the year to June 13:

	1906.	1907.	Increase.
[illegible]	£...,...,...	£...,...,...	£...,...,...
Calcutta	£...,...	£...,...	£...,...
[illegible]	£...,...	£...,...	£...,...
[illegible]	£...,...,...	£...,...,...	£...,...,...

Imports for the week were £93,000 from China, £2000 from the West Indies, £180,... from New York, a total of £...,... Exports were £13,500 to the Straits, £243,300 in bars, and £68,000 in Mexican dollars to India; £324,800 in all.

Indian exchange has been strong, the Council bills offered in London being taken at an average of 16.09d. per rupee. The shipments of silver to India have not been heavy.

Prices of Foreign Coins

	Buying.	Selling.
Mexican dollars	$...,...	$...,...
Peruvian sols	...,...	...,...
Chilean peso	...,...	...,...
Bolivian boliviano	...,...	...,...
Twenty francs	...,...	...,...
Spanish [illegible]	...,...	...,...

SILVER AND STERLING EXCHANGE.

June.	Sterling Exchange.	Silver. New York.	Silver. London.	June.	Sterling Exchange.	Silver. New York.	Silver. London.
20	4.87...	...	24...	24	4.87...	...¾	43...
21	4.87...	...	24...	25	4.87...	...¼	43...
22	4.8735	...	24...	26	4.87...	...¼	43¼

New York quotations are for fine silver, per ounce Troy. London prices are for sterling silver, 0.925 fine.

Other Metals

	Copper.			Tin.	Lead.	Spelter.	
June.	Lake, per lb.	Electrolytic, per lb.	Casting, per lb.	Straits, per lb.	New York, per lb.	New York, per lb.	St. Louis, per lb.
20	23¾	23...	...	46	4.50	6.35	6.20
21	24	23...	...	...	4.50	6.35	6.20
22	24	23...	...	...	4.50	6.35	6.20
24	24	23...	...	46¾	4.50	6.35	6.25
25	24	23...	...	45	4.50	6.35	6.20
26	23¾	23...	...	45	4.50	6.35	6.20

London quotations are for [illegible] copper, which is [illegible] New York. The [illegible] quotations are for [illegible] New York [illegible] London quotations are [illegible] New York [illegible] The [illegible] prices are [illegible] Sundays and [illegible] [illegible] [illegible]

The John Wahl Commission Company reports as follows: Lead is dull and lower. Missouri brands are freely offered at 5.62½ and are unsalable above 5.60, and only in limited quantities at that.

Spelter—The market is rather quiet, and smelters appear to be more anxious for orders than they have been for some time past. As a result there has been a further decline, the close being quoted at 6.35@6.45c., New York and 6.20@6.30c. St. Louis.

The European market is heavy and a further decline has brought the quotation down at the close to £24 5s. for good ordinaries and £24 10s. for specials.

Zinc Sheets—The base price is now $8.60 per 100 lb. (less discount of 8 per cent.) f.o.b. cars at Lasalle and Peru, in 60-lb. case for gages No. 9 to 22, both inclusive; widths from 32 to 60 in., both inclusive; the lengths from 84 to 96 in., both inclusive. The freight rate to New York is 27.50c. per 100 pounds.

Antimony—The market continues very weak, with buying of only hand-to-mouth character, and a downward tendency of prices. Quotations are 14½@15c. for Cookson's; 12½@13½c. for Hallett's; and 11@12c. for ordinary brands.

Nickel—For large lots, New York or other parallel delivery, the chief producer quotes 45@50c. per lb., according to size and terms of order. For small quantities prices are 50@65c., same delivery.

Quicksilver—Current prices in New York are $41 per flask of 75 lb. for large quantities and $42 for smaller orders. San Francisco orders are $38@39 per flask, according to quantities, for domestic orders, and $37@37.50 for export. The London price is £7 per flask, but £6 16s. 3d. is quoted by jobbers.

Platinum—There is little to report in the local market further than the belief held by refiners that the downward course of the market has been checked and that prices are at the low point. No change in prices has occurred and quotations remain as follows: Ordinary metal, $26 per oz.; hard metal, $28.50. Scrap is quoted at $20@21 per ounce.

British Metal Imports and Exports

Copper—Imports and exports of copper in Great Britain for the five months ended May 31, were as follows, in long tons; the totals giving the copper contents of all material:

	1906.	1907.	Changes.
[illegible]	16,958	14,457	I. 5,499
[illegible]	28,444	25,802	D. 2,642
[illegible]	45,402	40,259	D. 5,143
[illegible]	28,678	26,931	D. 1,747
[illegible]	16,681	17,822	I. 1,141
[illegible]	9,043	10,568	I. 1,525
[illegible]	6,666	7,032	I. 366
[illegible]	1,772	1,772	D. 10,103

Of the imports this year the United States furnished 98 tons of matte and 9185 tons of fine copper; against 1995 and 9286 tons, respectively, last year.

Tin—Imports and exports of tin in Great Britain for the five months ended May 31, were as follows, in long tons:

	1906.	1907.	Changes.
Straits	14,502	13,854	D. 648
Australia	1,711	2,305	I. 594
Other countries	1,212	1,396	I. 184
Total imports	17,425	17,555	I. 130
Exports	3,268	3,892	I. 624
Re-exports	13,456	11,798	D. 1,658
Total exports	16,724	15,690	D. 1,034
Balance, imp.	701	1,865	I. 1,164

Imports of tin ore and concentrate were 8839 tons in 1906, and 8340 tons in 1907; a decrease of 499 tons. Of the imports this year 6597 tons were from Bolivia.

Lead—Imports and exports of lead in Great Britain for the five months ended May 31 were, in long tons:

	1906.	1907.	Changes.
United States	8,723	6,467	D. 2,256
Spain	46,110	46,926	I. 816
Australia	21,055	21,361	I. 306
Germany	8,059	2,962	D. 5,097
Other countries	1,685	4,269	I. 2,584
Total imports	85,632	81,985	D. 3,647
Exports	18,487	22,411	I. 3,924
Balance, imports	67,145	59,574	D. 7,571

The lead credited to the United States is chiefly Mexican lead, refined here in bond.

Spelter—Imports and exports of spelter in Great Britain for the five months ended May 31 were, in long tons:

	1906.	1907.	Changes.
Spelter	35,922	38,590	I. 2,668
Zinc sheets, etc	7,727	9,009	I. 1,282
Total imports	43,649	47,599	I. 3,950
Exports	3,101	2,125	D. 976
Balance, imports	40,548	45,474	I. 4,926

Imports of zinc ore are not reported separately.

Quicksilver—Imports of quicksilver into Great Britain for the five months ended May 31 were 1,559,882 lb. in 1906, and 2,768,636 lb. in 1907; an increase of 1,208,754 lb. Re-exports of imported metal were 922,448 lb. in 1906, and 1,049,251 lb. in 1907; an increase of 126,803 lb. this year.

Missouri Ore Market

Joplin, Mo. June 22—The highest price paid for zinc ore was $51 per ton, on an assay base of $46 to $48 per ton of 60 per cent zinc. The average price was $[illegible].

The highest price for lead concentrate was $76 per ton, a decrease of $2, medium grades selling from $71 to $75, per ton, the average was $73.

It developed late tonight that a threatened advance of $1 per ton on all the better grades of zinc ore was averted by one purchasing company turning over to another a large part of its purchases, the occasion being a shortage in the output at the mines from which the company threatening the increase was drawing its supplies. The smelters realize that any movement toward an advance at this time might cause an upward start that would be hard to check, owing to the very susceptible condition of the market. There is little unsold stock in the bins, except a few large lots that are held for a base price of $50 per ton.

The purchasing agents for the lead smelters made little effort to secure ore, all offerings being on a much lower plane than the previous week, consequently there is considerable unsold lead in the bins. Buyers can see no ray of hope ahead for better prices, but some sellers expect a change for the better after the middle of July.

Following are the shipments of zinc and lead from the various camps of the district for the week ending June 22.

	Zinc, lb.	Lead, lb.	Value.
Webb City Carterville	3,336,100	626,840	$101,277
Joplin	2,151,810	206,630	59,185
Duenweg	1,378,790	88,230	35,621
Alba-Neck City	1,407,720	.....	34,489
Galena-Empire	1,162,630	132,500	32,166
Granby	670,000	92,000	13,996
Prosperity	467,270	79,440	13,660
Aurora	865,210	.....	11,196
Badger	364,710	.....	9,100
Oronogo	203,160	21,290	5,324
Spurgeon	168,560	58,670	5,146
Baxter Springs	127,320	.....	2,974
Carthage	112,670	.....	2,760
Sherwood	60,450	15,960	2,003
Sarcoxie	60,930	.....	1,401
Totals	12,537,330	1,315,560	$330,288
25 weeks	303,228,280	46,902,600	$8,986,886
Zinc value, the week, $282,266; 25 weeks, $7,084,582			
Lead value, the week, 48,022; 25 weeks, 1,902,304			

Average prices for ore in the district, by months, are shown in the following table:

ZINC ORE AT JOPLIN.			LEAD ORE AT JOPLIN.		
Month.	1906.	1907.	Month.	1906.	1907.
January	47.38	45.84	January	75.20	83.53
February	47.37	47.11	February	72.83	84.58
March	42.68	48.66	March	73.73	82.75
April	44.63	48.24	April	75.13	79.76
May	40.51	45.98	May	78.40	79.56
June	43.83	.....	June	80.96	.....
July	43.25	.....	July	74.31	.....
August	43.56	.....	August	75.36	.....
September	42.58	.....	September	79.64	.....
October	41.55	.....	October	79.84	.....
November	44.13	.....	November	81.98	.....
December	43.68	.....	December	81.89	.....
Year	43.24	.....	Year	77.40	.....

Wisconsin Ore Market

Platteville, Wis., June 22—Zinc prices for the week suffered no material change and 60 per cent. ore was in good demand; the usual brisk market for the lower grades was maintained. The majority of the producers are still confident that 60 per cent. will not go below the $40 mark and many say it will not reach $42. The highly satisfactory returns at these figures assures a continuance of prosperity and increased output for the Platteville district at least. One of the most noticeable things in this zinc field is the steady even

will of the latter (apparently) is but it appears to be permanent. The Union [illegible] that the latest purchase in the Platteville camp was [illegible] [illegible] the [illegible] and [illegible] [illegible] loading, and the [illegible] [illegible] will not show up as well as it would [illegible] ideal for a large output and the roads were good but a shortage of teams and cars compelled the shippers to leave a great deal [illegible] all reported as sold, consequently it can be said that there is no surplus in the Platteville district.

Lead prices were off, considerable 75 per cent. ore selling at $35. Some producers said that they would not sell on a falling market. The recent opening of one or two good lead mines shows conclusively that the early mines did not get all of the richer deposits. All of the recent strikes have been made in new locations which promises well for the future of the Platteville district.

Shipments of the district, by camps, for week ending June 22, were as follows:

Camps	Zinc, lbs.	Lead, lbs.	Value
Platteville	458,180		
Rincombe-Hazel Green	695,750		
Benton	274,000		
Linden	140,150		
Highland	[illegible]	[illegible]	[illegible]
Cuba City	73,500		
Galena	52,500		
Rewey	140,000		
Livingston	140,000		
Mineral Point	87,500		
Harker	61,250		
Total for week	[illegible]	[illegible]	[illegible]
Year to June 22	[illegible]	[illegible]	[illegible]

Chemicals

New York, June 26. The general chemical trade shows no new developments, business continuing generally good and prices easily maintaining themselves.

Copper Sulphate—There [illegible] during the week and outside of the regular consuming lines little or no business was done. Prices remain stationary at $7.50 per 100 lb. [illegible] for smaller quantities depending upon terms of sale.

Nitrate of Soda—The market is practically the same as reported last week. The demand is strong and supplies are far from plentiful; hence the price is easily maintained at 2.55c. for 96 per cent., 1907 delivery with 95 per cent. at 2.47c. For next year's delivery for these grades, [illegible] respectively.

[illegible] report shipments of phosphate rock through the port of Savannah, Ga., for May 1907 as follows: To Germany, 10,171 tons; to the Netherlands, 4414; to England, 2140; total, 16,725 tons.

Sulphur—[illegible] market report from Messina, Italy, under date of June 1, states that the election of [illegible] will in future be intrusted, has taken place, but the names of those elected are [illegible] to say whether or not the party in favor of repudiating the agreement with Mr. Frasch has gained control. The necessity of changing the hitherto inactive methods has, however, become imperative [illegible] the large stock begins to press on the market. According to the official bulletin of the mines [illegible] exports during January to April were diminished by 32,000 tons compared with the same period last year. The feeling that Sicily cannot completely surrender the American market gains ground. Of course a reduction of the output might needfully be enforced, but the authorities dread internal troubles and strikes of the mining population, which would certainly ensue. They will therefore resort to similar [illegible] may have failed.

As a palliative remedy, and in order to encourage the sulphuric-acid industry in Sicily, the Italian government authorizes the sale of sulphur to Sicilian acid manufacturers at reduced prices. This ordinance may probably call into life a number of acid factories, but whether it will be sufficient to dispose of the increasing stock without necessitating the remodeling of the agreement with Mr. Frasch remains an open question.

Exports of sulphur from Italy during April were 44,130 tons, against 49,529 tons in the same month of 1906. The total exports from January to April, 1907, inclusive, were 151,062, compared with 182,266 tons during the same period of 1906. Visible stocks in Sicily at the end of April were 495,203 tons. This compares with 425,448 tons in 1906 and 309,481 tons in 1905.

[illegible] heavy chemicals from Great Britain for the five months ended May 31, were as [illegible]

	[illegible]	[illegible]	[illegible]
Bleaching powder	[illegible]	[illegible]	[illegible]
Manufactured alkali	[illegible]	[illegible]	[illegible]
Soda ash	[illegible]	[illegible]	[illegible]
Bicarbonate of soda	[illegible]	[illegible]	[illegible]
Caustic soda	[illegible]	[illegible]	[illegible]
Soda crystals	[illegible]	[illegible]	[illegible]
Soda, sulphate	[illegible]	[illegible]	[illegible]
Sulphuric acid	[illegible]	[illegible]	[illegible]

[illegible] tons in 1906, and 35,490 in 1907; an increase of [illegible] tons.

Imports of chemicals and raw materials into Great Britain for the five months ended [illegible] were as follows:

	[illegible]	[illegible]	[illegible]
Nitrate of potash	[illegible]	[illegible]	[illegible]
Nitrate of soda	[illegible]	[illegible]	[illegible]
Phosphates	[illegible]	[illegible]	[illegible]
Sulphur	[illegible]	[illegible]	[illegible]

Exporting [illegible] of sulphuric acid [illegible] 1907 [illegible] tons, against [illegible] tons in 1906, and [illegible] tons in 1905.

Mining Stocks

[illegible] Consolidated Copper showed more strength and closed [illegible] Amalgamated [illegible] strength and closed [illegible] Mining [illegible] Boston [illegible] Consolidated [illegible] Copper [illegible] Consolidated [illegible] Copper [illegible] Consolidated [illegible] Copper

... being 3100. Nevada-Utah has been firm and active on the curb.

Colorado Springs

June 21—The trading on the local stock market has been dull and listless. The entire week's sales have amounted to only about 75,000 shares. The most active traders this week have been Dante, Doctor Jack Pot, Work and Pharmacist.

Work has been resumed on the deep drainage tunnel in Cripple Creek by the Tunnel company; the contractors, becoming discouraged, threw up their contract on it. The Tunnel company expects to push the work rapidly to completion.

STOCK QUOTATIONS

NEW YORK June 25	
Name of Comp.	Clg.
Alaska Mine	1
Am. Nev. M. & P. Co.	...
Amalgamated	84 ¼
Anaconda	57
Bainakiala	...
British Col. Corp.	8½
Buffalo Cobalt	2¾
Butte & London	1 ¾
Butte Coalition*	24 ½
Butte Cop. & Zinc	...
Cobalt Contact	50
Colonial Silver	2
Cum. Ely Mining	7
Davis Daly	1½
Dominion Cop.	53
El Rayo	5
Foster Cobalt	60
Furnace Creek	...
Giroux Mine	8
Gold Hill	2
Granby, New	...
Greene Gold	1 ⅝
Greene G. & S.	1
Greenw'r & D. Val.	75
Guanajuato	3 ⅝
Gurgen. Exp.	212 ½
Hancock	40
McKinley Dar.	1 ½
Micmac	6 ½
Mines Co. of Am.	1 ½
Mitchell Mining	2
Mont. Shoshone	1 ½
Nev. Utah M. & S.	3 ½
Newhouse M. & S.	18
Nipissing Mines	11 ¼
Old Hundred	27
Silver Queen	1 ½
Stewart	2
Tennessee Copper	50
United Copper	1
Utah Apex	6 ¾
West Columbus	11

N. Y. INDUSTRIAL	
Am. Agri. Chem.	17
Am. Smelt. & Ref.	114 ¾
Am. Sm. & Ref. pf	108
Bethlehem Steel	10½
Colo. Fuel & Iron	41
Federal M. & S. pf	77
Inter. salt	58
National Lead	60
National Lead, pf.	107
Pittsburg Coal	20
Republic I. & S.	42
Republic I. & S., pf.	92
Sloss-Sheffield	58
Standard Oil	602
Tenn. C. & I.	70
U. S. Red. & Ref.	37
U. S. Steel	44 ¾
U. S. Steel, pf.	107 ¾
Va. Car. Chem.	41
Va. I. Coal & Coke	61

BOSTON June 25	
Name of Comp.	Clg.
Adventure	23¼
Allouez	45
Am. Zinc	35⅝
Arcadian	4¾
Atlantic	12
Bingham	14⅝
Boston Con.	25¾
Calumet & Ariz.	157
Calumet & Hecla*	800
Centennial	27
Con. Mercur	....
Copper Range*	78⅝
Daly-West*	15¾
Franklin	14¾
Greene—Can.	....
Isle Royal	19¾
La Salle	13¾
Mass.	5¾
Michigan	12½
Mohawk*	78⅝
Mont. & C. (new)	3¼
Nevada	....
North Butte	79
Old Colony	....
Old Dominion	44¾
Osceola	136
Parrot	19
Phoenix	1¼
Quincy	116
Rhode Island	5
Santa Fe	2¾
Shannon	17
Tamarack	110
Trinity	22½
United Cop., com.	62¾
U. S. Oil	10⅝
U. S. Sm. & Ref.	47¾
U. S. Sm. & Ref. pf.	43
Utah Copper	51
Victoria	7
Washington	....
Winona	....
Wolverine	165
Wyandotte	....

*Ex. Div. †Ex. Rights.

BOSTON CURB	
Arizona	....
Ariz. Com.	....
Black Mt.	....
East Butte	¾
Hancock Con.	....
Keweenaw	2¾
Majestic	2¾
Bayard	1⅝
Shawmut	1
Superior	....
Superior & Pitts.	11¾
Trow. Mine	1¾

LONDON	
Name of Com.	Clg.
Tuolumne	£1 1s. 0d.
Stratton's Ind.	9 0 0
Camp Bird	1 10 0
Esperanza	1 1 0
Le Roi	1 1 0
Rosario	0 4 0
Treasury	....
Utah Apex	1 ....
Venture Cons. pfd	3 5 0
Arizona Comm. pf	3 7 0

Interest Strength Hay
Iler & Co., N. Y.

SAN FRANCISCO June 19	
Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.25
Best & Belcher	.70
Caledonia	.16
Challar	.07
Con. Cal. & Va.	.64
Crown Point	.22
Exchequer	.60
Gould & Curry	.15
Hale & Norcross	.50
Mexican	.41
Ophir	1.80
Overman	.12
Potosi	.09
Savage	.60
Sierra Nevada	.35
Union	.27
Utah	.05
Yellow Jacket	.75
TONOPAH STOCKS	
Golden Anchor	.20
McNamara	.29
Montana-Pitts. ex.	.10
North Star	.24
Rescue	.17
GOLDFI'D STOCKS	
Black Ants	.05
Blue Bull	.25
Columbia Mt.	.44
Comb. Frac.	2.55
Conqueror	.09
Daisy	1.15
Florence	1.60
Frances-Mohawk	1.00
Goldfield Con.	6.00
Grandma	.13
Great Bend	.51
Red Hills	.36
St. Ives	.34
BULLFROG STOCKS	
Amethyst	.34
Bonnie Claire	.54
Mayflower Con.	.02
Montgomery Mt.	.14
Original	.08
MANHAT'N STOCKS	
Gold Wedge	.05
Manhattan Mg.	.05
Pine Nut	.10
Ruby Wonder	...
Stray Dog	.16
Yellow Horse	.04

NEVADA June 26 (Weir Bros. & Co., New York)	
TONOPAH STOCKS	Clg.
Tono'h Mine of N.	14.37
Tonopah Exten.	1.70
Montana Tonop'h	3.00
Belmont	4.00
Tonopah Midway	1.25
West End Con.	.87½
Jim Butler	.98
GOLDFI'D STOCKS	
Sandstorm	.40
Kendall	.30
Red Top	2.75
Jumbo	2.75
Goldfield Mining	1.10
Dia'dfield B. B. C.	...
Atlanta	.48
Mohawk	13.00
Silver Pick	.54
Laguna	1.10
BULLFROG STOCKS	
Mont. Shoshone C.	6.00
Tramps Con.	.60
Gold Bar	.60
Bullfrog Mining	.16
Bullfrog Nat. B.	.21
Homestake Con.	...
MANHAT'N STOCKS	
Manhattan Con.	.48
Manhat'n Dexter	.13
Jumping Jack	.10
Stray Dog	.16
Indian Camp	.05

COLO. SPRINGS June 22	
Name of Comp.	Clg.
Acacia	9¾
Black Bell	...
C. C. Con.	...
Dante	4
Doctor Jack Pot	24½
Elkton	55
El Paso	42
Findlay	....
Gold Dollar	....
Gold Sovereign	4
Isabella	22
Index	....
Jennie Sample	5
Jerry Johnson	....
Mary McKinney	59
Pharmacist	5
Portland	....
Un. Gold Mines	8¼
Vindicator	79
Work	18¾

New Dividends

Company.	Payable.	Rate.	Amt.
Am. Smelting & Ref., com.	July 15	$2.00	$1,000,000
Am. Smelting & Ref., pfd.	July 1	1.75	875,000
Central C. & C., com.	July 15	1.50	76,875
Central C. & C., pfd.	July 15	1.25	23,438
Copper Range	July 1	2.00	767,562
Doe Run	June 15	0.50	29,531
Dominion Coal	July 2	1.00	150,000
Esperanza, Ltd.	July 18	1.32	600,600
Gen. Chemical, pfd.	July 1	1.50	150,000
Horn Silver	June 29	0.05	20,000
Inter. Nickel, pfd.	Aug. 1	1.50	131,123
Kerr Lake (Cobalt)	July 1	0.15	90,000
Kendall	June 24	0.03	15,000
Maryland Coal, pfd.	June 29	4.00	78,400
Mines Co. of Am.	June 26	0.02	40,000
New Idria	July 1	0.20	20,000
Nipissing	July 20	0.15	180,000
North Star	June 27	0.20	50,000
Shannon	July 1	0.50	150,000
St. Joseph	June 20	0.15	150,000
St. Mary's Mineral Land	July 1	1.00	150,000
Texarkian	July 1	2.00	....
Tonopah of Nev.	June	0.50	500,000
U. S. Smelting & Ref.	July 15	1.75	656,250

Assessments

Company.	Delinq.	Sale.	Amt.
Bullion, Nev.	June 10	July 2	$0.05
Challenge Con., Nev.	June 19	July 10	0.10
Edna King, Cal.	June 8	July 1	0.03
Forty-nine C. Nev.	July 8	July 30	0.05
Forty-nine G. Pl., U.	June 26	July 15	0.01
Homestake, Utah	June 25	July 30	0.20
India Con., Nev.	June 24	July 16	0.03
Mexican, Nev.	July 15	Aug. 5	0.10
Nev. Superior, Utah	June 17	July 5	0.10
Sacramento, Nev.	June 12	July 1	0.10
Silver Hill, Utah	June 15	July 1	0.02
Wasatch, Utah	June 17	July 2	1.25
Yellow Jacket, Nev.	July 3	Aug. 10	0.15

Monthly Average Prices of Metals

AVERAGE PRICE OF SILVER

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	65 288	68 .673	30 .113	31 .769
February	66 .108	68 .835	30 .464	31 .852
March	64 .597	67 .519	29 .854	31 .325
April	64 .765	65 .462	29 .984	30 .253
May	66 .976	65 .981	30 .968	30 .471
June	65 .394	.....	30 .185	.....
July	66 .105	.....	30 .113	.....
August	65 .949	.....	30 .529	.....
September	67 .927	.....	31 .488	.....
October	69 .523	.....	32 .148	.....
November	70 .813	.....	32 .671	.....
December	69 .050	.....	32 .003	.....
Year	66 .791	.....	30 .868	.....

New York, cents per fine ounce; London, pence per standard ounce.

AVERAGE PRICES OF COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1906.	1907.	1906.	1907.	1906.	1907.
January	18 .310	24 .404	18 .419	24 .825	78 .869	106 .739
February	17 .869	24 .869	18 .116	25 .236	78 .147	107 .356
March	18 .361	25 .065	18 .641	25 .660	81 .111	106 .594
April	18 .375	24 .224	18 .688	25 .260	84 .798	98 .625
May	18 .475	24 .048	18 .724	25 .072	84 .867	102 .375
June	18 .442	.....	18 .719	.....	83 .994	.....
July	18 .190	.....	18 .585	.....	81 .167	.....
August	18 .380	.....	18 .706	.....	83 .864	.....
September	19 .033	.....	19 .328	.....	87 .831	.....
October	21 .203	.....	21 .722	.....	97 .269	.....
November	21 .833	.....	22 .398	.....	100 .270	.....
December	22 .885	.....	23 .380	.....	106 .226	.....
Year	19 .278	.....	19 .616	.....	87 .282	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

AVERAGE PRICE OF TIN AT NEW YORK

Month.	1906.	1907.	Month.	1906.	1907.
January	36 .390	41 .548	July	37 .275	.....
February	36 .403	42 .102	August	40 .606	.....
March	36 .662	41 .313	September	40 .516	.....
April	38 .900	40 .938	October	42 .852	.....
May	43 .313	43 .149	November	42 .906	.....
June	39 .260	.....	December	42 .750	.....
			Av. year	39 .819	.....

Prices are in cents per pound.

AVERAGE PRICE OF LEAD

Month.	New York.		London.	
	1906.	1907.	1906.	1907.
January	5 .600	6 .000	16 .850	19 .828
February	5 .464	6 .000	16 .081	19 .531
March	5 .350	6 .000	15 .922	19 .703
April	5 .404	6 .000	15 .959	19 .975
May	5 .685	6 .000	16 .725	19 .688
June	5 .750	.....	16 .813	.....
July	5 .750	.....	16 .525	.....
August	5 .750	.....	17 .109	.....
September	5 .750	.....	18 .266	.....
October	5 .750	.....	19 .350	.....
November	5 .750	.....	19 .281	.....
December	5 .900	.....	19 .609	.....
Year	5 .657	.....	17 .370	.....

New York, cents per pound. London, pounds sterling per long ton.

AVERAGE PRICE OF SPELTER

Month.	New York.		St. Louis.		London.	
	1906.	1907.	1906.	1907.	1906.	1907.
January	6 .487	6 .732	6 .337	6 .582	28 .225	27 .125
February	6 .075	6 .814	5 .924	6 .664	26 .844	25 .938
March	6 .209	6 .937	6 .066	6 .787	24 .653	26 .094
April	6 .078	6 .685	5 .931	6 .505	25 .781	25 .900
May	5 .997	6 .441	5 .846	6 .291	27 .000	25 .563
June	6 .096	.....	5 .948	.....	27 .728	.....
July	6 .006	.....	5 .856	.....	26 .800	.....
August	6 .027	.....	5 .878	.....	26 .938	.....
September	6 .216	.....	6 .066	.....	27 .563	.....
October	6 .222	.....	6 .070	.....	28 .075	.....
November	6 .375	.....	6 .225	.....	27 .781	.....
December	6 .593	.....	6 .443	.....	27 .938	.....
Year	6 .198	.....	6 .048	.....	27 .020	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.

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